



ORIGINAL ARTICLE

# Patients' and Parents' Perception of Functional Appliances: A Survey Study

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## ABSTRACT

**Objective:** To evaluate patients' and parents' perception of removable, fixed rigid, and fixed hybrid functional appliances and to compare their impacts on anxiety and discomfort during treatment in different age groups and genders.

**Methods:** Data were gathered by means of a questionnaire that included items presumed to be associated with orthodontic compliance. A self-administered questionnaire was used to quantify patients' and parents' perceptions. Three groups were formed regarding the type of functional appliance used: fixed rigid (Functional Mandibular Advancer, FMA), fixed hybrid (Forsus Fatigue Resistant Device, FRD), and removable (Twin Block, TB). Two separate questionnaires were used for the patients and their parents comprising the necessary context. Chi-square, Mann-Whitney U, and Kruskal-Wallis tests were used for data analysis.

**Results:** Patients needed less time to adapt to the FRD appliance. Eating difficulties were encountered by patients in the FMA group. Adolescents who had completed functional orthodontic treatment with a removable appliance had difficulties in controlling their saliva. Patients' and parents' perceptions were found to be in accordance with each other.

**Conclusion:** Adolescents who had completed functional orthodontic treatment with fixed appliances had more difficulty in their daily life. Orthodontists should be aware of this impact caused by functional orthodontic treatment and should regularly encourage patients by reminding them of the improvements to be had by fixing the malocclusion.

**Keywords:** Orthodontic appliance, functional, questionnaire

## INTRODUCTION

Class II malocclusion is a frequently seen discrepancy, and it occurs as a result of prognathic maxilla, retrognathic mandible, or a combination of both (1). The main aim of Class II treatment due to mandibular retrognathism is to enhance mandibular growth in the sagittal direction during adolescence. Thus, various functional appliances have been developed targeting this effect. Fixed functional appliances such as fixed rigid (Herbst, FMA, MARA), fixed flexible (Jasper Jumper), and fixed hybrid appliances (FRD) require much less patient cooperation compared to their removable forms (2-6). These appliances have advantages and disadvantages regarding oral hygiene, soft tissue irritations, and limitations of mandibular movements (7). Effects of the functional appliances on skeletal and dental tissues have been heavily investigated, whereas patients' and parents' perception of these appliances has not been questioned (8-10).

During functional appliance treatment, patients may have pain and discomfort at various levels. It has been shown that the orthodontic appliances may lead to oral mucosa pressure, soft tissue tension, oral constriction, toothache, and pain (11,12). It has also been noted that removable appliances additionally may lead to fatigue or to functional speech and respiratory disorders, and they may affect the appearance of the face (13).

Informing patients' about possible problems and discomfort throughout functional treatment is beneficial in order to enhance the appliance efficiency and patient compliance (14). It is known that patient cooperation may

decline due to discomforts such as narrowing of the oral cavity and soft tissue irritation when orthodontic appliances are implemented (15,16). Speech difficulties can also be observed among patients, and the appearance of the appliances may be unpleasant in social interactions (16,14,17). All of these undesired consequences affect the patients' degree of compliance in a negative manner, and it is necessary to explain possible discomforts and how to eliminate them (18,19). In this sense, it is vital that the orthodontists select the suitable appliance for the patient (20). While selecting the functional orthodontic appliances, acceptability should be taken into consideration, in addition to the intraoral situations of the patients. One way of assessing the acceptability of an appliance is to conduct surveys asking about the experiences of patients and their parents (21,22).

To the best of the authors' knowledge, there are no studies aiming to investigate patient and parent perception of removable, fixed rigid, and fixed hybrid functional appliances. Therefore, the aim of this study was to prepare and conduct a survey with the purpose of comparing the experiences of patient and their parents with reference to different appliance user groups.

## METHODS

This study was approved by the Ethics Committee of Clinical Research of Medical School, Ege University (commission decision numbered 16-1.1/14). The study material comprised a questionnaire given to patients who were undergoing functional orthodontic treatment at Ege University School of Dentistry, Department of Orthodontics and their parents. The participants were informed about the aim of the survey, and the subjects and their guardians signed an informed consent form.

The survey questions were designed to be as simple as possible so that the participants could easily comprehend them. A total of 214 patients (mean age 13.25 years) and parents (mean age 44.23 years) participated in the study, and the outcomes were evaluated for three different groups. FRD (43 patients, mean age 14.47 years), FMA (42 patients, mean age 14 years), and TB (39 patients, mean age 11.10 years) were used as fixed hybrid, fixed rigid, and removable functional appliances, respectively (Table 1).

The survey consisted of 30 multiple choice question and 1 rating scale question (Appendix 1). The questions covered issues re-

garding the feeling of tension or pressure factors, tooth sensitivity, pain, speech problems, difficulties in swallowing, and lack of confidence in public. The survey was presented to the patients 6 months after they had started the functional treatment and were filled out in the counseling room by patients and their parents separately. They answered the multiple choice questions as "always," "often," "sometimes," "rarely," or "never" or as "I totally agree," "I agree," "unsure," "I do not agree," or "I strongly disagree."

The outcomes were interpreted through demographic distribution and chi-square analysis. The chi-square test was used to determine the differences in terms of pain, disorders, and the patients' acceptance of the treatment among the three groups. The significance level for the p value was set at 0.05. Kolmogorov-Smirnov and Shapiro-Wilk tests were used to test the normal distribution of the data. When evaluating the adaptation period for appliance usage, the Kruskal-Wallis non-parametric test was used. Because the data were not normally distributed, the Mann-Whitney U test was used in the intergroup analysis.

## RESULTS

The adaptation periods to FRD and FMA were significantly different in the parents' perception ( $p=0.004$ ). According to the parents, the average adaptation periods to FMA, FRD, and TB were 3.33 weeks, 2.14 weeks, and 2.46 weeks, respectively, whereas the appliance with the longest adaptation period was FMA with 3.88 weeks ( $p<0.001$ ). A total of 33.1% of the parents were not aware of the orthodontic disorders that their children suffered from, and 38.7% of the patients were not aware of the disorders they suffered from.

Prior to the treatment, 37.9% of the patients stated that their malocclusion absolutely did not affect their speech. According to 31.5% of the parents, no difficulties in chewing or biting were present, and the responses of the patients were in line with this view. Among the three groups, the patients in the FMA group were found to feel anxious when they saw the appliance for the first time ( $p<0.001$ ). Considering both the patients and their parents, the appliance user group with the least anxiety was the TB group. Detailed responses are summarized in Table 2, 3.

The patients and their parents stated that eating problems occurred, and most of these parents (38.1%) and patients (42.9%) belonged to the FMA group ( $p<0.001$ ). The patients who encountered the least eating problems were in the TB group. Many patients (31.5%) noted that they rarely had problems with drinking fluids, and again, the patients in the TB group encountered the least problems with drinking fluids ( $p<0.001$ ).

Toothache and jaw pain were observed at times during the appliance usage. These complaints were made mostly by the patient group using the TB appliance (61.5%). These complaints did not lead to medication intake (60.5%). More than half of the patients in the FMA group had oral sores (64.3%).

The parents noted that the patients treated with the FMA appliance experienced changes in their speech. The patients using

Table 1. Ages of groups

Participant groups	Patients (Age in years)				Parents (Age in years)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
TB (n=39)	11.10	1.84	8.0	14.0	40.82	3.42	34.0	47.0
FRD (n=43)	14.47	2.18	11.0	17.0	44.33	4.62	32.0	52.0
FMA (n=42)	14.0	1.34	11.0	18.0	47.31	4.75	39.0	60.0
Totals (n=124)	13.25	2.33	8.0	18.0	44.23	5.04	32.0	60.0

N: sample size; SD: standard deviation; Min: minimum; Max: maximum;  
FMA: functional mandibular advancer; FRD: forsus fatigue resistant device; TB: twin block

**Table 2.** Percentages of patients' and parents' responses on the questionnaires

question number	answers	PATIENT				PARENT			
		TB n (% among respondents)	FRD n (% among respondents)	FMA n (% among respondents)	TOTAL n (% among respondents)	TB n (% among respondents)	FRD n (% among respondents)	FMA n (% among respondents)	TOTAL n (% among respondents)
Q.01	yes	26 (66.7)	28 (65.1)	22 (52.4)	76 (61.3)	25 (64.1)	27 (62.8)	31 (73.8)	83 (66.9)
	no	13 (33.3)	15 (34.9)	20 (47.6)	48 (38.7)	14 (35.9)	16 (37.2)	11 (26.2)	41 (33.1)
Q.02	strongly agree	23 (59.0)	29 (67.4)	27 (64.3)	79 (63.7)	26 (66.7)	27 (62.8)	29 (69)	82 (66.1)
	agree	10 (25.6)	11 (25.6)	12 (28.6)	33 (26.6)	9 (23.1)	12 (27.9)	10 (23.8)	31 (25)
	unsure	5 (12.8)	3 (7.0)	3 (7.1)	11 (8.9)	3 (7.7)	3 (7)	3 (7.1)	9 (7.3)
	disagree	1 (2.6)	0 (0.0)	0 (0.0)	1 (0.8)	1 (2.6)	1 (2.3)	0	2 (1.6)
Q.03	strongly agree	26 (66.7)	30 (69.8)	26 (61.9)	82 (66.1)	23 (59)	24 (55.8)	24 (57.1)	71 (57.3)
	agree	10 (25.6)	13 (30.2)	11 (26.2)	34 (27.4)	12 (30.8)	19 (44.2)	15 (35.7)	46 (37.1)
	unsure	3 (7.7)	0 (0.0)	5 (11.9)	8 (6.5)	4 (10.3)	0	3 (7.1)	7 (5.6)
Q.05	strongly agree	25 (64.1)	27 (62.8)	27 (64.3)	79 (63.7)	26 (66.7)	24 (55.8)	24 (57.1)	74 (59.7)
	agree	14 (35.9)	13 (30.2)	12 (28.6)	39 (31.5)	13 (33.3)	13 (30.2)	15 (35.7)	41 (33.1)
	unsure	0 (0.0)	1 (2.3)	3 (7.1)	4 (3.2)	0	3 (7)	3 (7.1)	6 (4.8)
	disagree	0 (0.0)	2 (4.7)	0 (0.0)	2 (1.6)	0	3 (7)	0	3 (2.4)
Q.10	excellent	0 (0.0)	1 (2.3)	1 (2.4)	2 (1.6)	3 (7.7)	4 (9.3)	1 (2.4)	8 (6.5)
	good	20 (51.3)	25 (58.1)	30 (71.4)	75 (60.5)	22 (56.4)	28 (65.1)	24 (57.1)	74 (59.7)
	unsure	8 (20.5)	8 (18.6)	1 (2.4)	17 (13.7)	6 (15.4)	6 (14)	5 (11.9)	17 (13.7)
	poor	8 (20.5)	9 (20.9)	5 (11.9)	22 (17.7)	7 (17.9)	5 (11.6)	9 (21.4)	21 (16.9)
	very poor	3 (7.7)	0 (0.0)	5 (11.9)	8 (6.5)	1 (2.6)	0	3 (7.1)	4 (3.2)
Q.11	never	10 (25.6)	28 (65.1)	9 (21.4)	47 (37.9)	11 (28.2)	28 (65.1)	9 (21.4)	48 (38.7)
	rarely	14 (35.9)	6 (14.0)	14 (33.3)	34 (27.4)	18 (46.2)	8 (18.6)	13 (31)	39 (31.5)
	sometimes	11 (28.2)	8 (18.6)	13 (31.0)	32 (25.8)	9 (23.1)	5 (11.6)	14 (33.3)	28 (22.6)
	often	4 (10.3)	1 (2.3)	5 (11.9)	10 (8.1)	1 (2.6)	2 (4.7)	4 (9.5)	7 (5.6)
	always	0 (0.0)	0 (0.0)	1 (2.4)	1 (0.8)	0	0	2 (4.8)	2 (1.6)
Q.12	never	13 (33.3)	25 (58.1)	1 (2.4)	39 (31.5)	11 (28.2)	23 (53.5)	0	34 (27.4)
	rarely	7 (17.9)	10 (23.3)	9 (21.4)	26 (21.0)	7 (17.9)	11 (25.6)	9 (21.4)	27 (21.8)
	sometimes	18 (46.2)	7 (16.3)	21 (50.0)	46 (37.1)	19 (48.7)	8 (18.6)	24 (57.1)	51 (41.1)
	often	1 (2.6)	1 (2.3)	9 (21.4)	11 (8.9)	2 (5.1)	1 (2.3)	8 (19)	11 (8.9)
	always	0 (0.0)	0 (0.0)	2 (4.8)	2 (1.6)	0	0	1 (2.4)	1 (0.8)
Q.13	never	14 (35.9)	22 (51.2)	3 (7.1)	39 (31.5)	8 (20.5)	22 (51.2)	3 (7.1)	33 (26.6)
	rarely	10 (25.6)	15 (34.9)	20 (47.6)	45 (36.3)	17 (43.6)	8 (18.6)	18 (42.9)	43 (34.7)
	sometimes	15 (38.5)	6 (14.0)	13 (31.0)	34 (27.4)	11 (28.2)	12 (27.9)	17 (40.5)	40 (32.3)
	often	0 (0.0)	0 (0.0)	5 (11.9)	5 (4.0)	3 (7.7)	1 (2.3)	2 (4.8)	6 (4.8)
	always	0 (0.0)	0 (0.0)	1 (2.4)	1 (0.8)	0	0	2 (4.8)	2 (1.6)
Q.14	never	12 (30.8)	15 (34.9)	2 (4.8)	29 (23.4)	13 (33.3)	13 (30.2)	3 (7.1)	29 (23.4)
	rarely	12 (30.8)	13 (30.2)	16 (38.1)	41 (33.1)	11 (28.2)	10 (23.3)	19 (45.2)	40 (32.3)
	sometimes	11 (28.2)	5 (11.6)	20 (47.6)	36 (29.0)	10 (25.6)	12 (27.9)	15 (35.7)	37 (29.8)
	often	3 (7.7)	5 (11.6)	1 (2.4)	9 (7.3)	4 (10.3)	3 (7)	4 (9.5)	11 (8.9)
	always	1 (2.6)	5 (11.6)	3 (7.1)	9 (7.3)	1 (2.6)	5 (11.6)	1 (2.4)	7 (5.6)
Q.15	never	4 (10.3)	9 (20.9)	0 (0.0)	13 (10.5)	2 (5.1)	8 (18.6)	0	10 (8.1)
	rarely	13 (33.3)	8 (18.6)	14 (33.3)	35 (28.2)	13 (33.3)	11 (25.6)	21 (50)	45 (36.3)
	sometimes	16 (41.0)	18 (41.9)	18 (42.9)	52 (41.9)	18 (46.2)	16 (37.2)	13 (31)	47 (37.9)
	often	4 (10.3)	5 (11.6)	7 (16.7)	16 (12.9)	5 (12.8)	5 (11.6)	6 (14.3)	16 (12.9)
	always	2 (5.1)	3 (7.0)	3 (7.1)	8 (6.5)	1 (2.6)	3 (7)	2 (4.8)	6 (4.8)

FMA: functional mandibular advancer; FRD: forsus fatigue resistant device; TB: twin block

**Table 3.** Percentages of patients' and parents' responses on the questionnaires and p-values of significance tests of changes in relation to the three groups

question number	answers	PATIENT				p*	PARENT				p*
		TB n (% among respondents)	FRD n (% among respondents)	FMA n (% among respondents)	TOTAL n (% among respondents)		TB n (% among respondents)	FRD n (% among respondents)	FMA n (% among respondents)	TOTAL n (% among respondents)	
Q.04	strongly agree	9 (23.1)	15 (34.9)	30 (71.4)	54 (43.5)	<0.001	9 (23.1)	15 (34.9)	30 (71.4)	54 (43.5)	<0.001
	agree	14 (35.9)	12 (27.9)	11 (26.2)	37 (29.8)		13 (33.3)	11 (25.6)	10 (23.8)	34 (27.4)	
	unsure	7 (17.9)	12 (27.9)	1 (2.4)	20 (16.1)		7 (17.9)	10 (23.3)	2 (4.8)	19 (15.3)	
	disagree	7 (17.9)	3 (7.0)	0 (0.0)	10 (8.1)		8 (20.5)	7 (16.3)	0	15 (12.1)	
	strongly disagree	2 (5.1)	1 (2.3)	0 (0.0)	3 (2.4)		2 (5.1)	0	0	2 (1.6)	
Q.07	yes	22 (56.4)	22 (51.2)	25 (59.5)	69 (55.6)	0.735	30 (76.9)	19 (44.2)	26 (61.9)	75 (60.5)	0.01
	no	17 (43.6)	21 (48.8)	55 (44.4)	55 (44.4)		9 (23.1)	24 (55.8)	16 (38.1)	49 (39.5)	
Q.08.01	never	29 (74.4)	2 (4.7)	0 (0.0)	31 (25.0)	<0.001	28 (71.8)	1 (2.3)	0	29 (23.4)	<0.001
	rarely	3 (7.7)	9 (20.9)	9 (21.4)	21 (16.9)		4 (10.3)	14 (32.6)	10 (23.8)	28 (22.6)	
	sometimes	5 (12.8)	15 (34.9)	9 (21.4)	29 (23.4)		5 (12.8)	11 (25.6)	10 (23.8)	26 (21)	
	often	1 (2.6)	13 (30.2)	18 (42.9)	32 (25.8)		1 (2.6)	14 (32.6)	16 (38.1)	31 (25)	
	always	1 (2.6)	4 (9.3)	6 (14.3)	11 (8.9)		1 (2.6)	3 (7)	6 (14.3)	10 (8.1)	
Q.08.02	never	21 (53.8)	12 (27.9)	0 (0.0)	33 (26.6)	<0.001	20 (51.3)	14 (32.6)	0	34 (27.4)	<0.001
	rarely	15 (38.5)	17 (39.5)	7 (16.7)	39 (31.5)		14 (35.9)	17 (39.5)	13 (31)	44 (35.5)	
	sometimes	1 (2.6)	12 (27.9)	23 (54.8)	36 (29.0)		4 (10.3)	10 (23.3)	16 (38.1)	30 (24.2)	
	often	1 (2.6)	2 (4.7)	11 (26.2)	14 (11.3)		0	2 (4.7)	12 (28.6)	14 (11.3)	
	always	1 (2.6)	0 (0.0)	1 (2.4)	2 (1.6)		1 (2.6)	0	1 (2.4)	2 (1.6)	
Q.08.03	never	5 (12.8)	5 (11.6)	0 (0.0)	10 (8.1)	0.162	5 (12.8)	5 (11.6)	1 (2.4)	11 (8.9)	0.029
	rarely	10 (25.6)	12 (27.9)	7 (16.7)	29 (23.4)		8 (20.5)	14 (32.6)	9 (21.4)	31 (25)	
	sometimes	15 (38.5)	15 (34.9)	18 (42.9)	48 (38.7)		20 (51.3)	16 (37.2)	14 (33.3)	50 (40.3)	
	often	5 (12.8)	7 (16.3)	14 (33.3)	26 (21.0)		3 (7.7)	7 (16.3)	16 (38.1)	26 (21)	
	always	4 (10.3)	4 (9.3)	3 (7.1)	11 (8.9)		3 (7.7)	1 (2.3)	2 (4.8)	6 (4.8)	
Q.08.04	never	0 (0.0)	12 (27.9)	0 (0.0)	12 (9.7)	<0.001	0	8 (18.6)	1 (2.4)	9 (7.3)	0.002
	rarely	8 (20.5)	16 (37.2)	19 (45.2)	43 (34.7)		8 (20.5)	14 (32.6)	9 (21.4)	31 (25)	
	sometimes	18 (46.2)	10 (23.3)	15 (35.7)	43 (34.7)		14 (35.9)	17 (39.5)	21 (50)	52 (41.9)	
	often	12 (30.8)	4 (9.3)	5 (11.9)	21 (16.9)		16 (41)	4 (9.3)	10 (23.8)	30 (24.2)	
	always	1 (2.6)	1 (2.3)	3 (7.1)	5 (4.0)		1 (2.6)	0	1 (2.4)	2 (1.6)	
Q.08.05	never	6 (15.4)	21 (48.8)	0 (0.0)	27 (21.8)	<0.001	5 (12.8)	23 (53.5)	2 (4.8)	30 (24.2)	<0.001
	rarely	9 (23.1)	13 (30.2)	15 (35.7)	37 (29.8)		11 (28.2)	13 (30.2)	14 (33.3)	38 (30.6)	
	sometimes	20 (51.3)	7 (16.3)	22 (52.4)	49 (39.5)		18 (46.2)	5 (11.6)	20 (47.6)	43 (34.7)	
	often	4 (10.3)	2 (4.7)	2 (4.8)	8 (6.5)		5 (12.8)	2 (4.7)	5 (11.9)	12 (9.7)	
	always	0 (0.0)	0 (0.0)	3 (7.1)	3 (2.4)		0	0	1 (2.4)	1 (0.8)	
Q.08.06	never	9 (23.1)	11 (25.6)	0 (0.0)	20 (16.1)	0.006	4 (10.3)	12 (27.9)	0	16 (12.9)	<0.001
	rarely	15 (38.5)	21 (48.8)	15 (35.7)	51 (41.1)		18 (46.2)	23 (53.5)	15 (35.7)	56 (45.2)	
	sometimes	12 (30.8)	7 (16.3)	18 (42.9)	37 (29.8)		17 (43.6)	7 (16.3)	19 (45.2)	43 (34.7)	
	often	3 (7.7)	2 (4.7)	7 (16.7)	12 (9.7)		0	0	7 (16.7)	7 (5.6)	
	always	0 (0.0)	2 (4.7)	2 (4.8)	4 (3.2)		0	1 (2.3)	1 (2.4)	2 (1.6)	
Q.08.07	never	14 (35.9)	33 (76.7)	15 (35.7)	62 (50.0)	<0.001	12 (30.8)	32 (74.4)	11 (26.2)	55 (44.4)	<0.001
	rarely	10 (25.6)	6 (14.0)	13 (31.0)	29 (23.4)		16 (41)	7 (16.3)	11 (26.2)	34 (27.4)	
	sometimes	15 (38.5)	4 (9.3)	9 (21.4)	28 (22.6)		10 (25.6)	4 (9.3)	15 (35.7)	29 (23.4)	
	often	0 (0.0)	0 (0.0)	3 (7.1)	3 (2.4)		1 (2.6)	0	3 (7.1)	4 (3.2)	
	always	0 (0.0)	0 (0.0)	2 (4.8)	2 (1.6)		0	0	2 (4.8)	2 (1.6)	
Q.08.08	never	0 (0.0)	1 (2.3)	1 (2.4)	2 (1.6)	0.055	1 (2.6)	0	0	1 (0.8)	0.053
	rarely	15 (38.5)	13 (30.2)	10 (23.8)	38 (30.6)		9 (23.1)	10 (23.3)	9 (21.4)	28 (22.6)	
	sometimes	18 (46.2)	11 (25.6)	13 (31.0)	42 (33.9)		24 (61.5)	16 (37.2)	15 (35.7)	55 (44.4)	
	often	3 (7.7)	17 (39.5)	16 (38.1)	36 (29.0)		4 (10.3)	17 (39.5)	16 (38.1)	37 (29.8)	
	always	3 (7.7)	1 (2.3)	2 (4.8)	6 (4.8)		1 (2.6)	0	2 (4.8)	3 (2.4)	

**Table 3.** Percentages of patients' and parents' responses on the questionnaires and p-values of significance tests of changes in relation to the three groups

question number	answers	PATIENT				p*	PARENT				p*
		TB n (% among respondents)	FRD n (% among respondents)	FMA n (% among respondents)	TOTAL n (% among respondents)		TB n (% among respondents)	FRD n (% among respondents)	FMA n (% among respondents)	TOTAL n (% among respondents)	
Q.08.09	never	2 (5.1)	5 (11.6)	1 (2.4)	8 (6.5)	0.014	2 (5.1)	4 (9.3)	0	6 (4.8)	0.027
	rarely	17 (43.6)	12 (27.9)	12 (28.6)	41 (33.1)		16 (41)	12 (27.9)	9 (21.4)	37 (29.8)	
	sometimes	15 (38.5)	10 (23.3)	10 (23.8)	35 (28.2)		17 (43.6)	15 (34.9)	13 (31)	45 (36.3)	
	often	3 (7.7)	16 (37.2)	15 (35.7)	34 (27.4)		3 (7.7)	10 (23.3)	16 (38.1)	29 (23.4)	
	always	2 (5.1)	0 (0.0)	4 (9.5)	6 (4.8)		1 (2.6)	2 (4.7)	4 (9.5)	7 (5.6)	
Q.08.10	never	4 (10.3)	4 (9.3)	0 (0.0)	0 (0.0)	<0.001	5 (12.8)	3 (7)	0	8 (6.5)	<0.001
	rarely	14 (35.9)	4 (9.3)	2 (4.8)	2 (4.8)		15 (38.5)	3 (7)	3 (7.1)	21 (16.9)	
	sometimes	16 (41.0)	13 (30.2)	11 (26.2)	11 (26.2)		15 (38.5)	13 (30.2)	11 (26.2)	39 (31.5)	
	often	3 (7.7)	15 (34.9)	27 (64.3)	27 (64.3)		3 (7.7)	16 (37.2)	26 (61.9)	45 (36.3)	
	always	2 (5.1)	7 (16.3)	2 (4.8)	2 (4.8)		1 (2.6)	8 (18.6)	2 (4.8)	11 (8.9)	
Q.08.11	never	3 (7.7)	4 (9.3)	1 (2.4)	8 (6.5)	0.057	1 (2.6)	4 (9.3)	0	5 (4)	0.011
	rarely	10 (25.6)	9 (20.9)	10 (23.8)	29 (23.4)		9 (23.1)	8 (18.6)	12 (28.6)	29 (23.4)	
	sometimes	23 (59.0)	13 (30.2)	22 (52.4)	58 (46.8)		26 (66.7)	14 (32.6)	19 (45.2)	59 (47.6)	
	often	2 (5.1)	12 (27.9)	7 (16.7)	21 (16.9)		2 (5.1)	14 (32.6)	10 (23.8)	26 (21)	
	always	1 (2.6)	5 (11.6)	2 (4.8)	8 (6.5)		1 (2.6)	3 (7)	1 (2.4)	5 (4)	
Q.08.12	never	8 (20.5)	6 (14.0)	6 (14.3)	20 (16.1)	0.507	5 (12.8)	8 (18.6)	6 (14.3)	19 (15.3)	0.206
	rarely	13 (33.3)	13 (30.2)	7 (16.7)	33 (26.6)		11 (28.2)	12 (27.9)	4 (9.5)	27 (21.8)	
	sometimes	10 (25.6)	16 (37.2)	19 (45.2)	45 (36.3)		16 (41)	15 (34.9)	16 (38.1)	47 (37.9)	
	often	7 (17.9)	8 (18.6)	8 (19.0)	23 (18.5)		7 (17.9)	7 (16.3)	13 (31)	27 (21.8)	
	always	1 (2.6)	0 (0.0)	2 (4.8)	3 (2.4)		0	1 (2.3)	3 (7.1)	4 (3.2)	
Q.08.13	never	6 (15.4)	18 (41.9)	5 (11.9)	29 (23.4)	0.008	6 (15.4)	16 (37.2)	6 (14.3)	28 (22.6)	0.009
	rarely	19 (48.7)	9 (20.9)	16 (38.1)	44 (35.5)		20 (51.3)	8 (18.6)	14 (33.3)	42 (33.9)	
	sometimes	9 (23.1)	10 (23.3)	10 (23.8)	29 (23.4)		8 (20.5)	16 (37.2)	11 (26.2)	35 (28.2)	
	often	2 (5.1)	6 (14.0)	8 (19.0)	16 (12.9)		2 (5.1)	2 (4.7)	5 (11.9)	9 (7.3)	
	always	3 (7.7)	0 (0.0)	3 (7.1)	6 (4.8)		3 (7.7)	1 (2.3)	6 (14.3)	10 (8.1)	
Q.08.14	never	30 (76.9)	32 (74.4)	13 (31.0)	75 (60.5)	<0.001	28 (71.8)	25 (58.1)	14 (33.3)	67 (54)	0.056
	rarely	2 (5.1)	7 (16.3)	14 (33.3)	23 (18.5)		4 (10.3)	8 (18.6)	22 (17.7)	22 (17.7)	
	sometimes	6 (15.4)	3 (7.0)	13 (31.0)	22 (17.7)		5 (12.8)	9 (20.9)	14 (33.3)	28 (22.6)	
	often	0 (0.0)	1 (2.3)	0 (0.0)	1 (0.8)		1 (2.6)	1 (2.3)	1 (2.4)	3 (2.4)	
	always	1 (2.6)	0 (0.0)	2 (4.8)	3 (2.4)		1 (2.6)	0	3 (7.1)	4 (3.2)	
Q.08.15	never	6 (15.4)	4 (9.3)	7 (16.7)	17 (13.7)	0.082	4 (10.3)	6 (14)	5 (11.9)	15 (12.1)	0.391
	rarely	15 (38.5)	10 (23.3)	11 (26.2)	36 (29.0)		12 (30.8)	9 (20.9)	14 (33.3)	35 (28.2)	
	sometimes	15 (38.5)	18 (41.9)	20 (47.6)	53 (42.7)		19 (48.7)	15 (34.9)	18 (42.9)	52 (41.9)	
	often	1 (2.6)	10 (23.3)	2 (4.8)	13 (10.5)		3 (7.7)	9 (20.9)	3 (7.1)	15 (12.1)	
	always	2 (5.1)	1 (2.3)	2 (4.8)	5 (4.0)		1 (2.6)	4 (9.3)	2 (4.8)	7 (5.6)	
Q.08.16	never	3 (7.7)	13 (30.2)	16 (38.1)	32 (25.8)	0.011	0	14 (32.6)	16 (38.1)	30 (24.2)	0.001
	rarely	12 (30.8)	16 (37.2)	17 (40.5)	45 (36.3)		15 (38.5)	16 (37.2)	17 (40.5)	48 (38.7)	
	sometimes	16 (41.0)	12 (27.9)	5 (11.9)	33 (26.6)		15 (38.5)	11 (25.6)	7 (16.7)	33 (26.6)	
	often	6 (15.4)	2 (4.7)	3 (7.1)	11 (8.9)		7 (17.9)	2 (4.7)	1 (2.4)	10 (8.1)	
	always	2 (5.1)	0 (0.0)	1 (2.4)	3 (2.4)		2 (5.1)	0	1 (2.4)	3 (2.4)	
Q.08.17	never	12 (30.8)	8 (18.6)	1 (2.4)	21 (16.9)	<0.001	12 (30.8)	10 (23.3)	1 (2.4)	23 (18.5)	<0.001
	rarely	11 (28.2)	5 (11.6)	7 (16.7)	23 (18.5)		14 (35.9)	3 (7)	9 (21.4)	26 (21)	
	sometimes	14 (35.9)	16 (37.2)	8 (19.0)	38 (30.6)		11 (28.2)	15 (34.9)	8 (19)	34 (27.4)	
	often	1 (2.6)	12 (27.9)	24 (57.1)	37 (29.8)		1 (2.6)	14 (32.6)	22 (52.4)	37 (29.8)	
	always	1 (2.6)	2 (4.7)	2 (4.8)	5 (4.0)		1 (2.6)	1 (2.3)	2 (4.8)	4 (3.2)	

FMA: functional mandibular advancer; FRD: forsus fatigue resistant device; TB: twin block \*Mann-Whitney U test for independent samples

the TB appliance had difficulties in pronunciation. Displacement and breakage problems were mostly observed in the FMA group (57.1%) ( $p < 0.001$ ). According to the data, the patients had difficulties in keeping their appliances clean. A total of 55% of the patients stated that they would prefer to be treated with an alternative device, if possible (Table 2).

## DISCUSSION

The aim of this study was to prepare and conduct a survey with the purpose of comparing the experiences of patients who are treated with different functional appliances and the experiences of their parents, with reference to different appliance user groups.

Increasing the response rate for better representation of the patient group and increasing the number of questions for detailed examination without missing any data caused a dilemma while structuring the survey. Increasing the number and the content of the questions decreased the response rate causing misinterpretations (23). For this reason, a survey of 31 questions was prepared and the patients were asked to evaluate their experiences in using the appliances.

It can be anticipated that the wide range of age is likely to affect the outcome in studies investigating perception. However, removable functional appliances are mostly used during the early and late mixed dentition period at the ages of 8–13 years depending on the child's development, whereas the fixed functional appliances are used at the ages of 11–16 years (9,24,25). Therefore, the possible effects of the relatively wide age range were ignored in order to make a realistic comparison.

The main complaints resulting from use of the appliances were pain and difficulties in speaking. These complications were particularly troublesome while using the fixed and rigid functional appliances. These findings do not correspond with the other studies reporting the effects of the appliance type on patient complaints like pain or speech disorders (11,16). This may be due to the different functional appliances that were used in the earlier studies, such as Bionator and Frankel I.

In previous studies, the rationale for low patient cooperation has been reported as pain (28%), dissatisfaction with the appearance (16%), and functional limitations (7%) (13). For the present survey, 98.1% of the patients reported suffering from toothache, and there was no difference among the appliances regarding pain. Likewise, Oliver and Knapman. (15) did not find any difference in terms of pain. These findings match up with the outcomes of earlier studies that show that the functional appliances cause undesired consequences due to the sense of oral pressure (16,26). This sensation often occurs right after the appliance is placed, and there is an obvious correlation between the sense of pressure and the type of the functional appliance (26,27).

When problems about pronunciation were asked about, it was reported that the TB appliance led to difficulties in speaking. This might be due to the size of the appliance, the effects of the

acrylic part on the tongue, and the appliance's structure of two removable parts affecting the maxilla and mandible. These findings match up with the study by O'Brien et al. (7) discussing the effects of the functional appliances.

Tooth sensitivity occurred in each patient group, but it was mostly observed within the TB group. It can be concluded that the contact of the teeth and the acrylic parts of the appliance might have caused this discomfort. These findings were compatible with previous studies mentioning that the functional appliance may lead to tooth sensitivity (25,27). All patients suffered from a certain amount of pain due to use of the functional appliance. This problem was mentioned in previous studies as well (16,26,27).

There was an increased number of urgent appointment requests reported due to displacement and breakage of the fixed rigid functional appliances in comparison with the removable functional appliances in previous studies (7,28). Similarly, FMA patients experienced the most displacement and breakage problems.

## CONCLUSION

All functional appliances have their distinctive set of disadvantages and factors causing discomfort depending on their design and implementation. It might be beneficial for orthodontists to be aware of possible discomforts depending on the appliance type and to inform the patients beforehand. In the process of treatment planning regarding the appliance selection, besides age and clinical evaluations, orthodontists should also be aware of the patients' experiences in order to ensure high patient cooperation.

**Ethics Committee Approval:** Ethics committee approval was received for this study from the ethics committee of Ege University School of Medicine, İzmir, Turkey.

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

**Peer-review:** Externally peer-reviewed.

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**Appendix 1. Survey Questions**

**Personal Information**

Age:

Gender: female  male

**Q.1. Were you aware of your orthodontic problem before you started the treatment?**

Yes ( ) No ( )

**Q.2. I was informed by the orthodontist in detail about the treatment plan.**

I totally agree ( ) I agree ( ) Unsure ( ) I do not agree ( ) I strongly disagree ( )

**Q.3. I was informed by the orthodontist about the functional appliance that I would use.**

I totally agree ( ) I agree ( ) Unsure ( ) I do not agree ( ) I strongly disagree ( )

**Q.4. I was anxious when I first saw the appliance.**

I totally agree ( ) I agree ( ) Unsure ( ) I do not agree ( ) I strongly disagree ( )

**Q.5. I was informed by the orthodontist about how to use and take care of the appliance.**

I totally agree ( ) I agree ( ) Unsure ( ) I do not agree ( ) I strongly disagree ( )

**Q.6. How long does it take to get used to the appliance?**



**Q.7. If you had the chance to be treated with another device, would you prefer an alternative treatment?**

Yes ( ) No ( )

**Q.08. When using an appliance,**

	never	rarely	sometimes	often	always
Q.08.01. I had a problem with eating.					
Q.08.02. I had difficulty in drinking.					
Q.08.03. I was uncomfortable with my vision.					
Q.08.04. I was struggling with pronunciation.					
Q.08.05. I had problems sleeping.					
Q.08.06. I was embarrassed to eat in public.					
Q.08.07. I was having difficulty studying.					
Q.08.08. It caused pain in my teeth.					
Q.08.09. It caused pain in my jaw.					
Q.08.10. It injured my cheek/lips.					
Q.08.11. I was having trouble opening my mouth.					
Q.08.12. It was hard to keep the appliance clean.					
Q.08.13. I felt that others were constantly looking at my teeth.					
Q.08.14. I had to use medication for the pain.					
Q.08.15. It caused pain in my temporomandibular joints.					
Q.08.16. I had trouble controlling my saliva.					
Q.08.17. I had problems such as falling or breaking.					

**Q.09. I am aware of the changes in my facial profile after using the appliance.**

I totally agree ( ) I agree ( ) Unsure ( ) I do not agree ( ) I strongly disagree ( )

**Q.10. How do you define your final feelings about the use of the appliance?**

Very good ( ) Good ( ) Unsure ( ) Poor ( ) Very poor ( )



**Q.11. Prior to the treatment, did the retruded position of your lower jaw cause you to have difficulty in talking?**

Never ( )      Rarely ( )      Sometimes ( )      Often ( )      Always ( )

**Q.12. Prior to the treatment, did the retruded position of your lower jaw cause you to have difficulty in biting (snatching)?**

Never ( )      Rarely ( )      Sometimes ( )      Often ( )      Always ( )

**Q.13. Prior to the treatment, did the retruded position of your lower jaw cause you to have difficulty in chewing?**

Never ( )      Rarely ( )      Sometimes ( )      Often ( )      Always ( )

**Q.14. Prior to the treatment, did the retruded position of your lower jaw cause you to feel uncomfortable in public?**

Never ( )      Rarely ( )      Sometimes ( )      Often ( )      Always ( )

**Q.15. Prior to the treatment, did the retruded position of your lower jaw cause you to have problems during sleep? (Such as mouth open sleeping, saliva flow).**

Never ( )      Rarely ( )      Sometimes ( )      Often ( )      Always ( )