Acta Scientific Dental Sciences

Volume 9 Issue 11 November 2025

Research Article

The Efficacy of a Behavioral Management Technique in Reducing Anxiety and Pain in Adolescent Dental Patients: A Randomized Controlled Trial

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DOI: 10.31080/ASDS.2025.09.2066

Received: September 29, 2025

Published: October 24, 2025

Abstract

Objective: This randomized controlled trial investigated the effects of a modified behavioral management technique, a pre-procedural recorded patient video demonstration, on anxiety and pain in adolescents in the first five days following the initial placement of fixed orthodontic appliances.

Materials and Methods: A total of 116 subjects between the ages of 10-17 were enrolled in the study, with 88 completing the study. Subjects were randomly allocated to either a recorded typodont group (control) or a recorded patient video group (experimental). Patient perceptions of anxiety and pain were evaluated with the six-item short form of the Spielberger State-Trait Anxiety Inventory (STAI) and the visual analog scale (VAS). Primary outcome was the change in anxiety, while the secondary outcome was difference in pain.

Results: This study revealed that subjects in the recorded patient video group reported significantly lower levels of anxiety and pain compared to the recorded typodont group, particularly within the first 24 hours post-procedure ($p < 0.001$). Anxiety and pain and levels in both groups gradually decreased over the five-day follow-up period. No significant differences were found between genders for either anxiety or pain.

Conclusions: This study found that recorded patient video demonstrations significantly reduced physiological anxiety and pain in adolescents undergoing the initial placement of fixed orthodontic appliances compared to recorded typodont videos. The most pronounced reduction occurred within the first 24 hours, a critical period for patient comfort. Audiovisual tools like these can enhance the orthodontic experience by improving patient comfort and reducing anxiety.

Keywords: Behavior Management; Anxiety Management; Patient Education; Audiovisual Demonstration; Adolescents

Introduction

Dental anxiety remains pervasive with between 50 and 80% of children and adults in the United States exhibiting some degree of dental uneasiness [1]. Dental anxiety is a complex, subjective emotion influenced by many factors, including, age, sex, socioeconomic status, previous dental experiences and, in the case of children and adolescents, parental dental anxiety [2]. Previous studies have shown conflicting evidence on the effects of these factors on anxiety [3-7]. especially in the pediatric and adolescent populations which comprise the majority of orthodontic patients.

In orthodontics, pain and discomfort are side effects of orthodontic tooth movement and a common complaint of patients seeking orthodontic treatment [8-12]. Studies consistently report that

orthodontic pain usually begins two hours after force application, peaks within the first 24 hours post-force application and typically lasts 5-7 days [13-18]. One study demonstrated that it is not only the amount of tissue insult, but that other factors, including anxiety, are contributors to the severity of pain experienced following initial bonding [18].

Sheard and Garrud [19] found that providing adequate information to patients prior to a medical procedure resulted in less anxiety prior to the procedure. Another study found that 74% of children wanted to learn more about their orthodontic treatment and 40% expressed anxiety, in particular towards fixed appliances and impression-taking [20]. An additional study suggested that adolescent orthodontic patients were unclear about the process of placing fixed orthodontic appliances and would like more information to reduce their anxiety [21]. In fact, the majority (87%) of participants stated that they thought information in an audiovisual format would be beneficial to them because it would allow them to see what happens during the appointment [2].

The aim of this randomized controlled trial was to compare the effectiveness of a recorded patient video demonstration on reducing anxiety, as the primary outcome, and pain, as the secondary outcome, in the five days following initial placement of fixed orthodontic appliances.

Materials and Method

Trial design

This single center, parallel group randomized control trial was approved by the Institutional Review Board at the Seton Hill University in Greensburg, Pennsylvania. Guidelines as described by CONSORT 2010 [22] were followed to minimize bias and enhance reporting. The visual analog scale (VAS) for pain assessment [11] and the six item short form Spielberger State-Trait Anxiety Inventory (STAI) for anxiety assessment [23] were followed for data collection.

All eligible participants were assigned using permuted blocks randomization [24] to either the control group, patients viewing the recorded typodont video, or the experimental group, patients viewing a recorded patient video. Participants were blinded to their group allocation.

Treating residents were calibrated and followed a standardized bonding protocol. The video script was identical across the control and experimental groups.

Participants, eligibility criteria and study setting

Based on a power analysis, a sample size of 88 was determined. Eighty-eight healthy participants, aged 10-17 years, scheduled for initial bonding at Seton Hill University, Center for Orthodontics, Greensburg, Pennsylvania were recruited. Eligible participants were randomized from those who met the inclusion and exclusion criteria. If the patient and their parent(s) agreed to participate, they were debriefed but blinded to the purpose of the study. Written and verbal informed consents were then obtained from the legal parent or guardian, and verbal assent from each minor child, as all research subjects were under the age of 18. Protocols were thoroughly explained to participants prior to the beginning of their initial bonding procedure.

The inclusion criteria were as follows: (1) patients between the age of 10-17; (2) patients starting fixed orthodontic treatment with an initial single arch bonding of at least ten teeth; and (3) patients free from any periodontal disease. The exclusion criteria were as follows: (1) patients with a history of previous orthodontic treatment; (2) patients that have had extraction(s) of permanent teeth within the last four weeks; (3) patients with congenital abnormalities or craniofacial syndromes; (4) patients who took analgesic medications within eight hours of the appointment; (5) patients previously diagnosed with chronic pain or anxiety; and (6) patients who were unwilling or unable to comprehend or complete the provided questionnaires.

Interventions

A recorded typodont video (control) was created depicting a female doctor demonstrating an initial bonding appointment on a typodont. A recorded patient video (experimental) was created of a female doctor demonstrating the initial bonding appointment on both a male and female model patient between the ages of 10 and 17. Each video showed the initial bonding procedure and wire placement from start to finish with the same audio recording explaining the process step-by-step. Portions of the video were accelerated in the interest of time. Model patients were recorded so their body language and any audio feedback could be captured during the procedure. An AI-generated voice over narration was added to explain each procedural step.

All eligible participants were assigned using random permuted blocks with minimization to either the control group, or the experimental group [24]. Participants were blinded to their group allocation. The age and gender of all participants were recorded. During the consultation and prior to watching the video, patients were asked to complete the pre-procedure questionnaire assessing their baseline levels of pain and anxiety. The pre-procedural and post-procedure questionnaires were identical other than three additional questions on the pre-procedure questionnaire pertaining to previous orthodontic treatment, analgesic usage and diagnoses of chronic pain or anxiety. Written and verbal directions on how to complete the questionnaires were given to all subjects.

Outcomes and any changes after trial commencement

Participants were asked to complete the post-procedure questionnaire at least four hours after watching the video and initial bonding, 24 hours later, three days later, and five days later. A total of five timepoints were analyzed. All questionnaires were distributed automatically and electronically via Qualtrics (Seattle, Washington). Patient pain severity was measured with a 100-mm VAS while the STAI short form was rated on a Likert scale, typically from 1 to 4, with higher scores reflecting greater anxiety. Some items are reverse scored, meaning a high score on those items indicates lower anxiety. After adjusting for reverse-scored items, the scores are summed to obtain a total score, where higher totals reflect higher anxiety levels. The final score can be interpreted using normative data or cut-off points specific to different populations [23].

Dropouts and missing data

Dropouts were handled via the per-protocol principle which states that only patients who are fully compliant to the clinical trial protocol can be utilized in the data analysis. The per-protocol analysis provides an estimate of the true efficacy of an intervention, i.e., among those who completed the treatment as planned [25].

Sample size calculation

A power analysis was performed using the software program G*Power 3.1.9.7. (Kiel, Germany). With the power set at 80%, an effect size of f = 0.25 and an α risk of 0.05, a sample size of 82 subjects was needed.

Randomization

This was a parallel group, single center, randomized clinical trial. Group allocation was determined using block randomization with minimization. The randomization sequence was generated and participants were allocated to a random mix of blocks of size 4 to balance age and gender. Allocation was concealed using sequentially numbered, sealed, opaque manila envelopes containing the treatment assignment for each subject. The envelopes were prepared before trial initiation [26,27].

Statistical analysis

Descriptive statistics were presented through means, standard deviations, standard errors of mean, range, confidence intervals, and coefficient of variation. Data was analyzed using a 2x2x5r MANOVA with two levels of gender (male and female); two levels of treatment (typodont and live patient video); and five levels of time (Pre-treatment, 4 hours, 24 hours, 3 days, and 5 days. Pain and anxiety levels, were measured via a visual analog scale (VAS) and the Spielberger State-Trait Anxiety Inventory (STAI), respectively. The Bonferroni correction was used to adjust the significance level when conducting multiple hypothesis tests simultaneously. Data were analyzed with the software program IBM SPSS Statistics v. 29.0 (Armonk, NY). The level of significance was established at 0.05.

Results

Eighty-eight of the 116 enrolled patients completed all five assessment time points and were included in the analysis (Figure 1). Anxiety and pain scores were evaluated across time (pre-procedure and 4 hours, 24 hours, 3 days, and 5 days post-procedure) using a repeated-measures design with treatment group (recorded patient video vs. recorded typodont video) and gender as factors.

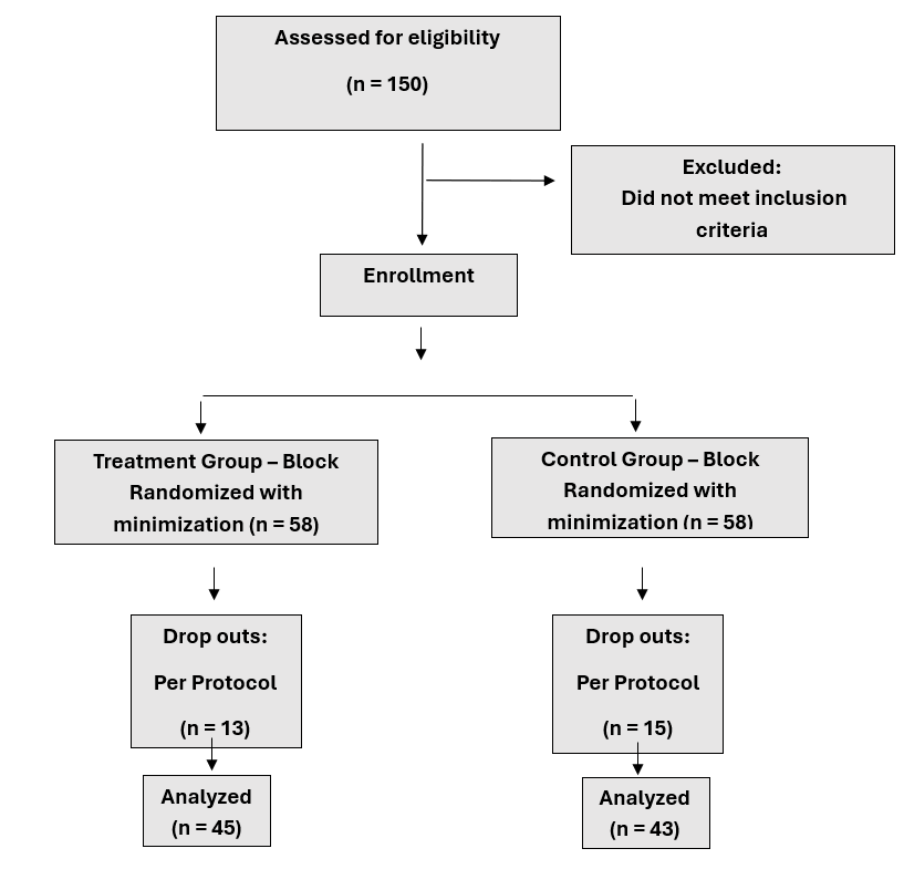

Figure I: Study Participation Flow Chart (Consort 2010) Consort 2010 Explanation and Elaboration: updated guidelines for reporting parallel group randomized trials. BMJ 2010; 340:c869.

Neither anxiety not pain outcomes differed significantly by patient gender (Table 1). In contrast, the type of pre-procedural video had a clear effect: participants who watched the recorded live-patient video demonstration reported significantly anxiety and pain levels than those who viewed the recorded typodont video (Table 2). Throughout the study period, the control group (recorded typodont video) consistently reported higher mean pain and anxiety scores than the experimental group (recorded patient video).

Anxiety and pain also varied significantly over time (Table 3). Both measures rose after appliance placement, peaked around 24 hours post-procedure, and then declined steadily. By the 5-day follow-up, average anxiety and pain levels had greatly diminished from their 24-hour peak (Figure 2 and Figure 3). There was a significant interaction between treatment group and time for both anxiety and pain (Table 4).

Measure	Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Pain (VAS)	Male	16.341	1.274	13.806	18.876
	Female	12.912	1.204	10.517	15.306
Anxiety (STAI)	Male	9.126	.299	8.532	9.721
	Female	9.100	.282	8.538	9.662

Table 1: Comparison of Pain and Anxiety Scores by Gender.

Measure	Treatment	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Pain (VAS)	Control	17.701	1.260	15.194	20.207
	Experimental	11.552	1.219	9.128	13.976
Anxiety (STAI)	Control	10.100	.296	9.512	10.688
	Experimental	8.126	.286	7.558	8.695

Table 2: Comparison of Pain and Anxiety Scores by Treatment Group.

Measure	Time	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Pain (VAS)	Pre	2.959	.820	1.329	4.590
	4 Hr	20.979	1.630	17.737	24.222
	24 Hr	29.570	1.699	26.192	32.948
	3 Days	14.007	1.369	11.285	16.729
	5 Days	5.616	1.137	3.355	7.877
Anxiety (STAI)	Pre	9.830	.337	9.159	10.501
	4 Hr	10.057	.362	9.337	10.777
	24 Hr	10.397	.376	9.650	11.145
	3 Days	8.160	.262	7.639	8.681
	5 Days	7.121	.201	6.722	7.521

Table 3: Comparison of Pain and Anxiety Scores by Timepoint.

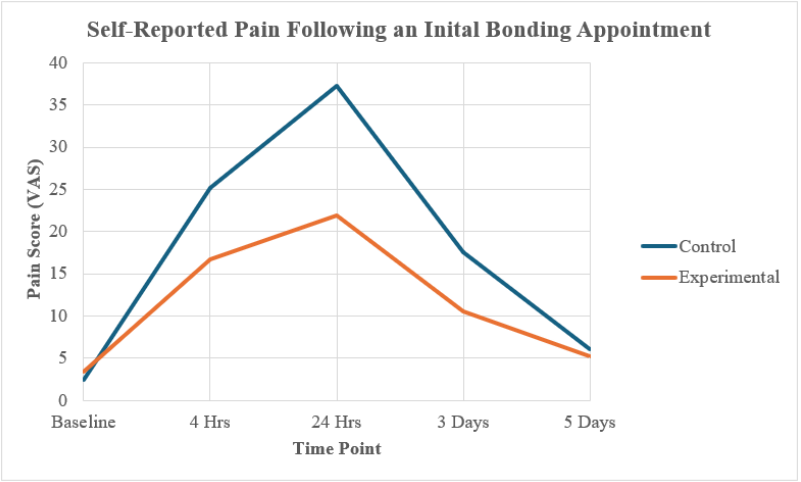

Figure 2: Comparison of Self-Reported Pain at an Initial Bonding Appointment after viewing a Video Illustration of self-reported pain scores utilizing the Visual Analog Scale, measured at 5 time points. Control group viewed a recorded video of initial bonding appointment using a typodont. Experimental group viewed a recorded video of initial bonding appointment using a live patient.

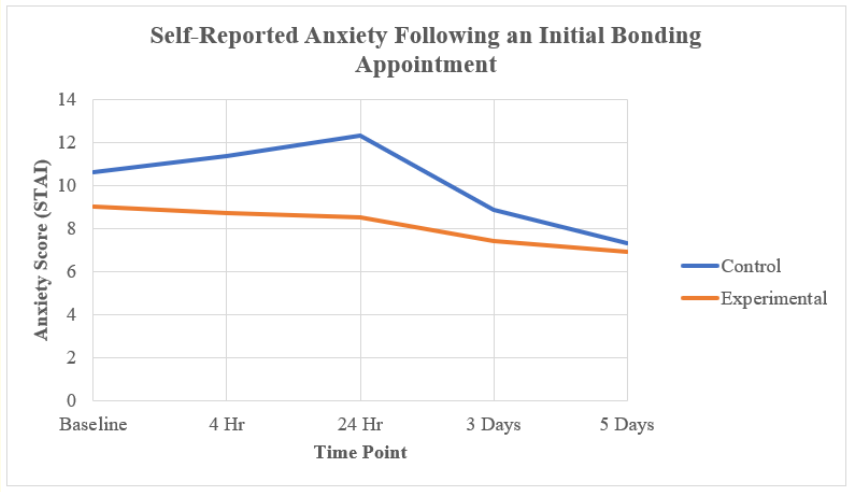

Figure 3: Comparison of Self-Reported Anxiety at an Initial Bonding Appointment after viewing a Video Illustration of self-reported anxiety scores utilizing the short form Spielberger State-Trait Anxiety Inventory, measured at five time points. Control group viewed a recorded video of initial bonding appointment using a typodont. Experimental group viewed a recorded video of initial bonding appointment using a live patient.

Measure	Treatment	Time	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Pain (VAS)	Control	Pre	2.475	1.179	.131	4.819
		4 Hr	25.200	2.343	20.539	29.861
		24 Hr	37.268	2.442	32.411	42.125
		3 Days	17.493	1.968	13.580	21.407
		5 Days	6.068	1.634	2.818	9.318
	Experimental	Pre	3.443	1.140	1.176	5.711
		4 Hr	16.759	2.266	12.251	21.267
		24 Hr	21.872	2.362	17.175	26.569
		3 Days	10.521	1.903	6.736	14.306
		5 Days	5.164	1.580	2.020	8.307
Anxiety (STAI)	Control	Pre	10.627	.485	9.663	11.592
		4 Hr	11.384	.520	10.349	12.419
		24 Hr	12.289	.540	11.214	13.363
		3 Days	8.889	.376	8.140	9.637
		5 Days	7.311	.289	6.737	7.885
	Experimental	Pre	9.033	.469	8.100	9.965
		4 Hr	8.729	.503	7.728	9.730
		24 Hr	8.506	.523	7.467	9.545
		3 Days	7.432	.364	6.707	8.156
		5 Days	6.932	.279	6.376	7.487

Table 4: Pain and Anxiety Scores by Timepoint.

Measure	Gender	Treatment	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Pain (VAS)	Male	Control	19.720	1.824	16.092	23.348
		Experimental	12.962	1.780	9.421	16.503
	Female	Control	15.682	1.739	12.223	19.141
		Experimental	10.142	1.665	6.830	13.454
Anxiety (STAI)	Male	Control	10.100	.428	9.249	10.951
		Experimental	8.152	.417	7.322	8.983
	Female	Control	10.100	.408	9.289	10.911
		Experimental	8.100	.391	7.323	8.877

Table 5: Effect of Treatments on Pain and Anxiety Scores by Gender.

	Gender	Time	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Pain (VAS)	Male	Pre	4.106	1.192	1.735	6.476
		4 Hr	22.938	2.370	18.225	27.652
		24 Hr	32.426	2.469	27.515	37.338
		3 Days	15.675	1.990	11.717	19.633
		5 Days	6.560	1.653	3.273	9.846
	Female	Pre	1.813	1.126	-.427	4.052
		4 Hr	19.021	2.239	14.568	23.474
		24 Hr	26.714	2.333	22.074	31.354
		3 Days	12.339	1.880	8.600	16.078
		5 Days	4.672	1.561	1.567	7.777
Anxiety (STAI)	Male	Pre	9.579	.490	8.603	10.554
		4 Hr	10.475	.526	9.428	11.522
		24 Hr	10.389	.546	9.303	11.476
		3 Days	8.061	.381	7.304	8.818
		5 Days	7.127	.292	6.547	7.708
	Female	Pre	10.081	.463	9.160	11.003
		4 Hr	9.638	.497	8.649	10.627
		24 Hr	10.405	.516	9.379	11.432
		3 Days	8.259	.360	7.544	8.975
		5 Days	7.116	.276	6.567	7.664

Table 6: Effect of Time on Pain and Anxiety Scores by Gender.

Measure	Time	(I) Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
							Lower Bound	Upper Bound
Pain (VAS)	Pre	Control	Experimental	-.968	1.640	.556	-4.229	2.293
	4Hr	Control	Experimental	8.441*	3.260	.011	1.957	14.925
	24Hr	Control	Experimental	15.396*	3.397	<.001	8.639	22.153
	3 Day	Control	Experimental	6.972*	2.737	.013	1.528	12.417
	5 Day	Control	Experimental	.904	2.273	.692	-3.617	5.426
Anxiety (STAI)	Pre	Control	Experimental	1.595*	.675	.020	.253	2.936
	4Hr	Control	Experimental	2.655*	.724	<.001	1.215	4.095
	24Hr	Control	Experimental	3.783*	.752	<.001	2.288	5.278
	3 Day	Control	Experimental	1.457*	.524	.007	.415	2.499
	5 Day	Control	Experimental	.380	.401	.347	-.419	1.178

Table 7: Test for Pairwise Comparisons.

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Differences between the two video groups were most pronounced at the early post-procedure intervals. At 4 hours and 24 hours after bracket placement, the control group reported substantially higher anxiety and pain than the live-video group. By day 5, anxiety and pain had decreased in both groups with little difference between the experimental and control conditions.

Discussion

The present study demonstrates that adolescents who viewed a peer-modeled, recorded patient video experienced significantly less self-reported anxiety and pain following the initial placement of fixed orthodontic appliances compared to those who viewed a typodont-based instructional video. These findings align with and extend previous literature emphasizing the effectiveness of audiovisual and modeling interventions in medical and dental anxiety management [28,29].

Anxiety and pain peaked at 24 hours post-bonding, corroborating earlier studies that show orthodontic pain generally intensifies within the first day after force application [14,18]. Our results confirm this trajectory while demonstrating that an audiovisual peer demonstration can mitigate this 24-hour peak. Pairwise comparisons confirmed that the experimental group reported significantly lower pain scores at 4 hours, 24 hours, and 3 days post-treatment. By day five, both groups reported similarly low pain levels, suggesting the primary benefit is during the acute phase of post-procedural discomfort.

Interestingly, baseline anxiety was significantly higher in the control group before video exposure, possibly influenced by two statistical outliers. While this complicates direct comparisons, the consistent pattern of reduced anxiety in the experimental group at all post-treatment timepoints suggests a meaningful psychological benefit from peer-modeled audiovisual exposure. Prior research supports this notion, showing that procedural modeling-especially by relatable peers-can reduce anticipatory anxiety and improve patient cooperation [30,31].

The use of patient-modeled video aligns with current adolescent learning preferences. Digital-native patients often respond more favorably to video-based content than text or static imagery [32]. Additionally, audiovisual modeling promotes greater engagement and emotional resonance, which are known to reduce threat perception in unfamiliar or stressful medical scenarios [33]. Importantly, this method is cost-effective, scalable, and adaptable to multiple languages and cultural settings, supporting its implementation across diverse patient populations.

While our findings are promising, several limitations must be acknowledged. This is a single center study of a non-invasive procedure (placing brackets). Despite calibration efforts, including scripting, inter-operator variability remains. Nonetheless, the results are promising and warrant further investigation. Future studies should consider using a smaller number of highly standardized operators or assess intra-rater reliability more systematically.

The generalizability of our findings is limited to adolescents aged 10-17undergoing initial orthodontic bonding at a single academic center. Broader research is needed to determine whether these outcomes apply to younger children, adult orthodontic patients, or those undergoing other types of dental or surgical procedures. Moreover, long-term follow-up could help determine whether decreased pain and anxiety positively influence treatment compliance, appointment attendance, and overall satisfaction.

Moving forward, comparative research on different formats of audiovisual education-including virtual reality, interactive mobile apps, and immersive simulations-may reveal even more effective behavioral strategies. Investigating how these tools affect cognitive understanding, memory retention, and behavioral adherence will also enhance the field of patient-centered care.

The findings of this study are especially relevant in today's increasingly technological world, where younger populations are growing more accustomed to receiving information through audiovisual media. The shift toward concise video presentations, as employed in this study, aligns with the learning preferences of this generation, making it easier for adolescents to engage with and understand information within their digital comfort zones. The use

of recorded patient videos not only personalizes the experience, bridging the gap between theoretical instruction and relatable content but also offers broad accessibility. This method transcends socioeconomic and educational barriers, providing a valuable tool for reducing anxiety and improving patient understanding across various populations, including those with higher needs. As reliance on technology and audiovisual education continues to rise, the approach highlighted in this study may serve as a model for enhancing patient education and experience in dental and medical settings.

Conclusions

- Viewing a recorded patient video demonstration significantly reduces anxiety and pain in adolescents undergoing the initial placement of fixed orthodontic appliances compared to a recorded typodont video demonstration.
- The reduction anxiety and pain is most pronounced in the first 24 hours following the procedure, which is the critical period for patient comfort and satisfaction.
- The use of audiovisual patient education tools, such as recorded patient video demonstrations, may enhance the orthodontic experience by improving patient comfort and reducing anticipatory anxiety.

Bibliography

1. Kamin Vara. "Fear, Stress, and the Well Dental Office". *Northwest Dentistry* 85.2 (2006): 10-18.

2. Srai JP., *et al.* "Assessment of the Effect of Combined Multimedia and Verbal Information vs. Verbal Information Alone on Anxiety Levels before Bond-up in Adolescent Orthodontic Patients: A Single-Center Randomized Controlled Trial". *American Journal of Orthodontics and Dentofacial Orthopedics* 144.4 (2013): 505-511.

3. Tickle M., *et al.* "A Prospective Study of Dental Anxiety in a Cohort of Children Followed from 5 to 9 Years of Age". *International Journal of Paediatric Dentistry* 19.4 (2009): 225-232.

4. Nuttall NM., *et al.* "Children's Dental Anxiety in the United Kingdom in 2003". *Journal of Dentistry* 36.11, 2008): 857-860.

5. Enkling Norbert., *et al.* "Dental Anxiety in a Representative Sample of Residents of a Large German City". *Clinical Oral Investigations* 10.1 (2006): 84-91.

6. Olteanu Cristian Doru., *et al.* "Pain Perception during Orthodontic Treatment with Fixed Appliances-A Systematic Review". *Applied Sciences* 12.13 (2022): 6389.

7. Hussain SA., *et al.* "Effects of Exposure to Animated Videos of Dental Procedures on Patients' Anxiety and Decision-Making". *Quarterly Journal of Social Sciences and Humanities* (2024).

8. Farzanegan F., *et al.* "Pain Reduction after Initial Archwire Placement in Orthodontic Patients: A Randomized Clinical Trial". *American Journal of Orthodontics and Dentofacial Orthopedics* 141.2 (2012): 169-173.

9. Sergl HG., *et al.* "Pain and Discomfort during Orthodontic Treatment: Causative Factors and Effects on Compliance". *American Journal of Orthodontics and Dentofacial Orthopedics* 114.6 (1998): 684-691.

10. Erdinc AM and B Dincer. "Perception of Pain during Orthodontic Treatment with Fixed Appliances". *European Journal of Orthodontics* 26 (2004): 79-85.

11. Polat O and AI Karaman. "Pain Control during Fixed Orthodontic Appliance Therapy". *Angle Orthodontist* 75, 2005): 214-219.

12. Li J., *et al.* "The Effect of Physical Interventions on Pain Control after Orthodontic Treatment: A Systematic Review and Meta-analysis". *PLOS ONE* 19.2 (2024): e0297783.

13. Bernhardt MK., *et al.* "The Effect of Preemptive and/or Postoperative Ibuprofen Therapy for Orthodontic Pain". *American Journal of Orthodontics and Dentofacial Orthopedics* 120 (2001): 20-27.

14. Fernandes LM., *et al.* "Pain and Discomfort Experienced after Placement of a Conventional or a Superelastic NiTi Aligning Archwire: A Randomized Clinical Trial". *Journal of Orofacial Orthopedics* 59 (1998): 331-339.

15. Jones M and C Chan. "The Pain and Discomfort Experienced during Orthodontic Treatment: A Randomized Controlled Clinical Trial of Two Initial Aligning Archwires". *American Journal of Orthodontics and Dentofacial Orthopedics* 102 (1992): 373-381.

16. Scheurer PA., *et al.* "Perception of Pain as a Result of Orthodontic Treatment with Fixed Appliances". *European Journal of Orthodontics* 18 (1996): 349-357.

17. Sheard C and P Garrud. "Evaluation of Generic Patient Information: Effects on Health Outcomes, Knowledge and Satisfaction". *Patient Education and Counseling* 61.1 (2006): 43-47.

18. Chatziandroni-Frey A., *et al.* "Briefing of Orthodontic Patients". *Journal of Orofacial Orthopedics* 61.6 (2000): 387-397.

19. Stephens R., *et al.* "Information-Seeking Behavior of Adolescent Orthodontic Patients". *American Journal of Orthodontics and Dentofacial Orthopedics* 143.3 (2013): 303-309.

20. Moher D., *et al.* "CONSORT 2010 Explanation and Elaboration: Updated Guidelines for Reporting Parallel Group Randomized Trial". *BMJ* 340 (2010): 849.

21. Marteau TM and H Bekker. "The Development of a Six-Item Short-Form of the State Scale of the Spielberger State-Trait Anxiety Inventory (STAI)". *British Journal of Clinical Psychology* 31.3 (1992): 301-306.

22. Broglio K. "Randomization in Clinical Trials: Permuted Blocks and Stratification". *JAMA* 319.21 (2018): 2223-2224.

23. Ranganathan P., *et al.* "Common Pitfalls in Statistical Analysis: Intention-to-Treat versus Per-Protocol Analysis". *Perspectives in Clinical Research* 7.3 (2016): 144-146.

24. Pandis N. "Randomization. Part 1: Sequence Generation". *American Journal of Orthodontics and Dentofacial Orthopedics* 140 (2011): 747-748.

25. Pandis N. "Randomization. Part 2: Minimization". *American Journal of Orthodontics and Dentofacial Orthopedics* 140 (2011): 902-904.

26. Al-Khotani A., *et al.* "Effects of Audiovisual Distraction on Children's Behaviour and Anxiety during Dental Treatment: A Randomized Controlled Clinical Trial". *Acta Odontologica Scandinavica* 74.6 (2016): 494-501.

27. Al-Namankany A., *et al.* "Video Modelling and Reducing Anxiety Related to Dental Injections in Children". *International Journal of Paediatric Dentistry* 25.4 (2015): 277-282.

28. Hine JF., *et al.* "Decreasing Disruptive Behaviour during Routine Dental Visits through Video Modelling". *Journal of Dentistry* 86 (2019): 103-110.

29. Phaneendra NS., *et al.* "The Effect of Video-Based Preanaesthetic Preparation versus Conventional Approach on Parental Anxiety in Paediatric Dental Procedures". *Cureus* 14.6 (2022): e25867.

30. Park JH., *et al.* "Adolescents' Compliance with Oral Hygiene Instructions during Orthodontic Treatment: A Randomized Controlled Trial". *American Journal of Orthodontics and Dentofacial Orthopedics* 151.3 (2017): 455-462.

31. Klassen JA., *et al.* "Educational Interventions for Children Undergoing Procedures: A Systematic Review". *Pediatrics* 121.2 (2008): e273-e277.