



Original Article

Evaluation of Orthodontic Treatment Method Preferences of Dentistry Students, Dentists and Orthodontic Residents

Merve Berika Kadioğlu^{ID}, Berrak Çakmak^{ID}, Ezgi Kardelen Altunal^{ID}, Meliha Rübendiz^{ID}

Ankara University Faculty of Dentistry, Department of Orthodontics, Ankara, Turkey

Cite this article as: Kadioğlu MB, Çakmak B, Altunal EK, Rübendiz M. Evaluation of Orthodontic Treatment Method Preferences of Dentistry Students, Dentists and Orthodontic Residents. *Turk J Orthod.* 2023; 36(2): 101-110.

Main Points

- Clear aligner was more preferred in terms of esthetics, advantage/disadvantage, health of the oral cavity, and short-term treatments, especially by orthodontic residents.
- Considering the success of treatment and long-term treatments, conventional metal brackets were preferred the most.
- Discrepancies in gender and income levels had little effect on treatment preferences.

ABSTRACT

Objective: The aim of this study was to evaluate orthodontic treatment method preferences among dentistry students, dentists and orthodontic residents taking into account factors such as esthetics, advantage/disadvantage, cost and treatment duration.

Methods: The study was carried out on three groups: dentistry students (n=318), dentists (n=110) and orthodontic residents (n=98), and a 17-question survey was applied. Questionnaire forms included informational photos of conventional metal brackets (CMB), esthetic ceramic brackets (ECB), self-ligating brackets (SLB), clear aligner (CA), and lingual brackets (LB). The participants' preferences for orthodontic treatment methods were evaluated using chi-square analysis, not only between groups but also considering gender and income level.

Results: Regarding esthetics, dentists (41%) and orthodontic residents (78%) mostly preferred CA, while dentistry students mostly preferred LB (44%). With regard to advantage/disadvantage, dentistry students (31%) and dentists (39%) mostly preferred SLB, while orthodontic residents mostly preferred CA (55%). Regarding the success of the treatment, all three groups mostly preferred CMB. (respectively 50%; 47%; 72%). While CA was mostly preferred for short-term treatments in all three groups (respectively 40%; 71%; 88%), CMB was mostly preferred for long-term treatments (respectively 35%, 51%, 55%). Gender and income-level differences had little effect on orthodontic treatment method preferences.

Conclusion: Except for long-term treatments and treatment success, there was generally great interest in CA, especially among orthodontic residents. Ceramic brackets and LB were generally the least preferred treatment methods among dentistry students, dentists, and orthodontic residents.

Keywords: Patient preferences, esthetics, orthodontic appliances, clear aligner

INTRODUCTION

Orthodontic treatments have traditionally utilized conventional metallic brackets (CMB). However, the appearance of metal brackets can lead to esthetic concerns, particularly in adults. As a result, there is a growing demand for orthodontic appliances that are less noticeable and more acceptable to patients.^{1,2}

The change in the perspective of esthetics in dentistry, especially in orthodontics, has led to a sense of urgency in incorporating esthetics into orthodontic treatment requirements and has increased the demand for invisible

orthodontic appliances.^{3,4} Additionally, reducing chair-time and shortening the treatment time has become a desire for both clinicians and patients. For this reason, trends in orthodontic appliance usage are constantly evolving.⁵ Currently, treatment modalities that prioritize esthetics and comfort during use are becoming the basic needs of patients seeking orthodontic treatment.⁵

Advancements in technology have resulted in the development of esthetic ceramic brackets, lingual brackets, clear aligner, and self-ligating brackets, which offer advantages over CMBs in terms of appearance and/or comfort and have impact on patient preference.⁶ Although each of these new orthodontic systems has its advantages and disadvantages, some promise greater comfort, some offer a more esthetically pleasing appearance, and others provide shorter treatment times.²

Although there are different orthodontic treatment methods available, studies have shown that there are differences in the perception of orthodontic appliances among different age groups, as well as among those with different social and cultural values.^{1,2,6} Understanding the factors involved in the perception of different orthodontic appliances in different populations can enable better planning of resources and treatment strategies in the clinical practice.³ In the study by Marañón-Vásquez et al.⁵, it was determined that before being informed in detail about orthodontic treatment methods, participants cared more about esthetics and attractiveness, and therefore preferred clear aligners and lingual brackets over traditional metal brackets, which were rejected at the highest rate. However, after being informed about the advantages and disadvantages of treatment methods, their preferences shifted towards clear aligner and traditional metal brackets, with lingual brackets being rejected more. This demonstrates that treatment preferences can change when patients are informed about orthodontic treatment methods. Since all these systems have some advantages as well as disadvantages, it is important to consider which orthodontic treatment method will be preferred by both orthodontists and patients who are informed about the various bracket systems in cases where orthodontic treatment is needed. Based on this idea, the current study aims to evaluate the preferred orthodontic treatment method in case of orthodontic treatment need considering factors such as esthetics, cost, advantage/disadvantage, health of the oral cavity, treatment success and treatment duration by dentistry students, dentists and orthodontic residents who are briefly introduced to different bracket systems.

METHODS

The study was conducted with three groups of participants: 3rd-4th year dentistry students, dentists, and orthodontic residents (post-graduate doctorate/specialty students studying in orthodontics). Ethical approval for the study was obtained from the Clinical Research Ethics Committee of Ankara University Faculty of Dentistry (date: 17.02.2021, decision number: 04/03).

Power analysis was used to determine the number of participants to be included in the study. The minimum sample size required for a significant relationship between the two categorical variables was determined to be 36 with an effect size of 0.80 (large effect), error level (α) of 0.05, test power (1-b) of 0.95 and degrees of freedom of 8. The questionnaire was applied to 559 volunteers and all participants provided written informed consent. Some questionnaire forms were excluded from the study after the preliminary examination based on the following criteria:

- Questionnaire forms in which all the questions were marked the same,
- Questionnaire forms in which the same answer was given to the control question put in the questionnaire to test whether the participants read the questions.

Accordingly, 526 questionnaires were evaluated. The numerical distribution of the number and gender of the participants in each group is given in Table 1. To avoid the problems that may be caused by numerical differences between the genders, it was attempted to have a similar percentage distribution of men and women among the groups. The participants were surveyed with 17 questions, evaluating demographic information (age, gender, study year for dentistry students, income level), and treatment preferences. Before the survey, the participants were briefly informed about the treatment methods with short introductions and intraoral photographs of conventional metal brackets (CMB), esthetic ceramic brackets (ECB), self-ligating brackets (SLB), clear aligner (CA) and lingual brackets (LB). Then, the participants were asked in case of need for orthodontic treatment, which orthodontic treatment method they would prefer in terms of esthetics, advantage/disadvantage, cost, health of the oral cavity, success of the treatment, long or short treatment time. Additionally, we evaluated whether there was a difference in treatment method preferences in terms of gender and income level.

Table 1. Distribution of the participants by gender

Participants	Women		Men		Total (N)
	(n)	(%)	(n)	(%)	
Dentistry students	222	70%	96	30%	318
Dentists	69	63%	41	37%	110
Orthodontic residents	76	71%	22	29%	98
Total (n)	367		159		526

Statistical Analysis

The differences in the participants' orthodontic method preferences were analyzed using chi-square analysis with SPSS Statistics 22.0 Software. Comparisons were made with a significance level of $p < 0.05$. Also, gender and income-level differences were tested in each group.

RESULTS

The chi-square test results regarding the differences in orthodontic treatment method preferences among participant groups are presented in Table 2. Statistical significant differences were observed among the participant groups for all evaluated factors ($p < 0.05$). In terms of esthetic concerns, lingual brackets were preferred by the students the most (44%), while clear aligners were preferred at the highest rate by the dentists (41%) and orthodontic residents (78%). Considering the advantages and disadvantages of the treatment methods, the students

(31%) and dentists (39%) mostly preferred self-ligating brackets, whereas clear aligners were the top choice for orthodontic residents (55%). When considering esthetics, cost, and advantage/disadvantages together as well as oral cavity health, metallic brackets were mostly preferred by students (27%, 33% respectively), while the dentists (28%, 44% respectively) and orthodontic residents (55%, 85% respectively) mostly preferred clear aligners. In all groups, CMBs were mostly preferred in terms of treatment success (50%; 47%; 72% respectively) and long-term treatment (35%; 51%; 55% respectively), while clear aligners were preferred for short-term treatment (40%; 71%; 88% respectively).

Table 3 presents the relationship between the gender of the participants and their preferences for orthodontic treatment methods. The analysis revealed no significant gender difference in any group considering the advantage/disadvantage factor, health of the oral cavity, treatment success, and short-term treatments. However, in terms of esthetics, a gender difference

Table 2. Percentage distribution of the preferences of participants and the chi-square table showing the differences between groups

Group	CMB (%)	ECB (%)	SLB (%)	CA (%)	LB (%)	χ^2	p value	
Esthetics								
Students	5	22	3	26	44	96.224	0.000*	
Dentists	9	14	4	41	32			
Orthod. Res.	1	0	3	78	18			
Advantage/Disadvantage								
Students	26	11	31	29	3	44.616		
Dentists	21	3	39	30	7			
Orthod. Res.	13	0	27	55	5			
Esthetics, Cost, Advantage-Disadvantage								
Students	27	21	23	23	6	57.744		
Dentists	18	18	19	28	17			
Orthod. Res.	10	19	8	55	8			
Health of the Oral Cavity								
Students	33	11	26	25	5	117.074		
Dentists	31	7	13	44	5			
Orthod. Res.	4	5	6	85	0			
Success of the Treatment								
Students	50	9	28	8	5	34.962		
Dentists	47	6	25	11	11			
Orthod. Res.	72	0	18	10	0			
Short-Term Treatment								
Students	26	13	12	40	9	98.034		
Dentists	18	3	0	71	8			
Orthod. Res.	6	0	0	88	6			
Long-Term Treatment								
Students	35	18	23	13	11	38.839		
Dentists	51	11	20	14	4			
Orthod. Res.	55	0	27	14	4			

Orthod. Res., Orthodontic Residents; CMB, Conventional metallic brackets; ECB, Esthetic ceramic brackets; SLB, Self-ligating brackets; CA, Clear aligner; LB, Lingual brackets (χ^2 : Chi-square test; *: $p < 0.05$ indicates statistically significance)

Table 3. Relationship between the gender of the participants and preferences of orthodontic treatment methods in each group

Group	Gender	CMB (%)	ECB (%)	SLB (%)	CA (%)	LB (%)	χ^2	p value
Esthetics								
Students	Female	5	22	3	26	44	0.24	0.993
	Male	4	22	2	27	45		
Dentists	Female	10	16	6	41	28	2.65	0.617
	Male	7	10	2	42	39		
Orthod. Res.	Female	1	0	0	78	21	11.98	0.007*
	Male	0	0	14	77	9		
Advantage/Disadvantage								
Students	Female	27	10	31	30	3	1.60	0.808
	Male	26	14	30	26	4		
Dentists	Female	17	4	45	30	3	9.37	0.052
	Male	27	0	29	29	15		
Orthod. Res.	Female	13	0	25	55	7	1.75	0.626
	Male	14	0	32	55	0		
Esthetics, Cost, Advantage/Disadvantage								
Students	Female	27	18	22	27	6	9.85	0.043*
	Male	28	29	24	14	5		
Dentists	Female	19	17	23	28	13	3.61	0.46
	Male	17	17	12	29	24		
Orthod. Res.	Female	11	20	5	55	9	4.32	0.364
	Male	9	14	18	55	5		
Health of the Oral Cavity								
Students	Female	35	10	27	24	5	2.45	0.637
	Male	28	13	25	27	7		
Dentists	Female	26	10	16	45	3	7.28	0.122
	Male	39	2	7	42	10		
Orthod. Res.	Female	5	5	7	83	0	1.40	0.701
	Male	0	5	5	91	0		
Success of the Treatment								
Students	Female	53	6	28	7	5	6.84	0.144
	Male	44	15	27	9	5		
Dentists	Female	46	7	26	9	12	2.06	0.724
	Male	49	2	24	15	10		
Orthod. Res.	Female	71	0	18	11	0	0.04	0.979
	Male	73	0	18	9	0		
Short-Term Treatment								
Students	Female	23	14	13	43	8	7.04	0.131
	Male	34	9	12	33	12		
Dentists	Female	15	1	0	74	10	3.57	0.308
	Male	24	5	0	66	5		
Orthod. Res.	Female	7	0	0	87	7	0.26	0.877
	Male	5	0	0	91	5		
Long-Term Treatment								
Students	Female	35	18	24	14	10	1.94	0.746
	Male	33	19	23	10	15		
Dentists	Female	58	13	16	13	0	11.13	0.025*
	Male	39	7	27	17	10		
Orthod. Res.	Female	57	0	28	13	3	2.33	0.506
	Male	50	0	23	18	9		

Orthod. Res., Orthodontic Residents; CMB, Conventional metallic brackets; ECB, Esthetic ceramic brackets; SLB, Self-ligating brackets; CA, Clear aligner; LB, Lingual brackets (χ^2 : Chi-square test; *: p<0.05 indicates statistically significance)

was observed in orthodontic residents, where male residents preferred self-ligating brackets (14%) and female residents preferred lingual brackets (21%) as their second choice, while the most preferred treatment method was the same for both genders. When considering the esthetics - cost - advantage/disadvantage factors together, only female dentistry students showed a gender difference, as they preferred clear aligners more (27%). In terms of long-term treatments, only female dentists showed a gender difference, as they preferred CMBs (58%) more.

Table 4 presents the relationship between the income levels of the participants and their preferences for orthodontic treatment methods. There was no significant difference in the preference of treatment method according to income levels of both dentistry students and orthodontic residents. However, significant differences were found for dentists, in terms of esthetics, advantage/disadvantage, and short-term treatment ($p < 0.05$). In terms of esthetics, all low-income dentists (100%) preferred esthetic ceramic brackets, the middle-income dentists mostly preferred clear aligners (46%), and the high-income dentists mostly preferred lingual brackets (46%). Considering the advantage/disadvantage of the orthodontic treatments, all low-income dentists preferred conventional metallic or esthetic ceramic brackets (50%-50%), while the middle-income dentists mostly preferred self-ligating brackets (44%), and the high-income dentists mostly preferred CMBs (31%) and clear aligners (31%). Regarding short-term treatments, low-income dentists preferred esthetic ceramic brackets (50%) and clear aligners (50%) at similar rates, while middle and high-income dentists mostly preferred clear aligners (71%;73% respectively).

DISCUSSION

The perception of attractiveness, confidence, intelligence, social skills, popularity, employment, and success can be influenced by the appearance of orthodontic appliances.⁷ Thus, the appearance of the orthodontic appliance plays a crucial role in patients' preference for orthodontic treatment. Also, the perceptions of individuals about orthodontic appliances differ and can vary according to various factors such as age, gender, social status, and income level.^{1-3,6} In current orthodontic practice, the interaction between clinician and patient is crucial in determining the diagnosis and treatment planning. In this regard, determining patients' and clinicians' preferences is important in making recommendations that will guide the decision-making process effectively.⁵

This study was conducted with three groups of participants from the dentistry community: students (3rd and 4th year) currently studying dentistry, dentists, and orthodontic residents (post-graduate doctorate/specialty students studying in orthodontics at different levels). Therefore, participants' ages, education levels, and knowledge of orthodontic treatment varied. For this reason, it is expected that the issues that influenced them would differ.

The first question was which orthodontic treatment method they would prefer considering aesthetics in case of need for orthodontic treatment. It was observed that while the dental students mostly preferred lingual brackets (44%), dentists (41%) and orthodontic residents (78%) mostly preferred clear aligners in terms of esthetics (Table 2). In similar studies evaluating the attractiveness of orthodontic appliances in patients, lingual brackets and clear aligner have been found to be the most attractive treatment methods.¹⁻³ A study investigating young people's perceptions of different orthodontic appliances at different ages, reported that clear aligners are the most esthetically acceptable materials in all age groups, while lingual brackets are preferred in the second place, similar to our findings.⁷ In some studies, age has been identified as an important factor in orthodontic appliance preferences considering esthetics, with metallic brackets being more attractive at younger ages, and interest in clear aligners increasing with age.^{4,8} For example, in the study of Kuhlman et al.⁴, it was found that while young individuals in the 8-12 age group preferred clear aligners the least, older individuals in the 13-17 age group found esthetic ceramic brackets and clear aligners without attachments more attractive. Alansari⁷, who obtained similar results to us, stated that the increase in the interest in clear aligners was due to the increase in advertisement and presence on social media, as well as clinicians' efforts to keep up the times. Additionally, the attachments that are indispensable part of clear aligner treatments, were not completely clear in the photographs used for informational purposes, and this may have influenced the emergence of this preference.⁷ Likewise in studies on adults and adolescents, clear aligners with attachments are less preferred than those without attachments.^{3,4}

In terms of the advantages and disadvantages of orthodontic treatment methods, students (31%) and dentists (39%) mostly preferred self-ligating brackets, while orthodontic residents mostly preferred clear aligners (55%) (Table 2). The students and dentists based their decisions solely as patients receiving orthodontic treatment and not as providers. However, orthodontic residents answered the survey as both a patient and a specialist who performs orthodontic treatment. Generally self-ligating brackets which can deliver 3-dimensional tooth control are considered the most durable and possibly the most efficient because of their lower sliding friction.⁹ Despite that, in this study, the orthodontic residents mostly preferred clear aligners in terms of advantages/disadvantages. It can be thought that factors such as social attractiveness of aligners, ease of use for eating, drinking and maintaining oral hygiene, the need to learn more about this new treatment method and an effort to set an example for their patients can be considered as the reasons for the emergence of this preference. Esthetic ceramic brackets and lingual bracket systems were the least preferred treatment methods in terms of advantage/disadvantage. It is thought that the handicaps of ceramic brackets such as fracturing during debonding and increased friction in sliding¹⁰ and the handicaps of lingual brackets such as the difficulty of manipulating, increased oral discomfort, impaired speech performance,

Table 4. Relationship between participants income levels and preferences of the orthodontic treatment method in each group

Group	Income	CMB (%)	ECB (%)	SLB (%)	CA (%)	LB (%)	χ ²	p value
Esthetics								
Students	Low	7	20	4	26	44	8.40	0.429
	Middle	4	22	2	28	45		
	High	3	36	0	19	42		
Dentists	Low	0	100	0	0	0	18.84	0.016*
	Middle	9	11	6	46	28		
	High	12	15	0	27	46		
Orthod. Res.	Low	0	0	0	60	40	2.26	0.894
	Middle	2	0	3	79	17		
	High	0	0	4	78	19		
Advantage/Disadvantage								
Students	Low	29	9	35	25	3	8.32	0.357
	Middle	26	11	30	30	4		
	High	19	23	19	36	3		
Dentists	Low	50	50	0	0	0	23.53	0.003*
	Middle	17	2	44	31	6		
	High	31	0	27	31	12		
Orthod. Res.	Low	0	0	0	100	0	5.94	0.43
	Middle	15	0	30	49	6		
	High	11	0	22	63	4		
Esthetics, Cost, Advantage/Disadvantage								
Students	Low	32	18	23	21	7	8.46	0.39
	Middle	27	21	24	24	5		
	High	16	36	13	29	7		
Dentists	Low	50	50	0	0	0	10.98	0.203
	Middle	13	16	22	33	16		
	High	31	19	12	15	23		
Orthod. Res.	Low	0	20	0	80	0	9.95	0.268
	Middle	9	23	12	49	8		
	High	15	7	0	67	11		
Health of the Oral Cavity								
Students	Low	30	13	27	25	5	7.85	0.448
	Middle	32	10	28	25	5		
	High	45	7	10	29	10		
Dentists	Low	50	50	0	0	0	8.44	0.392
	Middle	31	5	13	46	5		
	High	31	12	12	39	8		
Orthod. Res.	Low	0	0	0	100	0	2.53	0.864
	Middle	3	6	8	83	0		
	High	7	4	4	85	0		
Success of the Treatment								
Students	Low	50	10	26	9	5	6.22	0.622
	Middle	51	8	31	5	5		
	High	52	7	23	16	3		

Table 4. continued

Group	Income	CMB (%)	ECB (%)	SLB (%)	CA (%)	LB (%)	χ ²	p value
Dentists	Low	50	50	0	0	0	12.11	0.146
	Middle	45	4	28	13	10		
	High	54	8	19	4	15		
Orthod. Res.	Low	80	0	0	20	0	2.38	0.666
	Middle	68	0	21	11	0		
	High	78	0	15	7	0		
Short-Term Treatment								
Students	Low	25	11	15	44	6	8.49	0.387
	Middle	28	15	11	38	9		
	High	26	7	13	36	19		
Dentists	Low	0	50	0	50	0	17.82	0.007*
	Middle	18	2	0	71	9		
	High	19	0	0	73	8		
Orthod. Res.	Low	20	0	0	80	0	5.06	0.281
	Middle	6	0	0	85	9		
	High	4	0	0	96	0		
Long-Term Treatment								
Students	Low	32	17	29	14	9	8.43	0.392
	Middle	35	20	22	11	12		
	High	45	10	13	16	16		
Dentists	Low	50	50	0	0	0	6.97	0.539
	Middle	49	12	21	16	2		
	High	58	4	19	12	8		
Orthod. Res.	Low	100	0	0	0	0	6.33	0.387
	Middle	49	0	32	15	5		
	High	63	0	19	15	4		

Orthod. Res., Orthodontic Residents; CMB: Conventional metallic brackets; ECB, Esthetic ceramic brackets; SLB, Self-ligating brackets; CA, Clear aligner; LB, Lingual brackets (χ²: Chi-square test; *: p<0.05 indicates statistical significance)

difficulty in eating, higher cost and the lack of adequate technical knowledge and training may have contributed to their rejection by orthodontists.¹¹⁻¹⁴ In the study of Marañón-Vásquez et al.⁵, it was found that the use of the lingual bracket system is rejected with a rate of 80% due to a lack of experience with this method. Similarly, Riolo¹⁵ states that orthodontists do not use lingual brackets because of inadequate training in lingual treatments despite their esthetic and biomechanical advantages. When considering esthetic concerns, cost, advantage/disadvantage together, dentists and orthodontic residents mostly preferred clear aligners (28% and 55% respectively), while students have similar preferences among treatment methods, except for lingual brackets (6%) (Table 2). However, there was a small difference in preference for CMBs (27%), which may be influenced by social, cultural, and economic conditions. In a previous study, while CMBs were mostly preferred by orthodontists, clear aligners were ranked second due to high clinical performance and low adverse effects.⁵ In addition to their esthetic benefits, the direct access of clear aligner companies to patients via social media, and the inclusion of orthodontists and dentists in this aggressive

marketing, may have contributed to their popularity in terms of many parameters, except for esthetics alone.⁷

In terms of oral cavity health and side effects, it was found that while lingual brackets and esthetic ceramic brackets were the least preferred treatment methods in all groups, clear aligners were more preferred, especially by the orthodontic residents (85%) (Table 2). This high rate of preference for clear aligners indicates the advantage of these appliances being “easy to remove and clean”, which is one of the strongest aspects of this treatment system. Additionally, clear aligners cause less pain, and have a lower frequency of emergencies, incidence of periodontal damage and root resorption compared to conventional treatment methods.¹⁶⁻¹⁸ In a study that examined the periodontal health of individuals treated with clear aligner and lingual brackets, it was stated that although clear aligner cover the keratinized gingiva of all teeth throughout the day, the periodontal risk is lower than lingual brackets because aligners are mobile and do not interfere with oral hygiene, which supports the results of this study.¹⁹

Considering treatment success, it was observed that all three groups of participants primarily preferred conventional or self-ligating metallic brackets, with orthodontic residents showing the highest preference rate (students: 50%, dentists: 47%, orthodontic residents: 72%) (Table 2). This is consistent with the consensus that the best-known classical methods are more effective in achieving successful orthodontic treatment. In the study by Marańon-Vásquez et al.⁵, it was observed that participants who valued the finishing details and outcomes of treatment were more inclined to prefer CMBs and to reject clear aligners when they were informed about the advantages and disadvantages of different treatments. The fact that all three groups in the study predominantly preferred conventional or self-ligating metallic brackets in terms of treatment success shows that there is a consensus that successful orthodontic treatment can be achieved with the best-known classical methods.²⁰ Additionally, considering this result, it can be said that while the orthodontists trust clear aligner in terms of esthetics and advantage/disadvantages, they do not trust them enough regarding treatment success. Also, according to the results of our study, clear aligners were more preferred for short-term treatments in all groups, while CMBs were more preferred for long-term treatments, supporting our viewpoint on this matter (Table 2). Besides, the mild severity of malocclusion in short-term treatments may encourage the use of clear aligners, while the limitations of clear aligners may have led the participants to prefer metal brackets in long-term severe cases.^{21,22} Similar to our findings, a study examining the priorities of individuals in the orthodontic treatment process, found that those who considered treatment time and smile esthetics more important, were more likely to prefer clear aligners and reject CMBs, while those who prioritized finishing details and cost were more likely to choose CMB and reject clear aligners.⁵

When the data were evaluated according to gender (Table 3), it was found that there were no significant differences between men and women in terms of advantage/disadvantage, oral cavity health, success of treatment, and short-term treatment. However, gender differences were observed among orthodontic residents regarding esthetics and among dentists in terms of long-term treatments. As in other studies^{4,8} it is observed that gender has little effect on the preference of treatment methods in general. However, it can be said that women tend to be more sensitive to esthetics. Also, Feu et al.³ reported that in adults men tend to assign lower scores than women for all evaluated appliances.

When orthodontic treatment preferences were compared based on income levels, no significant difference was observed among dentistry students and orthodontic residents in any income level (Table 4). However, in the group of dentists, considering the esthetics, all low-income dentists preferred esthetic ceramic brackets (100%), while the middle-income dentists (46%) preferred clear aligner and the high-income dentists (46%) preferred lingual brackets (Table 4). It is worth

noting that clear aligner was preferred in all income groups (50%-73%) for short-term treatments, whereas lingual brackets (8%) were not preferred even in higher income groups. The preference of esthetic options such as lingual brackets or clear aligner appears to be related to the individual's economic status, with a higher income level being associated with a greater preference for lingual brackets. These findings are consistent with studies indicating that adults with higher socio-economic status are more willing to pay for esthetic options such as lingual brackets, clear aligner, or esthetic ceramic brackets.^{2,3} A similar study found that adults with high income levels preferred clear aligners (73%), while low-income adults preferred CMBs (69%) and esthetic ceramic brackets (65%).⁵ In contrast, another study conducted with children and adolescents, found no difference in treatment preferences based on income level for boys, but high-income adolescent girls were found to be more attracted to CA.⁴

When all parameters are evaluated in general, it is quite remarkable that the least preferred treatment methods among the orthodontic residents are esthetic ceramic and lingual brackets, respectively. Additionally, no orthodontic resident preferred esthetic ceramic brackets in terms of esthetics, advantage/disadvantage, treatment success, short-term or long-term treatment time. This situation calls into question the perspective and trust of orthodontists on esthetic ceramic and lingual brackets.

Although there are studies in the literature examining patients' preferences for bracket systems,^{4,6,8} this is the first study to evaluate the treatment preferences of three different dentistry groups, with various levels of knowledge about orthodontic treatment systems, if they need orthodontic treatment. Additionally, studies comparing the perspectives of dentists and orthodontists in terms of clear aligner treatment exist in the literature; however, all treatment methods are not compared in these studies.^{23,24} Furthermore, while other studies¹⁻⁸ have evaluated only the attractiveness and cost of the orthodontic appliances, our study examined different orthodontic treatment methods separately in terms of advantage/disadvantage, treatment duration, oral cavity health, and success of treatment. Also, both gender and income-level differences were evaluated. With this study, we aimed to clarify which factors are effective in orthodontic treatment method preferences in real terms and shed light on which factors clinicians should consider when deciding or directing the treatment method to be applied to their patients.

The number of adult orthodontic patients is increasing worldwide, and their concern about the appearance of the orthodontic appliance is growing.⁴ For this reason, it is crucial for clinicians to assist patients in making informed decisions about their preferred orthodontic treatment method, guide them properly and respond correctly to their demands.⁶ Understanding the general treatment method preferences of clinicians is crucial to empathize with patients and to guide and convince them effectively. Our findings are essential in

representing the view points of both patients and clinicians regarding orthodontic treatment preferences.

It is thought that the preferences of dentistry students with limited knowledge about orthodontic treatment and can view the treatment from the patient's perspective, are closer to those of the general orthodontic patient population. The orthodontic treatment preferences of dentists may be related to their economic status and their esthetic concerns as dental professionals. When considering the parameters in general, it is seen that there is a great interest in clear aligners, especially in orthodontic residents, despite concerns over long-term treatment and treatment success. This interest among young orthodontists may be due to a desire to keep up with the latest developments in the field, as well as a curiosity and need for learning about the clear aligner system. In order to increase the use of clear aligners in clinical practice, efforts should be made to reduce costs, and eliminate inadequacies and uncertainties. The production of self-ligating brackets with a more aesthetically pleasing appearance, as well as better education on their advantages, may increase their popularity among patients and orthodontists alike. Lingual bracket systems have generally received little attention, and improving both orthodontist and patient comfort and optimizing costs may be beneficial for increasing use of lingual brackets in the clinical routine.

Study Limitations

One limitation of this study is that the informational photographs provided to the participants may not fully reflect the appearance of orthodontic appliances in real life, as they are demonstrative models photographs without including tissues such as lips and gingiva. Additionally, the fact that the attachments, which are indispensable for clear aligners, were not clearly visible in the photographs may have influenced participant preferences. Another limitation is that the number of women and men are not equal between the groups, since the female population is generally higher in the dentistry. However, efforts were made to ensure similar percentages of women and men in the groups to avoid gender related differences.

In future studies, it would be valuable to include patients from different age groups who require orthodontic treatment and orthodontists with varying levels of clinical experience to provide a more comprehensive understanding of the results.

CONCLUSION

- There are differences in orthodontic treatment method preferences among the dentistry students, dentists, and orthodontic residents in case of need for orthodontic treatment.
- Considering esthetic reasons, dentistry students tend to prefer lingual brackets, whereas dentists and orthodontic residents tend to prefer clear aligners.
- One notable finding is that orthodontic residents overwhelmingly prefer clear aligners in terms of advantage/

disadvantage, short-term treatments and oral cavity health apart from esthetics.

- However, all three groups tended to prefer conventional metallic and self-ligating brackets regarding treatment success and long-term treatments.
- In general, ceramic and lingual brackets were the least preferred treatment systems among all three groups.
- Gender and income level had minimal impact on treatment method preference.

Ethics

Ethics Committee Approval: Ethical approval for the study was obtained from the Clinical Research Ethics Committee of Ankara University Faculty of Dentistry (date: 17.02.2021, decision number: 04/03).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - M.B.K., B.Ç., E.K.A., M.R.; Design - M.B.K., B.Ç., E.K.A., M.R.; Data Collection and/or Processing - M.B.K., B.Ç., E.K.A., M.R.; Analysis and/or Interpretation - M.B.K., B.Ç., E.K.A., M.R.; Literature Review - M.B.K., B.Ç., E.K.A., M.R.; Writing - M.B.K., B.Ç., E.K.A., M.R.

Financial Disclosure: This study has received no financial support.

Conflicts of Interest: The author report no conflicts of interest in this work.

REFERENCES

1. Ziuchkovski JP, Fields HW, Johnston WM, Lindsey DT. Assessment of perceived orthodontic appliance attractiveness. *Am J Orthod Dentofacial Orthop.* 2008;133(4):68-78. [\[CrossRef\]](#)
2. Rosvall MD, Fields HW, Ziuchkovski J, Rosenstiel SF, Johnston WM. Attractiveness, acceptability, and value of orthodontic appliances. *Am J Orthod Dentofacial Orthop.* 2009;135(3):276. [\[CrossRef\]](#)
3. Feu D, Catharino F, Duplat CB, Capelli Junior J. Esthetic perception and economic value of orthodontic appliances by lay Brazilian adults. *Dental Press J Orthod.* 2012;17(5):102-114. [\[CrossRef\]](#)
4. Kuhlman DC, de Lima TA, Duplat CB, Junior JC. Esthetic perception of orthodontic appliances by Brazilian children and adolescents. *Dental Press J Orthod.* 2016;21(5):58-66. [\[CrossRef\]](#)
5. Marañón-Vásquez GA, Barreto LSC, Pithon MM, et al. Reasons influencing the preferences of prospective patients and orthodontists for different orthodontic appliances. *Korean J Orthod.* 2021;51:115-125. [\[CrossRef\]](#)
6. Alansari RA, Faydhi DA, Ashour BS, et al. Adult perceptions of different orthodontic appliances. *Patient Prefer Adherence.* 2019;13:2119-2128. [\[CrossRef\]](#)
7. Alansari RA. Youth Perception of Different Orthodontic Appliances. *Patient Prefer Adherence.* 2020;14:1011-1019. [\[CrossRef\]](#)
8. Walton DK, Fields HW, Johnston WM, Rosenstiel SF, Firestone AR, Christensen JC. Orthodontic appliance preferences of children and adolescents. *Am J Orthod Dentofacial Orthop.* 2010;138(6):698. [\[CrossRef\]](#)

9. Damon DH. The rationale, evolution and clinical application of the self-ligating bracket. *Clin Orthod Res.* 1998;1(1):52-61. [\[CrossRef\]](#)
10. Bishara SE, Fehr DE. Ceramic brackets: something old, something new, a review. *Semin Orthod.* 1997; 3:178-88. [\[CrossRef\]](#)
11. Fritz U, Diedrich P, Wiechmann D. Lingual technique--patients' characteristics, motivation and acceptance. Interpretation of a retrospective survey. *J Orofac Orthop.* 2002;63(3):227-233. [\[CrossRef\]](#)
12. Long H, Zhou Y, Pyakurel U, et al. Comparison of adverse effects between lingual and labial orthodontic treatment. *Angle Orthod.* 2013;83(6):1066-1073. [\[CrossRef\]](#)
13. Papageorgiou SN, Gözl L, Jäger A, Eliades T, Bourauel C. Lingual vs. labial fixed orthodontic appliances: systematic review and meta-analysis of treatment effects. *Eur J Oral Sci.* 2016;124:105-18. [\[CrossRef\]](#)
14. Chen J, Wan J, You L. Speech and orthodontic appliances: a systematic literature review. *Eur J Orthod.* 2018;40:29-36. [\[CrossRef\]](#)
15. Riolo C. Lingual orthodontics: adding value to the care we offer our patients. *Semin Orthod.* 2018;24:269-70. [\[CrossRef\]](#)
16. White DW, Julien KC, Jacob H, Campbell PM, Buschang PH. Discomfort associated with Invisalign and traditional brackets: A randomized, prospective trial. *Angle Orthod.* 2017;87(6):801-808. [\[CrossRef\]](#)
17. Fang X, Qi R, Liu C. Root resorption in orthodontic treatment with clear aligners: a systematic review and meta-analysis. *Orthod Craniofac Res.* 2019;22:259-69. [\[CrossRef\]](#)
18. Jiang Q, Li J, Mei L, et al. Periodontal health during orthodontic treatment with clear aligners and fixed appliances: a meta-analysis. *J Am Dent Assoc.* 2018;149:712-20. [\[CrossRef\]](#)
19. Miethke RR, Brauner K. A Comparison of the periodontal health of patients during treatment with the Invisalign system and with fixed lingual appliances. *J Orofac Orthop.* 2007;68(3):223-31. [\[CrossRef\]](#)
20. Pithon MM, Baiao FCS, Sant Anna LIDA, Paranhos LR, Cople Maia L. Assessment of the effectiveness of invisible aligners compared with conventional appliance in aesthetic and functional orthodontic treatment: A systematic review. *J Investig Clin Dent.* 2019;10(4):12455. [\[CrossRef\]](#)
21. Robertson L, Kaur H, Fagundes NCF, Romanyk D, Major P, Flores Mir C. Effectiveness of clear aligner therapy for orthodontic treatment: A systematic review. *Orthod Craniofac Res.* 2020;23(2):133-142. [\[CrossRef\]](#)
22. Rossini G, Parrini S, Castrolforio T, Deregibus A, Debernardi CL. Efficacy of clear aligners in controlling orthodontic tooth movement: a systematic review. *Angle Orthod.* 2015;85(5):881-9. [\[CrossRef\]](#)
23. d'Apuzzo F, Perillo L, Carrico CK, et al. Clear aligner treatment: different perspectives between orthodontists and general dentists. *Prog Orthod.* 2019;20(1):10. [\[CrossRef\]](#)
24. Best AD, Shroff B, Carrico CK, Lindauer SJ. Treatment management between orthodontists and general practitioners performing clear aligner therapy. *Angle Orthod.* 2017;87(3):432-439. [\[CrossRef\]](#)