

# Self-image of people with mandibular prognathism before and after orthognathic surgery

Justyna Szpyt<sup>1,A</sup>, Kacper Pajor<sup>1,B</sup>, Robert Kowalczyk<sup>2,C</sup>, Iwona Radlińska<sup>3,D</sup>✉, Marta Kożybska<sup>3,E</sup>

<sup>1</sup> Pomeranian Medical University in Szczecin, Subdepartment of Medical Law, Department of Social Medicine, Student Research Group, Żołnierska 48, 71-210 Szczecin, Poland

<sup>2</sup> Pomeranian Medical University in Szczecin, Maxillo-Facial Surgery Clinic, al. Unii Lubelskiej 1, 71-252 Szczecin, Poland

<sup>3</sup> Pomeranian Medical University in Szczecin, Subdepartment of Medical Law, Department of Social Medicine, Żołnierska 48, 71-210 Szczecin, Poland

<sup>A</sup> ORCID: 0000-0003-1686-069X; <sup>B</sup> ORCID: 0000-0002-7280-3254; <sup>C</sup> ORCID: 0000-0003-1130-5945; <sup>D</sup> ORCID: 0000-0002-4726-0702; <sup>E</sup> ORCID: 0000-0002-9261-0548

✉ iwona.radlinska@pum.edu.pl

## ABSTRACT

**Introduction:** Mandibular prognathism, also called progenia, is a type of anterior malocclusion that has negative effects on physical and mental health.

The aim of the study was to determine differences in the self-image of people with mandibular prognathism before and after orthognathic surgery.

**Materials and methods:** The study included 155 people – 79 of whom had a mandibular prognathism (group A) and 76 of whom had a previous mandibular prognathism that had already been corrected by surgery (group B). The research method used was a diagnostic survey that included original questions about well-being, self-esteem, and self-confidence.

**Results:** Group A statistically significantly more often experienced feelings of frustration, lower self-confidence, embarrassment, concern about appearance, especially when meeting new people, and lack of comfort due to their appearance being the center of attention than group B. People in group A were statistically significantly more likely to avoid smiling or laughing in company, to hide a smile in pictures, to avoid looking at themselves in the mirror, to compare their appearance to others, and

to avoid meetings due to dissatisfaction with their appearance than were people in group B. People in group A were statistically significantly less likely to preferably rate the general appearance of the face, the profile of the face, the appearance of the face from the front, and the appearance of the teeth than were people in group B. People in group A were statistically significantly less likely to preferably rate the general appearance of the face, the profile of the face, the appearance of the face from the front, and the appearance of the teeth than were people in group B.

**Conclusions:** Orthognathic surgery is a very important factor affecting the psyche of people with prognathism. People with mandibular prognathism before orthognathic surgery experience more negative feelings about their appearance, more often engage in behaviors aimed at concealing a malocclusion, and rate their appearance worse than people who have undergone orthognathic surgery. In view of this, comprehensive medical care, including psychological care, should be provided before, during, and after surgery.

**Keywords:** prognathism; malocclusion; craniofacial abnormalities; Angle class III; orthognathic surgery.

## INTRODUCTION

Mandibular prognathism – anterior morphological mandibular position also known as progenia or skeletal Class III malocclusion, is a type of anterior malocclusion. It is characterized by excessive forward growth of the mandible or incomplete development of the maxilla, which causes a characteristic deformity involving the entire facial skeleton. Compared to the morphological norms, it is manifested by a longer shaft and often a mandibular branch and a smoothed labial-chin furrow. The face becomes more elongated and the chin more prominent. Functionally, the patient cannot perform the mandibular retraction movement, the orbicularis oris muscle is overactive. In daily life, chewing and biting of food is impaired. Speech disorders are also common [1, 2, 3]. Class III skeletal defects are particularly common in the Chinese, Malaysian, and Iranian populations, where they occur in 15–16% of the population. The prevalence is lower in Europeans, at 4.88% [4].

There are several methods of treating Class III skeletal malocclusions other than surgery, such as interception

treatment (chin slingshot or face mask) or orthodontic camouflage. The choice of treatment method depends on the severity of the defect. In adults, the treatment of malocclusion depends on the severity of the malocclusion. Mild defects with an acceptable facial profile for the patient can be treated with orthodontic camouflage. The goal is to move the teeth appropriately around the bone to mask the malocclusion. In cases where the defect is more advanced and/or the patient's facial profile is not acceptable, surgical treatment seems to be an appropriate option [5, 6]. The criterion for surgical treatment is the WITS measurement, which determines the position of the maxilla with respect to the mandible. A value greater than –5 mm indicates that surgical treatment is preferable for the patient [4, 7]. Other criteria that may prompt the introduction of this type of treatment are the anteroposterior position and inclination of the maxillary and mandibular incisors and the thickness of the mandibular symphysis [5, 6]. Several types of surgical procedures are performed in patients with skeletal class III.

These include maxillary osteotomy (most commonly Le Fort I osteotomy), mandibular osteotomy (most often bilateral sagittal split osteotomys), and genioplasty. The Le Fort I osteotomy involves cutting off the palate along with the alveolar processes. It can be performed as a single procedure. Sometimes an additional mandibular osteotomy is performed, which can also be a stand-alone procedure, as well as genioplasty if necessary. Bilateral sagittal split osteotomy involves the retraction of the mandible, while genioplasty may involve the shortening of the chin [8]. Importantly, if surgical treatment is chosen, orthodontic support is also necessary [3, 9, 10].

The motivations of people who decide to undergo genioplasty include the desire to improve the function of the masticatory system, the temporomandibular joints, and the speech apparatus, as well as to reduce pain. However, the main reason is the aesthetic, psychological, or psychosocial aspect, because patients with this lesion have to deal with many emotional problems [7].

According to the literature, the attractiveness of the face is influenced by features such as appropriate proportions and symmetry of the face, so patients with mandibular prognathism may experience psychological discomfort caused by excessive protrusion of the jaw [11, 12]. In our research, we decided to focus on this issue and investigate how self-image changes after surgery to correct the deformity. The aim of the study was to determine differences in self-image between people with mandibular prognathism before and after orthognathic surgery.

## MATERIALS AND METHODS

A total of 155 people ages 18–47 participated in the survey. Participants were divided into 2 groups. Group A consisted of people with mandibular prognathism who had not undergone orthognathic surgery and were waiting for orthognathic surgery (79 respondents; 50.97%). Group B consisted of people who had a morphological predominance in the past, which was corrected by surgery (76 patients; 49.03%). People in group B were characterized by a higher age than those in group A ( $z = -2.205$ ;  $p \leq 0.05$ ) – Table 1.

TABLE 2. Socio-demographic characteristics

|                    |                                        | All<br>n = 155 |       | Group A<br>n = 79 |       | Group B<br>n = 76 |       | $\chi^2$ | df | p     |
|--------------------|----------------------------------------|----------------|-------|-------------------|-------|-------------------|-------|----------|----|-------|
|                    |                                        | n              | %     | n                 | %     | n                 | %     |          |    |       |
| Sex                | female                                 | 136            | 87.74 | 67                | 84.81 | 69                | 90.79 | 1.288    | 1  | 0.256 |
|                    | male                                   | 19             | 12.26 | 12                | 15.19 | 7                 | 9.21  |          |    |       |
| Marital status     | married or in an informal relationship | 99             | 63.87 | 46                | 58.23 | 53                | 69.74 | 2.223    | 1  | 0.136 |
|                    | alone (single/divorced/widow/widower)  | 56             | 36.13 | 33                | 41.77 | 23                | 30.26 |          |    |       |
| Place of residence | village                                | 35             | 22.58 | 20                | 25.32 | 15                | 19.74 | 2.956    | 2  | 0.228 |
|                    | town with up to 250 000 inhabitants    | 51             | 32.90 | 21                | 26.58 | 30                | 39.47 |          |    |       |
|                    | town with over 250 000 inhabitants     | 69             | 44.52 | 38                | 48.10 | 31                | 40.79 |          |    |       |

TABLE 1. Group characteristics

| Characteristics of the group |       | Group A      | Group B     |
|------------------------------|-------|--------------|-------------|
| N                            |       | 79           | 76          |
| Age (years)                  | M     | 25           | 25          |
|                              | Q3–Q1 | 7            | 8           |
|                              |       | 25.14 ± 5.10 | 27.22 ± 5.9 |
|                              | max.  | 18           | 18          |
|                              |       | 42           | 47          |

The groups did not differ from each other in terms of other sociodemographic variables (Tab. 2).

The research method was a diagnostic survey using the authors' questionnaire. The questionnaire contained 19 questions for group A and 25 questions for group B. All questions, except for the age question, were closed questions. The questionnaires were sent to the respondents via the Internet, more precisely via the Polish group of descendants in the social network (facebook.com, January 2019). Both groups were surveyed in terms of:

- 1) socio-demographic variables (age, sex, marital status, place of residence),
- 2) feelings related to appearance (frustration, low self-confidence, embarrassment, concern about appearance, embarrassment about appearance when meeting new people, discomfort being the center of attention). Respondents rated the frequency of occurrence of each of these feelings on a scale of 1–5, where: 1 – never, 2 – seldom, 3 – sometimes, 4 – often, and 5 – very often,
- 3) appearance-related behaviors (avoiding smiling or laughing in company, hiding a smile in photos, avoiding looking at oneself in the mirror, comparing one's appearance to others, avoiding meetings because of dissatisfaction with appearance). Respondents rated the frequency of each behavior on a scale of 1–5, where: 1 – never, 2 – seldom, 3 – sometimes, 4 – often, and 5 – very often,
- 4) questions on the evaluation of appearance (evaluation of general appearance, evaluation of the facial profile, evaluation of the face from the front, evaluation of the appearance of the teeth, evaluation of the appearance of the nose). Respondents were rated on a scale of 1–5, where: 1 – very bad, 2 – wrong, 3 – neutral, 4 – good, and 5 – very good.

In addition, people in group B were additionally asked to assess the changes after surgery (self-assessment of changes in the perception of the appearance of your face, smiling, willingness to look at your face, appearance in relation to other people, self-confidence, willingness to smile at others). Respondents were rated on a scale of 1–5, where: 1 – it is much worse than before the operation,; 2 – it is worse than before the operation, 3 – I don't notice any change, 4 – it is better than before the operation, 5 – it is much better than before the operation.

Inclusion criteria for the study were 18 years of age and having current or past offspring. Exclusion criteria were age <18 years, no current or past offspring, and due to the research method, lack of computer skills to complete the online survey.

The analysis was performed in the licensed Statistica 13.1 package. The Shapiro–Wilk test was used to assess the normality of the distribution of quantitative characteristics, the Chi–Pearson square test for 2 variables, and the nonparametric Mann–Whitney U test for 2 independent groups. A p-value < 0.05 was considered statistically significant.

## RESULTS

Table 3 presents the participants' answers to questions about attitudes towards their appearance.

Among the negative feelings, people in group A most often reported being uncomfortable being the center of attention (Me = 3.759). In group B, the most common feeling was concern about appearance (Me = 2.750). Statistically significant differences were found between group A and group B in all aspects examined. Group A participants were statistically significantly more likely to experience frustration ( $p < 0.001$ ), low self-confidence ( $p < 0.001$ ), embarrassment ( $p < 0.001$ ), concern about appearance ( $p < 0.001$ ), embarrassment about appearance when meeting new people ( $p < 0.001$ ), and discomfort being the center of attention ( $p < 0.001$ ) than were group B participants (Tab. 3, Fig. 1).

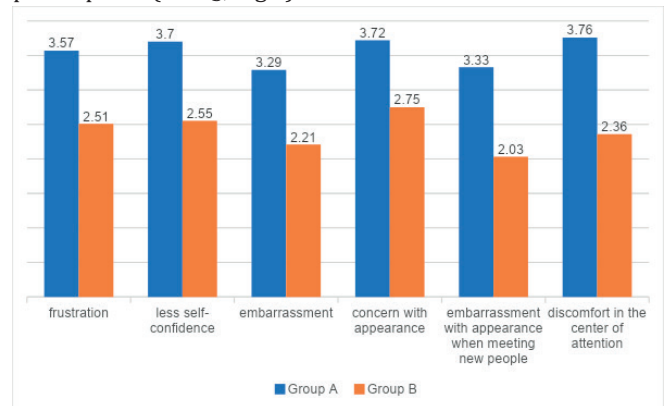


FIGURE 1. Feelings about one's own appearance in groups A and B (Me)

TABLE 3. Respondents' answers about attitudes towards their appearance

|                                                        |                                                          | Group A |      |   |       | Group B |      |   |       | z      | p        |
|--------------------------------------------------------|----------------------------------------------------------|---------|------|---|-------|---------|------|---|-------|--------|----------|
|                                                        |                                                          | Me      | SD   | M | Q3–Q1 | Me      | SD   | M | Q3–Q1 |        |          |
| Feelings related to one's own appearance <sup>1</sup>  | frustration                                              | 3.57    | 1.16 | 4 | 1     | 2.51    | 1.32 | 2 | 2.5   | 4.741  | 0.000*** |
|                                                        | less self-confidence                                     | 3.70    | 1.28 | 4 | 2     | 2.55    | 1.36 | 2 | 3     | 4.759  | 0.000*** |
|                                                        | embarrassment                                            | 3.29    | 1.26 | 4 | 2     | 2.21    | 1.37 | 2 | 2     | 4.671  | 0.000*** |
|                                                        | concern with appearance                                  | 3.72    | 1.32 | 4 | 2     | 2.75    | 1.29 | 3 | 2     | 4.449  | 0.000*** |
|                                                        | embarrassment with appearance when meeting new people    | 3.33    | 1.49 | 4 | 3     | 2.03    | 1.37 | 1 | 2     | 5.081  | 0.000*** |
|                                                        | discomfort in the center of attention                    | 3.76    | 1.43 | 4 | 2     | 2.36    | 1.52 | 2 | 2.5   | 5.145  | 0.000*** |
| Behaviors related to one's own appearance <sup>1</sup> | avoiding a smile or laughing in company                  | 2.27    | 1.26 | 2 | 2     | 1.71    | 1.11 | 1 | 1     | 2.812  | 0.004**  |
|                                                        | hiding a smile in photos                                 | 3.19    | 1.30 | 3 | 2     | 2.11    | 1.37 | 2 | 2     | 4.648  | 0.000*** |
|                                                        | avoiding looking at yourself in the mirror               | 3.44    | 1.32 | 4 | 3     | 2.43    | 1.44 | 2 | 2.5   | 4.166  | 0.000*** |
|                                                        | comparing your appearance to others                      | 3.84    | 1.37 | 4 | 2     | 3.22    | 1.36 | 3 | 2     | 2.906  | 0.004**  |
|                                                        | avoiding meetings due to dissatisfaction with appearance | 2.22    | 1.35 | 2 | 2     | 1.66    | 1.13 | 1 | 1     | 2.779  | 0.005**  |
| Appearance evaluation <sup>2</sup>                     | general appearance evaluation                            | 2.9     | 0.93 | 3 | 1     | 3.78    | 0.96 | 4 | 1     | -5.292 | 0.000*** |
|                                                        | facial profile evaluation                                | 1.94    | 0.88 | 2 | 1     | 3.7     | 1.13 | 4 | 2     | -7.977 | 0.000*** |
|                                                        | facial evaluation from the front                         | 2.99    | 1.02 | 3 | 2     | 3.71    | 1.11 | 4 | 1.5   | -4.140 | 0.000*** |
|                                                        | teeth appearance evaluation                              | 2.47    | 1.04 | 2 | 1     | 3.58    | 1.05 | 4 | 1     | -5.777 | 0.000*** |
|                                                        | nose appearance evaluation                               | 3.19    | 1.30 | 3 | 2     | 3.2     | 1.29 | 3 | 2     | -0.002 | 0.999    |

M – mean; SD – standard deviation; M – median; Q3–Q1 – interquartile range; 1 – grade on a scale of 1–5, a higher score means more frequent feeling/behavior; 2 – grade on a scale of 1–5, the higher the score, the better the appearance grade

\*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

Group A respondents were statistically significantly more likely to report behaviors such as avoiding smiling or laughing in a company setting ( $p < 0.01$ ), hiding a smile in pictures ( $p < 0.001$ ), avoiding looking in the mirror ( $p < 0.001$ ), comparing their appearance to others ( $p < 0.01$ ), and avoiding meetings because of dissatisfaction with appearance ( $p < 0.01$ ) than were group B respondents (Tab. 3, Fig. 2).

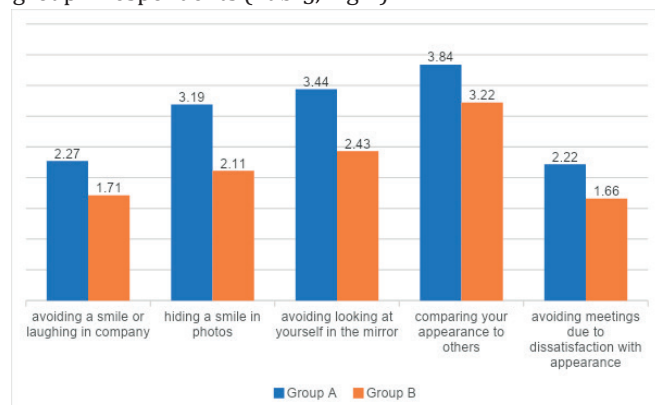


FIGURE 2. Behaviors related to one's own appearance in groups A and B (Me)

Regarding self-rating of appearance, people in group A rated the facial profile the lowest (Me = 1.937), while people in group B rated the nose the lowest (Me = 3.197). There were statistically significant differences between the groups for all aspects of appearance except the nose. Group A participants rated their overall appearance ( $p < 0.001$ ), facial profile ( $p < 0.001$ ), frontal facial appearance ( $p < 0.001$ ), and dental appearance ( $p < 0.001$ ) statistically significantly lower than group B participants (Tab. 3, Fig. 3).

Table 4 shows the opinions of group B respondents regarding their self-assessment of the change in appearance after surgery.

Most respondents indicated that their self-assessment of their face, smiling, willingness to look at their face, self-assessment of their appearance in relation to others, self-confidence, and willingness to smile at others were better or much better after surgery than before surgery (Tab. 4, Fig. 4).

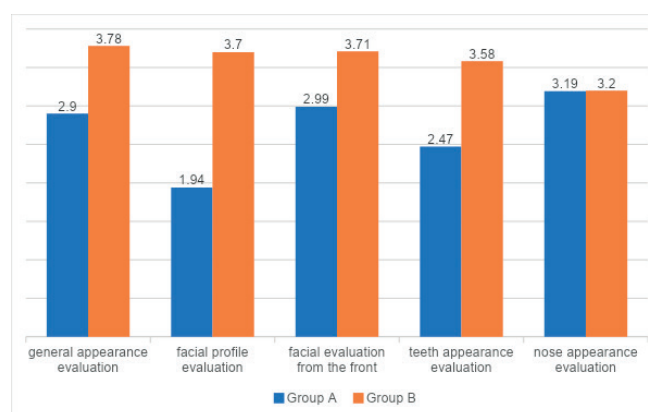


FIGURE 3. Appearance self-assessment in groups A and B (Me)

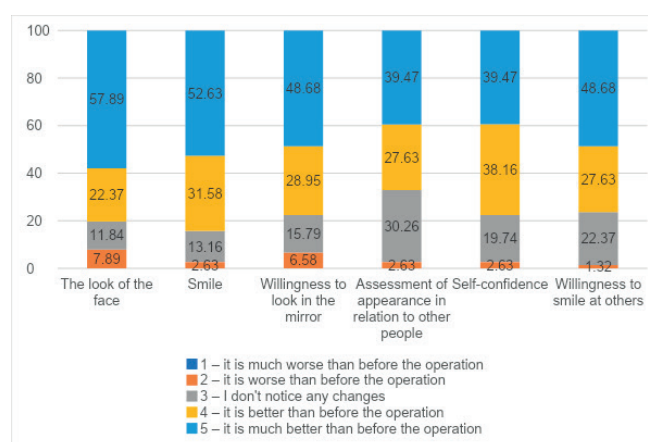


FIGURE 4. Self-assessment of group B respondents regarding changes in appearance after surgery (%)

## DISCUSSION

The obtained research results showed significant differences in appearance feelings, appearance-related behaviors, and self-assessment of appearance between people with protruding

TABLE 4. Self-assessment of group B respondents regarding changes in appearance after surgery

|                                             | The look on the face |       | Smile |       | Willingness to look in the mirror |       | Self-assessment of appearance in relation to other people |       | Self-confidence |       | Willingness to smile at others |       |
|---------------------------------------------|----------------------|-------|-------|-------|-----------------------------------|-------|-----------------------------------------------------------|-------|-----------------|-------|--------------------------------|-------|
|                                             | n                    | %     | N     | %     | n                                 | %     | n                                                         | %     | n               | %     | n                              | %     |
| It is much worse than before the operation  | 0                    | 0     | 0     | 0     | 0                                 | 0     | 0                                                         | 0     | 0               | 0     | 0                              | 0     |
| It is worse than before the operation       | 6                    | 7.89  | 2     | 2.63  | 5                                 | 6.58  | 2                                                         | 2.63  | 2               | 2.63  | 1                              | 1.32  |
| I don't notice any changes                  | 9                    | 11.84 | 10    | 13.16 | 12                                | 15.79 | 23                                                        | 30.26 | 15              | 19.74 | 17                             | 22.37 |
| It is better than before the operation      | 17                   | 22.37 | 24    | 31.58 | 22                                | 28.95 | 21                                                        | 27.63 | 29              | 38.16 | 21                             | 27.63 |
| It is much better than before the operation | 44                   | 57.89 | 40    | 52.63 | 37                                | 48.68 | 30                                                        | 39.47 | 30              | 39.47 | 37                             | 48.68 |

teeth before orthognathic surgery and people who underwent surgical correction of protruding teeth.

Deformities of the facial skeleton undoubtedly influence many psychological and sociological factors. The studies conducted so far show that people with anomalous jaw and mandible shape complain of greater stress, show depressive symptoms, and more often have psychosocial problems that significantly affect their quality of life [13, 14]. Furthermore, class III skeletal malocclusion, i.e. prognathism, is considered to be the most problematic maxillofacial deformity. Patients with prognathism present with a wide range of psychosocial disorders that they believe are caused by the appearance of their face [15]. As a result, the popularity of various methods of treating jaw protrusion continues to grow. However, despite the wide range of therapeutic methods available, surgical correction is the most effective [4].

Surgical correction of class III skeletal malocclusions is considered a relatively safe procedure for the patient, but it is not without risk of complications [16]. The most commonly reported complications are cranial nerve injuries (especially sensitivity alteration in the inferior alveolar nerve, temporomandibular joint disorders, and bleeding [17]. The occurrence of cranial nerve injury, which occurs in up to 50% of orthognathic surgeries, may affect patient satisfaction with the outcome. In a study by Lee et al., patients reported difficulty with some daily activities such as eating, applying makeup, and shaving. However, although they described these changes as disappointing, the vast majority of them (96.7%) reported that they would have undergone surgery even if they had known that they would experience these changes [18].

Orthognathic surgery has a significant effect on the craniofacial skeleton, restoring proportions to physiological norms and influencing not only aesthetics but also the functioning of organs in the oral cavity, with particular emphasis on improving airway patency. The operation also affects the condition of the soft tissues, which has a significant impact on their function in everyday life. A characteristic feature of this defect is the predominance of the muscles that allow the mandible to protrude over the muscles that retract it. Due to this disproportion in their function, the movement of the mandibular retraction becomes practically impossible, resulting in numerous functional disorders. Other problems that patients with Progenia face are problems with speech, temporomandibular joint function, and chewing function. These difficulties are caused by the improper positioning of the mandible around the jaw [19, 20, 21, 22, 23]. However, despite the many benefits of surgical correction of Class III malocclusions, improving the appearance of the face and teeth remains the main motivation for undergoing surgery. In a study by Zhou et al., as many as 93% of people reported the desire to improve facial appearance as the reason for correcting protruding teeth [24]. In a recent Polish study, facial and smile aesthetics as well as psychological aspects were the most important factors motivating patients to undergo surgery [25]. This shows the significant psychological burden of facial morphology disorder in the morphological anterior jaw.

Research shows that orthognathic surgery produces satisfactory results in the vast majority of patients. According to Finlay et al., as many as 87% of patients consider the surgeries to be successful [26]. Although medical statistics indicate that the number of operated patients is comparable by gender, emotional issues related to women can be considered. Taking into account our research and the predominance of the female sex in the respondents, it can be hypothesized that women are more willing to share their experiences related to the treatment of an orthognathic defect, indicating their greater commitment in this regard. The study by Nicodemo et al. showed that surgical treatment improved patients' self-esteem and reduced their depressive symptoms. In men, however, no significant changes were found after surgery [27].

Based on our research and previous scientific results, it can be concluded that people with a morphological predisposition have problems on many levels of life, including aspects of self-acceptance, self-esteem, and interpersonal relationships. Often, indicators of successful orthognathic surgery include parameters such as pain reduction, improved functionality, and/or improved stability of the masticatory apparatus. However, it should not be forgotten that surgery may be an appropriate treatment to improve quality of life by influencing the patient's psyche [28]. In the light of the research, the correction of progenia has a great impact on the emotional sphere of a person, so it is extremely important to provide psychological care both to people who have not yet undergone surgery and to those who have already undergone retention treatment. Adequate preparation of the patient for the procedure and, consequently, for a new appearance can positively influence the final results of the treatment and improve the cooperation of the therapeutic team with the patient [28].

## LIMITATIONS

The study presented is not without limitations. It should be emphasized that the study examined people who had never undergone orthognathic surgery for mandibular prognathism and a separate group who had undergone surgery. In the future, it would be worthwhile to extend the research to measure acceptance in the same group of people before and after surgery. The type of surgery performed, the years and place of treatment, and the fact of orthodontic treatment among the study participants should also be taken into account. The research tools used can be expanded to include questionnaires on quality of life and satisfaction with treatment of orthodontic and surgical patients.

## CONCLUSION

Orthognathic surgery is a very important factor affecting the psyche of people with prognathism. People with mandibular prognathism before orthognathic surgery experience more negative feelings about their appearance, more often engage

in behaviors aimed at concealing a malocclusion defect, and rate their appearance worse than people who have undergone orthognathic surgery. Thus, effective treatment of prognathism, a problem that affects many levels of health, requires comprehensive medical care, including psychological care – before, during, and after the procedure.

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