



EFFECT OF PSYCHOLOGICAL ACTIVITY ON ORTHODONTIC PAIN PERCEPTION - a VAS STUDY.

Dental Science

Garima D. Chaturvedi	Post Graduate Student, Department of Orthodontics and Dentofacial Orthopaedics, School of Dental Sciences, KIMS-DU Karad.
Renuka Pawar*	Professor, Department of Orthodontics and Dentofacial Orthopaedics, School of Dental Sciences, KIMS-DU, Karad. *Corresponding Author
Chanamallappa R. Ganiger	Professor and Head, Department of Orthodontics and Dentofacial Orthopaedics, School of Dental Sciences, KIMS-DU, Karad.
Sandesh Phaphe	Reader, Department of Orthodontics and Dentofacial Orthopaedics, School of Dental Sciences, KIMS-DU, Karad.
Yusuf Ahammed A.R	Reader, Department of Orthodontics and Dentofacial Orthopaedics, School of Dental Sciences, KIMS-DU, Karad.
Pratap Mane	Senior Lecturer, Department of Orthodontics and Dentofacial Orthopaedics, School of Dental Sciences, KIMS-DU, Karad.

ABSTRACT

Introduction: Approximately, 90% of the orthodontic patients report pain and this is one of the major causes for discontinuing and avoiding orthodontic care. Placement of orthodontic separators is one of the major steps at the start of the orthodontic treatment. Previous studies have shown that psychological factors have an important influence on pain perception. Both in clinic and experimental settings, distraction has been shown to reduce pain.

Objectives: To assess the effect of psychological activity on orthodontic pain perception and analgesic consumption after orthodontic separator placement in adolescents.

Methodology: 100 adolescent patients were selected for the study. Their baseline psychological activity was assessed. Orthodontic separators were placed at the mesial and distal contact points of the maxillary and mandibular first molars. A 100-mm visual analog scale was used for pain assessment. Analgesic consumption was recorded as binary response (yes/no). Both outcomes were assessed at 1 baseline time point and 7 follow-up time points (bedtime on days 1-7).

Results: Our preliminary findings show that 40% showed relief on day 1, 81% showed relief on day 3 and 98% showed relief on day 7.

Conclusion: Psychological distraction significantly influenced the orthodontic pain perception during orthodontic treatment. It is advisable for patients to engage in psychological activities like listening to music, watching media, reading novels and meditation to reduce the analgesic consumption. Further research is needed in this area to better understand the association between psychological activity and orthodontic pain.

KEYWORDS

Orthodontic Separators, Psychological Activity, Pain Perception.

INTRODUCTION

Orthodontic treatment during adolescence can bring many psychosocial benefits, including improvement in esthetic self-perception.¹ However, fear of pain and discomfort is one of the major concern for many prospective orthodontic patients², and pain has been reported to have a negative aspect of treatment and the highest-ranking reason for discontinuing the orthodontic treatment. In dental situation, the experience of pain is generally seen as a response to noxious stimuli from the dental treatment. In orthodontics the main cause of discomfort and pain is the application of forces to induce tooth movement. In previous studies, it is seen that 90-95% of teenage patients had pain after application of separators.^{3,5} Pain intensity peaks about 24 hours after administration of orthodontic forces, and most patients continue to report pain during next week.^{3,8} Orthodontic pain, being a subjective response can be influenced significantly by several factors, including age and sex of the individual. However, other studies have concluded that there is no significant effect of age^{5,11} or sex^{5,12,13} on orthodontic pain. A variety of pain modulatory mechanisms exists within the nervous system and these can be accessed either pharmacologically or through contextual or psychological manipulation. Variables such as attentional state, emotional context, empathy, hypnotic suggestions, placebo response have now been shown to alter both pain processing in the brain and pain perception¹⁶. Attention is probably the most widely studied psychological variable that modifies the pain experience.¹⁶ A number of clinical and experimental studies show that pain is less intense when a person is distracted. When people are distracted from noxious stimulation, they report significantly lower ratings of pain. Simply distracting a patient from his or her pain can have a profound effect on how the pain is processed in the brain and consequently on how it is perceived. A brief relaxation method and music-induced distraction reduced dental

anxiety significantly, but the relaxation method was particularly effective in highly anxious patient, whereas the music distraction did not have a clinically relevant effect on these patients. Therefore, the objective of the present study is to assess the effect of psychological activity on orthodontic pain perception after orthodontic separator placement in adolescents.

METHODOLOGY

The present study was conducted in the Department of Orthodontics and Dentofacial Orthopaedics, School Of Dental Sciences, KIMS-DU, Karad, Maharashtra. A total of 100 patients seeking orthodontic treatment were randomly selected from the out patient department. The inclusion criteria were 11 – 18 year old patients, erupted permanent first and second molars, presence of antagonist teeth in the opposite arch and absence of posterior open bite and interdental spaces, no concurrent use of analgesics and anti-inflammatory drugs and caries free dentition with a healthy periodontium. Patients with systemic disease or medical condition and missing 1st molars were excluded from the study. Orthodontic separators were placed by a single operator at the mesial and distal contact points of the maxillary and mandibular first molars. A questionnaire (Fig A) based on McGill's pain questionnaire¹⁴ was given to the patients by a clinical assistant and they were instructed to engage themselves in the given psychological activities like meditation, listening to music, watching television and reading books or novels for minimum 1 hour. According to the literature available it is said that the pain starts 2 – 4 hours after separators placement.^{4, 11, 15} The questionnaire was given and the outcomes were assessed at 3 follow-up time points (days 1, 3 and 7).⁴ A 100-mm visual analog scale was used for pain assessment (Fig B). Analgesic consumption was recorded as binary response (yes/no). The patients were asked to rate the visual analog scale on 1st, 3rd and 7th day.

Fig. A – Questionnaire given to the patients

STATISTICAL ANALYSIS

Statistics based on demographic and clinical data such as frequency or percentage, arithmetic mean, and standard deviation were calculated using basic descriptive statistical methods. Between-group differences were assessed via chi-square tests for categorical measures and independent t tests for continuous variables. SPSS 17.0 Software was used to analyze the longitudinal data with the multilevel mixed-effects model-analysis approach.

RESULTS

Data from 100 participants between the age group 11-18 years old were included in the analysis (25 participants were in age group of 11-12 years, 24 participants were in age group of 13-14 years, 26 participants were in age group of 15-16 years and remaining 25 participants were in age group of 17-18 years shown in Fig.B; mean age, 14.54 years; SD, 2.29 years; 50 girls, 50 boys Fig.C. The mean overall scores across before psychological activity all items of the VAS were 4.93(SD, 2.27) for boys and 4.31 (SD, 2.03) for girls. The mean overall scores across after psychological activity all items of the VAS were 4.93(SD, 2.27) for boys and 4.31 (SD, 2.03) for girls. Pearson chi-square tests showed that the differences before performing the psychological activity in day 1, day 3 and day 7 is statistically significant (chi-square-276.65& P-0.0001) Shown in Table.1 . Pearson chi-square tests showed that the differences after performing the psychological activity in day 1, day 3 and day 7 is statistically significant (chi-square-186.12& P-0.0001) Shown in Table.2 The association between visual analogue pain level and socio-demographic variable like age and sex we go for chi-square analysis there we can easily find statistically significance both age and sex group (P-value 0.0001). We had calculated analgesic consumption by “yes” and “no” type questionnaire which was also statistically significant (chi-square-186.12& P-0.0001) shown in Table.3.

Fig.B: Age wise distribution of participants

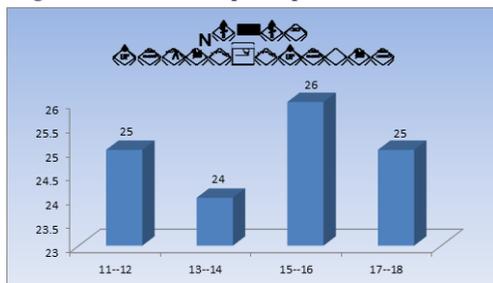


Fig.C: Mean and SD of study parameters

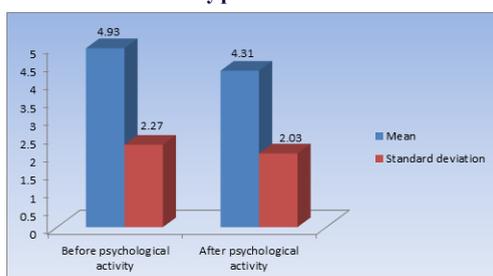


Table.1: Shows Chi-square analysis before psychological activity of Pain level on Day1, Day3 and Day7.

Pain level	Day 1	Day 3	Day 7	Chi-Square	P-value
Mild	0	16	86	276.65	0.0001*
Moderate	27	71	14		
Severe	73	13	0		

Table.2: Shows Chi-square analysis after psychological activity of Pain level on Day1, Day3 and Day7.

Pain level	Day 1	Day 3	Day 7	Chi-Square	P-value
Mild	8	63	98	186.12	0.0001*
Moderate	59	36	2		
Severe	33	1	0		

Table.3: Shows Chi-square analysis analgesic consumption on Day1, Day3 and Day7.

Analgesic Consumption	Day 1	Day 3	Day 7	Chi-Square	P-value
Yes	67	0	0	172.53	0.0001*
No	33	100	100		

Table.4: Comparison between Males and Females before Psychological Activity

Before Psychological Activity	Mean	S.D	Paired t-value	P-value	Inference
Male	4.313	1.196	5.476	0.0001	Significant
Female	5.546	1.051			

Table.5: Comparison between Males and Females after Psychological Activity

After Psychological Activity	Mean	S.D	Paired t-value	P-value	Inference
Male	2.826	1.133	3.747	0.0003	Significant
Female	3.623	0.9782			

DISCUSSION

The objective of this study was to evaluate the influence of psychological activity on orthodontic pain perception and analgesic consumption in adolescents undergoing orthodontic treatment. In this study, pain increased from two hours after orthodontic separator placement to a peak level at 24 hours after placement. This is in agreement with the results of several other studies. Polat et al,⁷ Law et al,¹⁷ Bernhardt et al,¹⁸ and Wilson et al¹⁹ reported peak discomfort at 24 hours with a gradual decrease in pain levels until seven days after separator placement. Several studies have shown that orthodontic treatment is frequently associated with pain.^{3,9,20,21,22} In agreement with these studies, the present investigation showed that the experience of pain peaked 1 day (24 h) after the start of treatment.^{3,12,20,23} Pain intensity and the number of individuals experiencing pain then decreased, but even at day 7 a considerable proportion still reported pain. This was in agreement with Scheurer et al,⁴ who reported 25% 'discomfort' (rather than pain) after one week. However, it should be remembered that, while Scheurer and coworkers used a variety of treatment methods, the present study only used patients who were subjected to one uniform treatment with separators. The orthodontic literature rarely points to any correlation between gender and perception of pain during orthodontic treatment.^{11,12,24} However, there are studies, which have found that girls report more discomfort/pain than boys,^{4,20} which is in agreement with reports on general pain among teenage individuals^{25,26,27} and with the present study. This finding could also be an important predictor of pain experiences in orthodontics. When pain intensity peaked 1 day after separation, 67% of the patients relieved the pain by taking painkillers. This was clearly a higher percentage than was reported by Scheurer et al,⁴ where 16% of the patients took painkillers. However, by day 3 and day 7 the pain was already reduced, and none of the patients continued medication. Many studies have evaluated the pain response of patients undergoing orthodontic treatment following separator placement.^{28,29} Ngan, and coworkers¹¹ reported that pain and discomfort started at 4 hours and increased over the next 24 hours after the insertion of separators. Bondemark and coworkers⁷ reported that the worst pain with separators was experienced on day 2, which subsided almost completely by day 5. Our findings demonstrate a significant influence of psychological activity on pain perception and analgesic consumption. On the first day after placing the separators, all the patients reported with moderate to severe pain whereas, after performing the prescribed psychological activity the pain perception was relieved in 40% of the patients. Similarly on the 3rd day pain

perception was relieved in 81% of the patients. These findings indicate that distraction with music, watching television, meditation, reading novels helps reducing the pain and analgesic consumption. These results are consistent with several other studies^{30,31,32} that proved that distraction with various methods can be used and are useful in reducing anxiety in dental patients and eventually the pain perception. Use of medication to relieve orthodontic pain can be quite frequent among adolescents, and there would likely be variability in the overall frequency of analgesic consumption on each day depending on the duration and the intensity of the pain.³³ In our study, however, the data related to analgesic consumption were limited to a yes or no response each day. Therefore, we could not quantify the dose and frequency of analgesic consumption. Further work is needed to extend the preliminary findings reported here, especially regarding the relationship between frequency and dose of analgesics.

CONCLUSION

- Distraction is a relatively unique activity which has the capacity to relieve some amount of pain.
- Many physiologic and psychobiologic mechanisms interact to produce the beneficial effects of reducing pain.
- Our preliminary findings show that psychological activity like distraction has a significant influence on orthodontic pain perception and analgesic consumption in adolescents undergoing orthodontic treatment.
- Meditation though performed less in the adolescent group showed significant and most reduction in the pain perception.
- The most performed activity in the adolescents were watching television and listening to music which also has significant reduction in the pain perception.
- These activities should be advised by the clinician to the adolescent patients seeking orthodontic treatment and should be motivated to engage themselves in such psychological activities to reduce the pain perception and ultimately reducing the analgesic consumption.
- Further research is needed in this area to better understand the association between psychological activity and orthodontic pain.

References

1. Feu D, Oliveira BH, Celeste RK, Miguel JAM. Influence of orthodontic treatment on adolescents' self-perceptions of esthetics. *Am J Orthod Dentofacial Orthop.* 2012;141:743-750.
2. Firestone AR, Scheurer PA, Burgen WB. Patients' anticipation of pain and pain-related side effects, and their perception of pain as a result of orthodontic treatment with fixed appliances. *Eur J Orthod.* 1999;21:387-396.
3. Marianne Bergius, Anders G. Broberg, Magnus Hakeberg, Ulf Berggren. Prediction of prolonged pain experiences during orthodontic treatment. *Am J Orthod Dentofac Orthop* 2008; 133: 339 e1-e5.
4. Philipp A. Scheurer, Allen R. Firestone, Walter B. Burgen. Perception of pain as a result of orthodontic treatment with fixed appliances. *Eur J Orthod* 1996; 18: 349-357.
5. Bergius M, Berggren U, Kiliaridis S. Experience of pain during an orthodontic procedure. *Eur J Oral Sci* 2002;110:92-98.
6. Bondemark L, Fredriksson K, Iiros S. Separation effect and perception of pain and discomfort from two types of orthodontic separators. *World J Orthod* 2004; 2: 172-176.
7. Omur Polat, Ali Ihya Karaman. Pain Control During Fixed Orthodontic Appliance Therapy. *Angle Orthod* 2005; 75: 214-219.
8. Giannopoulou C, Dudic A, Kiliaridis S. Pain discomfort and crevicular fluid changes induced by orthodontic elastic separators in children. *J Pain* 2006;7:367-376.
9. Patel V. Non-completion of orthodontic treatment: a study of patient and parental factors contributing to discontinuation in the hospital service and specialist practice [thesis]. Heath Park: University of Wales; 1989.
10. Oliver RG, Knapman YM. Attitudes to orthodontic treatment. *Br J Orthod* 1985;12:179-188.
11. Ngan P, Bratford K, Wilson S. Perception of discomfort by patients undergoing orthodontic treatment. *Am J Orthod Dentofac Orthop.* 1989;96:47-53.
12. Jones M, Chan C. The pain and discomfort experienced during orthodontic treatment. A randomized controlled trial of two aligning archwires. *Am J Orthod Dentofac Orthop.* 1992;102:373-381.
13. Erdinc AM, Dincer B. Perception of pain during orthodontic treatment with fixed appliances. *Eur J Orthod.* 2004;26:79-85.
14. Melzack, R. The McGill Pain Questionnaire: major properties and scoring methods. *Pain*, 1 (1975) 277-299.
15. Bergius M, Berggren U, Kiliaridis S. Experience of pain during an orthodontic procedure. *Eur J Oral Sci* 2002;110:92-98.
16. Chantal Villemure, M. Catherine Bushnell. Cognitive modulation of pain: how do attention and emotion influence pain processing? *Pain* 95 (2002) 195-19.
17. Law SLS, Southard KS, Law AS, Logan HL, Jakobsen JR. An evaluation of postoperative ibuprofen treatment of pain associated with orthodontic separator placement. *Am J Orthod Dentofacial Orthop.* 2000;118:629-635.
18. Bernhart MK, Southard KA, Batterson KD, Logan HL, Baker KA, Jakobsen JR. The effect of preemptive and/or postoperative ibuprofen therapy for orthodontic pain. *Am J Orthod Dentofacial Orthop.* 2001;120:20-27.
19. Wilson S, Ngan P, Kess B. Time course of the discomfort in patients undergoing orthodontic treatment. *Pediatr Dent.* 1989; 11:107-110.
20. Kvam E, Gjerdet NR, Bondevik O. Traumatic ulcers and pain during orthodontic treatment. *Community Dent Oral Epidemiol* 1987; 15: 104-107.
21. Bergius M, Kiliaridis S, Berggren U. Pain in orthodontics. A review and discussion of the literature. *J Orofac Orthop* 2000; 61: 125-137.
22. Jones ML, Chan C. Pain in the early stages of orthodontic treatment. *J Clin Orthod* 1992; 26: 311-313.

23. Steen Law SL, Southard KA, Law AS, Logan HL, Jakobsen JR. An evaluation of preoperative ibuprofen for treatment of pain associated with orthodontic separator placement. *Am J Orthod Dentofac Orthop* 2000; 118: 629-635.
24. Fernandes LM, Ogaard B, Skoglund L. Pain and discomfort experienced after placement of a conventional or a superelastic NiTi aligning archwire. A randomized clinical trial. *J Orofac Orthop* 1998; 59: 331-339.
25. McGrath PJ, Craig KD. Developmental and psychological factors in children's pain. *Pediatr Clin North Am* 1989; 36: 823-836.
26. Goodenough B, Thomas W, Champion GD, Perrott D, Taplin JE, Von Baeyer CL, Ziegler JB. Unravelling age effects and sex differences in needle pain: ratings of sensory intensity and unpleasantness of venipuncture pain by children and their parents. *Pain* 1999; 80: 179-190.
27. Perquin CW, Hazebroek-Kampschreur AA, Hunfeld JA, Bohnen AM, VAN Suijlekom-Smit LW, Passchier J, Van Der Wouden JC. Pain in children and adolescents: a common experience. *Pain* 2000; 87: 51-58.
28. Shrawan Kumar Sharma, Neeral Barthunia, Animesh Pandit, Alpna Singh. Perception of discomfort and amount of separation from two types of orthodontic separators: A Prospective Study. *IJOHMR* 2017; 4: 35-38.
29. Nalbantgil D. Perception of pain and discomfort during tooth separation. *Aust Orthod J;* 2009;25:110-115.
30. Ingersoll BD, Nash DA, Gamber C. The use of contingent audiotaped material with pediatric dental patients. *JADA.* 1984;109(5):717-719.
31. Stark LJ, Allen KD, Hurst M, Nash DA, Rigney B, Stokes TF. Distraction: its utilization and efficacy with children undergoing dental treatment. *J Appl Behav Anal.* 1989;22(3):297-307.
32. Parkin SF. The effect of ambient music upon the reactions of children undergoing dental treatment. *ASDC J Dent Child.* 1981;48(6):430-432.
33. Satpal S. Sandhu, Jasleen Sandhu. Effect of physical activity level on orthodontic pain perception and analgesic consumption in adolescents. *Am J Orthod Dentofac Orthop* 2015;148:618-627.