Submitted: 06 November, 2022 Accepted: 15 February, 2023 Published: 03 July, 2023 DOI:10.22514/jocpd.2023.018

ORIGINAL RESEARCH

Journal of Clinical Pediatric Dentistry

Evaluation of the relationship between anxiety levels and dental appearance

Gamze Metin-Gürsoy[1,*], Ayse Bikem Haciomeroglu[2], Selin Kale-Varlık[1], Tuba Tortop[1]

[1]Department of Orthodontics, School of Dentistry, Gazi University, Ankara, Turkey, Bişkek cad. 1. Sok. No:4 06510 Emek, Ankara, Turkey
[2]Department of Psychology, Hacettepe University, 06800, Ankara, Turkey

***Correspondence**
gamgursoy@gmail.com
(Gamze Metin-Gürsoy)

Abstract

Objective: The aim of this study was to evaluate the relationship between personal traits, dental anxiety level and dental appearance of the individuals. Study Design: The study included 431 individuals who completed State Trait Anxiety Inventory-Trait Form (STAI-T) and Corah's Dental Anxiety Scale (CDAS) questionnaires during their first appointment at the orthodontic clinic. The Index of Complexity, Outcome and Need (ICON) index scoring was performed using intraoral frontal photographs by an orthodontist. According to the STAI-T scores, three anxiety groups were formed: mild, moderate, and severe. The Kruskal-Wallis H test was used for intergroup comparisons. Spearman's correlation analysis was performed to evaluate the relationship between STAI-T, CDAS, and ICON scores. Results: It was found that 38.28% of the participants had mild, 34.1% had severe, and 27.62% had moderate anxiety levels. CDAS score was significantly lower in the mild anxiety group ($p \leq 0.0001$) compared to the groups showing moderate and severe anxiety. There was no significant difference between the moderate and severe anxiety groups. ICON score was significantly higher in the severe anxiety group ($p \leq 0.0001$) than the other groups. It was also significantly higher in the moderate anxiety group ($p \leq 0.0001$) than in the mild anxiety group. There was a significant positive correlation between STAI-T and both CDAS and ICON scores. There was no significant correlation between CDAS and ICON scores. Conclusion: Dental appearance had a significant effect on the general anxiety of individuals. Improving the dental appearance with orthodontic treatments can have positive effects on reducing anxiety. The low level of dental anxiety in individuals with a high need for treatment will facilitate the work of the orthodontist in the procedures to be applied.

Keywords

Aesthetics; Malocclusion; Psychology

1. Introduction

Facial and dental esthetics appear to play a role in the quality of life. People believe that orthodontic treatment is a way to improve facial esthetics because of the positive changes in their smiles. Besides, facial esthetics is highly correlated with increased self-esteem, development of personality, and social relationships [1, 2]. The effect of malocclusion on facial attractiveness and how orthodontic treatment need might affect a person's sense of self-worth are controversial issues. Several malocclusions including crowding, deep bite, anterior open bite, and overjet are responsible for the negative perceptions. These negative perceptions may act as a potential barrier for social relationships and may cause social anxiety [3]. Physical appearance is very important for adolescents and they are affected by the aesthetic outcomes of malocclusion. It has been shown that the perception of poor dental appearance is also effective in the general psychological state of the person [4–6]. The psychosocial effects of dental aesthetics can be explained as the effects of dental appearances on the social and psychological states of individuals, which are closely related to age and gender [7, 8]. Most of the adolescent individuals are uncomfortable with the alignment, colour, and shape of their teeth [9]. Anxiety, due to ental appearance may be experienced by most people at least once in their lifetime, which can cause nervousness, fear, apprehension, and/or worry [9–11].

Spielberger's State-Trait Anxiety Inventory (Form STAI-S, STAI-T) assesses anxiety that is transitory (STAI-S) as well as permanent, which is part of personality features (STAI-T) and not related to the orthodontic treatment. Each of these scales consists of twenty items scored with a 4-point Likert type of scoring scale. This tool was validated in children (8 years old and older) [10].

The Index of Complexity, Outcome and Need (ICON) scoring assesses several elements such as: dental aesthetics, cross bite, upper arch crowding, impacted teeth in the arches, antero-posterior and transversal relationship of the buccal segments, and anterior vertical relationship. A 5-point Likert scale (easy,

mild, moderate, difficult, and very difficult) is used to evaluate treatment complexity and the method is heavily weighted by aesthetics [12].

Dental anxiety which can be defined as "strong negative emotional state associated with dental treatment" is a common problem with a complex etiological background [13]. Pain and negative experiences from previous dental treatments [14, 15], socioeconomic factors [16], parental dental anxiety and attitude [17], patients' temperament and personality factors such as shyness and/or tendencies of negative emotionality [18], certain behaviours of dental staff [19], and more complex psychological disorders [20, 21] are considered as potential etiological factors for dental anxiety. Corah's Dental Anxiety Scale (CDAS) is probably the most widely used scale and consists of four items. This assessment tool was developed to assess dental treatment-related anxiety using multiple-choice items on a scale from 4 (no anxiety) to 20 (high anxiety) [22]. Despite the aforementioned literature findings, orthodontic treatment-related dental anxiety has not been studied in detail. There are studies examining the anxiety conditions of orthodontic patients during the treatment. Sarı *et al.* [23] reported that patients with malocclusion had high anxiety levels. The concern occurs with anxiety, and it is a cognitive activity about future events. Maj *et al.* [24] reported that the appliance was painful and stressful. They found that 77% of the children had experienced considerable psychological difficulty during the initiation of orthodontic treatment. Kazancı *et al.* [25] showed that orthodontic patients and their parents were concerned about orthodontic treatment in various ways, such as "feeling pain", "the appearance of braces", "being teased" and "missing school".

Today, anxiety is one of the most common psychological problems in society. Determining how dental appearance affects individuals and how much dental anxiety is experienced by individuals who want to have orthodontic treatment are important issues that need to be re-evaluated considering today's conditions. To that end, the aim of this study is to evaluate the relationship between appearance changes related to orthodontic problems and anxiety.

2. Material and methods

The study included 431 individuals over 12 years of age who were presented to the Department of Orthodontics at Gazi University. Inclusion criteria were having no history of orthodontic treatment, systemic disease, psychological disorder, physical problem, and not using any antidepressants. All participants completed the Turkish form of the STAI-T and CDAS questionnaires during their first appointment at the orthodontic clinic. ICON scoring was performed only aesthetically (AC scale) using the pre-treatment intraoral photographs by the same experienced orthodontist (GMG). In the AC scale, there are 10 intraoral photographs with different malocclusion intensities numbered gradually from the most beautiful dental appearance (score 1) to the least beautiful dental appearance (score 10). Frontal, left, and right intraoral photographs of the individuals included in the study were compared with the AC scale, matched with the most similar malocclusion and scored (Fig. 1). Individuals with malocclusions not defined at the AC scale, such as anterior crossbite, polydiastema, congenital missing teeth and impacted teeth were not included in the study.

The anxiety was assessed according to the STAI-T which evaluates anxiety as a personal trait. It is composed of twenty items and using a four-point Likert-scale items: 1 (almost never), 2 (sometimes), 3 (frequently), and 4 (almost always). The score range is 20 to 80, and higher scores indicate higher trait anxiety. The total score is used to categorize participants as having mild anxiety (<36 points), moderate anxiety (36–41 points), or severe anxiety (>42 points).

Three groups were formed from 431 individuals according to the STAI-T scores: mild (n = 165), moderate (n = 119), and severe (n = 147) anxiety groups. After the initial grouping, the sample size was equalized to 119 in all groups in order to make an accurate intergroup comparison. A method of reducing the number of sample size was made by drawing lots.

Statistical analyses were conducted using the SPSS software (v20.00; IBM, Chicago, IL, USA). To identify the intra-examiner accuracy, ICON scoring was repeated by the same investigator (GMG) and the intra-examiner correlation coefficients (ICC) were calculated.

The normal distribution of the data was checked by the Kolmogorov-Smirnov test. Because the data did not present a normal distribution, nonparametric tests were used.

The Kruskal-Wallis H test was used for intergroup comparisons. Intragroup and intergroup comparison of chronological ages of the individuals was made using Mann-Withney U test and Kruskal-Wallis H test between male and females, respectively. Spearman's correlation analysis was performed to evaluate the relationship between STAI-T, CDAS, and ICON scores. The level of significance was determined as $p < 0.05$.

3. Results

The ICC was between 0.985 and 1.000 for ICON scoring.

It was found that 38.28% of the 431 participants had mild (165), 34.1% had severe (147), and 27.62% had moderate (119) anxiety levels. Of the participants, 35.8% were male and 64.2% were female.

It was envisaged to include at least 84 cases in each of the groups (a total of 252 cases) in order to test the statistical significance of the differences between the groups at 95% power and 5% error level. In the case of an effect size of 0.25 (Cohen's F) according to the One-Way Analysis of Variance (One-Way ANOVA), the amount of variation in the STAI-T scores. The effect size of 0.25 was decided in the direction of clinical projections. G*Power 3.1.9.6 (Franz Foul, Universität Kiel, Kiel, Germany) package program was used for sample size calculations. In order to ensure homogeneity in the comparison between groups, the number of samples for each group was determined as 119.

There was no significant difference between the mean ages of the groups (Table 1). CDAS score was significantly lower in the mild anxiety group compared to the moderate and severe anxiety groups. There was no significant difference between the moderate and severe anxiety groups according to the CDAS score. ICON score was significantly higher in the severe anxiety group than the other groups. It was also significantly

FIGURE 1. Comparison of the intraoral photographs with AC scale for ICON scoring. (a) The Aesthetic Component (AC scale) [12], (b) intraoral photographs of individuals.

higher in the moderate anxiety group than the mild anxiety group (Table 2). There was a significant positive correlation between STAI-T score and both CDAS and ICON score. There was no significant correlation between CDAS and ICON score (Table 3).

4. Discussion

In order to improve facial aesthetics, which has become more and more important in the modern age, most people seek cosmetic and surgical interventions. It has been shown in various studies that the appearance of teeth plays an important role in facial aesthetics. On the face, the mouth and eyes also appear to be important. Therefore, people have become more likely to apply to orthodontists to improve their facial aesthetics [1, 4].

In our study, it was aimed to evaluate the anxiety of patients based on how they see their teeth in the mirror. Instead of cephalometric values that patients do not know the difference, a classification has been made for the aesthetic problems that patients may be aware of about themselves.

However, another condition that is more frequently encountered in the modern age is anxiety. The desire to be liked and the aesthetic appearance contribute to many situations that cause anxiety [11]. Carlsson *et al.* [26] reported that individuals with dental anxiety are not satisfied with their dental and facial appearance. Significant positive correlations have been reported between negative dimensions of dental impact (social impact, psychological impact, and aesthetic concern) and anxiety, suggesting that the perception and impact of dental image can have emotional outcomes related with anxiety [26, 27]. Adolescents concerned about their dental esthetics may experience behavioural problems [28, 29]. In this age group, malocclusion can result in psychological problems due to shame, intimidation, and depression [4, 5, 30, 31]. The effect of dental appearance on psychosocial interactions of individuals differ according to age and gender. In girls, older adolescents, and young adults, the effect of social anxiety is stronger and deeper, so the psychological effects are greater and a decrease in dental self-confidence is more common [11, 32].

In this study, our aim was to determine whether the dental appearance has an effect on the general and dental anxiety of individuals, and also to investigate whether there is any relationship between dental anxiety and general anxiety. When we classified the general anxiety states of 431 participants, we observed that most individuals were in the mild anxiety group. This was followed by the number of individuals with severe and moderate anxiety, respectively.

It was assumed that the participants had a high perception of their appearance, as they were patients who applied for orthodontic treatment only. When we looked at the aesthetic scores of these individuals, we observed that individuals with mild general anxiety had better-looking teeth, that is, their

TABLE 1. Intergroup and intragroup comparison of chronological age.

Gender	Mild anxiety				Moderate Anxiety				High Anxiety				
	n	mean	SD	p^1	n	mean	SD	p^1	n	mean	SD	p^1	p^2
Female	70	15.7	2.5	0.814	73	16.4	3.0	0.405	86	16.6	3.8	0.810	0.201
Male	49	16.1	3.6		46	15.8	2.3		33	16.0	2.1		0.677

*SD: Standart deviation; p^1: intra group comparison of the chronological age between female and male (Mann-Withney U test); p^2: inter group comparison of the chronological age between female and male (Kruskal-Wallis H test); *$p < 0.05$: significant difference.*

TABLE 2. Intergroup comparison.

								Kruskal-Wallis H test	
	Groups	n	Mean	Med.	Min.	Max.	SD	p	Groups
CDAS	(1) Mild anxiety	119	6.7	6	4	13	2.2	0.0001*	1–2
	(2) Moderate anxiety	119	8.1	8	4	15	2.7		1–3
	(3) Severe anxiety	119	8.9	9	4	17	2.9		
ICON	(1) Mild anxiety	119	3.0	3	1	8	1.0	0.0001*	1–2
	(2) Moderate anxiety	119	4.0	3	1	10	3.0		1–3
	(3) Severe anxiety	119	5.0	4	1	10	2.0		2–3

*CDAS: Corah's Dental Anxiety Scale; ICON: Index of Complexity, Outcome and Need; SD: Standart deviation; *$p < 0.05$: significant difference.*

TABLE 3. Correlation analysis.

		STAI-T	CDAS	ICON
STAI-T	Pearson Correlation		0.416*	0.353*
	Sig. (2-tailed)		0.000	0.000
	n		357	357
CDAS	Pearson Correlation	0.416*		0.094
	Sig. (2-tailed)	0.000		0.077
	n	357		357
ICON	Pearson Correlation	0.353*	0.094	
	Sig. (2-tailed)	0.000	0.077	
	n	357	357	

*CDAS: Corah's Dental Anxiety Scale; ICON: Index of Complexity, Outcome and Need; STAI-T; State Trait Anxiety Inventory-Trait Form; *$p < 0.05$: significant difference.*

ICON score was lower. A positive significant correlation between ICON score and STAI-T scores is seen in the present study, which indicates that general anxiety increases with the deterioration of dental appearance. However, the fact that there was no significant correlation between dental anxiety (CDAS) and dental appearance (ICON) indicated that individuals receiving treatment did not have increased anxiety about general dental procedures even if their dental appearance are worse.

Dental anxiety is a widespread psychological problem that represents one of the major barriers to dental care. High levels of anxiety before a medical or surgical procedure are common and can lead to negative consequences. In Indian population, 6.3%–9.4% of children in an age range of 10–15 years suffer from dental fear [13–21, 30]. Anxiety also plays an essential role in the severity of perceived dental impact on self-esteem in patients receiving orthodontic treatment [31].

Sarı *et al.* [23] stated that the patients had high state anxiety at the beginning of orthodontic treatment, which diminished with throughout the treatment period. In our study, it was observed that the ICON score, with which we made aesthetic evaluation only, was also high in individuals with high anxiety. It was observed that individuals with poor dental appearance also had high general anxiety. However, in terms of dental anxiety, no significant relationship was observed with dental appearance. In this case, it can be concluded that individuals with poor dental appearance do not feel any special concern about dental procedures but are generally anxious people.

In several previous studies in line with our study, dental anxiety has been shown to be related to general anxiety in children and adults [18, 33, 34].

Most of the studies evaluating dental anxiety focused on the effects of dental procedures which are commonly associated

with expected or experienced pain and involve injections, drilling for a cavity filling or tooth extractions [35–37] as pain is one of the major causes of dental anxiety [33, 38]. Orthodontic procedures may not only involve drilling for a cavity filling or local anesthetic injections but patients also experience pain during or after their appointments [39, 40]. Pain has been reported among the most cited negative side effects of orthodontic treatment, as a primary reason for wanting to cease treatment [41, 42] and has been rated as the greatest dislike during treatment and fourth among major fears and apprehensions prior to orthodontic treatment [43]. Yet, research on dental anxiety among orthodontic patients is relatively scarce.

One of the limitations of this study was the higher number of female individuals. However, this is thought to occur as a result of the fact that women apply to orthodontic clinics more because they pay more attention to their dental appearance. The fact that aesthetic anxiety is higher in women causes orthodontic patients to consist of more female individuals. The second limitation was that the socio-economic status of the participants was not known in general, which is seen as an effective factor in aesthetic perception and anxiety.

5. Conclusions

In the approach to individuals who apply for orthodontic treatment, they should be treated by considering their anxiety regarding their dental appearance, and it should be noted that considering their psychological needs and sensitivities in treatment planning will yield positive results.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on reasonable request from the corresponding author.

AUTHOR CONTRIBUTIONS

GMG—contributed to design, data collection, and manuscript draft; ABH—contributed to study conception, and data checking; SKV—performed an effective scientific and intellectual contribution to the study; TT—contributed to research supervision, and English revision. All authors read and approved the final version of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This research protocol was approved by the Ethical Committee of Gazi University (research number: 18-108). All participants or legal guardians gave informed consent during their first appointment at the orthodontic clinic.

ACKNOWLEDGMENT

The authors would like to thank Gazi University Academic Writing Application and Research Center for proofreading the article.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Bos A, Hoogstraten J, Prahl-Andersen B. Expectations of treatment and satisfaction with dentofacial appearance in orthodontic patient. American Journal of Orthodontics and Dentofacial Orthopedics. 2003; 123: 349–356.

[2] Faure JC. The influence of different facial components on facial aesthetics. The European Journal of Orthodontics. 2002; 24: 1–7.

[3] Papio MA, Fields HW, Beck FM, Firestone AR, Rosenstiel SF. The effect of dental and background facial attractiveness on facial attractiveness and perceived integrity and social and intellectual qualities. American Journal of Orthodontics and Dentofacial Orthopedics. 2019; 156: 464–474.e1.

[4] Bernabe E, De Oliveira CS, Sheiham A. Condition-specific, sociodental, impacts attributed to different anterior occlusal traits in Brazilian adolescent. European Journal of Oral Sciences. 2007; 115: 473–478.

[5] Marques LS, Ramos-Jorge ML, Paiva SM, Pordeus IA. Malocclusion: esthetic impact and quality of life among Brazilian schoolchildren. American Journal of Orthodontics and Dentofacial Orthopedics. 2006; 129: 424–427.

[6] Wolfart S, Quaas AC, Freitag S, Kropp P, Gerber W, Kern M. General well-being as an important co-factor of self-assessment of dental appearance. The International Journal of Prosthodontics. 2006; 19: 449–454.

[7] Klages U, Claus N, Wehrbein H, Zentner A. Development of a questionnaire for assessment of the psychosocial impact of dental aesthetics in young adults. European Journal of Orthodontics. 2006; 28: 103–111.

[8] Klages U, Erbe C, Sandru SD, Brüllman D, Wehrbein H. Psychosocial impact of dental aesthetics in adolescence: validity and reliability of a questionnaire across age-groups. Quality of Life Research. 2015; 24: 379–390.

[9] Ellakany P, Fouda SM, Alghamdi M, Bakhurji E. Factors affecting dental self-confidence and satisfaction with dental appearance among adolescents in Saudi Arabia: a cross sectional study. BMC Oral Health. 2021; 21: 149.

[10] Spielberg CD. Manual for the State Trait Anxiety Inventory (Form Y). Consulting Psychologist press: Palo Alto. 1983.

[11] Appukuttan DP. Strategies to manage patients with dental anxiety and dental phobia: literature review. Clinical, Cosmetic and Investigational Dentistry. 2016; 8: 35–50.

[12] Daniels C, Richmond S. The development of the index of complexity, outcome and need (ICON). Journal of Orthodontics. 2000; 27: 149–162.

[13] Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. International Journal of Paediatric Dentistry. 2007; 17: 391–406.

[14] Milgrom P, Mancl L, King B, Weinstein P. Origins of childhood dental fear. Behaviour Research and Therapy. 1995; 33: 313–319.

[15] Raadal M, Strand GV, Amarante EC, Kvale G. Relationship between caries prevalence at 5 years of age and dental anxiety at 10. European Journal of Paediatric Dentistry. 2002; 3: 22–26.

[16] Raadal M, Milgrom P, Weinstein P, Mancl L, Cauce AM. The prevalence of dental anxiety in children from low-income families and its relationship to personality traits. Journal of Dental Research. 1995; 74: 1439–1443.

[17] Themessl-Huber M, Freeman R, Humphris G. Empirical evidence of the relationship between parental and child dental fear: a structured review and meta-analysis. International Journal of Paediatric Dentistry. 2010; 20: 83–101.

[18] Klingberg G, Broberg AG. Temperament and child dental fear. Pediatric Dentistry. 1998; 20: 237–243.

[19] Zhou Y, Cameron E, Forbes G, Humphris G. Systematic review of the effect of dental staff behaviour on child dental patient anxiety and behaviour. Patient Education and Counseling. 2011; 85: 4–13.
[20] Thomson WM, Poulton RG, Kruger E, Davies S, Brown RH, Silva PA. Changes in self-reported dental anxiety in New Zealand adolescents from ages 15 to 18 years. Journal of Dental Research. 1997; 76: 1287–1291.
[21] Wogelius P, Poulsen S, Sorensen HT. Prevalence of dental anxiety and behaviour management problems among six to eight years old Danish children. Acta Odontologica Scandinavica. 2003; 61: 178–183.
[22] Haugejorden O, Solveig Klock K. Avoidance of dental visits: the predictive validity of three dental anxiety scales. Acta Odontologica Scandinavica. 2000; 58: 255–259.
[23] Sarı Z, Uysal T, Karaman AI, Sargin N, Ure O. Does orthodontic treatment affect patient' and parents' anxiety levels? European Journal of Orthodontics. 2005; 27: 155–159.
[24] Maj G, Squarzoni Grilli AT, Belletti MF. Psychologic appraisal of children facing orthodontic treatment. American Journal of Orthodontics and Dentofacial Orthopedics. 1967; 53: 849–857.
[25] Kazancı F, Aydoğan C, Akan Ö. Patients' and parents' concern and decisions about orthodontic treatment. Korean Journal of Orthodontics. 2016; 46: 20–26.
[26] Carlsson V, Hakeberg M, Blomkvist K, Boman UW. Orofacial esthetics and dental anxiety: associations with oral and psychological health. Acta Odontologica Scandinavica. 2014; 72: 707–713.
[27] Carlsson V, Hakeberg M, Boman UW. Associations between dental anxiety, sense of coherence, oral health-related quality of life and health behavior—a national Swedish cross-sectional survey. BMC Oral Health. 2015; 15: 1–8.
[28] De Oliveira Meira ACL, Custodio W, Filho MW, Borges TM, C Meneghim M, Santamaria M Jr, *et al*. How is orthodontic treatment need associated with per ceived esthetic impact of malocclusion in adolescent? American Journal of Orthodontics and Dentofacial Orthopedics. 2020; 158: 668–673.
[29] Kaieda AK, Bulgareli JV, Cunha IPD, Vedovello SAS, Guerra LM, Ambrosano GMB, *et al*. Malocclusion and dental appearance in underprivileged Brazilian adolescent. Brazilian Oral Research. 2019; 33: 14.
[30] Roy J, Dempster LJ. Dental anxiety associated with orthodontic care: prevalence and contributing factors. Seminars in Orthodontics. 2018; 24: 233–241.
[31] Romero-Maroto M, Santos-Puerta N, González Olmo MJ, Peñacoba-Puente C. The impact of dental appearance and anxiety on self-esteem in adults orthodontic patients. Orthodontics & Craniofacial Research. 2015; 18: 143–155.
[32] Wan Hassan WN, Makhbul MZM, Othman SA. Age and gender are associated with the component of psychosocial impact of dental aesthetics questionnaire in young people: a cross-sectional study. Children. 2022; 9: 496.
[33] Doganer YC, Aydogan U, Ucler Yesil H, Rohrer JE, Williams MD, Agerter DC. Does the trait anxiety affect the dental fear? Brazilian Oral Research. 2017; 31: 36.
[34] Ekuni D, Furuta M, Irie K, Azuma T, Tomofuji T, Murakami T, *et al*. Relationship between impacts attributed to malocclusion and psychological stress in young Japanese adults. European Journal of Orthodontics. 2011; 33: 558–563.
[35] Klages U, Ulusoy Ö, Kianifard S, Wehrbein H. Dental trait anxiety and pain sensitivity as predictors of expected and experienced pain in stressful dental procedures. European Journal of Oral Sciences. 2004; 112: 477–483.
[36] McNeil DW, Berryman ML. Components of dental fear in adults. Behaviour Research and Therapy. 1989; 27: 233–236.
[37] Van Wijk AJ, Jongh AD, Lindeboom JA. Anxiety sensitivity as a predictor of anxiety and pain related to third molar removal. Journal of Oral and Maxillofacial Surgery. 2010; 68: 2723–2729.
[38] Maggirias J, Locker D. Psychological factors and perceptions of pain associated with dental treatment. Community Dentistry and Oral Epidemiology. 2002; 30: 151–159.
[39] Krishnan V. Orthodontic pain: from causes to management—a review. European Journal of Orthodontics. 2007; 29: 170–179.
[40] Long H, Zhou Y, Pyakurel U, Liao L, Jian F, Xue J, *et al*. Comparison of adverse effects between lingual and labial orthodontic treatment. The Angle Orthodontist. 2013; 83: 1066–1073.
[41] Brown DF, Moerenhout RG. The pain experience and psychological adjustment to orthodontic treatment of preadolescent, adolescents, and adults. American Journal of Orthodontics and Dentofacial Orthopedics. 1991; 100: 349–356.
[42] Kluemper GT, Hiser DG, Rayens MK, Jay MJ. Efficiancy of a wax containing benzocaine in the relief of oral mucosa pain caused by orthodontic appliances. American Journal of Orthodontics and Dentofacial Orthopedics. 2002; 122: 359–365.
[43] O'Connor PJ. Patients' perceptions before, during, and after orthodontic treatment. Journal of Clinical Orthodontics. 2000; 34: 591–592.

How to cite this article: Gamze Metin-Gürsoy, Ayse Bikem Haciomeroglu, Selin Kale-Varlık, Tuba Tortop. Evaluation of the relationship between anxiety levels and dental appearance. Journal of Clinical Pediatric Dentistry. 2023; 47(4): 40-45. doi: 10.22514/jocpd.2023.018.