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Correlations between the changes in patients' dental–facial morphology at the end of the orthodontic treatment and the psychological variables

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Abstract

The purpose of this research was to assess the impact that the improvement of patients' dental–facial morphology has at the end of the orthodontic treatment upon the following psychological variables: self-esteem, current self-related thoughts as well as upon the variables of social self-esteem and performance. The number of patients included in the study was of 168 (82 children and 86 adolescents) who carried out the orthodontic treatment. At the end of the active treatment, we applied to all patients the assessment instruments for the level of self-esteem and self-related current thoughts: the *Rosenberg's Self-Esteem Scale* and the *Heatherton & Polivy Current Thoughts Scale*. As far as the patients in the study are concerned, the improvement of their facial aspect at the end of the treatment showed a significantly positive correlation with the variables of global self-esteem, self-related current thoughts, social self-esteem and performance, with the exception of the girls in children study group who showed no correlations between physical aspect and the performance variable.

Keywords: facial aspect, self-esteem, self-related current thoughts.

Introduction

Worldwide there are numerous references to patients' psychological variables including aspects related to: patients' concerns for facial aesthetics, improvement of the level of self-esteem, developing patients' adherence, doctor-patient communication, patients' expectations and satisfaction with the orthodontic treatment. We shall limit ourselves to quote only a few representative authors from the field of orthodontics that showed interest in psychological approaches: Nanda RS, Sinha PK, Fillingim RB, Pinkham JR, Alexander RG, Graber TM, Proffit WR, Kijak HA, Albino JE, and Sergl HG.

One of the psychological variables involved in the adherence to the orthodontic treatment is self-esteem. Self-image plays an important role in the life of each individual: it influences the tone of patients' emotional experiences, leads to self-awareness by comparison with other people, leading the individual to achieve self-esteem. Self-image represents a social construction: we are the outcome of our adhesion to a certain social group, by comparing ourselves to the others; we are influenced by social circumstances or by certain personalities from our social environment [1].

In their inter-individual relationships, people dedicate more time to the aspect of their interlocutor's eyes and mouth and less time to other facial features. Results of a study showed that, for the general public, the aesthetics of the smile is in second place, right after the aspect of eyes, in terms of attraction expressed by people's physiognomy [2].

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Material and Methods

The number of patients included in the study was of 168 children and adolescents who carried out the orthodontic treatment. The number of children patients included in the study was of 82, both genders, aged 7–11-year-old, mean age = 8.92 years and standard deviation = 0.85. The sample included 42.7% male subjects and 57.3% female subjects.

The number of adolescent patients included in the study was of 86, both genders, aged 12–18-year-old,

mean age = 14.67 years and standard deviation = 1.61. Gender repartition for adolescents was 41.9% male subjects and 58.1% female subjects.

At the end of the active treatment, at the session the orthodontic appliance was removed, we applied to all patients the assessment instruments for the level of self-esteem and self-related current thoughts: the *Rosenberg's Self-Esteem Scale* and the *Heatherton & Polivy Current Thoughts Scale*.

The Self-Esteem Scale, developed by Rosenberg in 1965, is an instrument that consists of 10 statements ranging from strongly disagree (1) to strongly agree (4). Scores range from 10 to 40, with higher scores indicating higher self-esteem. At statements 2, 4, 6, 8, and 10, the scores given by the subjects are reversed. Băban A finds for the *Rosenberg's Scale* an internal consistency α=0.89 and a test-retest reliability ranging from 0.85 to 0.88 [3].

The Current Thoughts Scale was developed by Heatherton TF and Polivy J in 1991 based on the *Rosenberg's Self-Esteem Scale* (1958) and the *Feelings of Inadequacy Scale* developed by Janis IL and Field PB in 1959 [4].

The Current Thoughts Scale consists of 20 statements, and the psychometric analysis reveals that it contains three main correlation factors: performance related self-esteem, social self-esteem and physical aspect related self-esteem. Several items evaluate each of these three factors. Thus, physical aspect related self-esteem is assessed by items 3, 6, 7, 11, 12, 16; performance related self-esteem by items 1, 4, 5, 9, 14, 18, 19; social self-esteem by items 2, 8, 10, 13, 15, 17, 20. For the following items, scoring is reversed: 2, 4, 5, 7, 8, 10, 13, 15, 16, 17, 18, 19, and 20. Physical aspect related self-esteem has proved the most significant feature in defining self-esteem in general.

Unlike the *Rosenberg's Self-Esteem Scale*, which assesses the general aspects of self-esteem, the *Heatherton & Polivy Current Thoughts Scale* refers to the particularities of self-esteem during the evaluation session. There are five types of answer for each item (1) meaning none (not a bit), up to (5) – extremely. The internal consistency is high 0.92, α-coefficient being 0.92 [4].

Some items were adapted according to the specific requirements of this particular research. Thus, we considered the dental appearance as the central component of the physical aspect.

To investigate the influence that the change of the of dental–facial morphology has at the end of orthodontic treatment upon patients' psychological variables, we performed an analysis based on the correlation between the variable of physical aspect and the variables of self-esteem, self-related current thoughts, social self-esteem and performances.

Results

At the end of the treatment, the orthodontist can offer an objective assessment regarding the improvement in patients' dental–facial aesthetics, both by a direct clinical evaluation and by measurements.

For example we present the changes of the dental–facial morphology pursuant to the orthodontic treatment (Figures 1–4) in the case of patient F.L.B., 11-year-old and seven months, gender F, with a Class II division 1 malocclusion, bimaxillary dentoalveolar crowding.

Figure 1 – *Patient F.L.B., 11-year-old and 7 months, before the orthodontic treatment.*
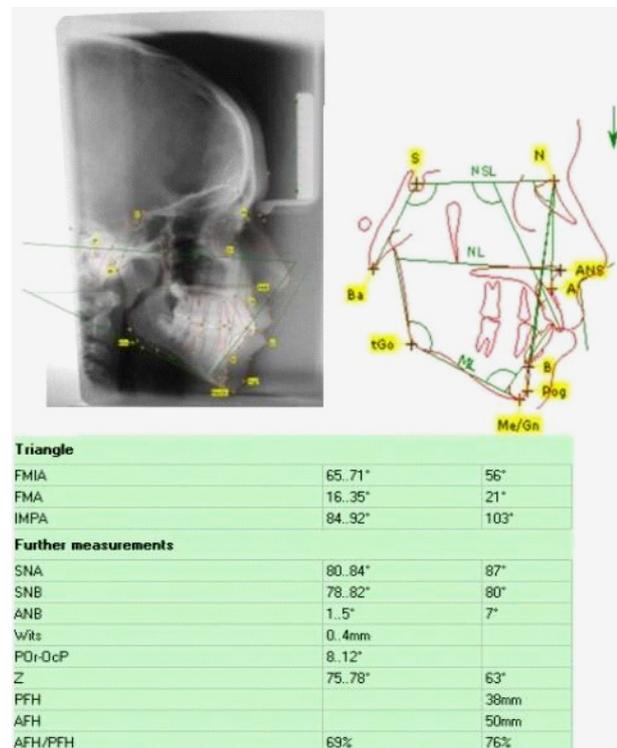

Triangle		
FMIA	65..71°	56°
FMA	16..35°	21°
IMPA	84..92°	103°
Further measurements		
SNA	80..84°	87°
SNB	78..82°	80°
ANB	1..5°	7°
Wits	0..4mm	
POr-OcP	8..12°	
Z	75..78°	63°
PFH		38mm
AFH		50mm
AFH/PFH	69%	76%

Figure 2 – *Patient F.L.B., cephalometric analysis at the beginning of the treatment.*

Figure 3 – *Patient F.L.B., 13 1/2-year-old, after 22 months of treatment.*

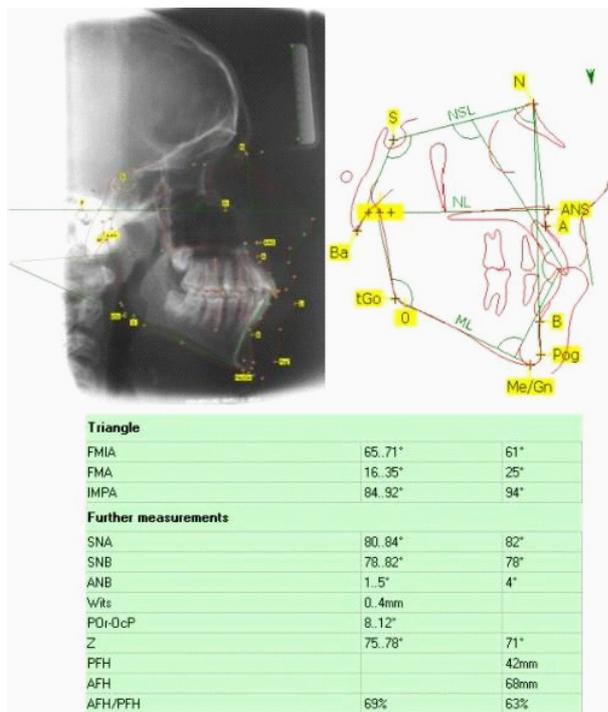| Triangle		
FMIA	65..71°	61°
FMA	16..35°	25°
IMPA	84..92°	94°
Further measurements		
SNA	80..84°	82°
SNB	78..82°	78°
ANB	1..5°	4°
Wits	0..4mm	
POr-OcP	8..12°	
Z	75..78°	71°
PFH		42mm
AFH		68mm
AFH/PFH	69%	63%

Figure 4 – *Patient F.L.B., cephalometric analysis after the treatment.*

Figures 1 and 2 presents the aspect at the beginning of the treatment and the cephalometric analysis, and Figures 3 and 4 validates the results of the orthodontic treatment that lasts for 22 months.

We examined the impact that the improvement of patients' dental–facial morphology has at the end of the orthodontic treatment upon the psychological variables taken into consideration and the results obtained from calculating the Pearson's correlation coefficients are presented in Table 1. Table 1 provides a perspective on how the improvement of the dental–facial aspect at the end of treatment influences the variations of the other variables.

Thus, male children presented positive correlations, highly significant from a statistic point of view, between dental–facial aspect and social self-esteem at a $p<0.01$ and between dental–facial aspect and self-related current thoughts at a $p<0.001$. There are also relationships of positive covariance at these boys between dental–facial aspect and self-esteem at a $p<0.05$ and between dental–facial aspect and performances at a $p<0.05$.

For the female children, the pleasant dental–facial aspect at the end of treatment presented positive correlations, highly significant from a statistic point of view, both with the way these patients will be perceived by society and with their self-related current thoughts at a $p<0.001$. The variable of dental–facial aspect correlates positively with global self-esteem at a threshold of statistical significance $p<0.01$.

Male adolescents presented positive correlations, highly significant from a statistic point of view, between dental–facial aspect at the end of the treatment and social self-esteem and between dental–facial aspect and global self-related current thoughts at a $p<0.001$. Dental–facial aspect correlates positively with self-esteem at a $p<0.01$ and with performances at a $p<0.01$.

For the female adolescents, the improvement of their dental–facial morphology at the end of the treatment presented positive correlations, highly significant from a statistic point of view ($p<0.001$), with the variables of social self-esteem, global self-esteem, self-related current thoughts, as well as relationships of positive covariance with the performance variable at a $p<0.05$.

Table 1 – *Correlations between the physical aspect and the variables investigated in patients*

Physical aspect/type of group	r/p	Self-esteem	Current thoughts	Social self-esteem	Performances
Children – male	r	0.355*	0.742**	0.458**	0.346*
	p	0.037	0.000	0.006	0.042
Children – female	r	0.435**	0.850**	0.489**	0.284
	p	0.002	0.000	0.000	0.053
Adolescents – male	r	0.457**	0.821**	0.595**	0.473**
	p	0.005	0.000	0.000	0.004
Adolescents – female	r	0.603**	0.784**	0.624**	0.339*
	p	0.000	0.000	0.000	0.016

*$p<0.05$; **$p<0.01$.

Discussion

One of the arguments, which led us to a separate analysis and to a slightly different approach of the group of children, respectively of the group of adolescents, is the fact that in the case of children (aged 7–11-year-old) we apply removable appliances, and in the case of adolescents (aged 12–18-year-old) we apply fixed appliances, exceptions to this rule being rare.

Children are generally regarded as having little cognitive and linguistic skills to answer questionnaires on abstract phenomena, such as items about the quality of life. However, psychologists who studied children brought arguments in favor pleading that children develop the self-concept at an early age, even at the age of 6-year-old, which gradually increases up to the mid-childhood, so, at the age of 9-year-old, children can express themselves when referring to anxiety or the concept of physical aspect. Twelve-year-old children are able to understand emotions such as sadness, shame, jealousy and their self-concept acquires complex variables (physical attractiveness and popularity within their social environment). It is surprising that parents, both mothers and fathers, have overestimated the negative impact of malocclusions in many respects, except the functionality of the dental–maxillary appliance [5, 6].

In a study by Sigelman KC and Shaffer RD that assessed the level of self-esteem at ages of 8–11-year-

old, 12–14-year-old and 15–18-year-old, the authors conclude that the most important problems related to self-image appeared to adolescents of 12–14-year-old, in terms of low self-esteem. The explanation would be that adolescents of 12–14-year-old accumulate a series of physical changes for which they do not possess the satisfactory psychological skills. Body image, located on the periphery of consciousness in childhood, becomes central, being assimilated by their self-awareness. This is the period when they spend more time in the bathroom looking in the mirror. The desire to retouch or to mask/cover different physical imperfections becomes more evident with girls. Both girls and boys worry about their acne, weight, wearing glasses, dental–maxillary anomalies [7].

There are studies that investigated patients' views on the changes in the morphology of the oral cavity due to dental malocclusions, such as the study conducted by Hamdan AM and the one conducted by Mann–Whitney. The authors gave patients a set of 10 photos with frontal occlusions of a few patients with different types of malocclusions, different levels of gravity (picture showed only the dental aspect). The purpose of these studies was to assess patients' requirements in terms of dental aspect and necessity of treatment. Patients were asked to range the 10 photos, according to the dental aesthetic aspect and choose those images that they considered to require treatment. Studies were performed on different age and gender groups and did not show significant statistic differences or showed minimal differences between genders in the way patients ranged the 10 photos. Results were assessed using the aesthetic component of *Index of Orthodontic Treatment Need* [8–10].

Aesthetic standards regarding the smile aspect should take into consideration the following elements: symmetric smile, lower lip parallel to the incisal edge of the upper frontal group, gingival edge of the alveolar ridge visible on a distance of 0.1–1 mm, proportion in terms of size and lack of the buccal corridor [11–14]. Referring to the shape of their teeth, women prefer rounded teeth, while men prefer teeth with better-defined angles [15].

A controversial issue remains the width of the buccal corridor, defined as the negative space between the buccal surface of the maxillary first premolar and the inner point at which the lips join when smiling [16, 17]. Some authors use the inter-canine width to define the buccal corridor width [18, 19]. Most orthodontists consider the absence of the buccal corridor as more aesthetic than its presence when smiling, and if there is a buccal corridor, and then it should be small in size [20–23].

The width of the buccal corridor represents an important criterion for the therapeutic outcome in terms of smile attractiveness, aspect that can be noticed in the patient presented in Figure 3 (post-treatment) compared to Figure 1 (pre-treatment).

Other studies that investigated patients' evaluation by means of photos showing different types of malocclusions have revealed that women's claims are higher in terms of dental aesthetics than men's are [24, 25].

⎗ Conclusions

Our research concluded that the improvement of the physical aspect at the end of orthodontic treatment had positive connotations on the psychological variables: self-esteem, social self-esteem, performances, and on the global self-related current thoughts.

The improvement of the dental–facial morphology due to the orthodontic treatment justifies the necessity of such a treatment in children and adolescents with dental–maxillary anomalies in order to increase the index of quality of life.

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