

ORIGINAL RESEARCH

The initial perception of patients and parents regarding Class 3 treatment with face mask and rapid maxillary expansion: a survey study

Başak Arslan Avan¹, Seçil Açar¹, İrem Kar², Burcu Baloş Tuncer¹,
Nehir Canigur Bavbek^{1,*}

¹Department of Orthodontics, Gazi
University Faculty of Dentistry, 06490
Ankara, Türkiye

²Department of Biostatistics, Faculty of
Medicine, Ankara University, 06050
Ankara, Türkiye

***Correspondence**

ncanigur@yahoo.com
(Nehir Canigur Bavbek)

Abstract

Background: This study aims to evaluate the effects of face mask and rapid maxillary expansion treatment (FM + RME) on patients' lives and how their parents perceived it. **Methods:** 85 patients (47 girls, 38 boys; mean age 11.53 ± 1.50 years) who were being treated with FM + RME and their parents (57 mothers, 28 fathers; mean age 38.97 ± 5.93 years) completed a one-time questionnaire composed of 20 questions, which assessed the initial perception of appliances by patients and parents regarding its effects on their lives. Participants first answered whether they experienced the problem stated in the question (yes/no), then they were asked to rate their discomfort on a scale between 1–5. Statistical analysis was performed with the Wilcoxon signed-rank test, McNemar, Mann-Whitney U, Pearson Chi-square, and Fisher's exact tests ($p < 0.05$). **Results:** When compared to patients, parents accepted with a higher rate that their children faced the problems stated in the questions (18/20). However, patients assessed most questions with higher discomfort scores. Girls admitted more than boys that they experienced painful aching in their mouth ($p = 0.007$), were tenser ($p = 0.019$), and worried about others' thoughts about treatment ($p = 0.033$). Mothers were more sensitive than fathers that their children experienced most of the problems stated (17/20) and gave higher discomfort scores. **Conclusions:** FM + RME treatment caused changes in consuming hard foods, bad breath, sleep quality, speech and social interactions. The reported patient discomfort was more significant than what parents expected from the procedure. Clinicians should inform patients and parents about possible consequences before treatment and parents should approach their children with empathy.

Keywords

Face mask; Parent; Patient; Perception; Rapid maxillary expansion; Survey

1. Introduction

Face mask (FM) is a frequently used extraoral device for early treatment of skeletal Class 3 [1]. The main indication of the appliance is to correct the maxillary deficiency in the sagittal direction. Throughout time, this appliance has been combined with several different intraoral appliances including removable acrylic plates, bonded cap splints with or without a rapid maxillary expansion screw, fixed appliances, mini screws and miniplates [2–7]. Among these, rapid maxillary expansion (RME) appliances are preferred due to the chance to treat an accompanying transversal deficiency and its potential benefit to increase the skeletal efficacy of the treatment procedure by loosening the circummaxillary sutures [8, 9]. Several studies in the literature show that these appliances can be significantly successful in correcting Class 3 malocclusions when properly used [7, 10–12].

In the era of 2000s, where people interact more in digital

and social platforms, the impact of orthodontic treatments on patients' daily lives has become an even more important issue than ever [13]. Patients are concerned whether their health problem can be treatable, but at the same time, they want to know how it will be treated and what consequences this treatment will bring to their lives. These attitudes have led clinicians to conduct more research dealing with objective measurement of the quality of life of their patients by applying various surveys [14–16]. Although those scales and questionnaires successfully detect many conditions, they may need to be more sufficient in questioning patients' experiences that can be unique to the applied treatment protocol. Previously published quality of life studies mainly investigated the effects of malocclusions and treatment results rather than the process itself [17–19]. Among the studies evaluating the treatment experiences [20–23], no studies have questioned the experiences of patients and parents regarding the use of intraoral (rapid maxillary expander—RME) and extraoral (face mask—

FM) appliances together even though this treatment protocol may have potentially negative social impacts while treating the patients' dentofacial problems.

Clinicians should always consider how to increase the effectiveness of treatments requiring cooperation by learning the perspectives of patients and families regarding their experiences. Feedback can also be used to inform new patients about what to expect throughout the treatment and to overcome the possible cooperation problems from the very beginning. From this point of view, the aim of this study was to evaluate the impacts of Class 3 treatment with FM + RME on patients' lives and how their parents perceived it with a questionnaire. The null hypothesis of this study was that using FM + RME appliances has no effect on patients' daily routines and that the parents do not observe any changes in their children's lives after the initiation of the treatment.

2. Methods

This study was carried out in Gazi University Faculty of Dentistry, Department of Orthodontics during January 2022–December 2023 after ethical approval was received from Gazi University Ethics Committee (25901600-2183). Patients with skeletal Class 3 discrepancy due to maxillary retrognathia with a transversal deficiency who were already undergoing FM + RME treatment with a Petit-type face mask and a tooth-borne (posterior cap splint) rapid maxillary expander were the focus of this study. Patients with cleft lip-palate or other craniofacial syndromes, medical diseases that would affect oral health quality, and mental disorders that would compromise giving feedback about treatments were not considered as potential participants. The priori sample size calculation was made based on Cohen's recommendations for mean differences between two independent means assuming a medium effect size ($d = 0.5$), a significance level of $\alpha = 0.05$, and a statistical power of 0.90. According to this calculation, this requires a minimum of 70 participants per group [24].

Patients were being treated with the same protocol. Face mask was instructed to be used for 14–16 hours/day, and rapid maxillary expander was activated with two turns per day until sufficient expansion had been achieved. Face masks were started to be used 1 week after the initial activation of RME, and 350–400 g of protraction force was applied per side by elastics.

The patients who fulfilled these criteria and the parents who accompanied them were asked to complete a one-time survey during their first month appointments. First, the survey was explained to contributors by clinicians and then it was filled out by patients and their parents in quiet and separate environments on the same day without any guidance. Children and their parents were blinded to each other's answers. Informed consent was obtained from both patients and their parents.

2.1 Content of the survey

The study material comprised the evaluation of two questionnaires composed of the same statements. A new survey, which was designed based on the existing literature and experienced clinician inputs about patient-reported impacts of FM + RME

treatment on patients' daily lives. While a pilot test was performed with a small group of patients to assess the clarity of the statements, no further formal validation procedures were performed.

There were 20 questions in the survey, and volunteers were first asked to choose whether they had experienced the situation mentioned in the question. If their answer was yes, they were asked to rate the degree of their discomfort from 1 (never) to 5 (very often). If the answer is no, then the question was left with no score. The same survey was then modified by only changing the subjects of the sentences grammatically to evaluate the perception of parents about the changes in their child's life after the treatment had started (e.g., Question 1 in patient survey: Have you felt pain in your teeth? Question 1 in parent survey: Do you think that your child has felt pain in his/her teeth?). The parent of the patient accompanying him/her on the date when the survey was applied answered the questions (Table 1). Demographical data such as age and gender of patients and parents were also collected in addition to the survey.

2.2 Statistical analysis

The statistical analysis was conducted using SPSS 11.5 for Windows (SPSS Inc., Chicago, IL, USA). The data were presented utilizing descriptive statistics, expressing continuous variables as mean \pm standard deviation and median (minimum–maximum), while categorical variables were represented as frequencies and percentiles. Yes/no answers (percentage of acceptance) and scores of patients and parents were evaluated separately. For the comparison of yes/no responses within these groups, either Pearson Chi-square test or Fisher's exact test was employed where appropriate. Wilcoxon signed-rank test was used when comparing patient and parent scores, whereas for the comparison of yes/no responses, the McNemar test was chosen. The comparison of scores between independent groups (girls & boys, mother & father) was performed with Mann-Whitney U test. Statistical significance was set as $p < 0.05$.

3. Results

Eighty-five patients (47 female, 38 male) and their parents (57 female, 28 male) participated in the study. The mean chronological age of patients and parents was 11.53 ± 1.50 and 38.97 ± 5.93 years, respectively. All patients and their parents answered all questions in the survey, and there was no missing data.

In 18 questions out of 20, the percentage of parents who said "yes" to the stated situation in the question was higher than the percentage of the children, and some of the results were also statistically significant. Statistical significance was seen regarding pronunciation problems (Q4: $p = 0.017$), prolonged eating times (Q9: $p = 0.014$), observing their kids to be tenser (Q11: $p < 0.001$), more embarrassed (Q12: $p = 0.001$), and worried about what others think about their teeth or treatment (Q13: $p < 0.001$), and noticing increased number of arguments with friends and family members (Q17: $p = 0.016$) (Fig. 1).

TABLE 1. Survey questions for patients and parents and their assessment.

Questions in the Survey					
Patients			Parents		
	After you started to use your appliances...		After your child started to use his/her appliances...		
Q1	Have you experienced any pain in your teeth?		Has he/she told you about any pain in his/her teeth?		
Q2	Have you had bad breath?		Do you think he/she had bad breath?		
Q3	Have you experienced painful aching in your mouth?		Has he/she told you that he/she had painful aching in his/her mouth?		
Q4	Have you had trouble in pronouncing some words?		Do you think he/she had trouble in pronouncing some words?		
Q5	Have you had trouble about eating/drinking hot and cold stuff?		Do you think he/she had trouble about eating/drinking hot and cold stuff?		
Q6	Is your sense of taste got worse?		Has he/she told you his/her sense of taste got worse?		
Q7	Does food stuck between your teeth and/or appliance?		Has he/she told you that food stuck between his/her teeth and/or appliance?		
Q8	Have you had difficulty about biting/chewing hard food?		Do you think he/she had difficulty about biting/chewing hard food?		
Q9	Does it take longer to finish your meals?		Do you think it takes longer to finish his/her meals?		
Q10	Have you started feeling unhappy with the appearance of the appliance?		Do you think he/she has started feeling unhappy with the appearance of the appliance?		
Q11	Have you started feeling tenser?		Do you think he/she has started feeling tenser?		
Q12	Have you felt embarrassed?		Do you think he/she has felt embarrassed?		
Q13	Have you started worrying about what other people think about your teeth or your treatment?		Do you think he/she has started worrying about what other people think about his/her teeth or treatment?		
Q14	Have people started to ask questions about your treatment?		Have people started to ask questions about his/her treatment?		
Q15	Have your friends or people around you started teasing, bullying or calling you with nicknames?		Do you think his/her friends or people around have started teasing, bullying or calling him/her with nicknames?		
Q16	Have you started to avoid smiling?		Do you think he/she has started to avoid smiling?		
Q17	Have you started to argue with your friends and family members?		Do you think he/she has started to argue with his/her friends and family members?		
Q18	Do your grades begin to drop?		Do you think his/her grades dropped?		
Q19	Have you felt discomfort about speaking/reading out loud in the class?		Has he/she told you that he/she has felt discomfort about speaking/reading out loud in the class?		
Q20	Is your sleep quality decreased?		Do you think his/her sleep quality decreased?		
Assessment of the Survey					
What is your answer to this question?	No		Yes		
If your answer is "Yes", what is the degree of your discomfort?	1	2	3	4	5
	Never	Hardly ever	Occasionally	Fairly often	Very often

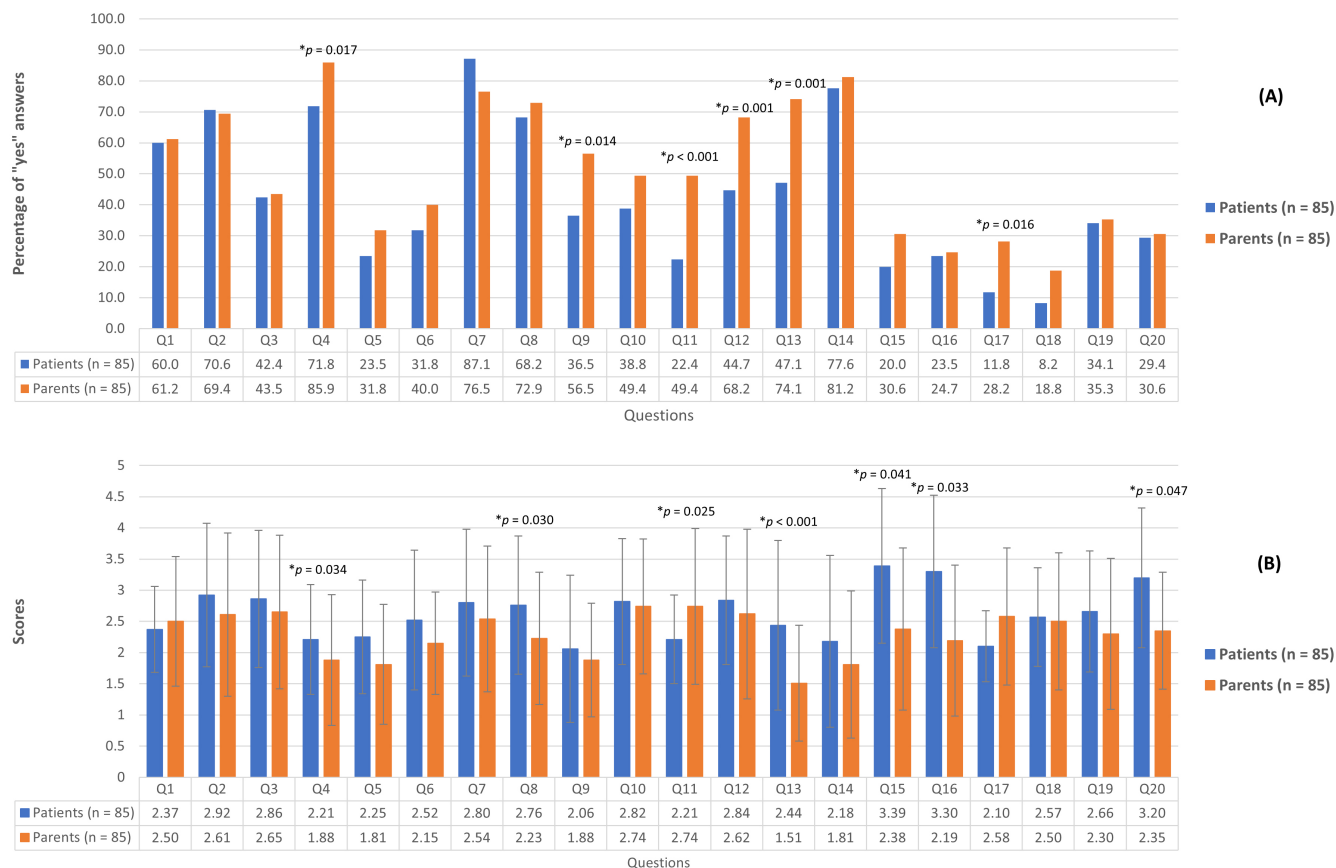


FIGURE 1. Comparison of percentage of acceptance (A) and scores (B) between patients and parents. (* $p < 0.05$. Only statistically significant p values were given in the graph. p -values for “Answer ‘yes’” were calculated using McNemar’s test. p -values for scores were calculated using the Wilcoxon signed-rank test.)

When the level of discomfort (marked scores after answering the questions with a yes) was analyzed, it was seen that patients rated the majority of the questions in the survey with higher scores and reported patient discomfort was significantly higher than their parents’ expectations regarding pronunciation problems (Q4: $p = 0.034$), consumption of hard foods (Q8: $p = 0.030$), other people’s thoughts about the treatment (Q13: $p < 0.001$), inability to smile (Q16: $p = 0.033$) and decreased sleep quality (Q20: $p = 0.04$). Most of the participants (both patients and parents) declared that patients’ school grades were not interrupted after the treatment (Q18). But since there was a high mismatch between the answers of patients and their parents, a p value for the scores of Q18 could not be calculated.

When the reactions of the patients were analyzed in accordance to gender, it was found that girls’ percentage of acceptance (yes/no questions) about experiencing painful aching in their mouth (Q3: $p = 0.007$), being tender (Q11: $p = 0.019$) and worried about other people’s thought about the treatment (Q13: $p = 0.033$) was higher than boys (Fig. 2). Although the acceptance rate varied significantly in some questions, the level of discomfort of girls and boys showed no statistical significance.

When parents’ answers were analyzed depending on whether they were mothers or fathers, it was seen that the percentage of mothers who thought that their children faced the experiences stated in the survey was higher than the

percentage of fathers. Notably, the results about having bad breath (Q2: $p = 0.026$), worsening in the sense of taste (Q6: $p = 0.048$), and their children feeling tender (Q11: $p = 0.026$) were statistically significant. On the other hand, when scores were evaluated, mothers’ scores were significantly higher regarding their children’s experiences, particularly about food consumption (Q6, worsened sense of taste, $p = 0.048$; Q9, longer meal times, $p = 0.018$), social (Q12, being embarrassed, $p = 0.025$; Q17, arguing with friends and family, $p < 0.001$), and educational problems (Q18, decreasing grades, $p = 0.038$; Q19, speaking in the classroom, $p = 0.032$) (Fig. 3).

4. Discussion

Orthopedic treatments are specific treatment modalities for patients in childhood or adolescence when there is remaining growth potential. However, while trying to treat a physical condition in a limited time, the psychosocial impact of these appliances is generally underestimated. Although the main goal for orthodontists is to treat a disorder with maximum efficiency and create a more aesthetic and well-functioning maxillofacial region, regular use of these “not pleasant-looking appliances” for a long time requires great willpower and patience when it is examined from the perspective of the patients. Therefore, it is not surprising that various patient and appliance-related factors may affect individuals’ compliance

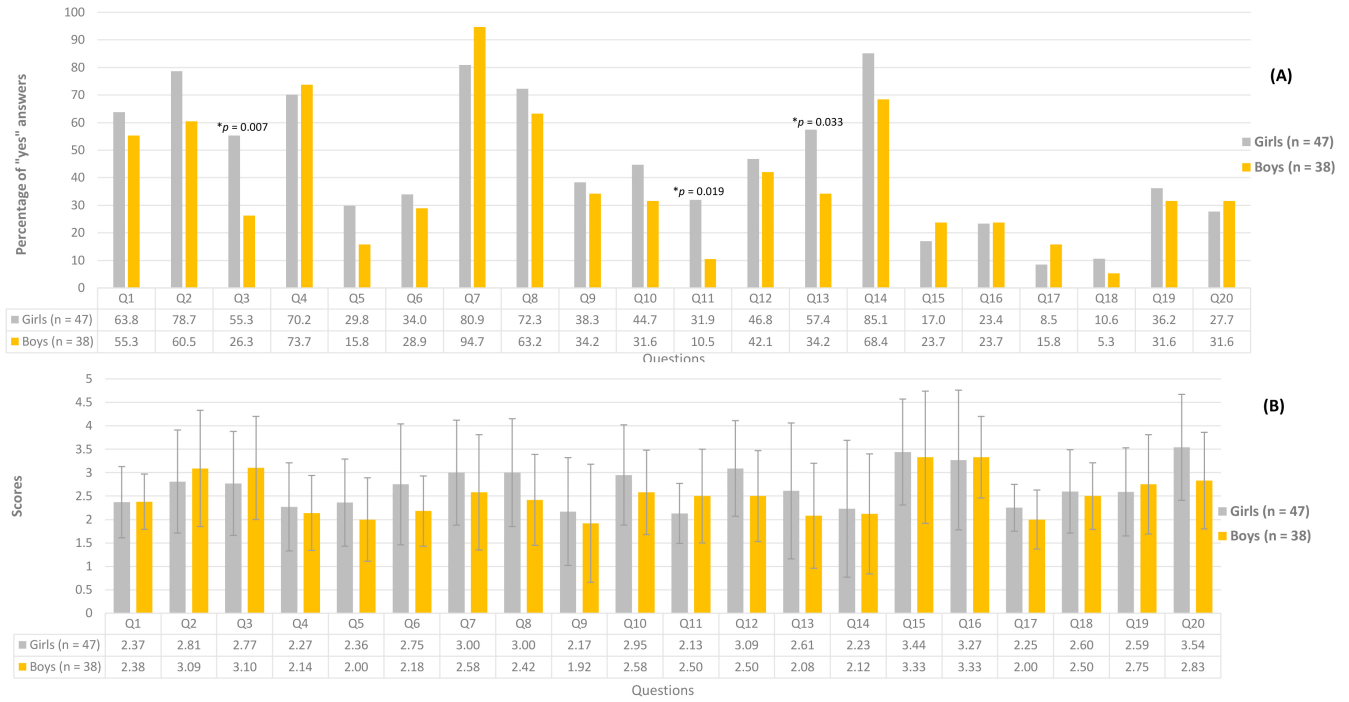


FIGURE 2. Comparison of percentage of acceptance (A) and scores (B) between boys and girls. (* $p < 0.05$. Only statistically significant p values were given in the graph. p values for "Answer 'yes'" were primarily calculated using the Pearson Chi-square test. For questions 7, 17 and 18, Fisher's exact test was used due to the small sample sizes. p values for scores were calculated using the Mann-Whitney U test.)

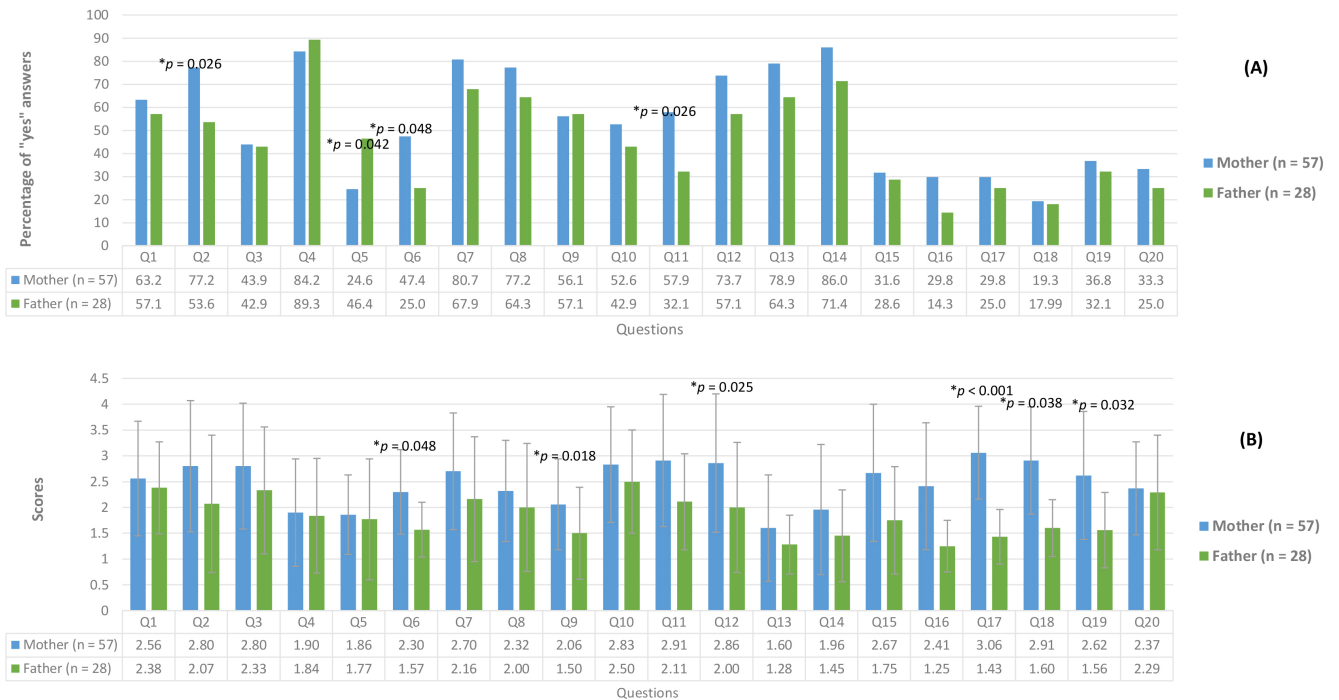


FIGURE 3. Comparison of percentage of acceptance (A) and scores (B) between mothers and fathers. (* $p < 0.05$. Only statistically significant p values were given in the graph. p values for "Answer 'yes'" were primarily calculated using the Pearson Chi-square test. For question 4, Fisher's exact test was used due to the small sample sizes. p values for scores were calculated using the Mann-Whitney U test.)

with these appliances [25].

Objectively evaluated patient experiences with orthodontic procedures give an insight into the patient's needs, quality of life changes, and therefore, the secrets behind their cooperation and adherence to treatment. Orthodontic literature presents quality-of-life studies related to different treatments such as clear aligners, fixed orthodontic appliances, orthognathic surgery, class 2 treatment with fixed and removable appliances and rapid maxillary expansion [19, 22, 26, 27]. Most findings suggest that the initiation of orthodontic treatment changes patients' lifestyles, which may cause cooperation problems during the treatment. Cooperation becomes even more important when patients are instructed to wear an extraoral removable appliance like FM [28]. Appliances which may have negative impacts on speech and swallowing can also cause problems of self-confidence and thus affect the patient adherence to the treatment [29]. As the potential intraoral anchoring unit for FM treatment, rapid maxillary expanders were previously reported to cause pain, speech impairments and irritations on tongue [30, 31]. With these in mind, Lena *et al.* [22] suggested that clinicians should be aware of these changes and cooperate with their patients by reminding them about the improvements that will be seen by fixing the malocclusion. When the possible consequences were analyzed thoroughly, the aim of this study was to evaluate how FM + RME treatment had changed the social and psychological well-being of patients by considering the thoughts of their parents. Thus, a novel survey was applied one month after the beginning of FM + RME treatment since it was reported to be the period when significant changes regarding the treatment could be observed [32].

Parents are an essential part of the treatment when orthodontists deal with children. They accompany their children during appointments and may mutually influence each other's emotions and perspectives on situations. Especially during pre-adolescence period, patients may be more prone to begin treatment due to the desire to receive the approval of their adult role models, and thus parents' attitudes about their treatment may have impacts on their cooperation [33]. Parallel to this notion, Uslu and Akcam reported that parents greatly influence patients' awareness of the need for treatment of Class 3 malocclusions [34]. Likewise, it was reported that patients' level of satisfaction after orthodontic treatment was strongly correlated with their parents, which shows the undeniable influence of parents on our treatment process [35]. Despite these facts, the number of studies in the literature considering the experiences of both patients and their parents during orthodontic treatment is limited [20, 22, 23]. The take-home message from these studies is to emphasize the importance of monitoring and motivation by parents for the cooperation of our patients. Unfortunately, no study was found about patient and parent perceptions at the same time regarding FM + RME treatment even though the success of this treatment modality requires the effort of not only the patient but also their family and the clinician.

Answering a question by marking "yes" in this survey meant that patients experienced the situation in the question, while the parents were aware of that experience. If their answer was "yes", they were asked to rate how much they were

irritated because of that situation, and the survey was analyzed according to these statements. Regarding our results about the percentage of acceptance (yes/no questions), parents thought that their children were experiencing most of the situations described in the survey (18/20), although their children didn't admit their opinion in every consequence. Regular parenthood behaviors including compassion, love and pity and parents' exaggerated emotions to their children who need medical care may cause this result [36]. However, in terms of scoring, it was observed that children gave higher scores to the majority (18/20) of the statements than their parents, which showed that they were more affected by the problems they experienced. Similar behavioral patterns of parents and patients were reported by Jaeken *et al.* [23] while our results were controversial to the findings of Bos *et al.* [37] and Lena *et al.* [22], which found similar parent and patient perceptions about orthodontic treatments. These results might be attributed to different perspectives of parents and their children as well as parents' lack of insight into their children's lives and social worlds [23]. Children can carry the appliances with a sense of duty, accepting the authority of the family and clinician but that may not suppress their intense feelings during treatment process. In addition to this, potential bullying due to their malocclusion and the possibility of eliminating this problem may be a motivation for children to go through and overcome the difficulties of an orthodontic treatment when compared to their parents [38]. Supporting this fact, Zheng *et al.* [39] previously reported that patients with Class 3 malocclusion benefits each phase of comprehensive orthodontic treatment and were better at performing their daily routines when compared to patients with class 1 and 2 malocclusions.

Maxillary protraction with face mask requires an intraoral appliance as an anchorage unit for elastics. Although there are different applications in literature, bonded or banded rapid maxillary expanders are the general choice for most practitioners due to either the accompanying maxillary transversal deficiency or the potential benefits of skeletal expansion on protraction of maxilla by loosening the maxillary sutures [8, 9]. This bonded non-removable part of the treatment may be the reason of some complaints of patients and their parents during treatment [40]. When the answers of children and their parents were compared on a question-by-question basis; it was determined that having trouble about pronouncing words (Q4) was noticed more by parents (85.9%) than by the children (71.8%). Still, it was found that the children were more affected by this situation (patients: 2.21/5, parents: 1.88/5), which may be due to parents being a routine listener of their children. It is known that there might be changes in the pronunciation of patients using palatal expansion appliances [41]. Not only changes in speech, it was seen that the cap splint RME also caused a great deal of discomfort to children in terms of being able to consume hard foods (Q8) and made eating difficult for them. This finding of ours was validated by the findings of De Felipe *et al.* [42], who found that regardless of the type of expander, patients felt discomfort about mastication starting from the first week of RME cementation although they may get used to their appliance with time. Another point that patients experienced was bad breath and food debris getting stuck around the teeth/appliance. Maxillary expansion

therapy widens the nasal airway in patients, encouraging nasal breathing instead of mouth breathing and reducing the halitosis [43]. This may be an expected result of RME treatment after debonding of appliance, but since treatment process was evaluated in our study and all patients had RME bonded in their mouth, bad breath may have increased due to factors such as inadequate oral hygiene, food debris entrapment [44], and plaque accumulation [45] during the time expansion device remained in the oral cavity.

United Nations Educational, Scientific and Cultural Organization (UNESCO) reported that almost one in every three children (32%) had been the victim of bullying on one or more days in the preceding month globally [46] and it is known that bullying brings negative health consequences for both bullies and victims [47]. Children who were bullied reported higher anxiety and depression levels, missed school more and showed poor school achievements [48, 49]. Extraoral appliances are also worn during the day when the child faces a social environment, which may cause psychological stress. It is reported that extreme malocclusions may also lead to occurrence of bullying among children and adolescents which may be a reason to decreased cooperation in appliance use and even resulted with refusal of treatment [50]. After they started FM + RME treatment, parents noticed more tension (Q11: $p < 0.001$) and arguments (Q17: $p = 0.016$) with their children and felt more uncomfortable in this respect (Q11: $p = 0.025$; Q17: $p = 0.180$). Parents' percentage of acceptance was higher than their children for the statement related to what other people think about their treatment (Q13) and name-calling (Q15), showing that they were aware of the situation and possible social consequences their children were facing. However, in terms of scoring, it was found that children felt more discomfort, proving that parents did not feel a similar level of inconvenience and not exactly understand the level of discomfort their children had. This situation was similar with findings of Uhac *et al.* [51], claiming that children can successfully hide from their parents that their peers did not fully accept them, but still parents can recognize disturbed emotions of their children. For that reason, clinician should advise parents to encourage and support their children in social environments during their orthodontic treatment. To support that, meetings with teachers during the treatment process may also be beneficial for the monitorization of child's condition at school.

The majority of patients (91.8%) and parents (81.2%) in this study stated that FM + RME treatment did not affect the school grades of patients. Similarly, Oyeleye *et al.* [52] reported that patients undergoing fixed orthodontic treatment and their parents claimed attending appointments for orthodontic treatment had minimal impact on a young person's school performance. Malocclusion may have a negative impact on school performance [53]. Thus, orthodontic treatment may motivate the patients and their parents to overcome the challenges they face due to malocclusion and accept their treatment process more efficiently by focusing on the positive effects they would achieve after treatment.

In our study, sleep quality changes related to FM + RME treatment were also evaluated and only 29.4% of the children reported a decrease in sleep quality, but they felt highly un-

comfortable in that manner with respect to the scores they gave. Kavaliauskiene *et al.* [20] reported that patients using functional appliances experienced a decrease in their sleep quality due to concerns about appliances coming off or being swallowed at night. On the contrary, Rawji *et al.* [54] observed no changes after at least 3 months of use. Face masks, as a big extraoral appliance, may have potentially disturbed the comfort zone of the patients and interrupted their sleep by changing their sleeping position but it was only valid for one-third of our sample. This result may be affected by personal consequences.

A balanced distribution can be seen considering the number of male and female patients participating in the survey. While there was no significant difference between genders regarding the scores, the percentage of acceptance of female patients was found to be higher in most questions (14/20). When compared to males the results were statistically significant for emotional and social questions, such as feeling tenser (Q11: $p = 0.019$) and wondering what others think about them (Q13: $p = 0.033$). This may be related to the fact that girls are generally more emotional by their nature and pay more attention to external comments about body image [55]. In addition, boys were found to restrict emotional expressions in adolescence period [56], which also describes our cohort, and this may be another reason behind our results.

Despite the balanced distribution of male and female patients, the number of mothers was more than twice of fathers, which is an indication that mothers accompany their children's appointments more often than fathers, like Ernest *et al.*'s [57] findings. Mothers accompany or guide their children more often than fathers to perform their personal care and maintain their daily routines [58]. As a result of this situation, they can observe them more and see emotional changes such as tension, shyness or aggressiveness before the fathers do [59]. Supporting this fact, although not all of them were statistically significant, mothers' percentage of acceptance for given statements were greater (17/20) and mothers gave higher scores than fathers to all the statements as a sign of higher discomfort regarding their children's behavioral and functional changes due to FM + RME treatment.

This study has some limitations which still do not invalidate our results. First, grouping the participants according to the severity of malocclusion could not be made and therefore possible consequences of this factor could not be judged. It has been previously reported that patients with severe Class 3 malocclusion tend to experience more social disabilities and psychological stress than patients with relatively mild malocclusions [39]. A one-time survey was applied in this study, and therefore, patients' and parents' experiences could not be followed longitudinally but there are studies in literature that included surveys applied at one time or different time periods [60]. It is also essential to emphasize that the present study was conceived as a survey aimed at capturing participants' perceptions, rather than as a rigorous scale development endeavor. The primary goal was to collect descriptive data that provides insights into the targeted population's specific perspectives. Given this objective, the study did not engage in the comprehensive psychometric validation processes that are typically required for scale development. It is thought that insights

gained from the results can make an interest in formalizing a measurement tool and focus on the systematic development and validation of a scale. Still, the study results are important to understand the initial experiences and acceptance of a common orthopedic treatment with extraoral appliances combined with a bonded intraoral appliance and gives possible clues regarding better patient care and cooperation problems in the long term. Future studies are encouraged to validate the instrument to improve the applicability of the results. Furthermore, studies conducted with larger sample groups on parents, patients and clinicians by comparing different appliances will contribute to the literature by adding different perspectives.

5. Conclusions

- Patients undergoing FM + RME treatment experienced discomfort about ability to consume hard foods, food residue getting stuck between teeth, bad breath, sleep quality, speech and social interactions.
- Parents think that their children face social issues such as feeling more nervous, being shy, or wondering what people think about them. However, regarding the discomfort, children felt more uncomfortable with these situations than their parents.
- Girls felt more discomfort from FM + RME treatment compared to boys, although no statistically significant difference was found.
- Mothers thought their children were affected and felt discomfort more than the attending fathers did.
- Clinicians should inform patients and parents about possible consequences of both intraoral and extraoral elements of the procedure before treatment starts.
- Parents should approach their children with empathy until orthodontic treatment ends and psychological support should be given when needed.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

AUTHOR CONTRIBUTIONS

NCB and BBT—contributed to conceptualization of the study and interpreted the collected data. BAA and SA—contributed to data collection. İK—made the statistical analysis and evaluation. BAA and NCB—wrote the manuscript. NCB—proofread the final version of the manuscript. All authors approved the final version of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The ethical approval was received from Gazi University Ethics Committee (25901600-2183) and informed consent was obtained from both patients and their parents.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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