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Multivariate analysis of interrelations between facial anthropometric parameters, self-esteem, psychosocial wellbeing and body image after reconstruction of nasal soft tissue defects and aesthetic surgery

SUMMARY OF DOCTORAL DISSERTATION

Medicine and Health Sciences M 000,
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This dissertation was written between 2009 and 2019 at the Clinic of Rheumatology, Orthopaedics Traumatology and Reconstructive Surgery, Faculty of Medicine, Vilnius University.

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VILNIAUS UNIVERSITETAS

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Veido antropometrinių parametrų, savivertės, psichosocialinės gerovės ir kūno įvaizdžio sąsajų po nosies minkštųjų audinių defektų rekonstrukcijų ir estetinių operacijų daugiamatė analizė

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ABBREVIATIONS

A – Aesthetic group
BMI – body mass index
C – Control group
F – females
FE – face evaluation
FI – face index
Fig. – figure
FM – facial anthropometry
Gr. – group
M – males
MS -Microsoft
NI – nose index
PW – psychosocial well-being
SD – standard deviation
T – Trauma group
UCSF – University of California San Francisco
O – Oncology group
OR – odds ratio

SUMMARY

1. Introduction

The human face is a business card of each person, a self-introduction to the environment. The face is a unique, important source of information and communication that reflects identity, ethnicity, age, gender, attractiveness, emotions, and physical health condition (*Júnior and Marinho de Sousa, 2014; Jack and Schyns, 2017*). Most facial features are inherited (especially face width and other horizontal dimensions, size and shape of the nose), which means we can identify genealogy on the face (*Cole et al., 2017; Crouch et al., 2018*).

The face is a means of social communication that shows the world not only who we are but can also influence who we can become (*Menick,* 2010). It is the most expressive part of the body, with its exceptional sophisticated small mimic muscles, capable of reflecting endless moods and emotions. According to the evolutionary theory of the human mate search, the face partly reflects the partner‘s biological fitness (*Wade, 2000, 2010; Tutkuviene et al., 2016*). It usually measures sexual characteristics that reflect the activity of sex hormones; symmetry that indicates the quality of development and "mediocrity" (*Foo and Rhodes, 2017; Jones, 2019*). Mediocrity implies not being distinguished with marginal qualities. Medium faces are generally considered attractive because the set of features is close to the population's average (*Little and al., 2011*). Studies show that medium faces may be preferred over less than medium faces; this is again explained by the evolutionary theory - because of the "quality" of the chosen partner - medium faces indicate a person's biological quality, immunocompetence, proper embryogenesis, less likelihood of congenital anomalies (*Lindova and al., 2016; Mogilski, 2017*). Certain combinations of facial features are characteristic of congenital

syndromes or acquired diseases (*Sforza and al., 2004; Bashour, 2006; Little and al., 2011*).

Historically, artists, folk in folklore and even the first facial researchers have portrayed people with facial deformities as villains, criminals or immoral, mentally handicapped (*Sarwer et al., 2003*). No physical disability is as socially damaging as facial deformities. Crutches, wheelchairs, or other physical disabilities cause pity for those around you, while facial deformities cause anxiety, fear, and a desire to turn your eyes away. A person is judged on appearance, which is crucial to the first impression. It is "beauty bias" that is addressed in detail in various works as one of the key factors (*Rankin and Borah 2003; Sarwer et al.; 2003; Margraf et al., 2013; Mousavi et al., 2018*).

Physical attractiveness is considered to be one of the most effective factors of social interaction, while facial attractiveness (one of the subtypes of physical attractiveness) is more likely to attract attention (*Mousavi et al., 2018*). What makes a face attractive is the hot topic of many contemporary works (*Bashour, 2006; Little, 2014; Cai et al., 2018; Huang et al., 2018; Vučinić et al., 2019*). The prevailing trends are constantly changing not only in the concept of fashion, music, cooking and other elements of pop culture, but also in terms of face beauty and attractiveness. In 1960, emphasis was laid on "wide eyes", in 1990 – pale skin, angled cheekbones and sunken cheeks, in the new millennium - sophisticated beauty (*Sarwer et al., 2003; Dayan and Romero, 2018; Maymone et al, 2019*). Social and cultural factors play a considerable role in understanding facial attractiveness (*Zhuang et al, 2017; Cai et all, 2018*). Some studies have suggested that people tend to appreciate similarities with their facial features (*Alvarez and Jaffe, 2004; Lindova et al, 2016; Sherlock et al, 2017*). There are also contradictory studies arguing that the people's evaluation of the attractiveness of faces similar to theirs showed no obvious priority (*Sulutvedt and Laeng, 2014*).

Facial perception is a complex process involving several areas of the brain, including complex relationships between facial recognition, perception of emotions and attractiveness (*Júnior and Marinho de Sousa, 2014; Freiwald W, et al, 2016; Haas et al, 2016; Bègue et al, 2019*). People are experts in face recognition – recognising people at first sight is important for interpersonal relationships (*Maurer et al., 2007; Júnior abd Marinho de Sousa, 2014*). Studies have shown that even babies are able to identify a person's face. According to evolution theory, the face recognition function in a baby acts as a protective system – preference is given to familiar people, the same skin colour, etc. (*Pascalis and Kelly, 2009; Heron-Delaney at al., 2011*). Studies have confirmed the distinctiveness and importance of the face in the overall body context (*Little et al., 2011; Rahtz et al., 2018*). As a result, the effects of facial injuries are of paramount importance as they can cause greater psychosocial discomfort than the consequences of body injuries (*Rahtz et al., 2018*).

Taking into account its central position in the face, character and its prominence, the human nose plays an important role in assessing attractiveness as well as femininity or masculinity in the socio-cultural, ethical, and psychological context (Morrison et al., 2016; Mousavi et al., 2018). "A face without a nose is like a sundial without a gnomon. It focuses our attention - its colour, size and shape reflect the person's character. So everyone is ready to pay a high price to get a "new" nose", Sir Harold D. Gillies and D. Ralph Millard Jr. said (*Gillies and Millard, 1957*). This saying accurately describes the importance of the nose in human life. Nasal correction and reconstruction techniques have evolved as a result of technological capabilities, levels of societal well-being have also evolved leading to a change in understanding of the beauty of the nose across societies and individuals. Nasal surgery performed as a result of illnesses, traumas or due to aesthetic reasons, is not only related to the reconstruction of the nasal function, but also to the individual's desire

to meet the criteria of beauty, and to adapt to the assessments of the surrounding people (*Sarwer, et al., 2003; Sarwer et al., 2008*).

The importance of the nose in the context of facial attractiveness is still an acute topic addressed in the biomedical literature (*Perrett et al., 1994; Springer et al., 2008*). A number of morphometric studies have been carried out analysing the concept of the "ideal/perfect" nose and its proportions (*Farkas et al., 1986; Leong and White, 2006; Broer et al., 2012; Gao et al., 2016*). The attractiveness of the face or the nose is determined by the individual's personal characteristics (skull characteristics, individual attitude, education, psychological features), cultural factors and fashion of the country (*Farkas et al., 1986; Broer et al., 2012*). The concept of facial beauty, like that of the nose, has been changing. The definition of an attractive, aesthetic nose has also changed over the decades: a classical Greco-Roman European nose was popular in 1960, presently focus is laid on the nose with healthy, natural-looking contours, harmoniously matching the surrounding facial features and maintaining the human national identity (*Leong and White, 2006; Choi et al., 2013; Jayaratne et al., 2014; Gao et al., 2016*). The results of many studies continuously emphasize the uncertainty of the concept of the attractiveness of the nose. One of the aims of this research was to examine how the consequences of operations performed for different reasons on the same facial segment, nose, and facial changes are related to the subjects' self-esteem and psychosocial well-being.

Body image research is no less important and relevant in modern biomedicine. Various studies have been carried out on the importance of body image, its relation to physical condition, the course of treatment (after aesthetic operations, oncological diseases, traumas), the quality of life (*Sarwer et al., 2008; Margraf et al., 2013; Herruer et al., 2015; Sobanko et al., 2015; Tutkuviene J, et al., 2018*). Even though the body is perceived and evaluated in human life much later than the face, the body evaluation is of great importance not only for personal self-esteem but also for the quality of communication and

trust in the psychosocial space, etc. (*Heron-Delaney et al., 2011; Jauregui et al., 2013; Kamburoglu and Ozgur, 2007; Sobanko et al., 2018*). The concept of the ideal figure is greatly influenced by epochal, cultural, ethnic, social, economic factors as well as the media and standards of beauty promoted by the general public (*Cash and Fleming, 2002; Tutkuviene, 2002; Blond, 2008; Barlett, 2008; Murnen, 2011; Tylka and Wood-Barcalow, 2015; Webb, 2015; Pallotti et al., 2018*). The concept of the ideal figure is established on the basis of self-analysis and the opinion formed by others (*Jones et al., 2007; Thompson-Brenner et al., 2011; Webb et al., 2014; Ralph-Nearman and Filik, 2018)*. Research shows that body image disturbance is also caused by cancer of the head and neck (*De Boer et al., 1999; Ellis et al., 2019*). The purpose of this study was to examine how body image is related to facial changes due to various nasal operations.

There is an abundance of research found in the literature examining facial or nasal aesthetic operations, evaluating their remote outcomes, patient expectations, satisfaction, the impact of surgery on patients' future lives - self-esteem, changes in quality of life, psychosocial well-being, etc. (*Kamburoğlu and Ozgur, 2007; Broer et al., 2012; Galanis et al., 2015; O'Connor and Gladstone, 2017; Manevska et al., 2018*); fewer studies are found on addressing these factors after reconstructions of facial oncologic skin defects (*Mureau et al., 2007; Moolenburgh et al., 2009; Pepper et al., 2012; Martin et al., 2018; Schnabl et al., 2018; Vaiday et al., 2019*), and even fewer after reconstructing traumatic facial defects *(Lento et al., 2004; Levine et al., 2005; Auerbach et al., 2008*). No studies were found that would examine the characteristics of anthropometric dimensions, satisfaction, self-esteem, body image, and psychosocial well-being after operations performed on the same segment (the nose) for different reasons.

The fact that the effects of facial injuries or surgeries have an impact on human life is a common truth, yet there is a lack of research

carried out into which aspects of the human psychosocial state are most vulnerable or have the most damaging impact on the nose and the face. There is a lack of research carried out into identifying which areas of human life are most vulnerable and which aspects are important to the patients.

2. The aim of the study and objectives

The aim of this study is to investigate the anthropometric measurements of the nose, other facial and body parts in patients after nasal surgery due to trauma, cancer and aesthetic considerations, to examine the evaluation of the nose and the face, body image, self-esteem and psychosocial well-being, and to identify multiple correlations.

The objectives of this study:

1. To determine the measurements of the nose and other parts of the face and key body size indicators (height, weight, BMI) of men and women who have undergone nasal surgery for different reasons.
2. To investigate the attitudes of men and women who have undergone nasal surgery for different reasons, to the nose and other parts of the face, and to determine the relationship between subjective evaluation of parts of the face and anthropometric indicators.
3. To investigate the attitudes of men and women who have undergone nasal surgery for different reasons, to their body shape and body parts, and to determine the correlation between subjective evaluation of body parts and body size parameters.
4. To investigate the self-esteem and psychosocial well-being of men and women who have undergone nasal surgery for different reasons.
5. Using multidimensional cluster (correlation) analysis, to identify the relationships between the dimensions of the nose, face and body and the evaluation of the nose, the face, body image, self-esteem, and

psychosocial well-being between men and women who have undergone nasal surgery for different reasons.

3. The relevance and novelty of the study

The cult of appearance and beauty is an acute and frequently discussed topic in the scientific literature. Irreversible nasal deformities resulting from surgical interventions are common problems affecting the future life of people. An increasing number of nasal aesthetic surgeries demonstrate the importance of the appearance of the nose in evaluating the attractiveness of the modern face. The active lifestyle, more frequent trips to distant lands, the radiation of the sun trigger the accelerating incidence of oncology of the facial skin. This just once again confirms the relevance of the topic in question.

A number of studies have been carried out on the importance of the appearance of the nose, its dimensions and the relationship between the changes in the dimensions and the evaluation of attractiveness, self-esteem and psychosocial well-being following aesthetic surgery of the nose. There are far fewer studies examining these factors after nasal reconstructive surgery. The available scientific studies separately examine the effects of nasal reconstruction and aesthetic surgery on patient self-esteem and psychosocial life, focus is laid on narrow aspects. The complexity of this study made it possible to determine the differences between the evaluation of the nose, face and body appearance and their association with self-esteem and psychosocial well-being in men and women who underwent nasal surgery due to traumas, oncologic diseases and aesthetic needs.

The results of the study are useful to specialists in plastic and reconstructive surgery, oral and facial surgeons, dermatologists, oncologists, otorhinolaryngologists, psychologists, all the professionals dealing with patients who have undergone nasal surgery.

4. Materials and methods

4.1. Research environment, subjects, selection criteria

The study was performed at the Plastic and Reconstructive Surgery Department at Vilnius University Hospital Santaros Klinikos and at the Head and Neck Surgery Department of the National Cancer Institute. The permission to conduct a research study was granted by the National Bioethics Committee, No. 158200-06-196-46 of 2 June 2010.

The medical histories of patients, treated in the branch of Vilnius University Hospital Santaros Klinikos Centre and the Department of Plastic and Reconstructive Surgery of Santaros Klinikos in 2006–2017, were examined. A cross-sectional analytical study was performed that included all patients who agreed to participate in this study. The selection criteria were as follows: (a) traumatic nasal injuries that occurred from 2016 through 2017 and were recorded in medical histories, (b) patients of 18-70 years of age, (c) defects larger than 0.5 cm, (d) reconstruction was made by local or nasolabial or forehead flaps. In this way, the Trauma group of 30 subjects was formed.

Other research groups were formed according to this group by maintaining the male - female ratio, i.e. including all patients in succession up to the required number of subjects.

The case histories of patients treated at the Head and Neck Surgery Department of the National Cancer Institute from 2006 through 2017 were examined. The patients hospitalised for nasal nonmelanoma skin tumours were selected for the study. The selection criteria were as follows: (a) patients of 18-70 years of age, (b) the tumour identified was primary, (c) surgical removal of the tumour was performed, (d) reconstruction was made using local or nasolabial or forehead flaps. The Oncology group was formed.

The patients involved in the Aesthetic group were consulted or treated for other problems at the Plastic and Reconstructive Surgery Department at Vilnius University Hospital Santaros Klinikos. On the basis of past aesthetic nasal surgery records in the case histories, they were included in this study. The selection criteria were as follows: (a) patients of 18-70 years of age, (b) primary, open rhinoplasty was performed (surgery was performed at private aesthetic medical centres). The Aesthetic group was formed.

The Control group patients were consulted or treated for other problems or aesthetic procedures at the Plastic and Reconstructive Surgery Department of Santaros Klinikos. The selection criteria were as follows: (a) patients of 18-70 years of age, (b) no history of nasal surgery. The Control group was formed.

All participants were informed about the study, and patients who volunteered to participate were enrolled randomly.

A total of 120 subjects were investigated. In all, four groups were formed: Control, Aesthetic, Trauma and Oncology (the groups were named in accordance with the cause of the operation). Each group consisted of 30 individuals - 15 women, 15 men.

The following patient data were collected from the medical histories: age, sex, education. The site of defects was evaluated according to the sub-unit principle - size, depth (skin, cartilage, mucous membrane), number of surgeries and type of nasal reconstruction, as well as histological test results in patients who underwent surgery for oncological skin diseases.

The patients excluded from the study were as follows: juveniles, patients with identified mental illnesses, treated for defects of less than 0.5 cm, patients after secondary or tertiary rhinoplasty, those treated for melanocytic skin tumours, and those who have undergone postoperative treatment less than 12 months ago.

The active search method was selected to evaluate the patients' remote outcomes; some were contacted by telephone or they presented at Santaros Klinikos, others were interviewed during

control visits for tumour recurrences at the National Cancer Institute, and a small percentage of patients were visited at their home. The active search method was chosen taking into account the experience of Lithuania and foreign countries, because the responsibility of the written invitation is insufficient to ensure the success of the research.

The examination of each study participant took place at an appointment fixed in advance. First, the subjects filled in the questionnaires without being interrupted, the questions they raised were answered, then anthropometric measurements were performed – the examination of one participant lasted for about 90 minutes.

4.2. Anthropometric study

Anthropometric measurements were performed for each research participant according to the methods described in the literature (*Flügel ert al., 1986; Kolar and Salter, 1996*). Technical standard deviation limits set for anthropometric measurements are as follows: standard deviation up to 3 mm for bone points and 5 mm for soft tissues (*Flugel et al., 1986*).

A pilot study was conducted to evaluate the researcher's measurement error. The researcher carried out measurements under the supervision of prof. J. Tutkuvienė, Consultant of the dissertation. The measurements were continuously made until the margin of error of the measurement results was within the allowable range, i.e. 5 mm compared to the results obtained by an expert (prof. J. Tutkuvienė).

Standardized anthropometric instruments were used to carry out measurements (measuring accuracy for length measurements - 1 mm) (*Siber Hegner*, Switzerland).

- metal anthropometer (measuring scale of 1 mm);
- small spreading calliper with rounded ends (measuring scale of 1 mm);
- sliding calliper (measuring scale of 1 mm);

The standard anthropometric methodology was used to measure and calculate the following:

- head and face measurements (mm) and indices;
- height (cm), weight (kg), body mass index (BMI).

While the subject was sitting at rest, with the face relaxed, the measurements of the face were taken using small spreading calliper with rounded ends, sliding calliper. The small spreading calliper with rounded ends was used to measure head length (*g-op*), head width (*eu-eu*), upper third of face width (*ft-ft*), face width (*zy-zy*), mandible width (*go-go*). The sliding calliper was used to measure: physionomic face height (*tr-gn*), morphological face height (*n-gn*), interpupillary distance (*pu-pu*), intercanthal distance (*en-en*), biocular width (*ex-ex*), nose width (*al-al*), lip width (*ch-ch*), upper face height (*se-sto*), nose height (*se-sn*), nasal bridge height (*se-prn*), nasal tip protrusion length (*prn-sn*)), upper face depth (*t-se*), middle face depth (*t-sn*), lower face depth (*t-gn*) (Table 1).

Table 1. Descriptions of craniofacial measurements with landmark definitions

Measurement (landmark abbreviations)	**Measurement description**
Forehead width (*ft-ft*)	Distance between *ft*
Face width (*zy-zy*)	Maximal distance between *zy*
Mandible width (*go-go*)	Distance between *go*
Physiognomic face height (*tr-gn*)	Distance between *tr* and *gn*
Morphological face height (*se-gn*)	Distance between *se* and *gn*
Morphological upper face height (*se-sto*)	Distance between *se* and *sto*

Table 1. (Continued)

Measurement (landmark abbreviations)	Measurement description
Morphological upper face depth (*t-se*)	Distance between *t* and *se* on the right side
Middle face depth (*tr-sn*)	Distance between *tr* and *sn* on the right side
Lower face depth (*t-gn*)	Distance between *t* and *gn* on the right side
Interpupillary distance (*pu-pu*)	Distance between *pu* (the centres of the right and left pupils measured with eyes focused straight ahead)
Intercanthal width (*en-en*)	Distance between *en*
Biocular width (*ex-ex*)	Distance between *ex*
Eye width (*ex-en*)	Distance between *ex* and *en* on the right side
Nose width (*al-al*)	Distance between *al*
Nose height (*se-sn*)	Distance between *se* and *sn*
Nasal bridge height (*se-prn*)	Distance between *se* and *prn*
Nasal tip protrusion length (*prn-sn*)	Distance between *prn* and *sn*
Lip width (*ch-ch*)	Distance between *ch*

al – *alare* (the most lateral point on the nose wing)*;*

ch – *cheilion* (the point on the labial corner measured with mouth closed)*;*

en – *endocanthion* (the point at the most medial corner of the eye fissure)*;*

ex – *exocanthion* (the point at the most lateral corner of the eye fissure)*;*

ft – *frontotemporale* (the point in the inward curve of the *linea temporalis* on the forehead)*;*

gn – gnathion (the lowest point in the midline on the lower border of the mandible)*;*
go – gonion (the most lateral point on the angle of mandible)*;*
prn – pronasale (the most frontally protruding point of the nose tip)*;*
pu – pupillare (the centre of the pupil)*;*
se – sellion (the deepest point in the midline of the concavity at the nasal root)*;*
sn – subnasale (the point at the midline of the nasal base where the nasal septum and the skin surface of the upper lip meet)*;*
sto – stomion (the point at the crossing of the facial midline and the horizontal labial fissure measured with mouth closed)*;*
*t – tragion (*the point in the notch of the upper margin of the tragus*);*
tr – trichion (midline of the hairline)*;*
zy – zygion (the most lateral point of the zygomatic arch).

The following measurements of facial parts were calculated:

Forehead height = Physiognomic face height - Morphological face height.

Total height of upper lip = Morphological upper face height - Nose height.

The following indices were calculated:

Face Index (FI) = (Morphological face height / face width) x 100

Nose Index (NI) = (Nose width / Nose height) x 100

The height (*vertex* – ground) (m) of subjects was measured with a metal anthropometer in a standing straight position, without leaning against any object, with the heels close together.

The body mass (weight, kg) of the subjects was measured using medical mechanical scales.

Body mass index (BMI) was calculated according to the formula:

BMI = weight (kg) / height $(m)^2$

In order to perform the correlation analysis of all the indicators according to BMI, all subjects were divided into 5 groups (in order to

correspond to the evaluation scores shown by other indicators, where the best evaluation was represented by 5 points, while the worst – by 1 point):

5 - normal weight - from 19.05 to 24.9 kg / m^2;

4 - mild overweight - from 25.0 to 27.5 kg / m^2;

3 - overweight - from 27.6 to 29.9 kg / m^2;

2 - obesity – from 30.0 to 34.6 kg / m^2;

1 - high degree of obesity> 36.0 kg / m^2.

4.3. Questionnaire survey

During the study, the respondents were asked to answer the questionnaire composed of a range of questions divided into five main groups (Annex 1):

1. Evaluation of general health condition;
2. Questionnaire on the subjective evaluation of the face and its parts (perception of attractiveness);
3. Questionnaire on the subjective evaluation of the body and its parts (perception of attractiveness);
4. Self-esteem evaluation scale;
5. Psychosocial welfare questionnaire.

1. The evaluation of their own general health condition was conducted by the subjects on a 5-point Likert scale where excellent health was rated by 5 points, whereas bad health condition – by 1 point.

2. The Questionnaire on subjective evaluation of the face and its parts was filled in by the subjects who evaluated their facial parts (face shape, forehead, eyes, nose, lips, cheeks, chin and neck). The aim of the questionnaire was to determine the subjects' self-evaluation of the attractiveness of and satisfaction with their own face. A 5-point Likert scale ranging from 5 points for the best rating to 1 point for the worst rating was employed.

3. The questionnaire on the subjective evaluation of the body and its parts was used by the subjects to assess their body parts (figure, shoulders, chest, waist, hips, thighs, calves, feet, arms, forearms, hands). A 5-point Likert scale ranging from 5 points for the best rating to 1 point for the worst rating was employed. Also, the participants indicated their desirable weight and height. By subtracting the desirable weight / height from the real weight / height, the resulting differences were called “the desirable weight” and “the desirable height”.

The indicators of “the desirable height” were also categorized into 5 groups:

5 – the desirable height coincides with the real height;

4 – the difference between the desirable and the real height ranges from 1 to 4 cm;

3 – the difference between the desirable and the real height ranges from 5 to 7 cm;

2 – the difference between the desirable and the real height ranges from 8 to 10 cm;

1 – the difference between the desirable and the real height> 10 cm.

The indicators of the desirable weight were categorized into 5 groups:

5 – the desirable weight coincided with the real weight;

4 – the difference between the desirable and the real weight was larger or less <5kg;

3 – the difference between the desirable and the real weight was 6-7kg;

2 – the difference between the desirable and the real weight was 8-10 kg;

1 – the difference was > 11kg.

4. The Rosenberg scale was used to assess self-esteem (Rosenberg 1965) (*Rosenberg, 1965*). In 1999 this scale was translated into

Lithuanian by L. Bukšnytė; the questionnaire is freely available online http://eib.emcdda.europa.eu/html.cfm/index3676EN.html; The scale consists of 10 statements with four possible responses: SA - strongly agree, A – agree, D – disagree, SD – strongly disagree. After calculating the total score of the responses to the scale, the subjects were divided into the following groups:

- low self-esteem – the total score of the responses to the scale <15,
- average self-esteem – from 16 to 25,
- high self-esteem - > 26. The maximum possible score of the responses to the scale was 30.

5. The Psychosocial Well-Being Questionnaire (PW) comprised 2 groups of 8 questions each (one group of questions was focusing on the general appearance of the body, the other – that of the face) reflecting different types of stress related to appearance:

PW-1 – *How do you evaluate your general / face appearance when looking in the mirror?*

PW-2 – *Do you think other people evaluate your general / facial appearance worse?*

PW-3 – *Do you feel irritable?*

PW-4 – *Do you feel stress (discomfort) when shopping for clothes in the store?*

PW-5 – *Do you feel stressed when you go to public events?*

PW-6 – *Do you think your appearance has a negative impact on your sexual life?*

PW-7 – *Do you avoid to leave home?*

PW-8 – *Do you feel stressed when other people say comments about your general / facial appearance?*

The responses were provided on a 5-point Likert scale (1 – very bad or very stressful; 5 – very good or no stress). The responses to the questions about the general and facial appearance and their means were calculated respectively in the groups.

Before starting the survey, the validity of the questionnaire was checked. Cronbach's alpha coefficient was used to measure the internal consistency of the scale questions to assess the reliability of the groups of questions. A pilot study was conducted to meet this requirement. A group of 20 people was formed. This group included patients who presented for facial aesthetic surgery or procedures (except nasal surgery). They were personally interviewed to evaluate their understanding of the questions, concepts, and options for responses in the questionnaire. These subjects were not included in the subsequent study. The calculated Cronbach alpha coefficient for the questions aimed to evaluate the general appearance was 0.922 and Cronbach Alpha for face evaluation questions – 0.853. Cronbach alpha score was> 0.7 for both question groups. Both sets of questions, aimed at self-evaluation of general appearance and the face, were found to be compatible with each other. Also, the compatibility of questions within the groups was confirmed, therefore, their use in subsequent focus group surveys is justified.

Statistical analysis of the data was performed using standard statistical package programs (IBM SPSS Statistics 25, MS Office Excel). Descriptive statistics of anthropometric parameters were performed: arithmetic means, their standard deviations (SD), minimum and maximum values were calculated. The Student's test was used to test for gender differences, and one-way ANOVA was used to assess differences between groups. All metric data were divided into groups by distribution into five quintiles (1 for very low, 2 for low, 3 for medium, 4 for high, 5 for very high). Logistic regression and odds ratios (OR) were used to determine the relationship between Rosenberg scale scores and facial and body parts. Pearson correlation analysis of multivariate cluster data (self-esteem (sum of the scores on the Rosenberg scale), anthropometric measurements, facial parts evaluation, body image, and psychosocial well-being) was performed in each group of subjects. The data are presented in dendrograms.

To obtain reliable differences in findings, the required sample size was calculated using the UCSF sample size calculator (University of California, San Francisco, USA; http://www.sample-size.net/sample-size-conf-interval-mean). It is reported in the scholarly literature that in order to obtain a reliable correlation coefficient of 0.25 ($\alpha = 0.05$, $\beta = 0.20$), a sample size of 123 patients should be included for an analytical study of a single group. In all, 120 were enrolled in this study. To compare two analytical groups, the effect size was calculated – in the case of an alpha of 0.05 ($\beta = 0.20$, SD = 1), the power of this study (study group 90 and control 30) to detect 80% of the difference the effect size was 0.595. To test for differences between individual male and female clinical groups, sample size was calculated from the standard deviation of a 7% in a sample size of the group of 30 patients, if SD is 3-5%, the recommended number of patients in subgroups was 6-15 (the number of women and men in each study group was 15).

5. Main results and discussion

5.1. Characteristics of the subjects: age, education, general health condition

In total over 200 medical histories of patients treated for bite injuries at the Department of Plastic and Reconstructive Surgery of Vilnius University Hospital Santaros Klinikos in 2006–2017 were examined. Annually, on average from 3 to 4 patients are hospitalised for plastic and reconstructive surgery at Vilnius University Hospital Santaros Klinikos. Half of the patients (51%) were diagnosed with nasal injuries resulting from bites and 42% of all the victims were children. During the study period, the number of facial injuries caused by bites decreased steadily over the year: in 2006 there were 4 patients hospitalized for facial injuries caused by bites, in 2012 – 3 patients, and in 2017 – 1 patient. It was found that 19.6% of nasal wounds after

bites were closed by primary suture while the rest of the cases required plastic surgery of tissues due to the resulting defect. Only adult patients who underwent reconstructive surgery in local cutaneous flap for nasal defects after bites were selected for the study. In all, 30 patients (15 males, 15 females) were enrolled in the study. The reconstruction was performed in the following ways: interpolated paramedian forehead flap was applied in 8 cases (27%), nasolabial flap – in 12 (40%), local cutaneous flap – in 10 cases (33 %). The frequency in the depth of the defects of bite injuries in the Trauma group was as follows: in 10 (33.3%) cases the skin and subcutaneous lesions were found, and in 20 (66.7%) cases cartilage injuries were observed. In the Trauma group, cartilage damage was found in 6 (40%) females and in 14 (93.3%) males.

Medical histories of patients treated at the Department of Surgery of the Head and Neck and Dermal Tumours of the National Cancer Institute over a period from 2006 through 2017 were analysed. It has been estimated that approximately 350 patients are hospitalised for surgical treatment of skin cancer in the head and neck area surgery per year. Of these, in an average of 1/3 of the patients, skin cancer was located in the nasal area. The study included 30 patients (15 males, 15 females) after reconstructive surgery performed as follows: 6 (20%) cases - interpolated paramedian forehead flap, 5 (17%) – nasolabial flap, 19 (63%) – local cutaneous flap. The depth of defects found in the removal of basal cell carcinomas was respectively as follows: 22 (73.3%) cases of skin and subcutaneous lesions only, and 8 (20.7%) cases of skin and subcutaneous and cartilage damage/lesions. In the female and male groups, cases of cartilage damage were equally distributed (4 (26.7%) cases for each gender). In this group, skin cancer (basal cell carcinoma) was localized only in the nasal area and did not spread to the surrounding areas of the face.

Plastic surgeons perform about 70 aesthetic rhinoplasty surgeries per year in private clinics in Vilnius. About 2/3 of rhinoplasties are of the primary type, 1/3 – of the secondary or tertiary types. Most

rhinoplasties are open rhinoplasties. 30 patients (15 men, 15 women) after primary open rhinoplasty were included to study.

5.2. A review of facial anthropometric data

The descriptive statistics indices of the facial anthropometric data of all subjects in each group were calculated and compared according to sex. Most facial anthropometric scores in males were significantly higher than those in women (Table 2).

One-way analysis of variance (one-way ANOVA) revealed statistically significant differences in all subjects: male subjects showed greater differences in facial size than females; however, morphological facial height, nose width, total upper lip height and mouth width varied significantly in groups of male and female subjects.

Table 2. Descriptive statistics of female (n = 60) and male (n = 60) facial anthropometric measurements (cm) and indices compared by sex in all study groups

Measurements	Females		Males		p
	Mean	Min-Max	Mean	Min-Max	
Forehead width	11.5	10.0-14.7	12.2	10.6-13.8	<0.001
Face width	12.4	10.3-13.7	13.2	11.1-14.2	<0.001
Mandible width	10.1	8.6-12.9	10.9	9.6-12.1	<0.001
Physiognomic face height	17.6	16.0-18.9	18.5	17.0-21.0	<0.001
Forehead height	6.1	3.8-7.3	6.0	3.9-8.6	0.37
Morphological face height	11.5	10.8-13.4	12.5	10.5-15.7	<0.001
Morphological upper face height	7.4	6.2-9.5	7.8	5.9-9.2	<0.001

Table 2. (Continued)

Measurements	Females		Males		p
	Mean	Min-Max	Mean	Min-Max	
Facial index	92.9	82.7-114.8	95.0	76.3-110.6	0.11
Morphological upper face depth	12.0	10.7-13.8	13.2	11.5-14.8	<0.001
Middle face depth	11.8	10.4-13.2	12.9	11.7-14.2	<0.001
Lower face depth	13.0	10.7-14.3	14.2	12.8-15.2	<0.001
Interpupillary distance	5.8	5.2-6.3	6.1	5.6-6.4	<0.001
Intercanthal width	3.2	2.4-3.5	3.3	2.3-3.6	<0.001
Biocular width	9.1	8.1-9.9	9.5	8.0-10.4	<0.001
Eye width	3.0	2.7-3.3	3.1	2.2-3.5	<0.001
Nose width	3.4	2.5-4.0	3.7	2.8-4.3	<0.001
Nose height	5.3	4.4-6.4	5.6	5.0-6.5	<0.001
Nasal bridge height	5.3	4.2-6.2	5.6	4.9-6.4	<0.001
Nasal tip protrusion length	2.1	1.5-2.7	2.1	1.5-2.9	0.74
Nasal index	65.1	45.3-81.3	66.4	49.2-82.0	0.30
Total height of upper lip	2.1	0.4-3.3	2.2	0.4-3.5	0.34
Mouth width	5.4	4.2-6.4	5.5	4.3-6.4	0.25

The anthropometric data of the male and female noses of each group were examined separately.

The analysis of the data of women of different groups (Table 3) showed that the nose of the Trauma group was the widest (mean 3.7

Table 3. Comparison of female nasal anthropometric data means (cm) by study groups (*Student's t statistic criterion* was used, reliable differences are given in bold)

Anthropo-metric measure-ments of the nose	Control group N=15	Aesthetic group N=15	Trauma group N=15	Oncology group N=15	p					
					C–A	C–T	C–O	A–T	A–O	T–O
Nose width (*al-al*)	3.3	3.2	3.7	3.5	>0.05	**<0.001**	>0.05	**<0.001**	**<0.01**	**<0.05**
Nose height (*se-sn*)	5.2	4.9	5.5	5.4	**<0.05**	**<0.05**	>0.05	**<0.001**	**<0.001**	>0.05
Nasal bridge height (*se-prn*)	5.1	5.1	5.4	5.4	>0.05	>0.05	>0.05	**<0.05**	**<0.05**	>0.05
Nasal tip protrusion length (*sn-prn*)	2.0	2.2	2.2	2.2	**<0.05**	**<0.05**	**<0.05**	>0.05	>0.05	>0.05
Nose index	63.1	65.4	67.2	64.6	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Groups: C- Control, A- Aesthetic, T- Trauma, O-Oncology

cm) and significantly different from the other groups. The females in the Aesthetic group of women had the lowest nose height and it was significantly different from other groups. Women in the Trauma group were also found to have higher noses than those of the Control group

(p <0.05). In the Control and Aesthetic groups of females, the length of the nasal bridge was the same. The noses of Trauma and Oncology female patients were significantly longer (p <0.05). The Control group's women had the smallest nasal depth (2.0 cm) and it was significantly different from other groups. No significant differences in nasal indices between the female groups were found.

The anthropometric data (Table 4) of different groups of men were

Table 4. Comparison of the male nasal anthropometric data means (cm) by study groups (*Student's t statistic criterion* was used, reliable differences are given in bold)

Anthropometric measurements of the nose	Control group N=15	Aesthetic group N=15	Trauma group N=15	Oncology group N=15	p					
					C–A	C–T	C–O	A–T	A–O	T–O
Nose width (*al-al*)	3.6	3.8	4.0	3.6	**<0.05**	**<0.005**	>0.05	>0.05	>0.05	**<0.01**
Nose height (*se-sn*)	5.7	5.6	5.6	5.7	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
Nasal bridge height (*se-prn*)	5.6	5.5	5.6	5.7	>0.05	>0.05	>0.05	>0.05	>0.05	>0.05
Nasal tip protrusion length (*sn-prn*)	2.3	2.1	2.0	2.2	>0.05	**<0.05**	>0.05	>0.05	>0.05	>0.05
Nose index	62.5	68.7	70.8	63.4	**<0.05**	**<0.001**	>0.05	>0.05	**<0.05**	**<0.005**

Groups: C- Control, A- Aesthetic, T- Trauma, O-Oncology

compared. It was found that the nose of the Trauma group of males differed significantly from other groups and it was the widest (4.0 cm), similarly to that in females. Interestingly, the Aesthetic group of men had a wider nose compared to the Control (statistically reliable difference) and Oncology (unreliable difference) groups. There was no difference in the length of the nasal bridge between the groups. Men in the Trauma group had the lowest depth of the nose. Minimum nasal index, i.e. the narrowest nose was observed in the Control group of men, the highest index (widest nose) was confirmed in the Trauma group of men. Thus, both the female and male Trauma groups had the highest nasal measurement indices. More reliable differences were found between groups of women than those of men. This may be one of the reasons for poorer nose rating. The comparison of the data of the Control and Aesthetic groups showed that the intervals of nasal dimensions in the Aesthetic group of women were smaller, also the dimensions of the width of (SD 0.1) and the depth (SD 0.1) of the nose in the Aesthetic group of men were significantly less varied. Such a "unification" of the nose is the result of aesthetic operations.

Our current study found reliable sexual differences of the facial anthropometric measurements in line with the findings obtained by other studies (*Farkas et al., 1984; Farkas et al., 1986; Ritz-Timme et al., 2011; Gao et al., 2016; Morrison et al., 201*6). After comparing the anthropometric facial dimensions between all the investigated groups, we detected reliable differences in the nasal width, the morphological facial height, the height of the upper lip and the width of the mouth. The nasal width had the most pronounced difference which could be explained by the fact that oncological and traumatic patients underwent reconstruction made by local flaps – this method causes a widening of the nose.

5.3. Overview of real anthropometric body indices

The real height (Table 5) and weight (Table 6) results showed that the tallest subjects were in the Aesthetic group, the shortest - in the female Control group and in the male Oncology group, the heaviest were men in the Trauma and Control groups and women in the Trauma group. The women of the Aesthetic group and men of the Oncology group weighed the least.

Table 5. Descriptive statistics of female and male real height (cm) by study groups

Group type	Females		Males	
	Mean (SD)	Min–Max	Mean (SD)	Min–Max
Control	166.5 (6)	152–174	177.9 (8)	165–193
Aesthetic	169.4 (5)	160–176	180.1 (5)	168–187
Trauma	166.8 (8)	154–185	177.3 (8)	165–192
Oncology	168.0 (8)	155–186	177.9 (8)	163–187

Table 6. Descriptive statistics of female and male real weight (kg) by study groups

Group type	Females		Males	
	Mean (SD)	Min–Max	Mean (SD)	Min–Max
Control	69 (12)	56–99	85 (9)	76–105
Aesthetic	67 (7)	57–80	83 (6)	71–94
Trauma	72 (6)	64–81	85 (7)	77–101
Oncology	70 (6)	59–80	80 (11)	60–102

Taking into account that the BMI better reflects body size than weight alone, the BMI was calculated and examined for each subject. Most subjects had a normal BMI (Fig. 1). Women had a lower BMI

than men. The lowest BMI was found in the Aesthetic group's patients, the highest - in the female Trauma group and in the male Control group. This explains the highest number of women (87.7%) in the Trauma group who wanted to weigh less (Table 7).

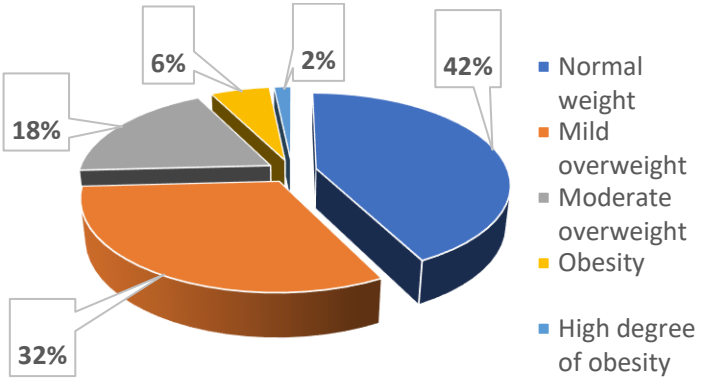

Figure 1. Distribution of overall BMI evaluation by scores and means

Table 7. Descriptive statistics of female and male BMI by study groups

Group type	Females		Males	
	Mean (SD)	Min–Max	Mean (SD)	Min–Max
Control	25.09 (5.07)	19.38–37.26	27.03 (3.55)	22.01–36.00
Aesthetic	23.47 (2.94)	19.05–29.38	25.64 (2.13)	20.75–28.3
Trauma	26.11 (2.72)	20.45–30.36	26.6 (2.36)	23.06–31.96
Oncology	24.79 (2.67)	20.81–30.39	25.94 (2.48)	21.27–29.39

5.4. Evaluation of the subjective attractiveness of the face and facial parts and the relationship with anthropometric data

Examining the differences of the subjective evaluation of facial parts between the sexes and study groups, it was found that women's evaluation of the lips and neck was significantly worse than men's (Table 8).

Table 8. Comparison of mean scores (mean and SD) of subjective evaluation of attractiveness of male and female facial parts (*Student's t statistic used*, reliable differences are given in bold)

Evaluation of facial parts	Females	Males	p
Shape of the face	4.1 (0.7)	4.3 (0.7)	>0.05
Forehead	4.2 (0.8)	4.3 (0.7)	>0.05
Eyes	4.2 (0.8)	4.2 (0.7)	>0.05
Nose	4.0 (0.9)	4.1 (0.7)	>0.05
Lips	4.1 (0.9)	4.3 (0.7)	**<0.05**
Cheeks	4.1 (0.8)	4.3 (0.7)	>0.05
Chin	4.2 (0.7)	4.2 (0.6)	>0.05
Neck	3.8 (0.9)	4.3 (0.7)	**<0.01**
Mean score	4.09 (0.6)	4.25 (0.6)	>0.05

Table 9. Mean of scores of subjective evaluations of attractiveness of facial parts and SD of study groups irrespective of sex (*Student's t statistical criterion* was used, reliable results are given in bold)

Evaluation of facial parts	Control group	Aesthetic group	Trauma group	Oncology group	p		
					C-A	C-T	C-O
Shape of the face	4.4 (0.7)	4.3 (0.7)	4.3 (0.6)	4.0 (0.7)	>0.05	>0.05	**<0.05**
Forehead	4.5 (0.7)	4.3 (0.7)	4.2 (0.7)	4.0 (0.8)	>0.05	>0.05	**<0.01**
Eyes	4.2 (1.0)	4.3 (0.8)	4.2 (0.6)	4.1 (0.6)	>0.05	>0.05	>0.05
Nose	4.4 (0.6)	4.3 (0.7)	3.8 (0.6)	3.5 (0.9)	>0.05	**<0.001**	**<0.001**
Lips	4.3 (0.9)	4.4 (0.6)	4.0 (0.8)	4.0 (0.7)	>0.05	>0.05	>0.05
Cheeks	4.4 (0.9)	4.3 (0.7)	4.1 (0.6)	4.0 (0.7)	>0.05	>0.05	**<0.05**
Chin	4.2 (0.8)	4.2 (0.6)	4.3 (0.5)	4.0 (0.7)	>0.05	>0.05	>0.05
Neck	4.2 (0.8)	4.2 (0.8)	4.1 (0.8)	3.8 (0.8)	>0.05	>0.05	>0.05

The subjective ratings of the nose provided by the two groups (Trauma and Oncology) of patients after nasal reconstructions were significantly worse than the evaluation given by the Control

group (Table 9). The face, forehead, and cheek ratings given by patients in the Oncology group were significantly worse than those observed in the Control group. As expected, the greatest differences between the groups were seen in the assessment of the nose.

The subjective evaluation of the nasal attractiveness by scores between groups of subjects and sex was examined (Fig. 2). The

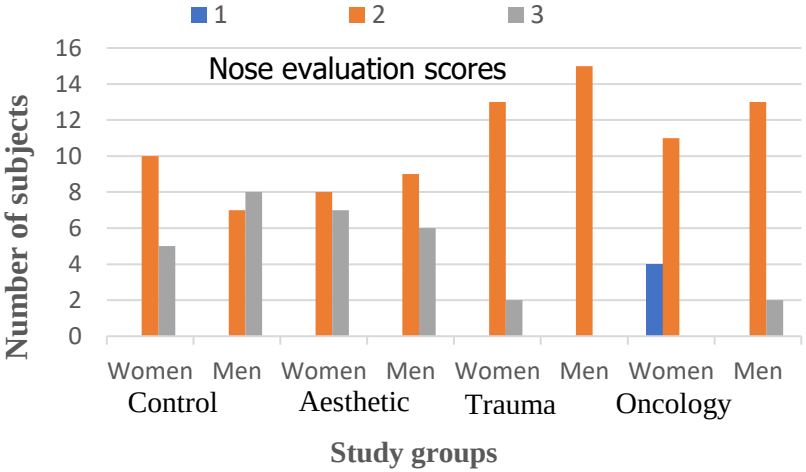

Figure 2. Distribution of the subjective evaluation of the attractiveness of the nose in female and male study groups (in scores)

Oncology group's women evaluated their nose by the lowest scores: 4 (26.7%) of them rated the nose poorly or very badly and none of them rated it very well. Most of the subjects in the female Aesthetic group (7 (46.7%) women) rated their noses as very good. Among the men, the best ratings were found in the Control group (8 (53.3%)). This coincides with the findings described in the literature that men underestimate their noses after aesthetic surgery. In the Trauma group, all 15 (100%) men rated their nose from moderate to good, 2 (13.3%) women as very good, and the remaining 13 (86.7%) females as moderate or good.

The correlation analysis of the subjective ratings of the attractiveness of some male and female facial parts and real anthropometric dimensions of that area were performed, only those facial parts and features (evaluation of nose, forehead, face shape, eyes, lips, chin) that could be linked to the measurements were selected. The only nasal measurements (Table 10), as observed in the overall study results, that produced reliable correlations in both male and female groups, were as follows: females rated smaller noses better, and males rated narrower noses better. The analysis of the study groups revealed reliable correlations between the subjective evaluation of the nose and nasal dimensions only among women in the Control and Oncology groups.

Table 10. Correlation analysis of female and male nasal anthropometric data and subjective evaluation of attractiveness of nose in study groups (*r coefficient,* statistically reliable coefficients are given in bold)

Nasal	**Control**		**Aesthetic**		**Trauma**		**Oncology**	
measurements	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**
Nose width *(al-al)*	-0.02	-0.31	-0.05	-0.31	-0.25	-0.16	**0.55**	-0.19
Nose height *(se-sn)*	**-0.55**	0.19	-0.41	0.22	-0.06	0.00	**-0.58**	-0.05
Nasal bridge height *(se-prn)*	-0.38	0.40	-0.40	0.05	-0.23	0.03	-0.11	-0.08
Nasal tip protrusion length *(sn-prn)*	-0.41	-0.29	-0.21	0.13	0.16	-0.13	0.39	-0.41
Nose index	0.36	-0.36	0.30	-0.38	-0.16	-0.17	**0.71**	-0.16

5.5. Analysis of the body image (the subjects' attitude to the body) and the relationship with anthropometric data

In order to find out whether the subjects were satisfied with their height and weight, the subjects' wish to change their height and weight was examined. The difference in height was calculated by subtracting the real height from the desirable height, and the difference in weight was found by subtracting the real weight from the desirable weight. It was found that the number of women wishing to change their height was almost twice larger than that of men (40.0% and 21.7%) (Fig. 3). Those that would prefer to change their height most belonged to the Trauma group's patients (plus 3 cm) and the Control group's women

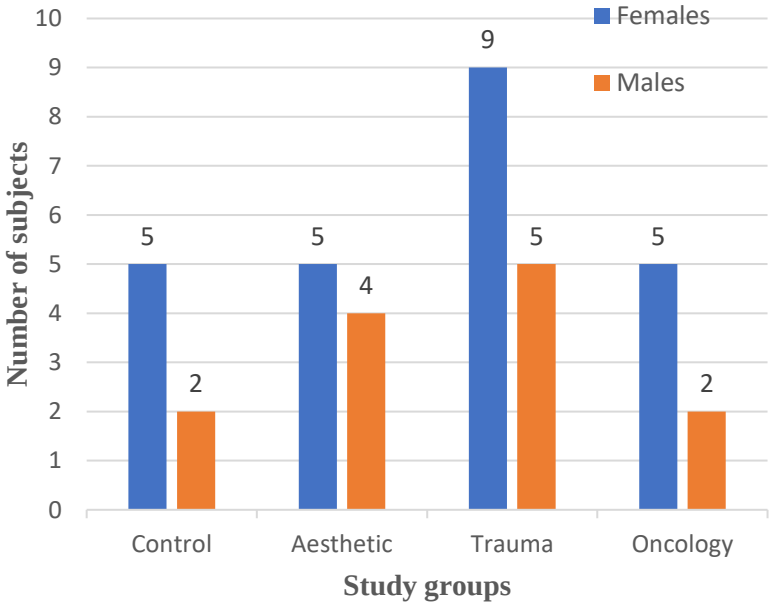

Figure 3. Distribution of males and females wishing to change their height (by groups)

(plus 3 cm). The proportion of women and men who wanted to lose weight was more similar (71.7% and 66.6%) compared to those who were dissatisfied with their height (Fig. 4). Those who would like to change their weight most were both, women (minus 8 kg) and men (minus 5 kg) in the Trauma group and men (minus 5 kg) in the Control group.

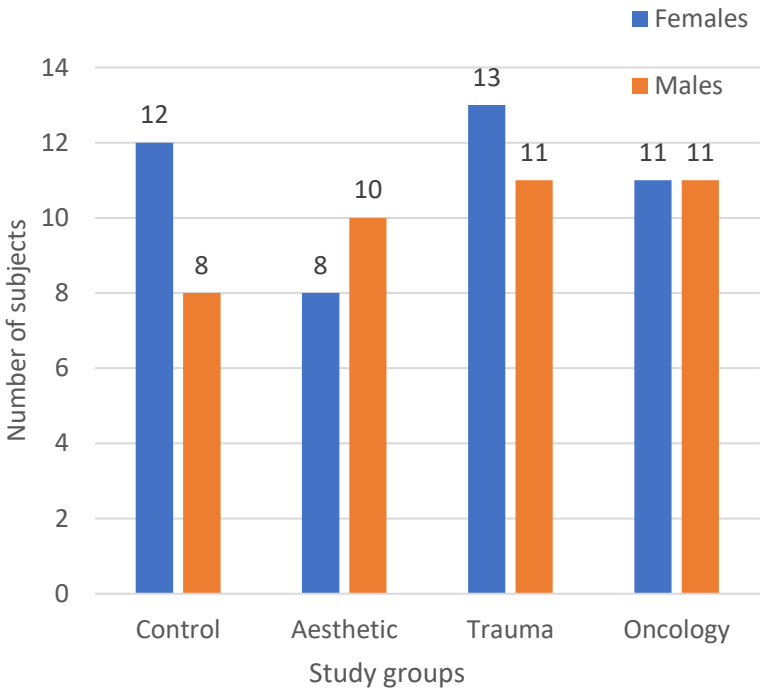

Figure 4. Distribution of males and females wishing to change their weight (by groups)

The analysis of the evaluation scores for body parts was performed and the mean values of the scores of the subjective assessment

provided by women and men were compared (Table 11). It was found that men rated their body slightly better than women. A statistically

Table 11. Comparison of mean of scores of subjective evaluations of attractiveness of body parts by sex (*Student's t statistical criterion was used*, reliable differences are given in bold)

Body parts	Females	Males	p
Shoulders	4.6	4.6	>0.05
Chest	3.8	4.5	**<0.001**
Waist	3.8	4.0	>0.05
Hips	4.1	4.6	**<0.001**
Thighs	3.8	4.4	**<0.001**
Calves	4.5	4.6	>0.05
Feet	4.7	4.8	>0.05
Upper arms	4.2	4.1	>0.05
Forearms	4.6	4.6	>0.05
Hands	4.3	4.8	**<0.001**
Mean of scores	4.24	4.5	<0.01

significant difference ($p < 0.01$) was found between male and female evaluation of their body parts - the rating score given by males was 4.5, while by women was 4.25. Both, males and females were most dissatisfied with their waistlines and rated their feet the best. Women were finding more faults with their body and did not value any part of their body better than men. Men showed a statistically significant superiority in evaluating their chest ($p < 0.001$), hips ($p < 0.001$), thighs ($p < 0.001$) and hands ($p < 0.001$).

The analysis of the subjective ratings of the attractiveness of the body parts by groups (irrespective of sex) (Table 12) showed that the

Table 12. Analysis of the subjective evaluation of the attractiveness of body parts in the groups (irrespective of sex) (*Student's t statistic criterion was used,* reliable results are given in bold)

Body parts	Control	Aesthetic	Trauma	Oncology	p		
					C-A	C-T	C-O
Shoulders	4.8	4.7	4.5	4.4	>0.05	>0.05	**<0.01**
Chest	4.2	4.4	4.2	3.9	>0.05	>0.05	>0.05
Waist	4.0	4.3	3.6	3.8	>0.05	>0.05	>0.05
Hips	4.6	4.5	4.2	4.1	>0.05	**<0.05**	**<0.05**
Thighs	4.3	4.4	3.9	3.9	>0.05	>0.05	>0.05
Calves	4.7	4.6	4.5	4.3	>0.05	>0.05	**<0.05**
Feet	4.8	4.9	4.7	4.6	>0.05	>0.05	>0.05
Upper arms	4.3	4.4	3.8	4.0	>0.05	**<0.05**	>0.05
Forearms	4.7	4.7	4.5	4.4	>0.05	>0.05	**<0.01**
Hands	4.6	4.7	4.5	4.4	>0.05	>0.05	>0.05
Mean of scores	4.5	4.56	4.24	4.18	>0.05	>0.05	**<0.05**

Aesthetic group's patients rated their body best (4.56 points), while the worst evaluation was given by the Oncology patients (4.18). The mean subjective body evaluation given by subjects in the Oncology group was significantly lower than that found in the Control group ($p < 0.05$). The subjects in all groups were compared with the Control group. The patients in the Aesthetic group rated their body parts very similarly to those of the Control group; no statistically significant differences were found between the two groups. The patients in the Trauma group showed significantly lower scores on hips ($p < 0.05$) and hands ($p < 0.05$). The patients in the Oncology group had significantly

worse scores than patients in the Control group in evaluating their shoulders ($p < 0.01$), hips ($p < 0.05$), calves ($p < 0.05$) and forearms ($p < 0.01$).

The correlation analysis of the male and female subjective evaluation of their individual body parts, and their body height, weight, and BMI (Tables 13-14) showed that larger men and women rated their body parts worse. The taller women were leaner and more appreciative of their body parts, and the taller men were heavier more frequently.

Table 13. Correlation analysis of female (n = 60) subjective evaluation of attractiveness of body parts and anthropometric parameters of body (height, weight, and BMI) (statistically significant *r-factor* is given in bold)

	Height	**Weight**	**BMI**
Weight	0.01		
BMI	**-0.57**	**0.81**	
Shoulders	0.25	**-0.40**	**-0.46**
Chest	0.24	**-0.40**	**-0.46**
Waist	**0.41**	**-0.59**	**-0.71**
Hips	0.11	**-0.47**	**-0.45**
Thighs	**0.39**	**-0.50**	**-0.63**
Calves	0.19	**-0.30**	**-0.34**
Feet	**0.27**	-0.18	**-0.28**
Upper arm	**0.37**	**-0.35**	**-0.48**
Forearm	**0.43**	**-0.27**	**-0.46**
Hands	**0.32**	**-0.27**	**-0.39**
Figure	**0.35**	**-0.60**	**-0.68**

Table 14. Correlation analysis of male (n = 60) subjective evaluation of attractiveness of body parts and anthropometric parameters of body (height, weight and BMI) (statistically significant *r-factor* is given in bold)

	Height	**Weight**	**BMI**
Weight	**0.41**		
BMI	**-0.41**	**0.66**	
Shoulders	**0.29**	-0.16	**-0.38**
Chest	0.15	**-0.27**	**-0.40**
Waist	0.15	**-0.52**	**-0.64**
Hips	0.13	**-0.40**	**-0.50**
Thighs	0.11	**-0.46**	**-0.53**
Calves	0.08	**-0.27**	**-0.32**
Feet	0.04	**-0.36**	**-0.41**
Upper arm	0.20	0.00	-0.15
Forearm	**0.27**	-0.12	**-0.35**
Hands	0.09	**-0.29**	**-0.36**
Figure	0.18	**-0.49**	**-0.63**

5.6. Subjects' self-esteem and its relationship with the subjective evaluation of the attractiveness of the face and the body

The examination of the responses obtained on the basis of Rosenberg questionnaire showed no significant difference between the sums of the male and female self-esteem scores ($p < 0.05$), self-esteem level by sex was almost equally distributed: most subjects had moderate self-esteem, a few individuals showed low self-esteem, a quarter of the subjects – high self-esteem. Most of those with low self-esteem came from the Oncology group (Figure 5). The patients in the Aesthetic group had a significantly higher self-esteem compared to the other groups.

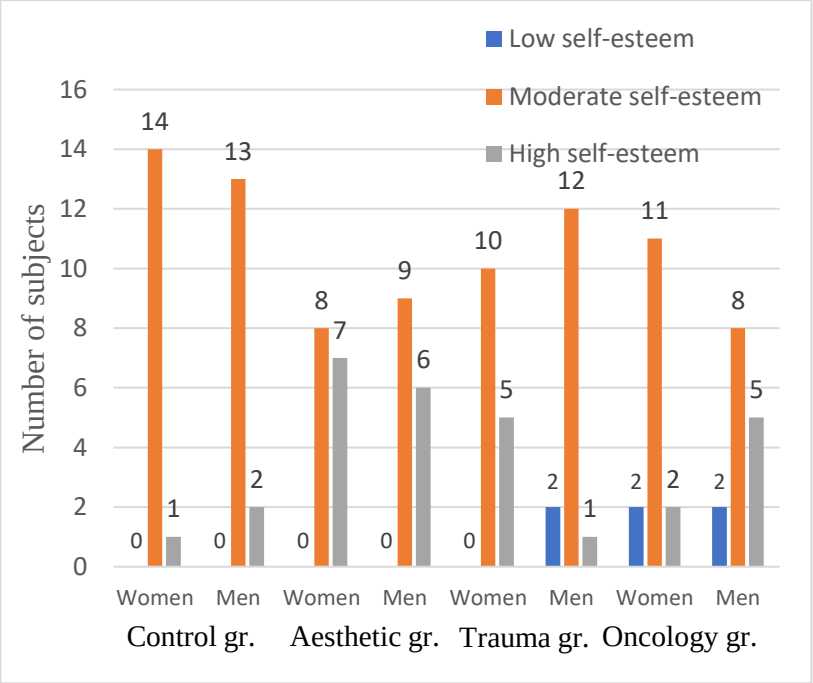

Figure 5. Distribution of self-esteem level between women and men

The correlation analysis of the subjective evaluation of the attractiveness of the facial and body parts and self-esteem (Rosenberg self-esteem scale sum scores) (Tables 15-16) showed that stronger correlations were found between self-esteem and face evaluation rather than between self-esteem and the assessment of body parts. The relationship between the nose rating and self-esteem was the weakest of the all facial parts rated.

Table 15. Correlation analysis of subjective evaluation of attractiveness of facial parts and self-esteem (statistically insignificant *coefficient r* is marked in bold)

Subjective evaluation of facial parts	**Shape of face**	**Forehead**	**Eyes**	**Nose**	**Lips**	**Cheeks**	**Chin**	**Neck**
Self-esteem	0.39	0.31	0.35	**0.16**	0.34	0.35	0.29	0.33

Table 16. Correlation analysis of subjective evaluation of attractiveness of body parts and self-esteem (statistically significant *coefficient r* is marked in bold)

Subjective evaluation of body	**Shoulders**	**Chest**	**Waist**	**Hips**	**Thighs**	**Calves**	**Feet**	**Upper arms**	**Forearms**	**Hands**
Self-esteem	0.16	**0.23**	**0.24**	0.17	0.14	-0.01	0.16	**0.19**	0.17	0.11

No statistically reliable correlation between self-esteem and BMI was found in the correlation analysis of BMI and self-esteem in male and female groups (irrespective of groups) (Table 17).

Table 17. Correlation analysis of female and male BMI and self-esteem (*coefficient r*) in study groups

Study groups	Females	Males
Control	-0.46	-0.26
Aesthetic	-0.41	0.26
Trauma	-0.24	-0.43
Oncology	0.28	-0.37

6.6. Results of the research on the psychosocial well-being of the subjects

The comparison of the means of the male and female responses to the psychosocial questionnaire related to the facial appearance (Table 18) found only one statistically significant difference: in response Question 1 (*How do you evaluate your appearance when*

Table 18. Comparison of means of responses to facial appearance-related psychosocial questionnaire by sex irrespective of groups (*Student's t statistical criterion* was used, reliable findings are given in bold)

Questions	Females	Males	p M/F
1	3.68	3.95	**<0.05**
2	4.27	4.18	>0.05
3	3.95	3.97	>0.05
4	4.13	4.37	>0.05
5	3.75	3.73	>0.05
6	4.23	3.95	>0.05
7	4.55	3.53	>0.05
8	3.68	3.88	>0.05

looking to *in the mirror?*) females gave lower scores and rated their appearance worse ($p < 0.05$). After calculating and comparing the means of the responses between the groups irrespective of sex (Table 19), we not only found that the highest scores for their appearance in

Table 19. Comparison of means of responses to facial appearance-related psychosocial questionnaire by study groups (irrespective of sex) (*Student's t statistical criterion* was used; statistically significant findings are marked in bold)

	Means of responses irrespective of sex				p					
Questions	**Control**	**Aesthetic**	**Trauma**	**Oncology**	**C and A**	**C and T**	**C and O**	**A and T**	**A and O**	**O and T**
1	3.7	4.2	3.7	3.6	**<0.05**	>0.05	>0.05	**<0.05**	**<0.05**	>0.05
2	4.6	4.4	4.2	3.7	>0.05	>0.05	**<0.01**	>0.05	**<0.01**	**<0.01**
3	4.3	4.3	3.9	3.3	>0.05	>0.05	**<0.01**	>0.05	**<0.01**	**<0.01**
4	4.6	4.5	4.3	3.6	>0.05	>0.05	**<0.01**	>0.05	**<0.01**	**<0.01**
5	4.3	4.4	3.2	3.1	>0.05	**<0.001**	**<0.001**	**<0.001**	**<0.001**	>0.05
6	4.6	4.5	3.9	3.4	>0.05	**<0.001**	**<0.001**	**<0.001**	**<0.001**	>0.05
7	4.8	4.8	4.6	4.0	>0.05	>0.05	**<0.01**	>0.05	**<0.01**	**<0.01**
8	4.4	4.0	3.4	3.4	>0.05	**<0.01**	**<0.01**	**<0.01**	**<0.01**	>0.05

Groups: C - Control, A - Aesthetic, T - Trauma, O - Oncology

the mirror was given by the Aesthetic group's patients, but also reliable differences in evaluation were observed in other groups ($p < 0.05$). Significantly lower scores ($p < 0.01$) were given by the subjects in the Oncology group if compared to other groups, in answering the questions reflecting the stress experienced when other people evaluate their appearance: *No 2 (Do you think other people value you less?), No 3 (Do you feel irritated?), No 4 (Do you feel stress (discomfort) when shopping for clothes at the store?) and No 7 (Do you avoid to leave home?).* The answers provided to questions *No 5 (Do you feel*

stress when you go to public events?), No 6 (Do you think your appearance adversely affects your sex life?) and No 8 (Do you feel stressed when other people comment on your appearance?) were also reliably ($p < 0.01$) different: the means of the answers obtained from the Control and Aesthetic groups were higher compared those for the Oncology and Trauma groups.

The psychosocial questionnaire responses were related to overall body appearance. First, the mean responses of all men and women were calculated and compared (Table 20), statistically significant

Table 20. Comparison of means of female and male responses to a psychosocial questionnaire related to overall body appearance irrespective of groups (*Student's t statistical criterion* was used, reliable findings are marked in bold)

Questions	Females	Males	p M/F
1	3.90	4.07	>0.05
2	4.35	4.30	>0.05
3	4.28	4.25	>0.05
4	4.08	4.35	>0.05
5	4.03	4.07	>0.05
6	4.37	3.98	**<0.05**
7	4.60	4.55	>0.05
8	3.82	4.12	**<0.05**

M – males, F- females

differences between the sexes were found in responses to questions 6 and 8. Men were more stressed than women ($p < 0.05$) when answering the question *"Do you think your appearance adversely affects your sexual life?"*. Women were more stressful in response to the question *"Do you feel stressed when other people comment on your appearance?"* ($P < 0.05$). The analysis of the means of psychosocial questionnaire responses in different groups irrespective of sex (Table

21) showed that the answers to almost all questions provided by the Oncology group's subjects differed more or less reliably from other groups.

Table 21. Comparison of the means of responses to a psychosocial questionnaire related to overall body appearance in study groups irrespective of sex (*Student's t statistical criterion* was used, reliable findings are given in bold)

	Means of responses irrespective to sex				**p**					
Questions	**Control**	**Aesthetic**	**Trauma**	**Oncology**	**C and A**	**C and T**	**C and O**	**A and T**	**A and O**	**O and T**
1	3.97	4.10	4.10	3.77	>0.05	>0.05	>0.05	>0.05	**<0.05**	**<0.05**
2	4.63	4.40	4.50	3.77	>0.05	>0.05	**<0.001**	>0.05	**<0.001**	**<0.001**
3	4.37	4.43	4.50	3.77	>0.05	>0.05	**<0.01**	>0.05	**<0.01**	**<0.01**
4	4.50	4.13	4.40	3.83	>0.05	>0.05	**<0.01**	>0.05	>0.05	**<0.01**
5	4.47	4.20	3.93	3.60	>0.05	>0.05	**<0.05**	>0.05	**<0.05**	>0.05
6	4.60	4.17	4.27	3.67	>0.05	>0.05	**<0.001**	>0.05	**<0.05**	**<0.05**
7	4.80	4.63	4.83	4.03	>0.05	>0.05	**<0,01**	>0.05	**<0.01**	**<0.01**
8	4.13	3.93	4.10	3.70	>0.05	>0.05	**<0.05**	>0.05	>0.05	**<0.05**

Groups: C - Control, A - Aesthetic, T - Trauma, O - Oncology

The comparison of the common means of responses to a psychosocial questionnaire provided by females and males of all the study groups (Table 22) showed that the females of the Control group felt a higher level of psychosocial stress than men. The men operated on for aesthetic reasons and traumas felt a higher level of psychosocial stress than the women in the respective groups. The highest levels of stress were demonstrated by women and men who underwent cancer surgery. Differences in sex between the groups were unreliable, except

for the only reliable difference $p<0.05$ found between male and female ratings in the Control group in response to questions on body appearance.

Thus, the appearance of the face was more stressful than the appearance of the body for both men and women. The stress the subjects were experiencing has been the main cause of patient irritability and public fears. The patients who have undergone nasal reconstruction (especially due to an oncological disease) feel the highest levels of stress due to a changed face.

Table 22. Means of responses to a psychosocial questionnaire by study groups and by sex

Parts of Psychosocial Questionnaire	Control		Aesthetic		Trauma		Oncology	
	W	M	W	M	W	M	W	M
Regarding facial	4.2	4.6	4.5	4.3	4.1	3.7	3.3	3.6
Regarding body	4.2	4.7	4.4	4.1	4.5	4.2	3.6	3.9
Common means scores	4.2	4.65	4.45	4.2	4.35	3.95	3.45	3.75

W – women, M – men.

5.7. Multidimensional cluster (correlation) analysis of the examined features

Multidimensional cluster (correlation) analysis of these indicators was performed to find out the relationship of the real anthropometric data and the subjective assessment of facial attractiveness, Rosenberg scale (self-esteem) data and psychosocial well-being, the differences were compared between groups by examining men and women separately.

The anthropometric measurements of the nose of the female Control group (Fig. 6) showed a reliable correlation, the nasal tip protrusion length correlated with the first question on psychosocial well-being, the nasal measurements of the men correlated between one another and with other facial dimensions. The subjective evaluation of the nose and other facial parts in men (Fig. 7) was more closely related to their self-evaluation in the mirror, whereas the female evaluation of the nose and other facial parts showed that the opinion of other people was more important for the women. Men's self-esteem reliably correlated with the real facial measurements, whereas self-esteem in women's dendrogram did not show any reliable associations.

The nasal tip protrusion length of the Aesthetic group of women (Fig. 8) correlated with self-esteem, stress at public events, irritability, also the nose height and nasal index correlated with other facial anthropometric parameters. The male nasal anthropometric measurements (Fig. 9) were associated with one another and with other facial anthropometric parameters. The subjective evaluation of female facial parts was more closely related to self-evaluation in the mirror, whereas the men of the Aesthetic group were more concerned with the opinions of others. The nasal assessment did not produce any reliable relationships in the female group, while in the male group the nasal evaluation showed a strong relationship with stress triggered by comments made by other people. Men's self-esteem correlated with

the ratings of facial parts and evaluation provided by other people, also with sexual life.

The subjective evaluation of the facial parts given by the Trauma group's women (Fig. 10) significantly correlated with each other and self-esteem, the women's nasal evaluation correlated with the assessment of the eyes, the male Trauma group's (Fig. 11) subjective evaluation of the facial parts was interrelated, the evaluation of cheeks correlated with anthropometric measurements, the subjective evaluation of the nose reliably associated with subjective evaluation of the forehead, shape of the face and self-evaluation in the mirror. The real nasal dimensions in this group of women were associated with irritability, sexual life, public events, while in men, they were associated with other facial anthropometric dimensions. Female self-esteem reliably correlated with the evaluation of facial features (face shape, neck, forehead), whereas no reliable relationships were found between male indicators.

The subjective evaluation of facial parts provided by both, women and men in the Oncology group was largely correlated. The subjective nasal evaluation of females in this group was related to other people's opinions and nose width, nose index, while the subjective nasal evaluation of men correlated with the evaluation of other parts of the face and psychosocial well-being. Men's self-esteem was associated with the real nasal parameters (nose width, nasal index), while women did not reveal any reliable associations.

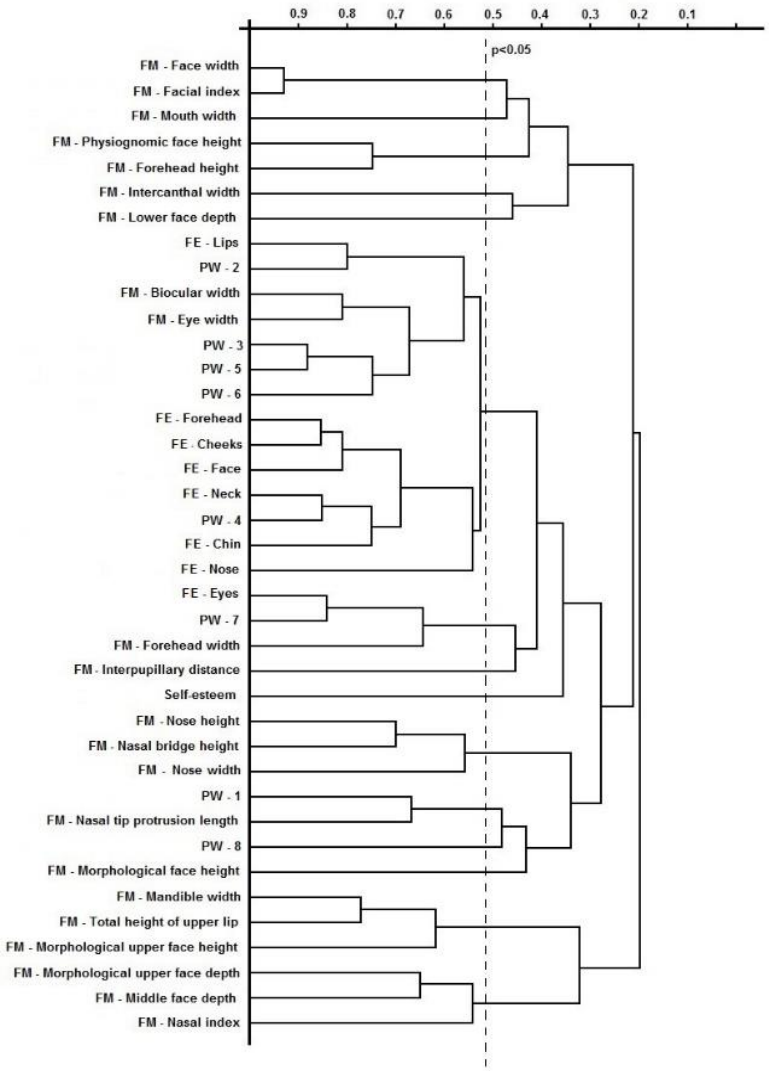

Figure 6. Dendrogram of cluster analysis on correlations between facial anthropometric data (*FM*), subjective evaluation of attractiveness of facial parts (*FE*), self-esteem, and psychosocial well-being (*PW*) in the female Control group (n = 15)

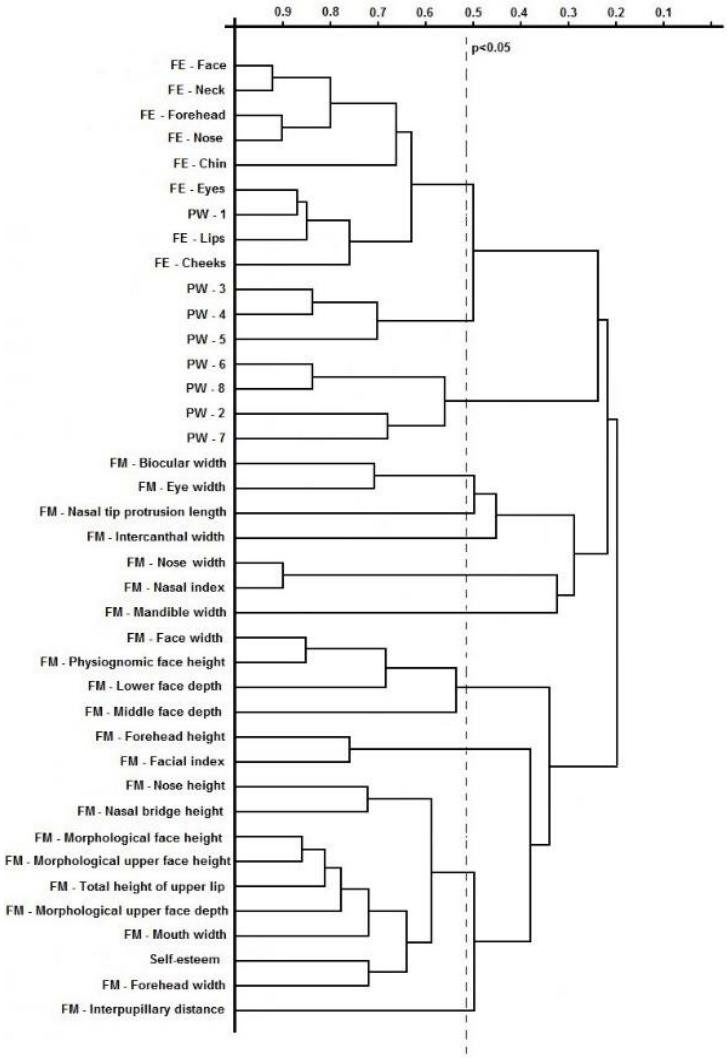

Figure 7. Dendrogram of cluster analysis on correlations between facial anthropometric data (*FM*), subjective evaluation of attractiveness of facial parts (*FE*), self-esteem and psychosocial well-being (*PW*) in the male Control group (n = 15)

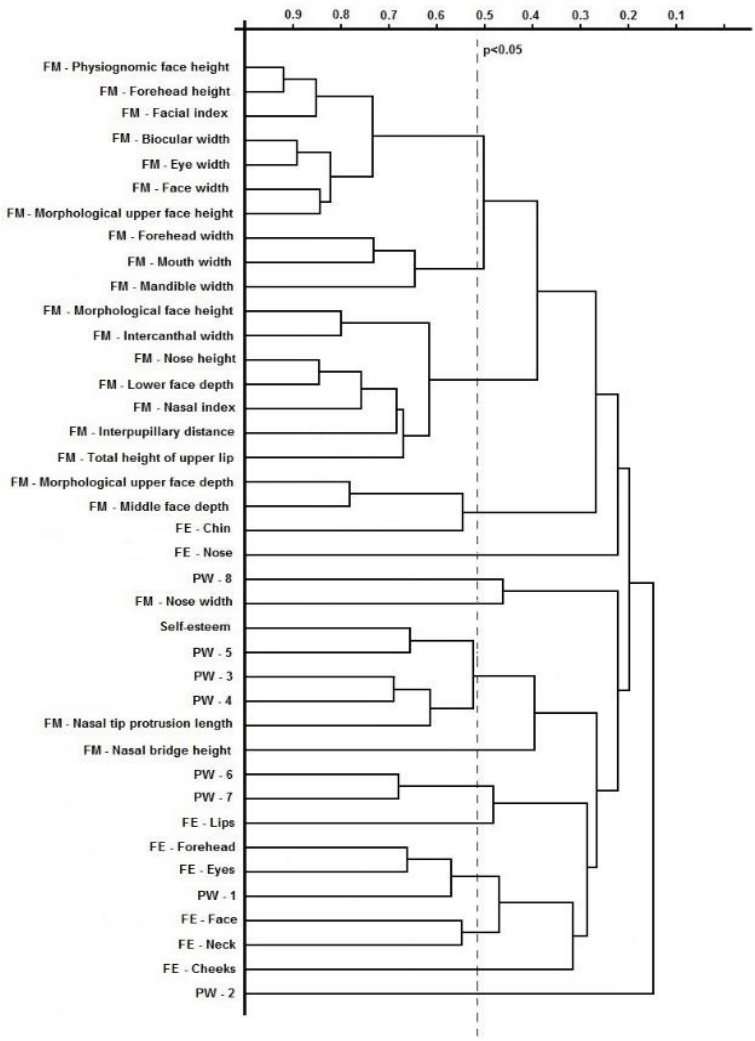

Figure 8. Dendrogram of cluster analysis on correlation between facial anthropometric data (*FM*), subjective evaluation of attractiveness of facial parts (*FE*), self-esteem, and psychosocial well-being (*PW*) in the female Aesthetic group (n = 15)

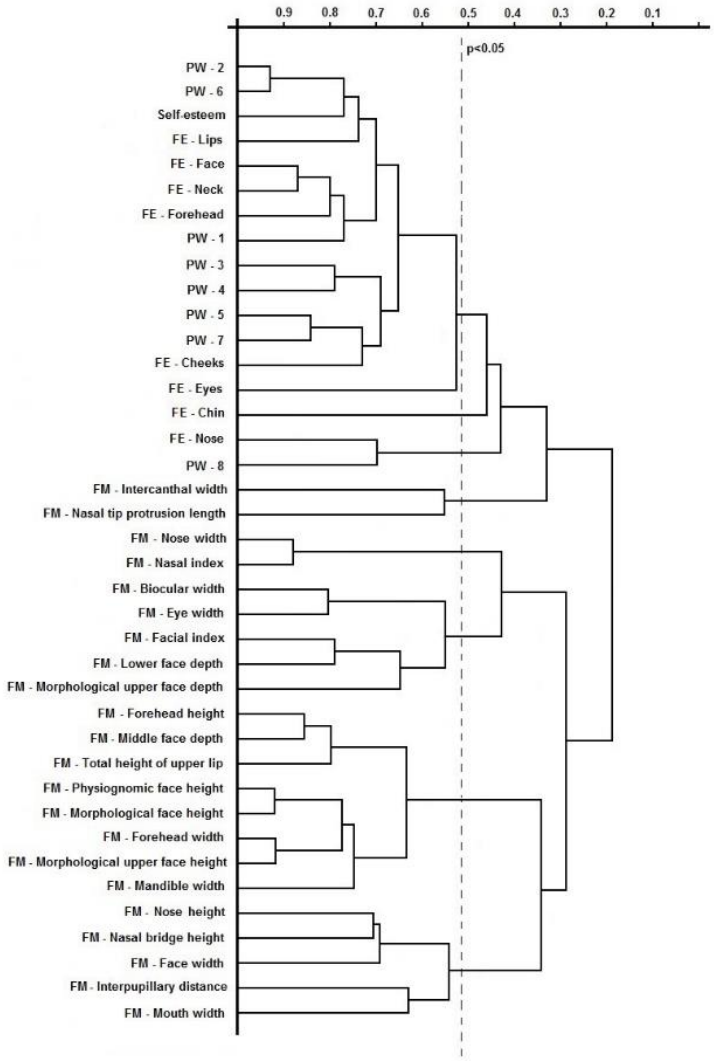

Figure 9. Dendrogram of cluster analysis on correlation between facial anthropometric data (*FM*), subjective evaluation of attractiveness of facial parts (*FE*), self-esteem, and psychosocial well-being (*PW*) in the male Aesthetic group (n = 15)

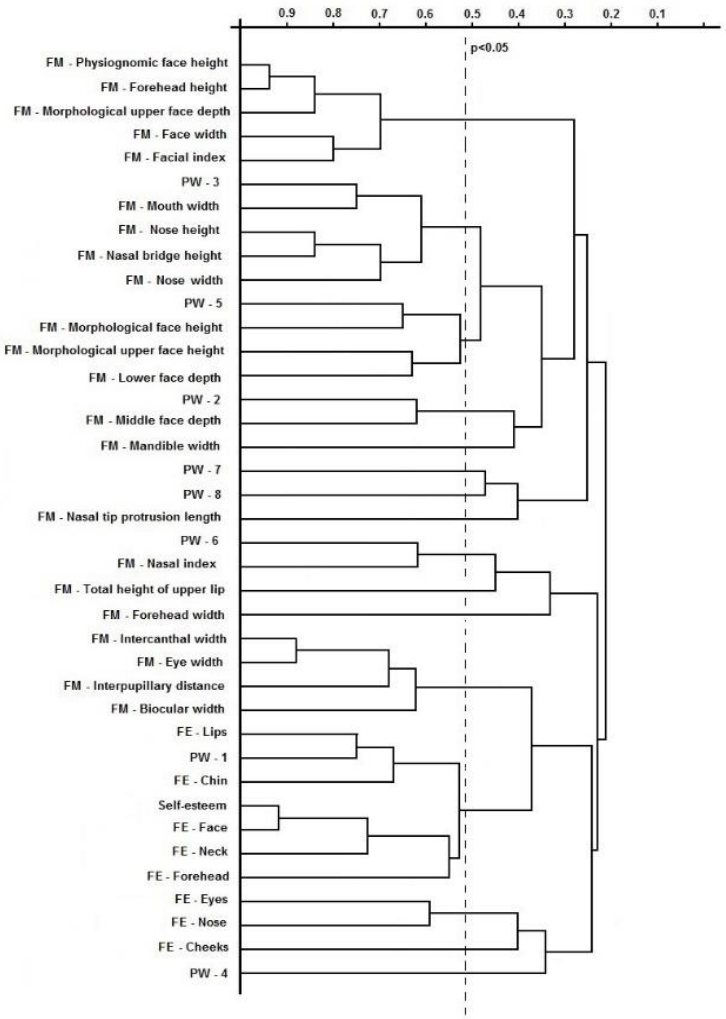

Figure 10. Dendrogram of cluster analysis on correlation between facial anthropometric data (*FM*), subjective evaluation of attractiveness of facial parts (*FE*), self-esteem, and psychosocial well-being (*PW*) in the female Trauma group (n = 15)

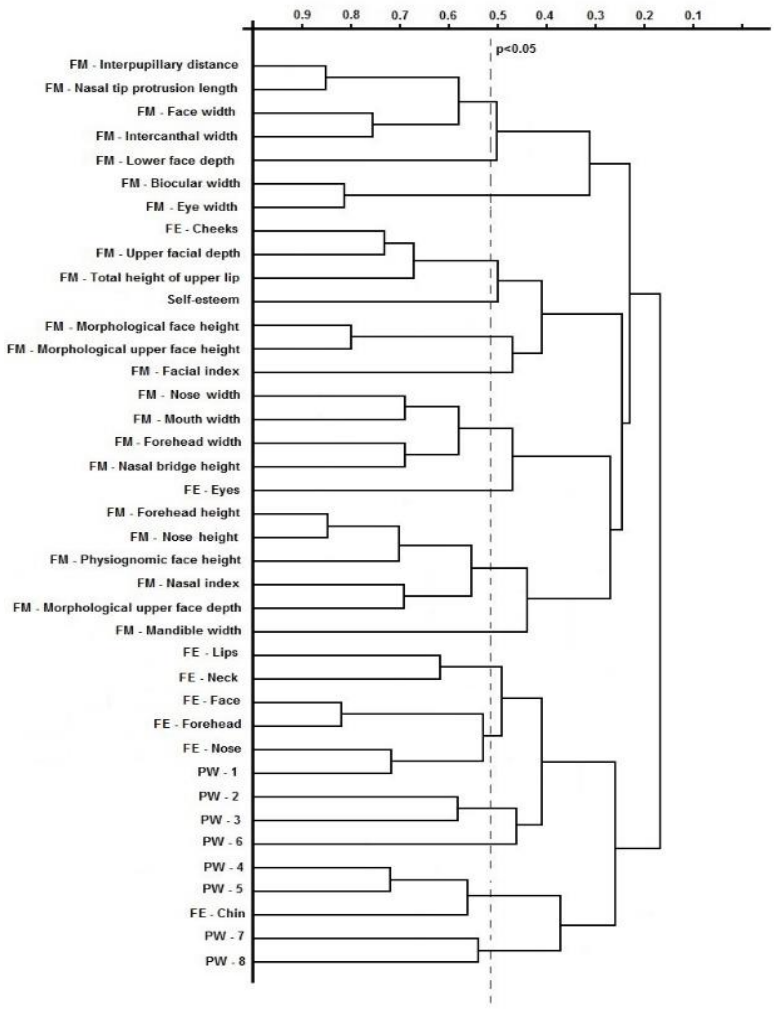

Figure 11. Dendrogram of cluster analysis on correlation between facial anthropometric data (*FM*), subjective evaluation of attractiveness of facial parts (*FE*), self-esteem, and psychosocial well-being (*PW*) in the male Trauma group (n = 15)

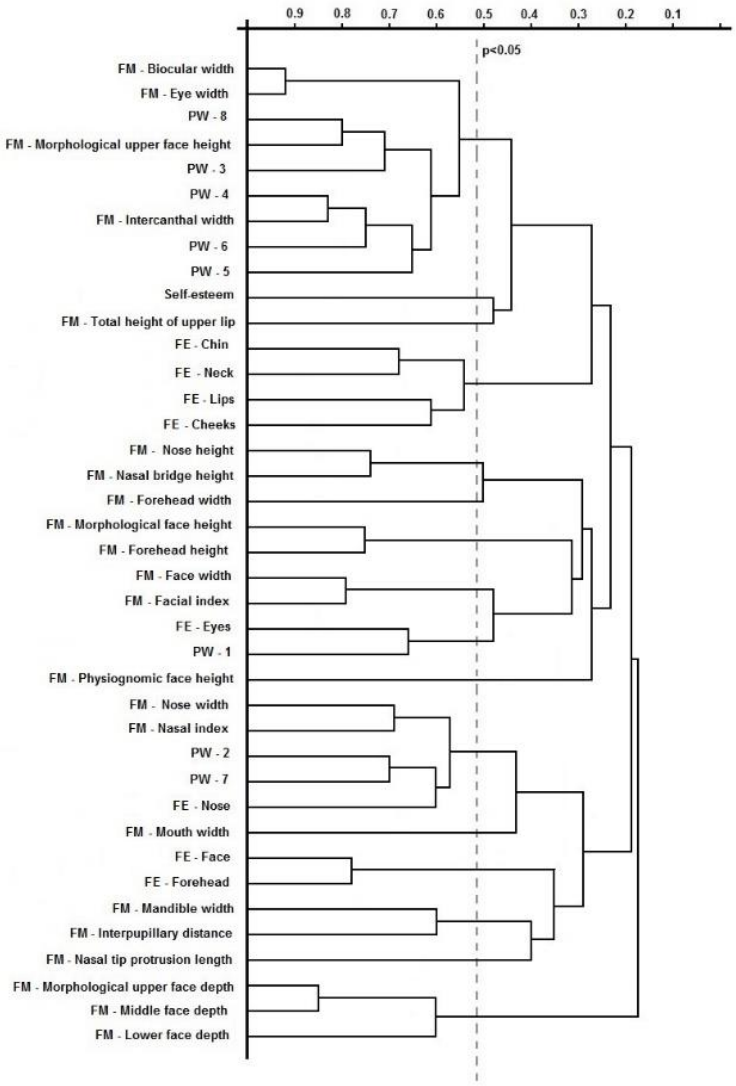

Figure 12. Dendrogram of cluster analysis on correlation between facial anthropometric data (*FM*), subjective evaluation of attractiveness of facial parts (*FE*), self-esteem, and psychosocial well-being (*PW*) in the female Oncology group (n = 15)

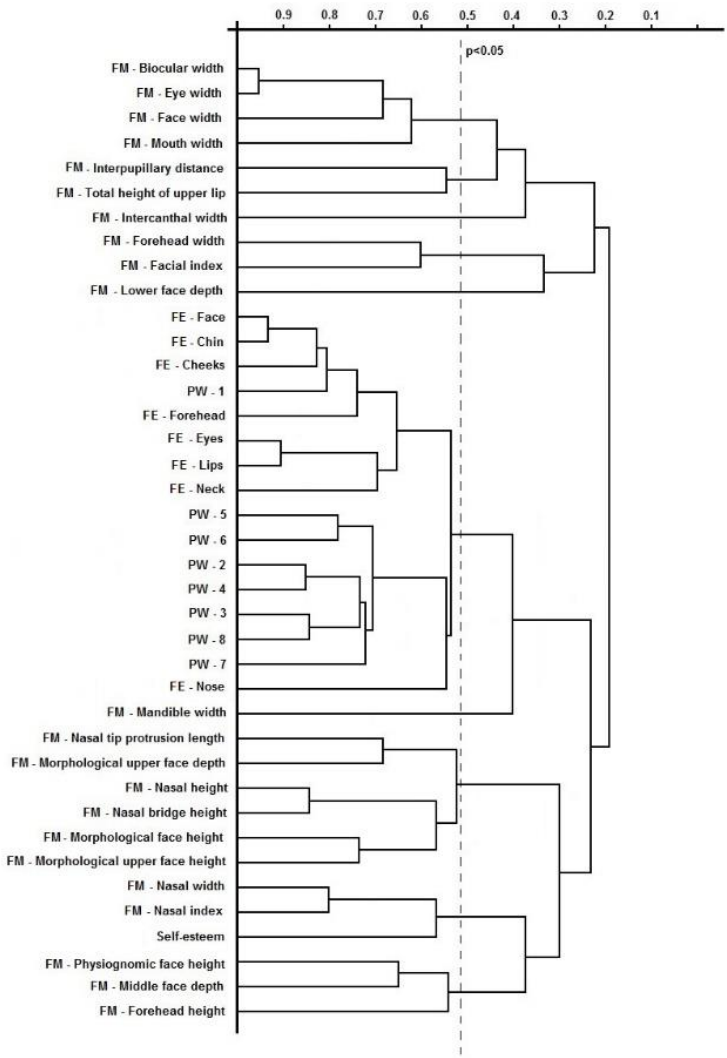

Figure 13. Dendrogram of cluster analysis on correlation between facial anthropometric data (*FM*), subjective evaluation of attractiveness of facial parts (*FE*), self-esteem, and psychosocial well-being (*PW*) in the male Oncology group (n = 15)

Cluster analysis demonstrated a tendency that real anthropometric measurements were significantly related to each other, and in the majority of cases they showed no reliable links to the perception of the whole face. However, evaluation scores of separate facial features had links with some anthropometric dimensions in several groups (evaluation of the chin – with facial depths in the female group after aesthetic rhinoplasty; evaluation of the cheeks – with the upper facial depth and the height of the upper lip in males after trauma; evaluation of the nose – with nasal dimensions in the female cancer group). All in all, nasal measurements were related to the perception of the nose only in the group of females with cancer.

The whole face and the nasal perception were interrelated in the majority of male groups and in the female control group, so the perception of the nose was not isolated from the perception of the face as a whole. This could be explained by the fact that complex mechanisms by which our brains are responsible for the perception of the face as a whole include the analysis of separate facial features as well (*Freiwald et al., 2016; Logan et al., 2017; Grill-Spector et al., 2018*). The evaluation of the nose was absolutely unlinked to the whole face perception in persons after aesthetic nasal surgery which shows a specific enhanced attitude to the nose of those people who underwent aesthetic surgery. Reliable links between the perception of the whole face and self-esteem were detected in men after aesthetic nasal surgery and in women after rhinoplasty due to trauma.

The nasal evaluation presented by women from trauma group was related to the evaluation of the eyes. According to the literature, the feminine beauty standards emphasize large eyes, a comparatively narrow nose with a tip rotated cephalically, full lips (*Broer et al., 2012; Benzeval et al., 2013; Morrison et al., 2016; O'Connor and Gladstone, 2017*). Probably, the appearance of the eyes of females from trauma group tends to overshadow the imperfection of the reconstructed nose.

A reliable relationship between self-esteem and the evaluation of the nose was not revealed in any clinical or the control group. The analysis showed that other connections of self-esteem in the studied groups were quite variable. In females from the control group, there were no reliable links between self-esteem and other studied indices, including psychosocial well-being responses, whereas a significantly reliable relationship between self-esteem and some anthropometric measurements was found in men from the control group. This finding is consistent with the evidence provided by literature on the link between masculine self-esteem and attractiveness, handsome features of men's face with a special emphasis on the size of the lower jaw and the height of the nose (*Lemay et al., 2010; Benzeval et al., 2013; O'Connor and Gladstone, 2017*).

The females from the trauma group associated self-esteem with the evaluation of many facial features. The results did not show a reliable relationship between self-esteem and the injured facial segment, but revealed the correlations with other parts with the remaining postoperative scars. This could be explained by the fact that in 80 percent of the studied cases, nasal reconstruction was performed using interpolated forehead or nasolabial flaps. Self-esteem of the trauma group's males did not show a reliable relationship with the evaluation of facial features or psychosocial issues. Self-esteem connections with the anthropometric dimensions were close but insignificant. We have found only a few studies about the status of post-traumatic patients and their self-esteem; these studies were largely focused on the functional post-reconstructive results (*Callahan, 2005; Moolenburgh et al., 2010; Beal et al., 2018*).

Self-esteem of females from the cancer group did not correlate with any of our investigated factors, while self-esteem of males from the cancer group was directly related to the nose width and the nasal index. The literature emphasizes a link between the self-esteem of oncology patients and the skin segment affected by cancer (*Benzeval et al., 2013; Karia et al., 2013; Kappos et al., 2017*). We found this

relationship in the cancer group's males, but it was not observed in the female group. This could be explained by different male and female awareness of oncological diseases as a result of diagnosis (*Imadojemu et al., 2014; Ellis et al., 2019*).

Self-esteem of females from the aesthetic group was closely related to the issues of psychosocial well-being (irritability, stress in public places due to appearance) and the nasal tip protrusion length. The shape of the nasal tip was particularly emphasized in the studies on the beauty of a female nose, and the optimal shape is considered than the tip protrusion is of the moderate length and slightly rotated cephalically *(Davis, 2006; Danel et al., 2017*). Self-esteem of the males from the aesthetic group showed a reliable relationship between the evaluation of some facial features (the shape of the face, the cheeks and the eyes) and the experience of stress triggered by other people's evaluation of their appearance. The results of the present study confirmed the importance of the aims of aesthetic operations not only to improve the individuals' appearance and self-satisfaction, but also to enhance the quality of their life (*Davis, 2006; Springer et al., 2008; Margraf et al., 2013; Herruer et al., 2015; Mousavi et al., 2018*). Since the patients of the aesthetic surgery groups underwent the evaluation after nasal correction, the reliable relationship between the nasal perception, self-esteem and psychosocial distress was not detected, therefore it could be assumed that the patients were satisfied with the outcomes of the surgery.

The nasal evaluation of the males from the aesthetic group was reliably connected with the response to stress as a result of other people's remarks about their appearance. This finding is in line with the evidence presented in literature that women are three times more satisfied with rhinoplasty than men (*Slator and Harris, 1992; Herruer et al., 2015*). It seems that those men who decided to have their nose operated on for aesthetic reasons were more concerned with postoperative outcomes. Unfortunately, this conclusion is not reliable because we had no pre-operative data.

All in all, psychosocial well-being was mostly related to self-esteem in males and females after aesthetic nasal surgery. Reliable links between facial perception (even between real facial parameters) and various aspects of psychosocial stress were estimated almost in all the investigated groups of patients (except females after aesthetic nasal surgery, probably, because they were satisfied with surgery results), and were less evident in the control group. However, facial perception in females from the control and cancer groups was related to stress feeling in the publicity, in females after nasal trauma surgery – looking to the mirror, in males from the control and trauma groups – looking at the mirror as well, in males after aesthetic nasal surgery and rhinoplasty due to cancer – looking at themselves and in publicity. Both, women and especially men from the cancer groups, demonstrated the closest connections between the appearance of the nose and psychological stress. That might be connected with the fact, that the diagnosis of an oncological disease itself causes stress and major changes in priorities (*Danel et al., 2017*).

To find out the correlation between the evaluation of the face and facial parts, the evaluation of the nose, body image, body size, the desirable height and weight, self-esteem and psychosocial well-being, a cluster analysis of the mentioned data was performed.

The Control female subjects' subjective ratings (Fig. 14) of facial parts and nasal attractiveness and psychosocial well-being level formed a separate cluster, while body size, desirable weight, and subjective evaluation of the attractiveness of the individual body parts combined another cluster; self-esteem and the desirable height did not show reliable relationships with any of the indicators. The Control male subjects' (Fig. 15) subjective assessment of the attractiveness of the face and nose, body parts, psychosocial well-being level and desirable height merged into one cluster, while body size and desirable weight formed another cluster. As in the Control women's group, male self-esteem did not establish any reliable relationships with any of the indicators.

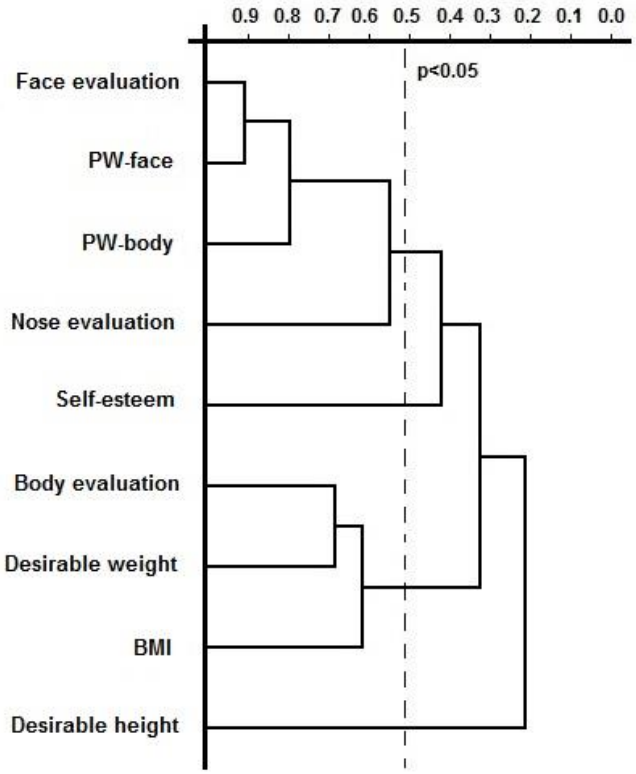

Figure 14. Dendrogram of cluster analysis on correlations between BMI, subjective evaluation of attractiveness of face, nose and body parts, desirable weight, height, self-esteem, and psychosocial well-being related to face *(PW-face)* and body *(PW-body)* in the female Control group (n = 15)

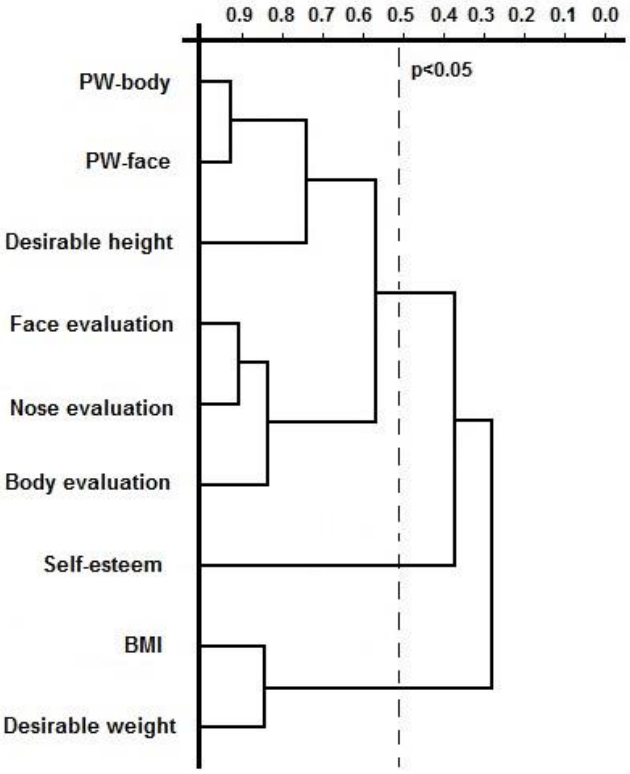

Figure 15. Dendrogram of cluster analysis on correlations between BMI, subjective evaluation of attractiveness of face, nose and body parts, desirable weight, height, self-esteem, and psychosocial well-being related to face *(PW-face)* and body *(PW-body)* in the male Control group (n = 15)

The subjective evaluation of the attractiveness of facial parts and psychosocial well-being in the female Aesthetic group (Fig. 16) formed a separate cluster, while body size, desirable weight and subjective assessment of the body parts constituted another cluster, whereas the subjective assessment of the nose, self-esteem and

desirable height did not establish any reliable relationships with any of the indicators. In the male Aesthetic group (Fig. 17), the subjective evaluation of facial parts and nose, psychosocial well-being and self-esteem of formed one cluster, while the body size and the desirable body weight data formed another cluster, but the subjective assessment of body parts and desirable height did not establish any reliable associations with any of the indicators.

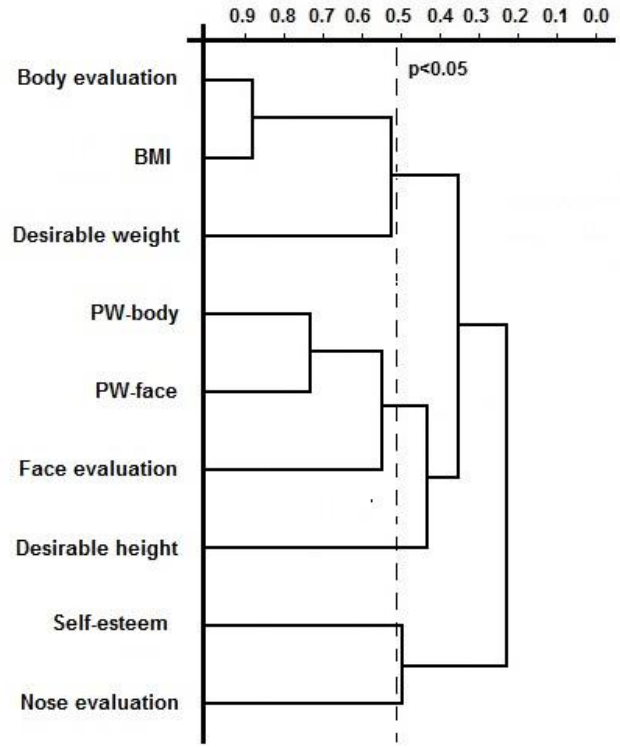

Figure 16. Dendrogram of cluster analysis on correlations between BMI, subjective evaluation of attractiveness of face, nose and body parts, desirable weight, height, self-esteem, and psychosocial well-being related to face *(PW-face)* and body *(PW-body)* in the female Aesthetic group (n = 15)

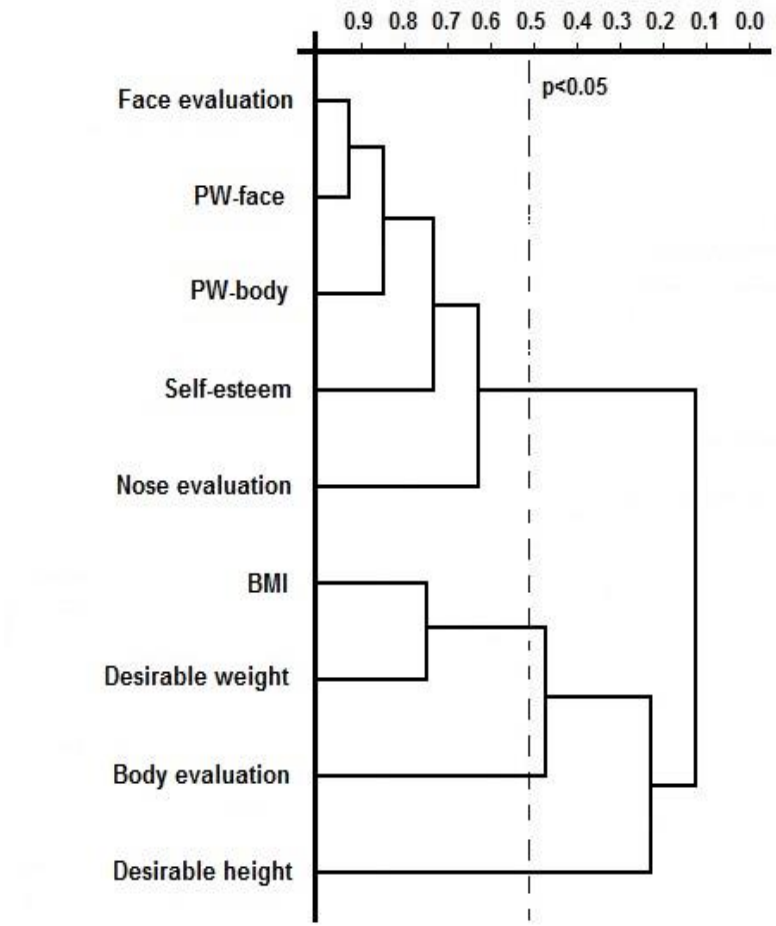

Figure 17. Dendrogram of cluster analysis on correlations between BMI, subjective evaluation of attractiveness of face, nose and body parts, desirable weight, height, self-esteem, and psychosocial well-being related to face *(PW-face)* and body *(PW-body)* in the male Aesthetic group (n = 15)

The subjective evaluations of the face and the body observed in the female Trauma group (Fig. 18) were interconnected, the psychosocial well-being level and self-esteem merged into one cluster, and the body size, the desirable weight, and the height joined another cluster, whereas the only indicator that did not produce any reliable associations was the subjective evaluation of the nose. The male Trauma group's (Fig. 19) subjective ratings of the face, nose and body, the level of psychosocial well-being was interrelated while the self-esteem with the body size index formed another cluster.

The least reliable correlations were found between the indicators of the female Oncology group (Fig. 20): the body size reliably correlated with the desirable height, the subjective evaluation of the body parts correlated with the desirable weight in another cluster, however, no reliable associations were found between the subjective evaluation of the facial parts and the nose, and self-esteem. The male Oncology group's (Fig. 21) evaluation of the facial parts, the level of psychosocial well-being, the body size and the desirable weight comprised one cluster. The subjective evaluation of the body parts, self-esteem and the desirable height did not show any reliable links.

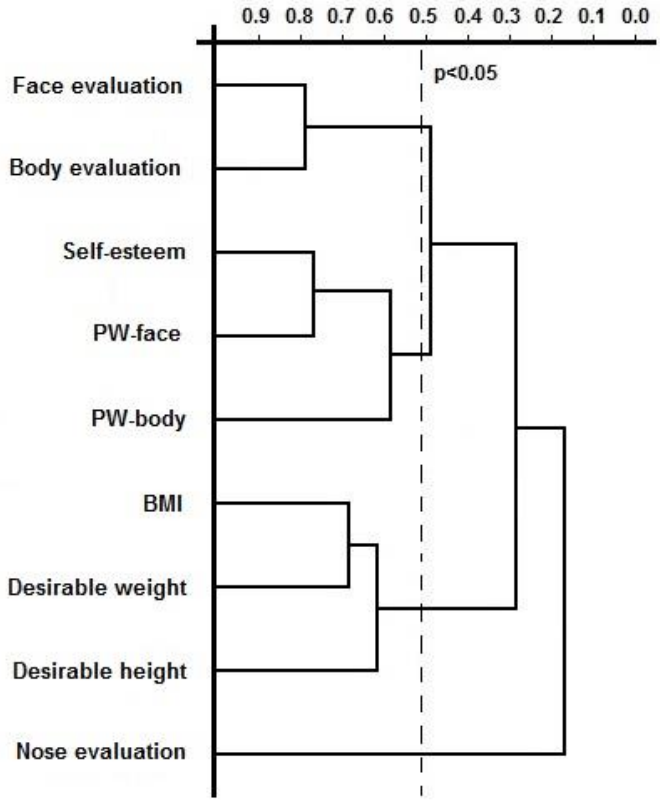

Figure 18. Dendrogram of cluster analysis on correlation between BMI, subjective evaluation of attractiveness of face, nose and body parts, desirable weight, height, self-esteem, and psychosocial well-being related to face *(PW-face)* and body *(PW-body)* in the female Trauma group (n = 15)

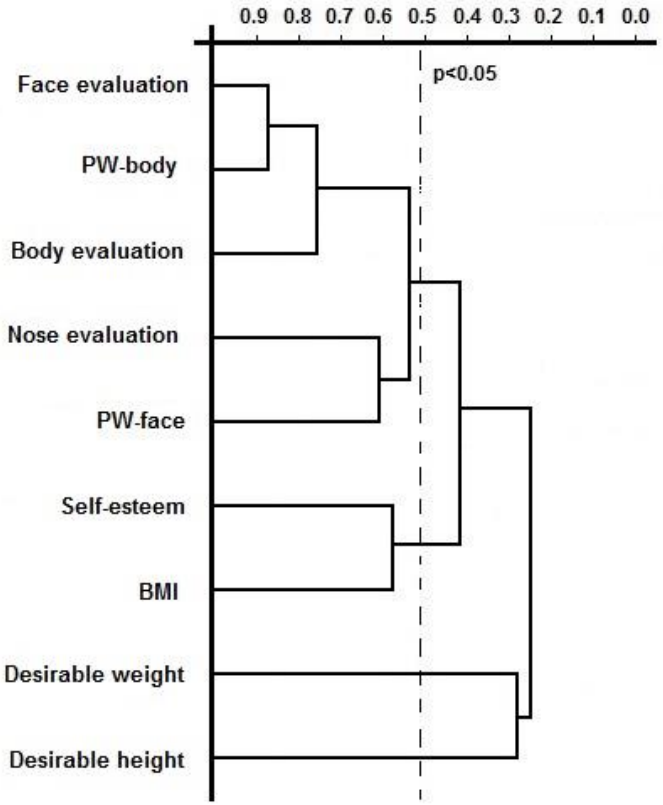

Figure 19. Dendrogram of cluster analysis on correlation between BMI, subjective evaluation of attractiveness of face, nose and body parts, desirable weight, height, self-esteem, and psychosocial well-being related to face *(PW-face)* and body *(PW-body)* in the male Trauma group (n = 15)

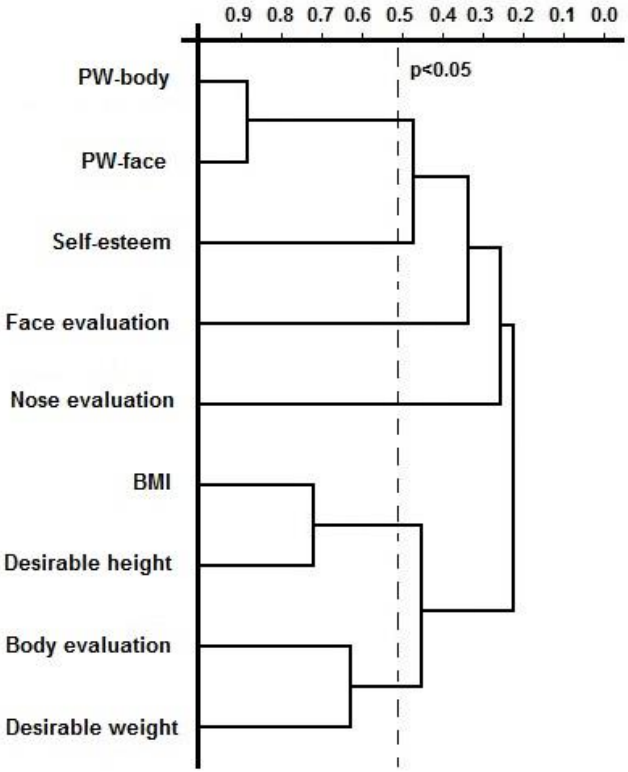

Figure 20. Dendrogram of cluster analysis on correlations between BMI, subjective evaluation of attractiveness of face, nose and body parts, desirable weight, height, self-esteem, and psychosocial well-being related to face *(PW-face)* and body *(PW-body)* in the female Oncology group (n = 15)

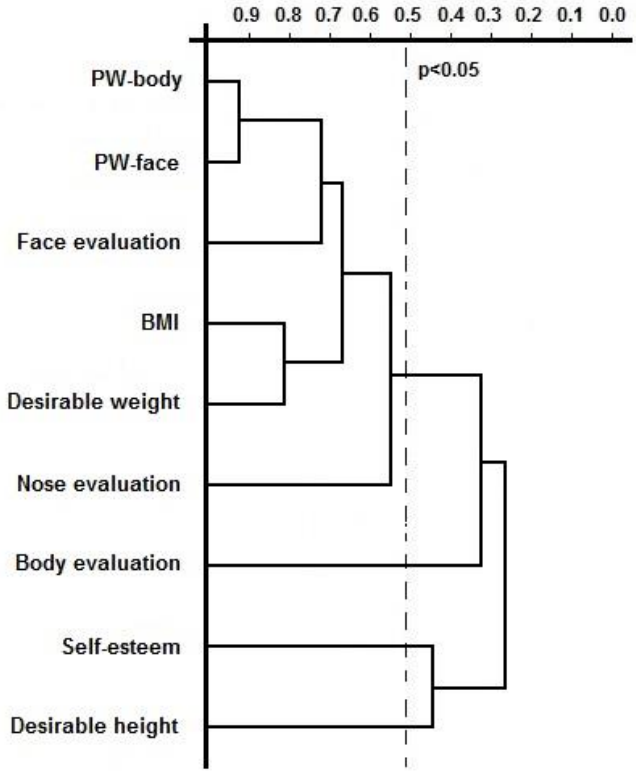

Figure 21. Dendrogram of cluster analysis on correlations between BMI, subjective evaluation of attractiveness of face, nose and body parts, desirable weight, height, self-esteem, and psychosocial well-being related to face *(PW-face)* and body *(PW-body)* in the male Oncology group (n = 15)

6. Conclusions

1. Most of the facial anthropometric indices in all the groups of male subjects were significantly higher than those in females. The smallest nasal tip protrusion length was found in the female Control group, the lowest nasal index was found in the Control males, and the highest nasal width was found in women and men operated on for traumas. The mean height and BMI were higher in men than in women. 58% of the subjects were overweight. The lowest BMI was found in men and women who underwent surgery for aesthetic reasons, the highest BMI was found in women who underwent surgery for traumas and in the Control group of males.

2. Men of all the study groups subjectively evaluated all the facial parts better than women, and a statistically significant difference was observed in better ratings of male lips and neck. The evaluation of the subjective attractiveness of the nose for trauma and cancer-operated patients was significantly worse than that of other facial parts and in the other study groups. Reliable relationships between subjective nasal evaluation and nasal anthropometric dimensions were found only in the Control females and women who underwent surgery for cancer, females from these groups gave a significantly better evaluation for lower nose height indices.

3. In terms of subjective attractiveness, women rated their chest area, hips, thighs and hands significantly worse than men. Patients operated on for cancer had the worst evaluation of their bodies. All women, except those who underwent surgery for aesthetic reasons, rated their chest area worse than men. Both males and females with high BMI rated all body parts worse.

4. The self-esteem of patients who underwent aesthetic nasal surgery was significantly higher than that of the Trauma and Control subjects. The majority of subjects with a low self-esteem were found among patients operated on for cancer. The subjective evaluation of the nose

alone of all facial parts had no reliable relationship with self-esteem. The correlation between the subjective attractiveness rating and self-esteem of other parts of the face was stronger than with the subjective rating of body parts. The highest levels of stress among all the study groups were shown by women and men who underwent cancer surgery. Men in all study groups felt more stress than women only when answering a question about sexual life.

5. Multidimensional cluster (correlation) analyses showed the following:

5.1. Anthropometric facial and nasal measurements in separate study groups reliably did not correlate with subjective evaluation of facial parts and nose in the overall context of all biological and psychosocial features examined - except for the Control females' nasal tip protrusion length, which correlated with psychosocial well-being, and nose width and nasal index in women operated on for cancer which were related to the subjective evaluation of the nose.

5.2. The subjective evaluation of the nose in almost all study groups was associated with the evaluation of other facial parts. The evaluation of the nose by patients who underwent surgery for aesthetic reasons was the only indicator that did not show any reliable relationship to other facial parts (what reflects their unique attitude towards the nose).

5.3. The self-esteem of the males of the Control group and those operated on for cancer were related to the anthropometric dimensions of the face and nose, and only the self-esteem of the males operated on for aesthetic reasons correlated with the subjective evaluation of the facial parts. Self-esteem in women of the Control and Oncology groups showed no reliable association with facial or nasal anthropometric data and other findings. The self-esteem of women who underwent surgery for aesthetic reasons was related to the nasal tip protrusion length, while the self-esteem of women operated on for

traumas was associated with subjective assessments of facial parts and also with psychosocial well-being.

5.4. The psychosocial well-being was associated with self-esteem only in groups of men and women operated on for aesthetic reasons. Relationships between individual psychosocial stress elements and subjective ratings of facial parts and some anthropometric dimensions were found in almost all study groups (except women who underwent surgery for aesthetic reasons).

5.5. The comparison of all the study groups showed that the most striking differences in the relationships between the evaluation of the face and the nose, self-esteem and psychosocial well-being were observed only in patients who underwent surgery for aesthetic reasons.

5.6. Multidimensional cluster (correlation) analysis of the subjective evaluation of the nose and the face, body size (BMI) and subjective assessment (image), self-esteem, and psychosocial well-being showed that the subjective assessment of the attractiveness of the nose in all men after nasal surgery showed more reliable correlations (was related to the evaluation of other facial parts and psychosocial well-being) than in women; however, in the groups of men who underwent surgery for traumas or cancer, the subjective evaluation of the nose was also reliably associated with the subjective evaluation of body parts, and in men operated on for aesthetic reasons, was also reliably associated with self-esteem. The subjective evaluation of the attractiveness of the nose in the Control women only, reliably correlated with the evaluation of other facial parts and psychosocial well-being. Men who underwent nasal surgery had more reliable associations between self-esteem and other indicators rather than women: self-esteem of men operated on for aesthetic reasons was reliably associated with subjective assessment of the attractiveness of facial features and the nose, while self-esteem in men operated on for

traumas, correlated with the body size (BMI). Only the self-esteem in the group of women who underwent surgery for traumas was reliably related to psychosocial well-being.

5.7. In summarising the results of a multidimensional cluster (correlation) analysis, it should be highlighted that, contrary to stereotypes, our study found that men's (not women's) self-esteem and psychosocial well-being were more frequently associated with the subjective perception of the nose and the face, as well as with facial anthropometry and body size parameters and body image elements. Women's self-esteem is apparently more dependent on other factors not examined in this study.

References

A list of references is provided in the manuscript of the Dissertation.

Publications

Articles published on the present research findings:

1. Barsauskiene-Stundzaite G, Zakaraite J and Vitkus K. Retrospective Analysis of Facial Dog Bite Injuries and Surgical Management at the Plastic Surgery Center: 10 Years' Experience, Vilnius University Hospital, Lithuania. Journal of Surgery 2017; 13 (2): 2–3.
2. Stundzaite-Barsauskiene G, Examining J, Barkus A, Jakimaviciene EM, Gibaviciene J, Jakutis N, Tutkus V, Venciute R, Dadoniene J. Facial perception, self-esteem, and psychosocial well-being in patients after nasal surgery due to trauma, cancer, and aesthetic needs (cluster analysis of multiple interrelations). Annals of Human Biology Published online: 21 Nov 2019. ISSN: 0301-4460.

Scientific presentations on the theme of the dissertation:

1. Stundzaite-Barsauskiene G, Zakaraite J and Vitkus K. "Retrospective Analysis of Facial Dog Bite Injuries and Surgical Management at the Plastic Surgery Center: 10 Years' Experience". EAFPS Annual Conference. September 2017, Lisbon,
2. Stundžaitė-Baršauskienė G, Tutkuvienė J, Dadonienė J, Venciūtė R. "General health status, self-esteem, and the feeling of distress in social environments in patients who for different reasons underwent nasal reconstruction". The International conference: Evolutionary medicine: perspectives in understanding health and disease. June 2018, Vilnius University, Lithuania.

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