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Assessing the impact of myofunctional and functional appliances on the daily performances of children in the South Indian population using the Child–OIDP scale

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Abstract

Background:This study aimed to assess the degree to which an individual's daily activities were affected during the treatment with myofunctional and functional appliances by using a validated tool called the Oral Impact on Daily Performance scale.

Materials and methods:The study population consisted of 51 children aged 7- to 13years undergoing functional and myofunctional therapy. The patients' total and subscale scores were compared based on age, gender, nature and type of appliances using Independent sample t-test, Chi-square and ANOVA.

Results:All patients reported impacts on eating and speaking, smiling, and social contact irrespective of the type of appliance delivered. The performance with the maximum impact score on daily performance was smiling (49.1%) and emotional stability (49%). The impact of very severe intensity was reported for speaking (29.4%), social contact (21.6%) and eating (17.6%). A significantly higher overall impact was reported with fixed appliances in comparison to removable appliances, with performances like cleaning ($p=0.001$), sleeping ($p=0.03$), and school work ($p=0.045$) being significantly affected. A significant difference was seen in overall impact based on the type of appliance ($p=0.03$), with the highest mean impact for Modified Reverse Twin Block.

Conclusion:During the early stages of treatment, the functional and myofunctional appliance considerably impacts daily performance and may reflect on patient compliance and acceptance of treatment.

Keywords: Myofunctional appliances; functional appliances; quality of life; malocclusion.

Introduction

Malocclusion is ranked third in priority among dental public health problems worldwide, edging dental caries and periodontal diseases (Alhammadi et al., 2018). The perception of beauty and the association of one's self with professional achievement is strongly influenced by having teeth that are in proper alignment, and these traits are also shared by those favored by society. In contrast, persons with aesthetic disorders could experience distress and a lack of confidence in themselves. India, a vast nation with a diverse population, exhibits a clear difference in the prevalence of malocclusion from its northern to southern regions. North India shows a higher prevalence of class 2 malocclusion, whereas; the southern population has higher cases of bimaxillary protrusion. These problems can negatively influence the quality of life (Alves e Luna et al., 2014) in terms of the social interactions and psychological well-being of affected individuals (Marques et al., 2006; Nield et al., 2008). In growing children, the maxillofacial skeleton is adaptable to the changes brought about by internal and external forces. Treating any malocclusion and skeletal discrepancies during active growth enables harnessing the individual's growth capacity to prevent malocclusion and guide normal development. Therefore, early diagnosis and successful treatment have both short and long-term benefits in achieving the objectives of dentofacial aesthetics and psychological well-being (Nield et al., 2008).

Myofunctional and functional appliances correct any maxillomandibular discrepancy when the growth surge is highest in the middle to late mixed dentition period. Myofunctional therapy improves the quality of life by correcting the aesthetic component and enhancing the individual's self-esteem. Furthermore, it can bring about physical, psychological, and social changes. Although patient demands and perceived needs differ depending on social and cultural contexts, the primary incentive of myofunctional treatment is typically an improvement in appearance, not just of the teeth but also of the entire face. However, these appliances necessitate a period of adaptation by the patients, during which they experience oral hygiene problems (Lucchese et al., 2021), soft tissue irritations, speech disturbances, limitations of mandibular movements (DiBiase et al., 2015) and esthetic concerns due to the bulky design of the appliance. These problems can majorly impact their daily routine and social life and could be a significant deterrent for children considering myofunctional therapy. Therefore, assessing the oral health-related quality of life of children and adolescents undergoing myofunctional therapy is worthwhile. It would provide insights into the significant barrier to achieving optimal patient compliance for myofunctional therapy and how to address it more effectively. This paper aims to assess the intensity and extent of impacts on daily performance while wearing different kinds of myofunctional appliances.

Material and methods:

Study population

Children undergoing myofunctional and functional therapy for dental and skeletal malocclusion in the Department of Pediatric and preventive dentistry, AB Shetty memorial institute of dental sciences, Mangalore, India, were included in this study. The study subjects were mainly from three states of South India (Karnataka, Kerala, Tamil Nadu). 51 children between the ages of 7- 13 participated in the study, and informed consent was taken from all the participants. This study was carried out after obtaining ethical approval from the ethics committee of AB Shetty memorial institute of dental sciences, Nitte (Deemed to be University), Mangalore, India.

Oral health-related quality of life

Information regarding sociodemographic characteristics, type of appliances worn and their impact on daily life 1 month after using myofunctional and functional appliances was collected through interviews using a structured questionnaire. The Child-Oral Impact on

Daily Performances (Child- ODP) scale, previously validated in different cross-sectional settings (Karki et al., 2021; Zaror et al., 2019), was used to collect data on socio-dental impacts. The Child-ODP assesses the severity and frequency of oral impacts based on 8 psychometric properties (eating, speaking clearly, cleaning mouth, sleeping, emotional stability, smiling without shame, carrying out school work and social contact with people). A trained pediatric dentist interviewed children undergoing myofunctional appliances (twin block, reverse twin block, modified reverse twin block, face mask combined with rapid maxillary expansion, Frankel and headgear with rapid maxillary expansion) for developing malocclusion.

Children were asked if there is any presence or absence of problem during appliance usage. Children who responded yes were further asked about the severity and frequency of each daily performance which was scored on a 3-point Likert scale as 0= no impact, 1= little effect, 2= moderate effect and 3= severe effect. The frequency scores were 0= no impact, 1= once or twice a month, 2= once or twice a week and 3= three or more times a week. The impact scores for each performance were calculated by multiplying the severity and frequency scores (0-9). The overall impact score was calculated by summing all the impact scores of all 8 performances (range 0–72). This overall score was divided by 72 and multiplied by 100 to obtain the total percentage score. If no impact was reported, then a zero score was assigned. Only those impacts related to wearing myofunctional and functional appliances were considered for the analysis. After determining whether or not the child had an impact, adolescents were clinically assessed to identify the kind of appliance they were wearing during the survey. Also, they were classified based on the nature of the appliance as fixed and removable.

Statistical procedures

SPSS (Statistical Package for Social Sciences) version 20. (IBM SPSS statistics [IBM Corp. released 2011] was used for statistical analysis. The mean, standard deviation for quantitative variables, frequency and proportions for qualitative variables were used to determine the descriptive statistics of the explanatory and outcome variables. Inferential statistics like the Chi-square test were applied for qualitative variables to find the association. An Independent sample t-test was used to evaluate the mean impact score between the groups based on age, gender and appliance nature. ANOVA test was applied to compare the mean impact score among the groups based on appliance type. The level of significance was set at 5%.

Results

A total number of 51 patients belonging to the age group 7-13 years (mean age - 10.31), 24 boys (47.1%) and 27 girls (52.9%), undergoing myofunctional treatment participated in this study. The distribution of the study population is mentioned in Figure 1.

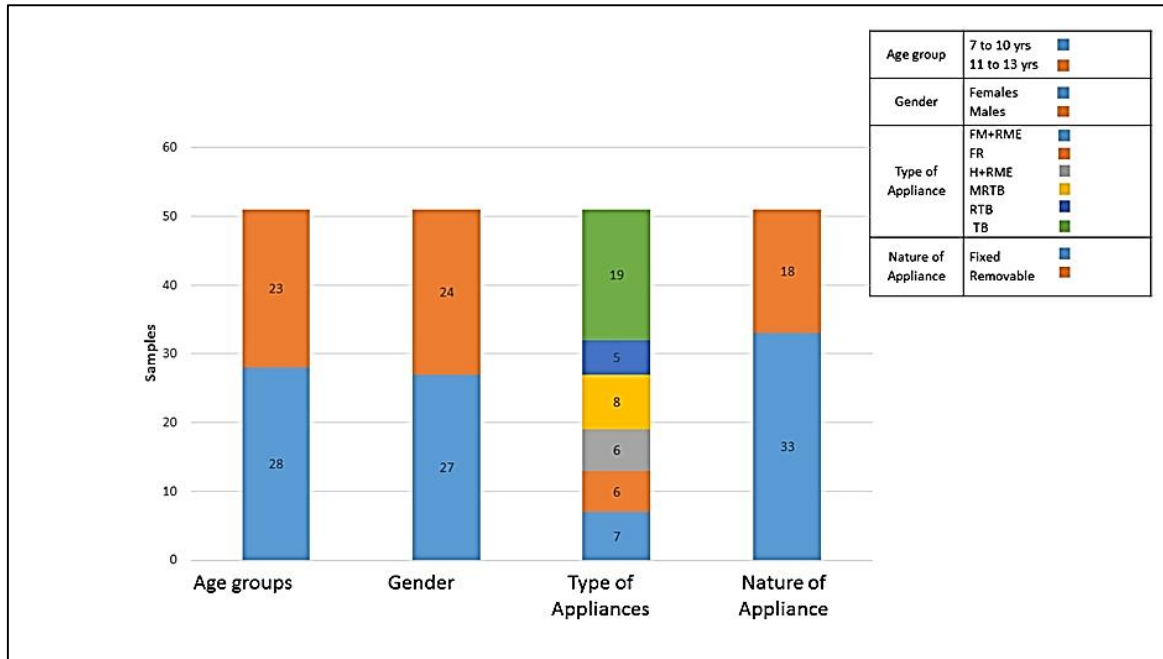


Figure. 1: Distribution of samples among age groups, gender, type and nature of appliances.

All patients, irrespective of the appliance delivered, reported an impact on daily performances for eating, speaking, smiling and social contact. However, the level of impact reported was moderate (39.2% and 39.4%, 49.1%, 37.3%). The most frequently reported performance to have an impact was smiling (49.1%) and emotional stability (49%) (Table1). Furthermore, a 'very severe' impact was reported for speaking (29.4), social contact (21.6%) and eating (17.6%). Performances like cleaning (p- 0.001), sleeping (p=0.03) and school work (p=0.045) showed significantly higher impact with fixed appliances when compared to removable appliances. (Table 2)

Table 1: Distribution of the performance scores of children undergoing myofunctional and functional appliances

		No impact 0	Very little 1.0	Little 2.0	Moderate 3-4	Severe 6.0	Very severe 9.0
Eating	Frequency	0	9	5	20	8	9
	Percent	0	17.6	9.8	39.2	15.7	17.6
Speaking	Frequency	0	0	8	16	12	15
	Percent	0	0	15.7	31.4	23.5	29.4
Cleaning	Frequency	14	18	10	9	0	0
	Percent	27.5	35.3	19.6	17.6	0	0
Sleeping	Frequency	17	21	10	1	1	1
	Percent	33.3	41.2	19.6	2.0	2.0	2.0
Smiling	Frequency	0	11	3	25	10	2
	Percent	0	21.6	5.9	49.1	19.6	3.9
Sad	Frequency	5	25	13	4	3	1
	Percent	9.8	49.0	25.5	7.8	5.9	2.0

Social	Frequency	0	4	5	19	12	11
	Percent	0	7.8	9.8	37.3	23.5	21.6
	Frequency	21	27	2	1	0	0

Table 2: Cross-tabulation of the impact with OIDP based on the type of appliance

			Type of appliance		Total	Chi-square value	p-value
			Fixed	Removable			
Eating	With Impact	Count	33	18	51	-	-
		%	64.7%	35.3%	100.0%		
Speaking	With Impact	Count	33	18	51	-	-
		%	64.7%	35.3%	100.0%		
Cleaning	With Impact	Count	33	12	45	12.46	0.001*
		%	64.7%	23.5%	88.2%		
	Without Impact	Count	0	6	6		
		%	0.0%	11.8%	11.8%		
Sleeping	With Impact	Count	30	12	42	4.71	0.03*
		%	58.8%	23.5%	82.4%		
	Without Impact	Count	3	6	9		
		%	5.9%	11.8%	17.6%		
Smiling	With Impact	Count	33	18	51	-	-
		%	64.7%	35.3%	100.0%		
Sad/Unhappy	With Impact	Count	32	16	48	1.37	0.241
		%	62.7%	31.4%	94.1%		
	Without Impact	Count	1	2	3		
		%	2.0%	3.9%	5.9%		
Social Gathering	With Impact	Count	33	18	51	-	-
		%	64.7%	35.3%	100.0%		
School work	With Impact	Count	27	10	37	4.03	0.045*
		%	52.9%	19.6%	72.5%		
	Without Impact	Count	6	8	14		
		%	11.8%	15.7%	27.5%		

*Significance

There was no significant difference based on age and gender. A significant difference was observed in the overall impact score of the 6 appliances delivered ($p=0.03$), with the highest mean impact reported with the Modified Reverse Twin block. Mean (43.57 ± 8.56). A significant difference in Overall impact on performances was found between fixed and removable appliances (p -value- 0.023), with a higher impact for fixed appliances (Mean value – fixed appliance 39.015 ± 14.67) (Table 3).

TABLE 3: Comparison of the mean overall impact score using Independent sample t-test^{\$} and ANOVA[#]

		N	Minimum	Maximum	Mean	S.D	P-value
Age groups	7 to 10 yrs	28	8.33	68.06	32.242	16.974	0.484 ^{\$}
	11 to 13 yrs	23	15.28	55.56	35.205	11.930	
Gender	Males	24	8.33	68.06	32.118	15.392	0.822 ^{\$}
	Females	27	11.11	68.06	34.877	14.512	
Type of Appliance	FM+RME	7	18.06	50.00	32.937	11.750	0.032 ^{*#}
	F.R	6	8.33	26.39	17.593	8.501	
	H+RME	6	12.50	56.94	29.630	15.155	
	MRTB	8	27.78	54.17	43.576	8.560	
	RTB	5	25.00	51.39	37.778	11.343	
	TB	19	11.11	68.06	34.795	16.849	
Nature of Appliance	Fixed	33	12.50	68.06	39.015	14.671	0.023 ^{*\$}
	Removable	18	8.33	38.89	23.611	8.976	

*Significant

Discussion

About 30 - 40% of children suffer from malaligned teeth and jaws, affecting the proper functioning of dentofacial apparatus and esthetics (Lal S et al., 2004). Successful treatment of these children requires a positive attitude and willingness to continue, which mainly depends on their experience during the treatment. Therefore, assessing the degree and extent to which the treatment affects the patient's day-to-day activities is imperative. Thus, in this study, we aimed to assess the degree to which an individual's daily activities were affected during the course of the treatment with myofunctional and functional appliances by using a validated Oral Health Related Quality of Life tool called the Oral Impact on Daily Performance (OIDP) scale.

In cases of pediatric malocclusion, early intervention orthodontics utilizes the growth potential to eliminate or modify skeletal anomalies and thereby promote normal dental and skeletal growth (Thomas Rakosi and Thomas M. Graber, 2010; Rajbhoj et al., 2023). Myofunctional and functional appliances have been advocated since the 1930s to aid normal

maxilla-mandibular growth. However, the treatment effects of these appliances largely depend on the patient's cooperation and appliance design (removable and fixed). The initial phase of these treatments involves a period of adaptation, where the patient can experience pain and discomfort after insertion. The appliance's bulky design often poses difficulty in their daily activities such as speech, deglutition, breathing, and eating (Sergl et al., 1992; Mohammed et al., 2020). Also, during the treatment, variations in the vertical rest position of the jaws or freeway space are often seen, which in turn causes difficulty in chewing.

In our study, all the patients wearing myofunctional and functional appliances, irrespective of the type or nature of the appliance, reported an impact on daily performances for eating (39.2%), speaking (39.4%), smiling (49%) and social contact (37.3%) with the level of impact being moderate. The most frequently reported performance to have an impact was smiling (49.1%) and emotional stability (49%) (Table 1). Furthermore, a 'very severe' impact was reported for speaking (29.4%), social contact (21.6%) and eating (17.6%). Functional and myofunctional appliances change the anteroposterior position of jaws, which alters masticatory muscle activity, causing unstable occlusion. This, accompanied by interferences from intraoral components such as expansion screws cause difficulty eating hard food, impedes the cleaning process, and contributes to food lodgement ((Di Palma et al., 2017; Mohammed et al., 2020; Yang et al., 2022). Additionally, the bulky design of appliances can majorly affect their confidence to participate in social gatherings and school activities (Al-Omari et al., 2014; Olsen and Inglehart, 2011). The patient's self-perceived dissatisfaction with aesthetics during treatment is found to be proportional to the patient's acceptance rate. Hence, Social discomfort caused during treatment can be one of the factors leading to discontinuity of the treatment, especially in the adolescent age group where peer pressures play a significant role.

The present study assessed for impact on daily performances between fixed and removable appliances, performances like cleaning ($p=0.001$), sleeping ($p=0.03$) and school work ($p=0.045$), and results showed a significantly higher impact with fixed appliances when compared with removable appliances (Table 2). Fixed appliances are cemented using glass ionomer cement onto the tooth's surfaces, posing a greater cleaning challenge (Clark et al., 1993). Overall impact scores based on age and gender showed no significant difference. However, there was a significant difference between the overall impact score of the six appliances delivered ($p=0.03$), with the highest mean impact reported with the Modified Reverse Twin Block appliance (MRTB) (mean 43.57 ± 8.56). MRTB is usually delivered in the management of skeletal class 3 malocclusion and consists of intraoral components such as occlusal bite blocks, labial bow and clasps for retention, expansion screws and hooks to engage elastics. This can be attributed to the high impact reported on daily activities such as cleaning, chewing and speech. This study also found that there was a significant difference in the overall impact on performances between fixed and removable appliances ($p=0.023$), with a higher impact for fixed appliances (mean value 39.015 ± 14.67) (Table 3).

Data collected for this study was during the initial adaptation period (1 month) to the appliance. However, the OIDP scores may improve as patients adapt to the appliance with time. Therefore long-term follow-up studies evaluating the relationship between the impact of the appliance and resultant patient compliance would provide further insights into the overall quality of life with myofunctional and functional therapy.

Conclusion

The results of our study highlighted functional and myofunctional appliances significantly impact daily performance in children, particularly affecting activities like eating, speaking, and social interaction. Fixed appliances tend to have a greater impact than removable ones, with specific appliance types showing varying degrees of impact. The difficulties children face in adapting to myofunctional appliances in the earlier stages of treatment, may affect the

patient's compliance with the treatment. Therefore, long-term follow-up studies are recommended to assess changes in impact over time and their implications for patient compliance.

Conflict of Interest: The authors have no financial or proprietary interests in any material discussed in this article.

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