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ORIGINAL ARTICLE

A comparison of self-esteem and social appearance anxiety levels of individuals with different types of malocclusions

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ABSTRACT

Objective: The aim was to compare Rosenberg self-esteem scale (RSES), sensitivity to criticism scale (STCS) and social appearance anxiety scale (SAAS) scores of individuals with different types of malocclusions, and investigate the correlation between these scores and the index of complexity, outcome and need (ICON) score.

Materials and methods: One hundred and twenty individuals, who did not have any previous orthodontic treatment, were included. Group 1 included 40 patients with Class I malocclusion (median age of 14 years), Group 2 included 40 patients with Class II malocclusion (median age of 14.25 years) and Group 3 included 40 patients with Class III malocclusion (median age of 15.15 years). ICON scores were 46, 53 and 56 for Groups 1, 2 and 3, respectively. RSES, STCS and SAAS questionnaires were performed to the patients. Student's *t*-test, one-way analysis of variance (ANOVA), Mann–Whitney's *U* and Kruskal–Wallis's tests were used for the statistical analysis.

Results: Group 1 showed significantly higher level of RSES scores compared to Groups 2 and 3 ($p<.05$). STCS scores were found to be significantly higher in Group 2, compared to other groups ($p<.05$). Group 1 (32.53 ± 8.94) showed significantly lower level of SAAS scores compared to Group 2 (39.63 ± 9.28) and Group 3 (39.42 ± 10.54) ($p<.05$). A significant positive correlation was found between the ICON and SAAS scores ($r = 0.247$, $p=.007$).

Conclusions: Adolescents with Class II and III malocclusions reported higher levels of social appearance anxiety scores, and lower levels of self-esteem scores compared to Class I. Complexity of orthodontic treatment need showed a significant impact on social appearance anxiety.

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Introduction

Psychological effects of different malocclusions have long been of interest in orthodontics since dentofacial problems might have possible effects on psychological well-being [1–4]. It has been emphasized that dentofacial characteristic may have a high potential to affect self-esteem, especially when there is a strong social and sentimental interaction [5]. Besides, it has been indicated that children and adolescents' facial attractiveness has been found to be associated with social acceptance [6,7].

Self-esteem term is described as a person's sense related to self-respect or personal value [8]. Sensitivity to criticism is a definition that falls within the scope of self-esteem, and can provide information about the specific psychosocial characteristics of an individual [9,10]. Since adolescents are very sensitive about their facial aesthetics, and malocclusion is one of the most prevalent oral pathology that affects the physical appearance of an individual, any malocclusion type can lead to lower self-confidence, self-esteem and increase the sensitivity to criticism level of an individual. In a previous study, it has been concluded that subjective and objective orthodontic treatment need of adolescents has a strong association with self-esteem level [11]. However, controversial results have been found in several studies regarding the effect of malocclusion on self-esteem in the literature. While some authors [12,13] indicated that malocclusion affected the self-esteem level of patients, others [14,15] have reported no significant effects of malocclusion or orthodontic treatment on self-esteem. Evaluating the interaction between self-esteem and orthodontic treatment need is crucial for the clinicians to develop more effective orthodontic care. In a recent prospective cohort study, self-esteem was found to be negatively correlated with the subjective need of orthodontic treatment [16].

Social appearance anxiety is defined as the stress that a person feels while others are evaluating his/her physical appearance. Hart et al. [17] emphasized social appearance anxiety as a comprehensive concept including also the presence of dental anomalies. Anxiety with regard to a dentofacial problem is a prevalent problem that must be dealt with successfully [18]. Due to the limited number of studies with regard to the social appearance anxiety levels in different skeletal malocclusions [9], further researches are needed to

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investigate the possible differences between the different types of malocclusions in related to social anxiety scores besides self-esteem scores.

The main purpose of this study was respectively to compare social appearance anxiety, self-esteem and sensitivity to criticism scores of 12–18-year-old adolescent patients referred for orthodontic treatment with different types of malocclusions (Class I, II and III malocclusion) based on skeletal evaluation via cephalometric analysis. Besides, it was also aimed to examine the relationship between the index of complexity, outcome and need (ICON) scores and social appearance anxiety, self-esteem and sensitivity to criticism scores. The null hypothesis of the present study was that there was no difference with regard to the level of self-esteem and social appearance anxiety between different types of skeletal malocclusion types (Class II and Class III malocclusion) compared both to each other and to Class I malocclusion.

Materials and methods

This study was carried on 120 adolescent patients (71 females and 49 females), who referred to the Department of Orthodontics, Hacettepe University, and Faculty of Dentistry for orthodontic treatment between January 2019 and June 2019. The ethical approval for the present study was obtained from the Ethics Committee of Hacettepe University with a registration number of GO 19/67. The study was conducted in accordance with the ethical guidelines of the Helsinki Declaration, and written and verbal informed consents were obtained from both the patients and their parents or legal guardians.

The following inclusion criteria were assessed for the present study: (1) patients aged between 12 and 18 years, (2) patients with the presence of all permanent teeth, (3) patients with reading and comprehension ability, (4) patients having cephalometric evaluation file, maxillary and mandibular impression dental models before orthodontic treatment for diagnostic purposes and (5) patients clinically assessed by one operator to identify ICON score. The exclusion criteria for the present study were: (1) the presence of any congenital craniofacial deformity (cleft lip and palate or any craniofacial syndrome or deformity) and (2) patients who have already initiated or completed orthodontic treatment. Besides, subjects with a history of organic or psychiatric disease, presence of caries, facial asymmetry and any skin deformity affecting facial aesthetics were also excluded from the study as all these factors could effect the results of the study by influencing the perception of appearance.

The sample size calculation was performed using G* Power statistical software taking into account the primary outcome of the present study, which was the social appearance anxiety assessment. With an alpha risk of 0.05 and a power of 90%, a minimum sample size of 31 patients in each malocclusion group was required to distinguish a significant difference related to anxiety score between Class I and Class III malocclusion according to the results of a previous study [9] (for Class I malocclusion; mean 31.23, SD ± 8.87; for Class III malocclusion mean 41.58, SD ± 14.83). It was decided to take minimum 40 patients for each group with the expectation of possible dropouts.

The sample was selected from the patients who underwent skeletal and dental evaluations with lateral cephalometric films for diagnostic purposes before starting the orthodontic treatment. The type of patients' malocclusion was classified according to both lateral cephalometric variables (SNA°, SNB°, ANB° and overjet amount) and Angle's classification of molar relationship. Besides cephalometric evaluations, the crowding amounts of the maxillary and mandibular arches were calculated from the models obtained from the patients for diagnostic purposes using Hayes-Nance crowding analysis. The patients were assigned to one of the three groups according to their malocclusion types.

Group 1 consisted of 40 patients (25 female and 15 male) with a median age of 14.00 years, who presented orthognathic soft tissue profile, overjet with a median of 3 mm (2–4.80 mm), ANB angle with a median of 2.5° (2°–4°) and Angle Class I molar relationship. Group 2 consisted of 40 patients (26 female and 14 male) with a median age of 14.25 years, who presented convex soft tissue profile, excessive overjet with a median of 6 mm (2–15 mm), ANB angle with a median of 6° (4°–8°) and Angle Class II molar relationship. Group 3 consisted of 40 patients (20 female and 20 male) with a median age of 15.15 years, who presented concave soft tissue profile, ANB angle with a median of −2° (–8° to 1°), negative overjet with a median of −2 mm (–12 mm to –1 mm) and Angle III Class molar relationship.

After a brief explanation of the questionnaires, patients completed social appearance anxiety, Rosenberg self-esteem scale (RSES) and sensitivity to criticism scale (STCS) in the orthodontic clinical environment with the help of co-authors involved in the study. Also a basic data sheet regarding demographic data including age, sex and educational status was recorded for each patient. The educational level of the adolescent patients was scored at baseline by him/herself.

The ICON is both an index of treatment need and occlusal index of malocclusion severity. ICON consists of five components, which are multiplied by their weightings, and total score reflects the need for the orthodontic treatment required the actual severity of the malocclusion [19]. The scores related to different levels of malocclusion difficulty can be identified as following: easy (<29), mild (29–50), moderate (51–63), difficult (64–77) and very difficult (>77). ICON score of each patient was evaluated by only one calibrated examiner with over 10 years of experience in clinical practice (E.A.). Sixty randomly selected patients (20 patients for each group) were re-evaluated for the ICON score after 2 week's interval to test the reliability. Intraclass correlation coefficient (ICC) values were respectively 0.973, 0.986 and 0.997 for repeated ICON scores of Groups 1–3.

The level of self-esteem of the patients was determined by using RSES, which has been proven in terms of reliability and validity [20,21]. A four-point scale was used to score the responses of 10 items. According to this scale, the positive questions were scored as following: 3, strongly agree; 2, agree; 1, disagree; and 0, strongly disagree, while the

negative questions were scored as following: 0, strongly agree; 1, agree; 2, disagree; and 3, strongly disagree. According to the final total score of RSES, scores between 0–15, 15–25 and 25–30 respectively present low, normal and high self-esteem level scores.

Sensitivity to criticism subscale was also used to assess the sensitivity to criticism levels of the subjects. According to this subscale of self-esteem assessment, the scores between 0 and 1 indicate less sensitivity, while the scores between 2 and 3 indicate more sensitivity.

Social appearance anxiety scale (SAAS) was used to define the level of opinions regarding social appearance of the patients [17,22]. This scale contains 16 items, and is related to how the patients feel about their appearance. For each item, a score ranging from 1 to 5 is given as following: 1, completely disagree; 2, partly disagree; 3, not sure; 4, partly agree; 5, completely agree. The scores range between 16 and 80, and the higher scores represent the higher social appearance anxiety.

Statistical analysis

Statistical analysis was performed using IBM-SPSS for Windows version 21 (SPSS Inc., Chicago, IL). Descriptive statistics were given as number (frequency %), mean ± SD or median (minimum–maximum). For determining the normality of the parameters' distribution, Kolmogorov–Smirnov's test was used. Chi-square test was used for the comparison of gender and education level distribution among the groups. Student's *t*-test and one-way analysis of variance (ANOVA) were used for the comparison of parametric variables, and Mann–Whitney's *U* test and Kruskal–Wallis's test were used for the comparison of non-parametric variables. Bonferroni's test was used for the post hoc comparisons. Spearman's correlation analysis was used to analyse the association between ICON scores and RSES, STCS and SAAS scores. The level of the significance for all tests was set at $p<.05$.

Results

The demographic and cephalometric variables for each group are given in Table 1. All patients in the present study were White Caucasian, so there were not any ethnic differences between the individuals with different malocclusions. Gender distribution, the educational level distribution and the average age of the patients did not show significant difference among the groups. The median value of ANB angle and overjet measurements was significantly different among the groups ($p<.001$). Median ICON score value for Group 1 (46, 19–63) was significantly lower, compared to Group 2 (53, 42–88) and Group 3 (56, 42–79) ($p<.001$). Maxillary and mandibular crowding amounts did not show significant difference among the three-malocclusion groups ($p>.05$).

Table 2 shows the mean ± SD or median scores for RSES, STCS and SAAS. RSES scores were respectively 23 (16–30), 20 (14–26) and 21 (7–26) for Group 1–3. Group 1 showed significantly higher level of RSES scores compared to Groups 2 and 3 (*p* value for 1–2=.006 and *p* value for 1–3=.004). STCS score was significantly greater in Group 2 (median value of 2), compared to Groups 1 and 3 (median value of 1) (*p* value for 1–2=.023 and *p* value for 2–3=.037). SAAS scores for Groups 1–3 were respectively 32.53 ± 8.94, 39.63 ± 9.28 and 39.42 ± 10.54. Groups 2 and 3 showed significantly higher level of SAAS scores compared to Group 1 (*p* value for 1–2=.004 and *p* value for 1–3=.005).

Table 3 shows that there was a significant positive correlation between the ICON and SAAS scores ($r=0.247$, $p=.007$). Age showed significant negative correlation with RSES ($r=-0.294$, $p=.001$) and STCS scores ($r=-0.238$, $p=.009$). Overjet was significantly positively correlated with STCS scores ($r=0.208$, $p=.023$). The correlation between the different scales presented that SAAS scores showed significant negative correlation with RSES scores ($r=-0.340$, $p<.001$), while significant positive correlation with STCS scores ($r=0.301$, $p=.001$).

Considering the effect of gender on the evaluated scores, females (a median value of 2) presented significantly higher STCS scores than males (a median value of 1) presented ($p=.022$) (Table 4).

According to the results of comparison of different educational levels (secondary and high school), there was a significant difference with regard to STCS score only in Group 1, which was higher in secondary school students compared to high school students ($p=.022$) (Supplementary Table 1).

Discussion

It has been emphasized by several studies that severe malocclusion causes emotionally and psychosocially negative side effects on a patient's life [23,24]. Social and socio-psychological perspective of the different skeletal malocclusions during adolescent period is an important point of orthodontics, as the treatment of these skeletal deformities is laborious and comprehensive that requires much time. Due to the effects of significant visible malocclusions on personal dissatisfaction, recognition of the association between malocclusion and psychological aspects could be considered an important treatment-motivating factor. The present study was performed on adolescent patients aged between 12 and 18 years, since this age range is the point where the subject begins to consider his/her own appearance to be of great importance [23]. The fact that the groups were statistically similar in terms of mean age, gender distribution and educational level distribution might be considered important for the homogeneity of the study groups.

The null hypothesis of the study was rejected. According to the results of present study, the value of RSES scores for Group 1 (a median score of 23) was significantly higher, compared to Group 2 (a median score of 20) and Group 3 (a median score of 21). The differences found between the groups may be statistically significant, but may not be considered clinically important. RSES score ranges from 0 to 30 units, and the values between 15 and 25 are considered to be normal [8,25]. In the present study, the RSES scores were within the normal range in all groups, which can indicate that, a difference amount of two (between Groups 1 and 3)

Table 1. Comparison of different malocclusion groups according to demographic and cephalometric variables.

Variables	Group 1 (Class I) Number (%) or Median (min–max)	Group 2 (Class II) Number (%) or Median (min–max)	Group 3 (Class III) Number (%) or Median (min–max)	*p* Value
Gender	25 F, 15 M (62.5%, 37.5%)	26 F, 14 M (65%, 35%)	20 F, 20 M (50%, 50%)	.343[a]
Educational level	Secondary school 50% High school 50%	Secondary school 47.5% High school 52.5%	Secondary school 32.5% High school 67.5%	.232[a]
Age (years)	14.00 (12.00–17.00)	14.25 (12.00–17.00)	15.15 (12.00–17.00)	.077[b]
ANB	2.50 (2.00−4.00)	6.00 (4.00–8.00)	−2.00 (−8.00 to 1.00)	<.001[b,**] 1–2<.001 2–3<.001 1–3<.001
Maxillary crowding (mm)	−2.00 (−9.00 to 5.00)	−3.00 (−10.00 to 14.00)	−3.00 (−13.00 to 5.00)	.787[b]
Mandibular crowding (mm)	−2.00 (−10.00 to 8.00)	−2.50 (−8.00 to 8.00)	−2.50 (−8.00 to 7.00)	.601[b]
ICON score	46.00 (19.00–63.00)	53.00 (42.00−88.00)	56.00 (42.00−79.00)	<.001[b,*] 1–2<.001 1–3<.001 2–3=.276
Overjet (mm)	3.00 (2.00−4.80)	6.00 (2.00−15.00)	−2.00 (−12.00 to 1.00)	<.001[b,**] 1–2<.001 2–3<.001 1–3<.001

1–2: comparison of Groups 1 and 2; 1–3: comparison of Groups 1 and 3; 2–3: comparison of Groups 2 and 3.
*Difference is derived from Group 1.
**Difference is derived from significant difference among all groups.
[a]Chi-square test.
[b]Kruskal–Wallis's test.
All variables were distributed non-normal. $p<.05$ statistically significant.

Table 2. Comparison of the groups regarding Rosenberg self-esteem, sensitivity to criticism and social appearance anxiety scores.

			95% confidence interval		
Variables	Groups	Mean ± SD or median (min–max)	Lower	Upper	*p* Value
Rosenberg self-esteem score (RSES)	Group 1	23 (16–30)	21.83	24.12	.005[a,*]
	Group 2	20 (14–26)	19.67	21.63	1–2=.006
	Group 3	21 (7–26)	18.56	21.29	1–3=.004
					2–3=.731
Sensitivity to criticism score (STCS)	Group 1	1.00 (0.00–3.00)	1.03	1.62	.042[a,**]
	Group 2	2.00 (0.00–3.00)	1.51	2.14	1–2=.023
	Group 3	1.00 (0.00–3.00)	1.03	1.67	1–3=.956
					2–3=.037
Social appearance anxiety scores (SAAS)	Group 1	32.53 ± 8.94	29.67	35.38	.001[b,*]
	Group 2	39.63 ± 9.28	36.66	42.59	1–2=.004
	Group 3	39.42 ± 10.54	36.05	42.80	1–3=.005
					2–3 = 1.000

1–2: comparison of Groups 1 and 2; 1–3: comparison of Groups 1 and 3; 2–3: comparison of Groups 2 and 3.
*Difference is derived from Group 1.
**Difference is derived from Group 2.
[a]Kruskal–Wallis's test.
[b]One-way analysis of variance (ANOVA).
SAAS scores were normally distributed, whereas RSES and STCS scores were non-normally distributed. $p<.05$ statistically significant.

Table 3. Correlation between ICON score, age, overjet and other assessed scale measurements.

Variables	Sample size	Rosenberg self-esteem score (RSES)	Sensitivity to criticism score (STCS)	Social appearance anxiety scores (SAAS)
ICON score	120	r_s= −0.179 p=.051	r_s=0.123 p=.182	r_s=0.247 p=.007*
Age (years)	120	r_s= −0.294 p=.001*	r_s= −0.238 p=.009*	r_s= −0.032 p=.727
Overjet (mm)	120	r_s=0.038 p=.682	r_s=0.208 p=.023*	r_s=−0.032 p=.730
Rosenberg self-esteem score (RSES)	120	–	r_s=−0.098 p=.289	r_s=−0.340 p<.001
Sensitivity to criticism score (STCS)	120	r_s=−0.098 p=.289	–	r_s=0.301 p=.001
Social appearance anxiety scores (SAAS)	120	r_s=−0.340 p<.001	r_s=0.301 p=.001	–

Spearman's correlation analysis was used.
*$p<.05$ statistically significant.

Table 4. Comparison of Rosenberg self-esteem, sensitivity to criticism and social appearance anxiety scores between genders.

	Female ($N = 71$)	Male ($N = 49$)	
Variables	Mean ± SD or median (min–max)	Mean ± SD Median (min–max)	p Value
Rosenberg self-esteem score (RSES)	20.92 ± 3.95	21.57 ± 3.76	.363[a]
Sensitivity to criticism score (STCS)	2.00 (0–3)	1 (0–3)	.022[b,*]
Social appearance anxiety score (SAAS)	37.00 (20–62)	36 (16–61)	.098[b]

RSES scores were normally distributed, whereas STCS and SAAS scores were non-normally distributed.
*$p<.05$ statistically significant.
[a]Student's t-test.
[b]Mann–Whitney's U test.

or three unit (between Groups 1 and 2) may not be of clinical importance. Florian-Vargas et al. [26] compared the self-esteem scores of adolescents aged between 12 and 16 years with different malocclusion types. They also found three malocclusion groups within the normal range of self-esteem scores, however in contrast to the results of the present study, they presented that Class II malocclusion patients reported higher self-esteem scores compared to those with Class I malocclusion. However different from the present study, they used only Angle's molar classification system, and did not consider dentoskeletal features, which are also likely to have impact on the aesthetic situation. We also evaluated the possible impact of ICON score, which is based on different components such as maxillary and mandibular crowding/spacing, crossbite, anterior openbite/overbite and sagittal posterior occlusion on the RSES and SAAS scores. Spearman's correlation analysis indicated that ICON scores did not have an impact on RSES and STCS scores, while showed a positive correlation with SAAS scores. This result means that high orthodontic treatment need could lead to a higher social anxiety level within the patients who refer to the orthodontic treatment. No other previous studies investigated the relation between ICON and SAAS scores, and the significant correlation found in the present study can imply that the complexity of the treatment required can have emotional consequences related to the appearance anxiety and associated psychological distress. From the practical perspective, some psychosocial intervention programmes could also be carried out to address emotional variables, as anxiety can have a fundamental role on the course of orthodontic treatment.

Sun and Jiang [13] evaluated the relationship between the malocclusion type classified by Angle's classification and self-esteem of adolescents aged between 12 and 18 years. In similar to our results, they concluded that Class II malocclusion presented higher risk for low appearance of self-esteem. Gavric et al. [27] studied the interaction between the dentofacial aesthetic and self-esteem in adolescents and young adults. According to their results, there was not a correlation between malocclusion and self-esteem. Similarly, different studies also confirmed the result that dentofacial deformity does not strictly have an impact on self-esteem [14,28]. Inconsistent and contradictory results in relation to the malocclusion and self-esteem interaction could be explained with the fact that there are variable factors which may also effect self-esteem besides malocclusion such as obesity, social life activity, school success, family approach to child, health situation, family income and personality traits.

According to a subscale of RSES, which is called STCS, the results of the present study indicated that Class II patients presented significantly higher level of STCS scores compared to Class I and III malocclusion patients. According to the results of the correlation analysis, as the overjet amount increased, STCS scores also increased. We can assume that severe and noticeable features of Class II malocclusion such as increased overjet would have a significant psychosocial effect that must be taken into account by the orthodontists before starting orthodontic and/or orthopaedic treatment. Visible malocclusions comprising excessive overjet with incomplete lip closure and crowded incisors have been found to be associated with the lower self-esteem level on teenagers [2,29,30]. In the study of Kaieda et al. [31], it was emphasized that there was an increase in dissatisfaction with oral health with the increase in anterior maxillary overjet. This can also explain the results of the present study in terms of higher sensitivity in Class II patients. The result of increased STCS with decreasing age according to the correlation analysis also should be taken into account especially in younger Class II malocclusion patients. Besides, low levels of STCS scores in Class III malocclusion compared to Class II could also be related to greater number of high school students than secondary school students in Group 3.

We also aimed to evaluate and compare one of the other psychological parameters, which is the social appearance anxiety among different malocclusion groups. There are limited studies in the literature evaluating social appearance anxiety in patients with different malocclusions [9,32]. To the best of our knowledge, we believe in that the present study is the first to determine and compare the effect of cephalometrically diagnosed different malocclusions (Class I, II and III) with regard to SAAS. Agırnaslıgıl et al. [9] reported that in patients with Class III malocclusion, SAAS level was significantly higher than in the control group before orthognathic surgery. Amasyali and Sabuncuoglu [32] compared the level of SAAS in individuals with and without alignment, and found higher levels of anxiety in patients with dental misalignment. In the present study, SAAS scores were significantly higher in Class II and III malocclusions compared to control Class I group. The possible explanations for this finding can be thought as significant anteroposterior skeletal discrepancy (significantly different ANB angles and overjet amount) and significantly higher complexity of orthodontic treatment need (ICON scores) observed in Class II and III

patients. Besides, a strong positive relationship between the ICON score and SAAS score also supports this result. Therefore, it is particularly and clinically an important point to take care of decreasing the anxiety as an additional of orthodontic treatment in Class II and Class III patients. Considering the differences in terms of social anxiety between different malocclusion groups can provide to the clinician better results in terms of taking a better behavioural management, and as a result gaining successful treatment results. Besides ICON score, self-perception of a malocclusion by the patient is also another important factor, which can play a vital role on patient's self-esteem and social appearance anxiety [33]. For example, patients with severe malocclusion can be satisfied about their appearance, while patients with minor teeth irregularities can be anxious about their facial and dental appearance. Maybe it would also be better to carry out further studies also including an index with an aesthetic component just to reveal a possible correlation between the self-perception of a malocclusion and self-esteem scores.

The results of the present study showed that gender played an important role on sensitivity to criticism results. Females presented higher median of STCS scores than that of males in the present study. However, there was not a significant difference in terms of RSES and SAAS scores between the different genders according to the results of the present study. Although Jung [12] showed that sex played an important role in means of the relationship between self-esteem and malocclusion, Gavric et al. [27] also found no correlation between sex and self-esteem in similar to our results. When age was taken into account, in the light of the findings of the present study, the level of RSES and STCS scores decreased as the age increased, in contrast to the finding of the study of Gavric et al. [27]. This result implies a tendency towards improvement of self-esteem in younger children. In similar to our result, Avontroodt et al. [16] also showed a significant age by time interaction for physical appearance and self-worth.

Positive relationship between the academic achievement and self-esteem of the subjects has been pointed out by previous studies [34,35]. According to the results of the present study, no significant difference was found between the different educational levels in almost all groups except for in Group 1 for STCS, which might be considered clinically insignificant. This result may be related to higher number of female in secondary school group as females presented higher STCS scores than males according to the results of the study.

As self-esteem is one of the important remarkable factor affecting the oral health-related quality life of children, who need orthodontic treatment [36,37], the results of the present study should be interpreted with caution from the clinical perspective. Higher levels of social appearance anxiety scores, and lower levels of self-esteem scores in Class II and Class III malocclusions compared to Class I malocclusion according to the results of the present study can lead the clinician to think that malocclusion can cause individual development anxiety conditions and a low level of self-esteem. The results of the present study with regard to significant correlation of overjet amount at the beginning of the treatment with STCS, and correlation of the complexity of orthodontic treatment need (ICON) with SAAS have important practical implications in order to address cognitive-emotional variables as an important part of treatment. However, it is difficult to identify the pure contribution of malocclusion on the self-esteem and anxiety conditions of individuals as it should also be kept in mind that these conditions can be influenced by many other factors instead malocclusion properties such as image of body and face, social acceptance by other people, school performance, and household income of the patient. As it has been indicated by researchers that self-esteem is positively associated with demographic variable of socio-economic status, not evaluating the socio-economic status of the parents at the beginning of the study would be considered as one of the limitations of the present study [38,39]. However, since all patients in the present study were admitted to a statewide university hospital, their families often have almost similar economic levels according to our observations.

It should be remembered that the results of the present study should be analysed with caution because of the relatively small sample size, and selecting subjects only from a specific area of a same country instead of different areas. Also another limitation is that the findings are based on cross-sectional data, which cannot allow examining the casual relationship between the variables investigated.

Conclusions

Adolescents with Class II and III malocclusions reported higher levels of social appearance anxiety scores, and lower levels of self-esteem scores compared to Class I malocclusion. Significant correlation of overjet amount with STCS, and correlation of the complexity of orthodontic treatment need (ICON) with SAAS have important practical implications in order to address cognitive-emotional variables as an important part of orthodontic treatment.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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