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Article

# Well-Being of Orthodontic Patients Wearing Orthodontic Appliances

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**Abstract:** Orthodontic appliances may cause discomfort for patients. It could influence person's psychological well-being. The aim was to examine psychological health of patients wearing orthodontic appliances. It is important to analyze well-being of patients during orthodontic treatment because it is started in a young age and it may affect one's psychological health. Therefore, for doctors and patients it is important to understand and take every aspect of the treatment into consideration when deciding when to start the treatment and what appliance to choose. 339 patients answered anonymous questionnaire. They were divided into four groups according to their age and type of appliance. Main reasons to seek treatment were crooked teeth and bad bite. Statistically significant difference was between women and men as women sought treatment because of crooked teeth, meanwhile men indicated bad bite as main reason. 48.7% of subjects noted that they were feeling good during treatment, however, 4% of all patients noted that they were feeling bad. 45% of subjects stated that they felt unhappy at least sometimes. 43% of subjects felt stress. Even though patients indicated various negative aspects on their well-being during treatment, for the majority of the subjects end results significantly increased their psychological well-being.

**Keywords:** health related quality of life; orthodontic appliances; malocclusion

## 1. Introduction

The World Health Organization's (WHO) constitution states that health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity [1]. Mental health is an integral and essential component of health [1]. Thus, healthy oral cavity is one of the components of one's well-being which for orthodontic patients depends mainly on the comfort while wearing orthodontic appliances.

According to WHO tooth decay, periodontological diseases and formation of malocclusions are three most commonly found disorders of the oral cavity [1]. As it is such a common problem, a lot of countries are investigating the prevalence of these anomalies [2]. It was found that the most common malocclusion was Angle Class I (found in approximately 70% of the subjects) and the least common malocclusion was Angle Class III (found in approximately 5% of the subjects) [2–4]. In most of these investigations, researchers focused more on changes in psychological well-being of the patients before and after orthodontic treatment. Moreover, in a majority of the researches of patients wearing orthodontic appliances emphasis was on psychical pain or psychical discomfort. However, psychological health of patients wearing orthodontic appliances during orthodontic treatment was not investigated.

Therefore, the purpose of this investigation was to analyze and evaluate psychological health of patients wearing various orthodontic appliances during orthodontic treatment emphasizing mental issues rather than psychical ones.

## 2. Materials and Methods

Investigation was performed using anonymous questionnaires of 31 questions that were composed to evaluate psychological well-being of patients wearing orthodontic appliances. The authors confirm that all methods were carried out in accordance with relevant guidelines and regulations. All experimental protocols were approved by the Bioethical committee of Lithuanian University of Health Sciences (No. BEC-OF-98). Informed consent was obtained from all subjects and/or their legal guardian(s).

Questionnaire consisted of: 7 questions about demographical information of the patient; 13 questions about psychological well-being of the patient; 3 questions about pain; 4 questions about eating difficulties; 3 questions about speech difficulties; 1 question about salivating. All of the questions were given with an option to choose from given answers or if needed to write their own. Investigation was performed in Orthodontic Clinic. Selected subjects of the investigation were patients wearing various orthodontic appliances.

### *Transparency and Openness*

We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study, and we follow JARS (Kazak, 2018). Sample size was calculated using Paniotto formula:  $n = 1 / (\Delta^2 + 1/N)$ .  $n$  – sample size of subjects;  $\Delta^2$  – size of the sampling error;  $N$  – general sample size. When size of the sampling error was 0.05, calculated sample size was 333. There were 339 patients in this investigation, therefore, the sample size of was enough.

Criteria for inclusion into investigation were the following: patients that were being treated orthodontically in Orthodontic Clinic without mental disorders and congenital syndromes.

All of the collected data was processed using SPSS 22.0 (Statistical Package for Social Sciences) program which was used in collecting and analyzing data. Descriptive statistics were reported as the mean and standard deviation (SD). Hypotheses of interrelations between characteristics were verified using Pearson chi-squared test ( $X^2$ ). P-values less than 0.05 were considered significant. The power of the analysis was 0.8. This study's design and its analysis were not pre-registered.

## 3. Results

This investigation included data of 339 patients. Average age of subjects was 14.08 years, the youngest patient was 7 years old and the oldest patient was 42 years old. As shown in the table below (Table 1) more than half of the investigated patients included were women (69%) and only 31% were men. Subjects were divided into four groups: 1) younger than 14 years of age (14 years old included) wearing removable appliances; 2) younger than 14 years of age wearing braces; 3) older than 14 years of age wearing removable appliances and 4) older than 14 years of age wearing braces. This division was based on average age of the subjects which was around 14 years of age.

**Table 1.** Social and demographical characteristics of the patients.

	Characteristics	n	Percentage
Patients' group	Younger than 14 years old wearing removable appliances	167	49.3%
	Younger than 14 years old wearing braces	57	16.8%
	Older than 14 years old wearing removable appliances	8	2.4%
	Older than 14 years old wearing braces	107	31.6%
Gender	Men	105	31.0%
	Women	234	69.0%

Between both age groups reasons to seek orthodontic treatment did not differ much. Both younger and older than 14 years old patients indicated crooked teeth and bad bite as main reasons

to seek orthodontic treatment (Table 2). However, women sought orthodontic treatment because of crooked teeth meanwhile men indicated bad bite as the main reason for treatment.

**Table 2.** Reasons to seek orthodontic treatment in different patient groups.

		Crooked teeth	Bad, traumatic bite	Esthetics	Other
<b>Patient group</b>	Younger than 14 years old wearing removable appliances	64.1%	48.5%	18.0%	0.0%
	Younger than 14 years old wearing braces	84.2%	52.6%	22.8%	0.0%
	Older than 14 years old wearing removable appliances	50.0%	0.0%	0.0%	50.0%
	Older than 14 years old wearing braces	55.1%	52.3%	37.4%	0.0%
	$\chi^2$	<b>14.472</b>	<b>8.469</b>	<b>16.149</b>	<b>167.476</b>
	<b>df</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
	<b>p</b>	<b>0.002*</b>	<b>0.037*</b>	<b>0.001*</b>	<b>0.000*</b>
<b>Gender</b>	Men	55.2%	69.5%	11.4%	0.0%
	Women	68.4%	40.2%	30.3%	1.7%
	$\chi^2$	<b>5.450</b>	<b>24.984</b>	<b>14.022</b>	1.816
	<b>df</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
	<b>p</b>	<b>0.020*</b>	<b>0.000*</b>	<b>0.000*</b>	0.178

\*Statistical significance when  $p < 0.05$ .

This investigation evaluated patients' satisfaction with their smile before orthodontic treatment. It was discovered that 41.6% were satisfied with their smile while even 48% were unsatisfied (Table 3).

**Table 3.** Prevalence of satisfaction before orthodontic treatment in different patient groups.

		Satisfaction with their smile				$\chi^2$	df	p
		Very satisfied	Satisfied	Unsatisfied	Very unsatisfied			
<b>Patient group</b>	Younger than 14 years old wearing removable appliances	2.4%	44.3%	50.9%	2.4%	<b>39.497</b>	<b>9</b>	<b>0.000*</b>
	Younger than 14 years old wearing braces	26.3%	24.6%	43.9%	5.3%			
	Older than 14 years old wearing removable appliances	0.0%	50.0%	50.0%	0.0%			
	Older than 14 years old wearing braces	15.0%	45.8%	39.3%	0.0%			
<b>Gender</b>	Men	3.8%	46.7%	49.5%	0.0%	<b>10.742</b>	<b>3</b>	<b>0.013*</b>
	Women	13.2%	39.3%	44.4%	3.0%			

\*Statistical significance when  $p < 0.05$ .

Considering psychological well-being of the patients, almost 50% of the subjects (48.7%) noted that they were feeling good and about 38% noted that they were feeling normal. Nevertheless, only 4% of all subjects included in this investigation noted that they were feeling bad while wearing

orthodontic appliances. Also, statistically significant difference was found between genders as women were more likely to feel very comfortable (great) while men usually felt good or normal while wearing orthodontic appliances. Results are shown in Table 4.

**Table 4.** Psychological well-being of patients wearing orthodontic appliances.

		Psychological well-being of patients wearing orthodontic appliances					$\chi^2$	df	p
		Great	Good	Normal	Bad	Very bad			
<b>Patient group</b>	Younger than 14 years old wearing removable appliances	2.4%	56.3%	39.5%	1.8%	0.0%	73.398	9	0.000*
	Younger than 14 years old wearing braces	1.8%	63.2%	24.6%	10.5%	0.0%			
	Older than 14 years old wearing removable appliances	50.0%	50.0%	0.0%	0.0%	0.0%			
	Older than 14 years old wearing braces	21.5%	29.0%	46.7%	2.8%	0.0%			
<b>Gender</b>	Men	0.0%	55.2%	41.9%	2.9%	0.0%	16.408	3	0.001*
	Women	13.7%	45.7%	36.8%	3.8%	0.0%			

\*Statistical significance when  $p < 0.05$ .

Only 9% of the subjects included in this investigation stated that they felt unhappy wearing orthodontic appliances, however 45% of subjects stated that they felt unhappy at least sometimes. It was found that patients younger than 14 years old wearing braces statistically more often felt unhappy (Table 5).

**Table 5.** Prevalence of feeling unhappy while wearing orthodontic appliances in different patient groups.

		Feeling unhappy wearing orthodontic appliances			$\chi^2$	df	p
		Yes	No	Sometimes			
<b>Patient group</b>	Younger than 14 years old wearing removable appliances	10.5%	56.1%	33.3%	20.804	6	0.002*
	Younger than 14 years old wearing braces	7.8%	37.1%	55.1%			
	Older than 14 years old wearing removable appliances	0.0%	100.0%	0.0%			
	Older than 14 years old wearing braces	9.3%	51.4%	39.3%			

\*Statistical significance when  $p < 0.05$ .

It was found that 43% of subjects felt stress while wearing orthodontic appliances. There was a statistically significant difference between patients younger than 14 years old wearing removable appliances and patients older than 14 years old wearing braces as these two groups felt stress more often than other patient groups (Table 6).

**Table 6.** Stress felt while wearing orthodontic appliances.

		Stress felt			$\chi^2$	df	p
		Yes	No	Sometimes			
<b>Patient group</b>	Younger than 14 years old wearing removable appliances	9.0%	55.7%	35.3%	14.432	6	0.025*
	Younger than 14 years old wearing braces	10.5%	64.9%	24.6%			
	Older than 14 years old wearing removable appliances	0.0%	100.0%	0.0%			
	Older than 14 years old wearing braces	18.7%	51.4%	29.9%			
<b>Gender</b>	Men	9.5%	50.5%	40.0%	5.946	2	0.051
	Women	13.2%	59.8%	26.9%			

\*Statistical significance when  $p < 0.05$ .

Evaluation of eating difficulties with orthodontic appliances showed that even 75% of patients had these difficulties while wearing braces. These patients had to stop eating certain kind of foods such as nuts, chewing gum and popcorns to avoid breakage of braces. When evaluating effect of orthodontic appliances on structures of oral cavity it was found that 56% of the subjects had problems only in the beginning of the treatment and only less than 20% of the subjects had these issues during the whole treatment. Also, statistically significantly more often problems with mucosa had patients wearing braces and men.

Speech difficulties were felt by more than 30% of the subjects and about 26% indicated that they felt speech difficulties at least partially. Statistically significant difference of speech difficulties were felt by patients wearing removable appliances. The most common speech difficulties were slurred speech (84%) and difficulties pronouncing certain words (16%).

Increased salivation was felt by more than half of the subjects (58.8%). Statistically significantly more often increased salivation was felt by patients wearing removable appliances and more often by men. Moreover, subjects were asked whether they had to give up any leisure activities due to orthodontic treatment and only 3 respondents said they gave up playing the winds. Others did not indicate any restrictions of leisure activities due to orthodontic treatment.

#### 4. Discussion

Usually, orthodontic treatment is performed in young patients because for the achievement of good results it is necessary to start treatment in growing patient (at least until the age of 14 years of age). However, orthodontic treatment can be proposed even for older patients, but they require different methods of orthodontic treatment.

The main goal of orthodontic treatment is to balance aesthetic, functional, and patients' ambitions, which contributes to their quality of life [5,6].

Several factors affect the quality of life during orthodontic treatment, such as pain, difficulties while eating, changes in speech and diet [6,7]. Previous research had identified that fixed appliances affect everyday life, in terms of aesthetics, functional limitations, diet, oral hygiene and socially [8,9]. Oral health status and quality of life were negatively affected during treatment, but improved afterwards [8,10,11]. Pain from fixed appliances reduced after a few days [8,12,13]. However, there were no research on removable orthodontic appliances and retainers, although the ability to remove one's appliance during eating, cleaning and talking, could result in different effect [8]. Thus, this investigation focussed on well-being of patients wearing removable and non-removable orthodontic appliances.

From 339 patients included in this study more than two thirds were woman and only one third were men. Furthermore, main reason for women to seek orthodontic treatment were crooked teeth and esthetic reasons, while for majority of men main reason was bad, traumatic bite. A study by Jung on Korean mid school going adolescents unveiled that after fixed orthodontic treatment, the girls had higher self-esteem than the untreated malocclusion group compared to boys [14]. This showed that

women tended to pay more attention to esthetics, thus their self-esteem depended on their smile esthetics.

More than 50% of the subjects wearing orthodontic appliances evaluated their well-being as average and only 4% said they felt very bad. Moreover, patients wearing braces evaluated their well-being as normal or bad when compared to patients wearing removable appliances. This was because braces, which were fixed to a person's teeth, could cause pain or discomfort, and it might make everyday life more difficult in feeling as 'embarrassing' or 'upsetting' [8]. Furthermore, younger than 14 years old patients wearing removable appliances were less likely to feel great or good, compared to older than 14-year-old patients wearing removable appliances. This can be explained by the disturbances of speech, tongue irritation and difficulty in chewing with more social embarrassment for younger patients [15]. Whereas, older patients usually use removable appliances only at night as retainers after orthodontic treatment.

It was discovered that only 9% of the subjects marked that they feel unhappy wearing orthodontic appliances, however 45% of the subjects stated that they feel unhappy at least sometimes. Moreover, women were statistically significantly more prone to feel unhappy compared to men. Similar results were found in study performed in 2020 in India. Authors discovered that there was a statistically significant difference between the overall psychological impact of dental aesthetics and specific psychological impact in males and females, with females having higher scores [16]. This may be explained by the fact that females were more concerned and dissatisfied with their dental appearance as compared to males [16], therefore, orthodontic treatment worsened women's appearance for the time of the treatment and they felt more unhappy.

The majority of patients feeling stress during orthodontic treatment were patients wearing braces in both age groups. However, the majority of patients who did not feel stress were patients older than 14 years old wearing removable appliance. This seems like a paradox as removable appliances usually affect speech and older patients wearing removable appliances should feel more stress, yet most of these patients wore removable appliances as retainers after orthodontic treatment only at night, therefore, they did not feel stressed about it.

Furthermore, patients' well-being greatly depended on discomfort or difficulties that occurred because of orthodontic treatment. Discomfort included speech difficulties, changes in eating habits, effect on oral structures, increased salivation and more attention to one's teeth by others. The greater the discomfort, the lesser the well-being of the patient. Similar results were found in various studies around the world. Investigation done in United Kingdom showed that 47% of students of 11-12 years age experienced bullying due to appearance of their teeth [17], thus they evaluated their well-being poorly. Another research done in 2019 by S.Silva also found that 18% of the subjects undergoing orthodontic treatment with braces experienced difficulties while eating [15]. In our investigation patients with braces had more difficulties compared to patients with removable appliances and this can be explained as patients with removable appliances removed it before eating while patients wearing braces could not do that. Moreover, in our investigation 26% of the patients experienced at least partial difficulties of speech. Similar results were found in reasearch of A.Kavaliauskiene with colleagues where 26.8% of the subjects experienced speech difficulties [18]. Usually, removable appliances cover the palate and are relatively huge appliances, thus tongue has less space for articulation and difficulties in speech may appear. Furthermore, patients wearing removable appliances experienced increased salivation statistically significantly more often.

## 5. Conclusions

In conclusion, even though patients indicated various negative aspects of orthodontic appliances on their well-being during orthodontic treatment, for the majority of the subjects end results of the treatment significantly increased their psychological well-being, self esteem and social life [15,19].

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