Impact of Angle malocclusions on oral health related quality of life in adolescents

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Objectives: To investigate the impact of Angle Class I, Class II, and Class III malocclusions on oral health-related quality of life (OHRQOL) in children aged 11 to 14 years.
Methods: The Turkish version of the Child Perception Questionnaire 11-14 (CPQ_{11-14}) was administered to 83 individuals with a Class I malocclusion, 111 individuals with a Class II Division 1 malocclusion, and 63 individuals with a Class III malocclusion. The CPQ_{11-14} was used to evaluate the OHRQOL of children aged between 11 and 14 years. The questionnaire consisted of 37 questions which evaluated oral symptoms, functional limitations, emotional well-being, and social well-being.
Results: No statistically significant difference was observed between the groups in relation to the individual's CPQ_{11-14} total scores and subscale scores for oral symptoms, functional limitations, and emotional well-being ($p > 0.05$), except for the social well-being subscale. Patients with a Class III malocclusion had significantly higher social well-being scores compared to individuals with a Class I malocclusion.
Conclusions: A Class III malocclusion may negatively impact on the social well-being of adolescents. Early diagnosis of a Class III malocclusion and the application of early orthopaedic treatment may prevent the negative impact on a child's social well-being.
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Introduction

Malocclusions and dentofacial deformities are common problems that can affect an individual's physical function, social interactions, and psychological well-being. Malocclusions may affect diverse aspects of life including social acceptance and interpersonal interactions and lead to the lessening of a person's quality of life (QoL).[1–3]

The concept of Oral Health-Related Quality of Life (OHRQoL) is defined as the effect of oral health or disease on an individual's daily functioning, psychosocial well-being, or overall quality of life.[4] OHRQoL measures are being used with increasing frequency in oral health research and clinical studies in dentistry.[5]

Numerous OHRQoL measures have been developed for adults.[6–10] However, it has been reported that quality of life measures for adults are not suitable for application in children. Since the majority of orthodontic patients are children and adolescents, OHRQoL measures suitable for this age group are therefore needed.[5] As their emotional, social, cognitive, and linguistic developments are ongoing, children's self-concepts and health perceptions vary depending on their age. Similarly, the content of daily activities, the ability to understand emotions, relationship perceptions, and communication skills also develop commensurate with the age of the child.[11,12] Considering these developmental differences, instead of using a single standardised health status self-report scale for children within the

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age range of 6-14 years, age-specific questionnaires should be applied for age groups 6-7, 8-10, and 11-14.[5] The most frequently used OHRQoL scale for children and adolescents is the Child Perception Questionnaire (CPQ).[2]

Although there are numerous studies evaluating the effects of OHRQoL, a limited number have been identified which evaluated the effects of different sagittal malocclusions on OHRQoL.[13,14] The aim of the present study was to investigate the impact of Angle Class I, Class II, and Class III malocclusions on the oral health-related quality of life in children aged 11 to 14 years.

Material and methods

The study was approved by the Non-invasive Clinical Trials Ethics Committee of Bezmialem Vakif University (23/249, 03.12.2019). Signed informed consent forms were obtained from all participants and their parents.

The study included individuals between the ages of 11 and 14 years whose native language was Turkish and who applied to the Department of Orthodontics at Bezmialem Vakif University, Faculty of Dentistry, Istanbul, Türkiye. The malocclusion of the individuals was determined by considering the anteroposterior relationship between the maxillary and mandibular first molars. Due to ethical reasons, lateral cephalometric radiographs were not taken of the patients who presented for examination, and the malocclusion classification was determined dentally by clinical examination. Individuals with an overjet greater than 6 mm were included in the Class II malocclusion group, and individuals with an anterior crossbite were included in the Class III malocclusion group. A minimum sample size of 55 subjects in each group was proposed to determine a difference of 20% in the impact of a malocclusion on QoL between Angle Class I, II and III, with 80% power at a 95% confidence interval.[13]

The exclusion criteria of the participants were:

- Patients with crowding greater than 7 mm
- Presence of supernumerary teeth
- Congenitally missing teeth
- Patients affected by cleft lip and palate
- Patients with mental retardation or physical disability
- Patients with extensive dental caries

The Child Perception Questionnaire 11-14 (CPQ_{11-14}), which was previously validated in Turkish by Aydogan et al.[15] and Bekiroglu et al.[16], was used to evaluate the OHRQoL of individuals. The Turkish version of the CPQ_{11-14} was administered to 83 individuals (39 males, 44 females) who had a Class I malocclusion, 111 individuals (46 males, 65 females) with a Class II Division 1 malocclusions, and 63 individuals (28 males, 35 females) with a Class III malocclusion. The questionnaire consisted of 37 questions to evaluate oral symptoms (6 questions), functional limitations (9 questions), emotional well-being (9 questions), and social well-being (13 questions). Questions were asked about the frequency of events in relation to the child's oral/orofacial condition during the previous 3 months. Each item was scored on a 5-point Likert-type scale ranging from 0 to 4 (0="Never", 1="Once/twice", 2="Sometimes", 3="Often", 4="Every day/almost every day"). The total score obtained from the questionnaire fell between 0 and 148 and a high score was associated with a low QoL.[16]

Statistical analysis

The data were analysed using the IBM SPSS Statistics Version 22 (SPSS Inc.; Chicago, IL, USA). The Shapiro-Wilk test was applied to test the data for normal distribution. To compare the age and gender distributions between the groups, the Kruskal–Wallis and Chi-square tests were used, respectively. The intergroup comparison of the CPQ_{11-14} total scale and subscale scores was performed using the Kruskal–Wallis test. Intergroup comparisons were conducted using the Bonferroni post-hoc test. The level of significance was set at 0.05.

Results

There was no statistically significant difference between groups in relation to age and gender (p>0.05) (Table I).

The CPQ_{11-14} total scale and subscale scores are shown in Table II. There was no statistically significant difference observed between the groups in the individuals' total scores and subscale scores for oral symptoms, functional limitations, and emotional well-being (p > 0,05). The only significant difference was noted in the social well-being subscale. Individuals presenting with a Class III malocclusion had significantly higher social well-being scores

Table I. Comparison of age and sex distribution between groups

	Class I (n=83)		Class II (n=111)		Class III (n=63)		*p value*[a]
Age (years)	12.65 ± 1.10		12.55 ± 1.13		12.50 ± 1.23		0.72
Sex (n %)	Female	Male	Female	Male	Female	Male	*p value*[b]
	44 (53%)	39 (47%)	65 (58.6%)	46 (41.4%)	35 (55.6%)	28 (44.4%)	0.60

[a]Results of Kruskal–Wallis test.

[b]Results of Chi-square test.

(9.08 ± 7.13) compared to individuals with a Class I malocclusion (6.63 ± 6.96).

Discussion

In a systematic review conducted by Liu et al.[2] which evaluated the relationship between malocclusion/orthodontic treatment need and QoL, it was reported that the majority of the published studies (18 out of 23 articles) were conducted on child/adolescent populations, and the most frequently-used measure was the CPQ (9 out of 18 articles). In most conducted studies, individuals were classified according to their orthodontic treatment need rather than occlusal traits. The clinical classification of the study populations was primarily based on the application of the Index of Orthodontic Treatment Need (IOTN). Most of the findings obtained from cross-sectional studies showed that there was a relationship between OHRQoL and malocclusion/orthodontic treatment need.[2] In the present study, instead of a classification according to the severity of a malocclusion or orthodontic treatment need, the individuals were classified by clinical examination and the Angle classification of malocclusion. In addition, the CPQ, which is the most frequently used measure in the children/adolescent population, was used to evaluate the OHRQoL of the individuals.

In the present study, 83 individuals with a Class I malocclusion, 111 individuals with a Class II Division 1 malocclusion, and 63 individuals with a Class III malocclusion were surveyed. In determining sample groups, in addition to anteroposterior relationship between the upper and lower first molars, overjet criterion was also considered, and individuals with an overjet of 6 mm or more were included in the Class II group and individuals with a negative overjet were placed in the Class III group. The lower number of patients in the Class III malocclusion group could be explained by the incidence of a Class III malocclusion in the Turkish population is lower compared to the other classes of malocclusion[17], or the possibility of individuals having received functional treatment when younger.[18]

There are numerous studies that have evaluated the effect of malocclusion on OHRQoL.[13,19–21] O'Brien et al.[20] evaluated the $CPQ_{11\text{-}14}$ total scale and subscale scores of malocclusion and non-malocclusion groups. Significant differences were found between the two groups in the total scale and emotional and social well-being subscales. When the malocclusion group was divided into subgroups as increased overjet (>6 mm), crowding of anterior teeth (≥4 mm), and hypodontia (at least one absent tooth in upper or lower arch), no significant differences in CPQ scores were observed between the groups. Based on the results, the researchers reported that a malocclusion negatively affected OHRQoL, and that the most significant impact of a malocclusion on QoL was psychosocial, rather than oral or functional problems.[20] Similarly, Kok et al.[19] reported that children who expressed concerns about their malocclusions stated that they would be upset if unable to receive orthodontic treatment and had worse emotional and social impacts and a higher total CPQ 11-14 score. Aydogan et al.[15] determined a statistically significant positive correlation between the $CPQ_{11\text{-}14}$ total scale and emotional and social well-being subscale scores and the ICON (Index of Complexity, Outcome, and Need) scores, which were utilised to assess the need for orthodontic treatment. It was reported that children who required orthodontic treatment had a lower quality of life compared to those who did not require orthodontic treatment.

Atik et al.[22] determined that adolescents with a dentoskeletal Class II malocclusion (excessive overjet

Table II. Intergroup comparison of total and subscale CPQ_{11-14} scores

	Class I (n=83)				Class II (n=111)				Class III (n=63)				
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.	*P* value[a]
Total score	28.05	17.66	3	77	32.87	20.39	1	90	33.75	18.60	3	92	0.14
Subscales													
Oral symptoms	6.34	3.68	0	16	6.21	3.64	0	16	6.54	3.90	1	17	0.92
Functional limitations	6.53	4.53	0	24	6.75	5.21	0	26	7.33	5.46	0	23	0.82
Emotional well-being	8.55	7.33	0	32	9.16	7.09	0	36	10.75	8.37	0	36	0.25
Social well-being	6.63	6.96	0	38	7.46	6.38	0	25	9.08	7.13	0	30	0.03* (1-3**, p=0.009)[b]

[a]Results of Kruskal–Wallis test.

[b]Results of Bonferroni post-hoc test.

SD, standart deviations; Min., minimum; Max, maximum.

*$p < 0.05$, **$p < 0.01$.

with a median of 6 mm) and a dentoskeletal Class III malocclusion (negative overjet with a median of –2 mm) reported higher levels of social appearance anxiety scores, which is defined as the stress that a person feels when others are evaluating his/her physical appearance. Lower levels of self-esteem scores were noted in Class III subjects compared to those with a Class I malocclusion. In a study that investigated the psychosocial impact of a malocclusion in young adults aged 17 to 22 years, it was reported that four malocclusion groups had more severe psychosocial effects compared to a normal occlusion group. Furthermore, the scores within the four malocclusion groups were ranked from highest to lowest as Class III, Class II Division 1, Class II Division 2, and Class I.[14] An additional study conducted on orthognathic surgery patients concluded that crowding, crossbite, open bite, a concave profile, an edge-to-edge overjet, or a Class III malocclusion had a negative impact on OHRQoL.[23] Even though the present study focused on a younger age group, it similarly concluded that a Class III malocclusion had a negative effect on social well-being compared to those with a Class I malocclusion.

In the 11-14 year age group, defined as early adolescence, emotions such as embarrassment, jealousy, and worry were at the forefront, and being popular among peers and caring about other's opinions regarding themselves became important.[24] Bullying, which is common in society, is a social issue that particularly affects children and adolescents.[25,26] It has been expressed that children with certain malocclusions are more likely to be exposed to actions of teasing, name-calling, and physical bullying.[27] Duarte-Rodrigues et al.[28] reported that children with a Class III malocclusion were more likely to experience bullying compared to those with a mild or absent malocclusion. Based on the findings of the present study, it is believed that when making decisions about treatment methods and the timing of treatment for children with a Class III malocclusion, it is important to consider their social well-being and OHRQoL. In cases in which appropriate indications exist, it is concluded that seeking early orthopaedic treatment to improve occlusion and facial aesthetics could have a positive impact on a child's social well-being.

The limitations of the present study include a lack of information about the socioeconomic status and environmental factors that could affect each participant's quality of life, as well as the absence of an evaluation of the skeletal pattern. Larger sample sizes and standardised cohort studies are needed to investigate the functional, social, and psychological effects of malocclusions more comprehensively.

Conclusion

- According to the overall $CPQ_{11\text{-}14}$ score, there was no significant difference observed in the oral health-related quality of life between adolescents presenting with a Class I, Class II Division 1, or a Class III malocclusion with an anterior crossbite.
- Class III malocclusions may have a negative impact on the social well-being of children between 11 and 14 years of age.

Conflict of interest

The authors declare that there is no conflict of interest.

Author contributions

E.S.A: Conceptualization, methodology, supervision, collecting data, writing original draft, reviewing and editing the manuscript; F.N.Y: Methodology, collecting data, writing original draft; H.U: Collecting data, writing original draft; E.D.S: Data analysis, reviewing and editing the manuscript. All authors read and approved the final version of the manuscript.

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