

Anterior openbite malocclusion in adults: Treatment stability and patient satisfaction in National Dental Practice- Based Research Network patients

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ABSTRACT

Objectives: To investigate stability and satisfaction in adult anterior open bite (AOB) patients at least 9 months post-treatment, as well as patient and practitioner factors that may be associated with stability and satisfaction.

Materials and Methods: Practitioners and their adult AOB patients were recruited through the National Dental Practice-Based Research Network. Data on patient and practitioner characteristics, treatment recommendations and factors were previously collected. Treatment stability was determined by assessing post-treatment intraoral photographs. Patient satisfaction was determined from post-treatment questionnaires. Treatment was categorized into aligners, fixed appliances, temporary anchorage devices, and orthognathic surgery. Extractions were also investigated. Retention type was categorized into vacuum-formed, Hawley-style, or bonded retainers, and regimens were classified as full-time or part-time wear.

Results: Retention data collected from 112 patients had a mean post-treatment time of 1.21 years. There were no statistically significant differences in stability between treatment groups. Depending on whether a qualitative index or a millimetric measure was employed, stability ranged from 65% to 89%. Extractions and less initial lower incisor proclination were associated with higher stability in patients treated with fixed appliances only. High satisfaction was reported by patients at retention. There were no clear differences in stability or satisfaction among retention types or regimens.

Conclusions: The stability of adult AOB orthodontic treatment was high, regardless of treatment or retainer modality. Satisfaction in adult AOB patients was high, regardless of retention type or regimen. (*Angle Orthod.* 2022;92:27–35.)

KEY WORDS: Anterior openbite; Stability; Retention; Satisfaction

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INTRODUCTION

Anterior open bite (AOB) is defined as a condition in which the maxillary and mandibular incisors are not in contact when a person occludes on his/her posterior teeth. The prevalence of AOB was found to be about 3% in an adult Caucasian American population, but the prevalence of AOB can range widely from 1.5% to 11% depending on ethnic group and dental age.¹ AOB has been historically considered one of the more challenging malocclusions to correct². This difficulty in treatment can be attributed to AOB's complex etiology, which may be from skeletal, dental, respiratory, habitual, or combined factors.³

Most AOB patients are successfully treated but maintaining positive overbite after treatment can be difficult.⁴ Although there is considerable literature on the end-of-treatment results for AOB patients, there is less literature on the stability of AOB treatment.⁵⁻⁷ Greenlee's meta-analysis on stability included 21 studies and highlighted the need for better evidence.⁵ There also has been an increased interest in the relationship between orthodontic care and quality of life, with a need for better information.^{8,9}

In 2015, the National Dental Practice-Based Research Network (NDPBRN) Anterior Openbite Study was initiated. The purpose of this large, multicenter, prospective cohort study was to explore conventional and newer therapies for adult AOB patients. The study had three phases: Enrollment (T1), End-of-Active Treatment (T2), and >9 months Post-Treatment (T3). Prior publications reported on treatment recommendations, as well as the success rates and patient satisfaction at the end of treatment.¹⁰⁻¹² The purpose of the current paper is to report on the overall stability rate of AOB treatment at T3, patient satisfaction, and factors that might influence stability and satisfaction.

MATERIALS AND METHODS

Dental providers and their adult AOB patients were recruited for this study from across the United States, specifically from the six regions of the NDPBRN. Institutional Review Board approval was obtained prior to study initiation. Details regarding the earlier phases of this study have previously been reported.¹⁰⁻¹² Only adult patients 18 years of age or older were recruited to the study to minimize the impact of facial growth on treatment outcomes and stability. Practitioners were requested to enroll all eligible patients consecutively to avoid selection bias, with a maximum of 15 patients per practitioner. All study forms and questionnaires can be accessed at:

<https://www.nationaldentalpbrn.org/study-results/#1589299528044-b9cab599-914e>

Intraoral frontal photographs from all time points were de-identified and forwarded to the research team at the University of Washington. The Photographic Openbite Severity Index (POSI)¹¹ was used to assess the stability of a patient's open bite based on intraoral frontal photographs. Figure 1 shows examples of POSI scores 1 through 6, and the criteria for each score. A POSI score of 0 indicated that all four incisors had vertical overlap, and represented treatment success at T2 and treatment stability at T3.

Additionally, millimetric overbite of the right central incisors at T2 and T3 was calculated using the intraoral frontal photographs. A positive overbite indicated a stable result. The method for measuring the millimetric photographic overbite from the photos is described in the Appendix. At T3, the proportion of patients exhibiting treatment stability was calculated using the two methods described above.

POSI scores at T3 were assessed by two raters, and the overbite measurements and calculations were performed by one assessor. For POSI scoring,

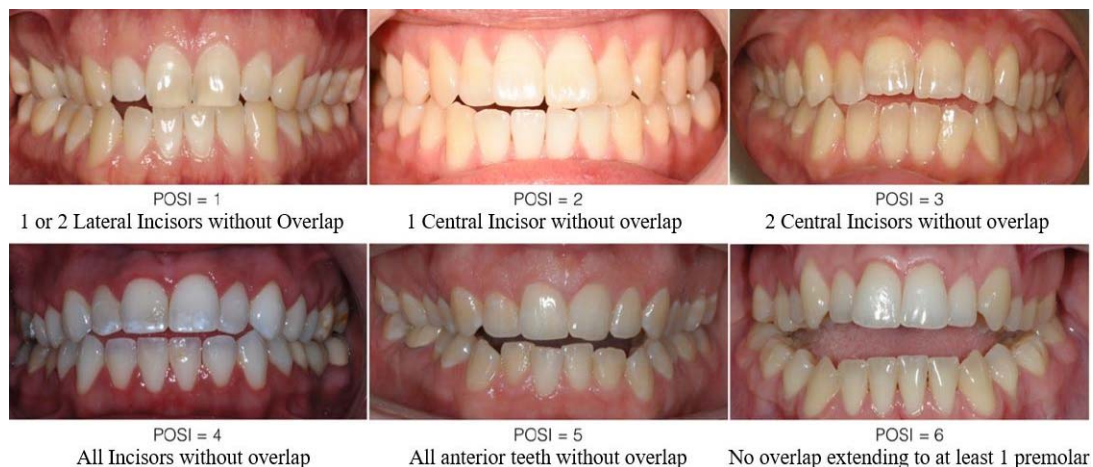


Figure 1. Photographic Openbite Severity Index (POSI).

disagreements in ratings were resolved through consensus between the examiners. To calculate intra- and inter-rater reliability for T3 POSI, twenty T3 intraoral frontal images were randomly selected and millimetric measurements and POSI scores were determined.

Inter-rater reliability of the T3 POSI scores was 95% between the two raters (DG and LT). The intra-rater reliability of the POSI measurements for measurements by the same rater (DG) one month apart was 95%. The intra-rater reliability of the millimetric measurements showed a linear regression R of .9779 for measurements by the same rater one month apart.

Practitioner characteristics included age, gender, race and ethnicity, specialization, country of dental school, years in practice, geographic region of practice, and practice type. Patient characteristics included age, gender, race, and ethnicity, insurance coverage, education level, and previous orthodontic treatment.

Dentofacial characteristics that were reported by the practitioner included profile, Angle molar classification, maxillary and mandibular arch length, posterior cross-bites, and habits such as tongue or finger habits. Cephalometric values were obtained from pre- and post-treatment cephalometric radiographs.

Treatment stability rates using millimetric overbite and POSI were calculated overall, as well as by the following 4 factors: treatment modality, extractions, retention type, and retention regimen.

Treatment Modality

Four mutually exclusive treatment categories were identified for this study, arranged in order of increasing invasiveness and ability to treat complex malocclusions:

1. Aligners (no fixed appliances, temporary anchorage devices (TADs), or orthognathic surgery)
2. Fixed appliances (no TADs or orthognathic surgery)
3. TADs (with no orthognathic surgery)
4. Orthognathic surgery

Patients who received multiple treatments were placed into the most invasive treatment category. For example, a patient treated with both aligners and fixed appliances was placed in the fixed appliances group.

Extractions

When premolars or anterior teeth were removed as part of the orthodontic treatment, patients were classified as having extractions. Patients who had third molars removed were not classified as extraction patients unless other teeth, such as premolars or incisors, were extracted.

Retention Type

Retention modality was ascertained from the end of treatment practitioner questionnaire.

The provider selected one of the retention categories for each arch:

- (1) Hawley-style or circumferential-style (also referred to as Hawley)
- (2) Vacuum-formed (clear plastic overlay shell)
- (3) Bonded retainer
- (4) Other (provider specified)

The "Other" category allowed practitioners to report other retention devices or dual retainers in one arch. In the case of dual retention, the following rules were used:

- If a removable and bonded retainer were prescribed for an arch, that arch was classified to have bonded retention, since that was more permanent and full time.
- If two types of removable retainers (such as vacuum-formed and Hawley) were prescribed for an arch, that arch was classified to have vacuum-formed retention, as vacuum-formed retainers have been reported to be preferred by patients, and they provide occlusal coverage.¹³

Retention Regimen

The provider selected one of the retention regimen categories for each arch:

- (1) Full time (Wearing at all times except when eating, drinking, or brushing)
- (2) Part time (Typically, night-time use)
- (3) Other (provider specified)

A bonded retainer was automatically considered full time.

Patient satisfaction at T3 was assessed using a five-point, Likert-type scale (very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, and very dissatisfied). Patients rated their satisfaction on their self-perception of their overbite, overall retainer experience, retainer type, retainer-wear regimen, appearance of teeth, biting/chewing, and overall satisfaction with their orthodontic treatment. Patients were asked to provide open-ended explanations when they reported to be somewhat dissatisfied or very dissatisfied. Because the great majority of responses fell into the very satisfied category, satisfaction was dichotomized into *Satisfied* vs *Not Satisfied*. The *Satisfied* category included the very satisfied and somewhat satisfied, while the *Not Satisfied* category included responses of neither satisfied nor

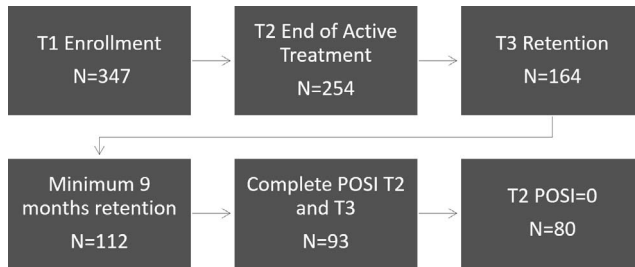


Figure 2. Patient sample.

dissatisfied, somewhat dissatisfied, and very dissatisfied.

Stability rates were calculated overall, and for treatment modality, retainer type, and retainer regimen.

Linear multivariable regression analysis was conducted using least-squares regression to identify factors related to stability among those patients treated with fixed appliances who had T2 POSI scores of 0. All statistical tests were two-sided and a *P* value of $<.05$ was deemed to be statistically significant. All statistical analyses were conducted using the R statistical software package (<https://www.R-project.org/>).

RESULTS

Due to the small number of patients in some treatment and/or retention categories, the results are largely descriptive, as there was insufficient power for many of the planned analyses. In total, 91 practitioners and 347 patients were recruited for the study from October 2015 to June 2016 (Figure 2). Data at T2 were collected from 84 practitioners and 260 patients through December 2018. Six patients did not have sufficient records for analyses. The rest of the patients had either withdrawn from the study ($N = 24$) or did not complete orthodontic treatment within the study period ($N = 63$).

Data at T3 were collected for 164 patients. It was decided to exclude all patients with post-treatment time <9 months (52 patients), leaving 112 patients with 9 months or more of post-treatment time. Figure 3 shows the distribution of patients by number of months since end of treatment. Patients who were missing T3 intraoral images or other T3 data were excluded from the POSI analysis ($N = 19$). Data from patients who were missing intraoral photos or had poor quality intraoral images ($N = 28$) were excluded from millimetric overbite analysis.

At T3, 93 patients had complete T2 and T3 POSI data. In the stability analyses, the sample was further restricted to only those who were successfully treated to POSI = 0 at T2. With this restriction, the number of patients in the sample decreased from 93 to 80. Initial practitioner characteristics are summarized in Table 1

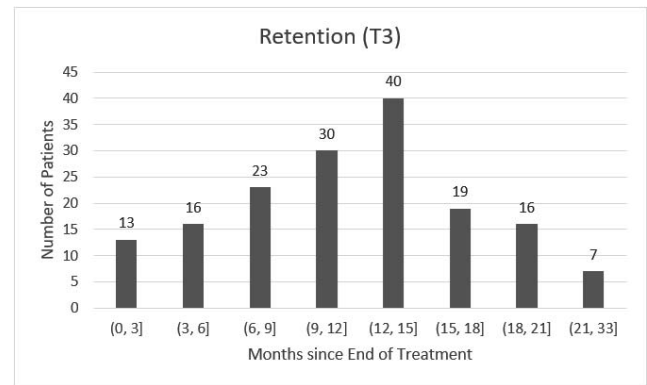


Figure 3. Distribution of patients.

and initial patient characteristics can be seen in Table 2. Table 1 indicates that practitioner characteristics were mostly similar across the time periods. Likewise, the patient dentofacial characteristics and cephalometric values were relatively similar across the time points. When the sample was restricted to those with successful treatment, the overall mean overbite at T3 was 1.34 (Table 3). For patients with a minimum of 9 months retention, the average overall treatment time (Table 4) observed was 1.78 years. The average overall retention time was 1.21 years.

While there was some variability in the millimetric stability rates by treatment category, the aligner and TAD groups were small, and no statistically significant differences were observed (Table 3). Similarly, the stability rates for the treatment categories based on POSI were not significantly different.

Only 7 of the 80 patients with T2 POSI = 0 underwent extraction. Six were in the fixed appliances group, and one was in the surgery group. The mean treatment duration for extraction treatment was 2.47 years, while the mean treatment duration for non-extraction treatment was 1.67 years (Table 4). Of the seven extraction patients, 71% maintained a POSI = 0 at T3 and 100% maintained a positive overbite. In the non-extraction patients ($N = 73$), 64% maintained a POSI = 0 at T3 and 88% maintained positive overbite (Table 3). However, these differences did not reach statistical significance.

The final T2 and T3 POSI scores for all patients with complete POSI data are reported in Table 5. Of the 39 patients who had T3 POSI scores greater than 0, the great majority of them were in the POSI 2 category.

Because there were no statistically significant differences in stability between full-time and part-time wear or between upper and lower arch stability, maxillary and mandibular regimens were combined together into full-time wear regimen in both arches ($N = 42$), which exhibited 60% stability, vs part-time wear in at least one arch ($N = 38$), which had 71% stability

Table 1. Initial Practitioner Characteristics at T1, T2, T3 With Minimum 9 Months Retention, and T3 Minimum 9 Months Retention and Complete POSI Data^a

Practitioner Characteristics	T1, % (N = 345)	T2, % (N = 254)	T3, % (N = 112)	T3 Complete POSI Data, % (N = 93)
Gender				
Male	74	73	75	74
Female	26	27	25	26
Race and Ethnicity				
White/Caucasian	58	60	63	63
Asian	29	28	21	20
Hispanic	11	9	13	13
Other/Unknown	2	2	4	3
Age, years				
<45	39	39	38	33
45–54	23	24	26	27
55–64	32	30	29	32
≥65	7	6	7	9
Geographic Region of Practice				
West	47	48	54	52
Midwest	10	10	5	6
Southwest	11	11	14	15
South Central	6	4	3	2
South Atlantic	11	13	13	14
Northeast	16	13	11	11

^a POSI indicates Photographic Openbite Severity Index.

(Table 6). Among the four treatment groups, the stability (assessed as POSI = 0) ranged from a low of 57% for surgical patients to a high of 83% for the TADs group. However, the sample sizes in all but the fixed appliances group were small. With respect to the combinations of retainers used, upper and lower vacuum-formed retainers were by far the most common (N = 41), with the next most common combination being bonded upper and lower (N = 13). The small number of patients within the different treatment and retainer regimens and types precluded meaningful statistical analyses.

Satisfaction was assessed overall at T3, as well as by treatment and retention factors (Table 7). Patients expressed a 96% satisfaction rate with their overall orthodontic treatment experience and their retainer experience. Additionally, most patients (86%–97%) reported being satisfied overall with the positive-overbite self-assessment, retainer type, treatment duration, appearance, and ability to bite/chew.

Non-extraction patients had an overall 97% satisfaction rate with their orthodontic treatment, while 82% of patients with extractions reported being satisfied with their orthodontic treatment. For the other satisfaction measures, the non-extraction patients' satisfaction ranged from 82% to 98%, while the extraction patients' satisfaction ranged from 70% to 91%. Due to the extremely small number of dissatisfied patients, there was insufficient statistical power to investigate differences in satisfaction based on various factors.

Multivariable linear models were only developed to predict treatment stability in the largest category of treatment: fixed appliances (N = 48). Based on these models (Table 8), lower POSI scores at T3 were associated with less severe initial open bite, lower initial incisor to mandibular plane values, and extractions. When millimetric overbite was the outcome, deeper overbite at T3 was associated with lower initial incisor to mandibular plane values and extractions.

DISCUSSION

This study evaluated the overall treatment stability and satisfaction of adult AOB patients treated in the United States. With respect to millimetric overbite, the rate of 89% stability was slightly higher than the fixed appliance sample reported by Greenlee.⁵ However, the post-treatment observation time was considerably shorter in this study. Janson¹⁴ reported that stability decreased as the amount of time since end-of-active treatment increased and, perhaps these patients would exhibit lower stability in the years to come. It is possible that the study setting influenced both practitioners and patients to employ robust retention methods, which may help to explain the relatively good stability. This was evidenced by 13 patients being prescribed fixed and removable retention in the same arch.

The only treatment group large enough for predictive model analysis was the fixed appliance group, which contained 60% (N = 48) of the 80 patients with T2 POSI = 0. Additionally, this group contained six of the

Table 2. Initial Patient Demographics, Dentofacial Characteristics, and Cephalometric Values at T2, T3 With Minimum 9 Months Retention, and T3 With Minimum 9 Months Retention and Complete POSI Data^a

	T1, % (N = 345)	T2, % (N = 253)	T3, % (N = 112)	T3 Complete POSI Data, % (N = 93)
Patient Demographics				
Gender				
Male	26	25	26	27
Female	74	75	74	73
Age, years				
18–20	17	17	8	10
21–30	45	42	35	35
31–40	22	23	33	31
≥41	16	18	24	24
Race and Ethnicity				
White/Caucasian	55	58	63	63
Black/African-American	10	9	5	4
Asian	8	9	9	9
Multirace	4	3	4	3
Hispanic	23	21	19	21
Previous Orthodontic Treatment				
Yes	39	42	49	48
No	61	58	51	52
Initial Patient Dentofacial Characteristics				
Arch Length (Severest of maxillary or mandibular)				
No Crowding	20	19	21	21
Mild Crowding (1–3 mm)	35	40	44	50
Moderate Crowding (4–6 mm)	31	31	25	19
Severe Crowding (>6 mm)	14	10	10	10
Tongue Thrust and Tongue Posture				
Yes	12	11	13	16
No	88	89	87	84
Initial POSI				
1-3	32	33	37	35
4-6	68	67	63	65
Initial Patient Cephalometric Values, Mean (SD)				
MPSN: Mandibular Plane Angle	38.8 (7.2)	38.5 (7.1)	38.1 (7.2)	38.3 (7.5)
U1 to NA	25.6 (8.3)	25.8 (8.7)	25.3 (8.7)	25.2 (8.9)
IMPA (Mn incisor angulation to MP)	94.9 (8.8)	94.8 (8.5)	95.7 (7.7)	95.8 (7.8)
Overbite (mm)	−2.4 (2.2)	−2.4 (2.1)	−2.0 (1.7)	−2.1 (1.7)

^a POSI indicates Photographic Openbite Severity Index; SD, standard deviation.

seven extraction patients. It was interesting that less initial lower incisor proclination and extractions were associated with better stability using POSI and millimetric overbite as the outcome variables. The decreased initial incisor angulation might be related to increased stability because those patients may have had less tendency to posture their tongues in a forward position. While tongue pressure was not measured in

this study, several studies would support this theory.^{15,16} With respect to extractions, they may assist in relieving crowding without proclination during treatment. This could be beneficial, as incisor proclination is often accompanied by decreased overbite. Janson reported that extraction treatment was more stable in adolescent AOB patients.¹⁴ However, the mechanism by which extractions would assist with stability is

Table 3. Overbite and POSI for Patients With T2 POSI = 0^a

	Overall N = 80	Aligner N = 12	Fixed Appliances N = 48	TADs N = 6	Surgery N = 14	Non-extraction N = 73	Extraction N = 7
T1 Mean Overbite (in mm (sd))	−2.16 (1.78)	−2.23 (1.86)	−2.05 (1.94)	−2.05 (1.15)	−2.52 (1.44)	−2.18 (1.84)	−1.94 (1.01)
T2 Mean Overbite	1.66 (0.75)	2.12 (0.61)	1.48 (0.78)	1.95 (0.76)	1.70 (0.57)	1.69 (0.75)	1.35 (0.70)
T3 Mean Overbite	1.34 (0.93)	1.77 (0.51)	1.14 (0.95)	1.76 (0.86)	1.55 (1.04)	1.32 (0.92)	1.49 (1.06)
T3 Overbite > 0 mm	89%	100%	85%	100%	90%	88%	100%
T3 POSI = 0	65%	75%	63%	83%	57%	64%	71%

^a POSI indicates Photographic Openbite Severity Index.

Table 4. Treatment and Retention Times, Minimum 9 Months Retention

	Overall	Aligners	Fixed Appliances	TADs	Surgery	Non-extraction	Extraction
Treatment Time in Years (SD)	1.78 (0.83)	1.52 (0.52)	1.90 (0.88)	2.25 (0.99)	1.43 (0.70)	1.67 (0.77)	2.47 (1.04)
Retention Time in Years (SD)	1.21 (0.34)	1.23 (0.33)	1.19 (0.33)	1.21 (0.33)	1.28 (0.41)	1.18 (0.31)	1.48 (0.48)

* SD = standard deviation.

unclear as, theoretically, extraction therapy could be considered to result in less space for the tongue.

Fifty-one percent of the patients were prescribed both upper and lower vacuum-formed retainers (N = 41). This was over three times more common than the next most popular category, which was upper and lower bonded retainers (16%, N = 13). The many types of retention devices and their various combinations and regimens was surprising. Dental providers may have felt that vacuum-formed retainers were well-suited for AOB retention due to the presumed intrusive effect on molars from occlusal coverage. Boyd¹⁷ described that clear aligners could be a preferable treatment modality for patients with AOB due to the thickness of the clear aligner in conjunction with the patient’s masticatory forces. Adult orthodontic patients may also prefer vacuum-formed retainers, as they are a more esthetic retainer option than Hawley retainers. Interestingly, bonded retainers were not associated with a higher rate of stability than vacuum-formed retainers.

There was no significant difference in stability between full-time vs part-time retainer regimens. This was surprising, since it is largely believed that full-time retainer wear should be more stable than part-time wear. Castle investigated patient compliance with Hawley-style retainers fitted with Bluetooth data trackers and reported that the patient sample was fairly compliant with regimen instructions.¹⁸ Vagdouti found that there was high patient compliance with Hawley-style and vacuum-formed retainers. They also found that vacuum-formed retainers were better accepted by patients.¹³ It is possible that patients on full-time retainer regimens wore them less than requested, and those on part time regimens wore them

more than requested, diluting the differences between the two regimens.

At T3, patients maintained high levels of satisfaction similar to T2 satisfaction rates.¹² The high levels of satisfaction might be attributed to the continuation of overall positive experiences the patients had with orthodontic treatment. As reported by Pacheco-Perreira, the literature described high levels of contentment and satisfaction with orthodontic care.¹⁹ That systemic review concluded that satisfaction after orthodontic treatment was strongly associated with perceived esthetic outcomes and dissatisfaction after orthodontic treatment was associated with discomfort or pain, and problems with usage of retention appliances.

Limitations

This study had several limitations. While sample sizes were calculated to provide adequate power in the planning stages of this study, the length of time to complete treatment in a subset of patients was considerably longer than anticipated. This may have been related to the difficulty in treating the malocclusions, problems with patient compliance or attendance, changes to the initial treatment plans, or other unanticipated factors. The nonrandom nature of the patient and practitioner sample, as well as the non-random assignment of treatment and retention, resulted in uneven distributions of treatments and retention strategies. In future studies, larger samples of aligner, TAD, and surgical patients should be recruited to better understand long-term stability in those patient populations. Additionally, allowing only a few standardized retention options would help to increase study power,

Table 5. T2 and T3 POSI Scores (Minimum 9 Months Retention and Complete POSI Data)^a

POSI at T2	Number of Patients	POSI at T3						
		0	1	2	3	4	5	6
0	80	52	22	2	0	4	0	0
1	9	2	6	0	0	1	0	0
2	2	0	2	0	0	0	0	0
3	1	0	0	0	1	0	0	0
4	1	0	0	0	0	1	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
Total	93	54	30	2	1	6	0	0

^a POSI indicates Photographic Openbite Severity Index.

Table 6. T3 Stability for Patients With T2 POSI = 0^a

	Overall		Clear Aligners (N = 12)		Fixed Appliances (N = 48)		TADs (N = 6)		Surgery (N = 14)	
	% Stable	Mean Overbite	% Stable	Mean Overbite	% Stable	Mean Overbite	% Stable	Mean Overbite	% Stable	Mean Overbite
Overall (N = 80)	65	1.34	75	1.77	63	1.14	83	1.76	57	1.55
Regimen (N = 80)										
Full Time U & L (N = 42)	60	1.40	67	2.22	59	1.20	75	1.82	50	1.67
Part Time U or L (N = 38)	71	1.27	78	1.61	67	1.07	100	1.67	67	1.38
Retainer Type										
Vacuum-formed U & L (N = 41)	68	1.37	89	1.94	63	1.17	NA	NA	50	2.43
Bonded U & L (N = 13)	62	1.26	50	1.53	40	0.50	67	1.89	100	2.25
Vacuum-formed U, Hawley L (N = 10)	70	1.37	NA	NA	80	1.58	100	1.67	33	0.81
Vacuum-formed U, Bonded L (N = 9)	44	0.91	NA	NA	50	0.82	NA	NA	40	1.03
Bonded U/ Removable L (N = 3)	100	2.62	NA	NA	100	2.40	NA	NA	100	3.08
Other (N = 4)	50	0.99	0	0.91	50	0.68	100	1.70	NA	NA

* L indicates lower arch; U, upper arch.

^a POSI indicates Photographic Openbite Severity Index.

Table 7. T3 Patient Satisfaction

Satisfaction Measure	Overall, %	Vacuum-formed Upper and Lower, % (N = 41)	Bonded Upper and Lower, % (N = 13)	Vacuum-formed Upper, Hawley-style Lower, % (N = 10)	Vacuum-formed Upper, Bonded Lower, % (N = 9)	Bonded Upper, Removable Lower, % (N = 3)	Other, % (N = 4)	Non-Extraction, %	Extraction, %
Overall Orthodontic Treatment	96	95	100	100	100	100	75	97	82
Positive Overbite	86	79	92	90	100	67	100	82	70
Retainer Experience	95	95	100	100	89	67	100	95	82
Retainer Type	92	90	100	100	89	67	100	91	82
Treatment Duration	95	95	100	100	89	67	100	91	73
Appearance	96	98	100	90	100	67	100	95	91
Biting and Chewing	97	98	92	100	100	100	100	98	91

Table 8. Regression Analysis Restricted to Fixed Appliances, T2 POSI = 0^a

	T3 POSI			T3 Overbite		
	Estimated Effect	Standard Error	P	Estimated Effect	Standard Error	P
Initial Overbite (mm)	-.0185	0.068	.01	0.053	0.069	.44
Initial Mandibular Plane (deg)	0.030	0.034	.38	0.037	0.020	.07
Initial L1MP (deg)	0.045	0.023	.05	-0.033	0.013	.01
Extraction	-0.941	0.441	.03	0.832	0.333	.01
Residual Habits	0.198	0.322	.54	-0.360	0.233	.12

^a POSI indicates Photographic Openbite Severity Index.

and planning adequate follow-up times is imperative for prospective studies.

CONCLUSIONS

- The stability of orthodontic treatment in adult AOB patients who participated in this study was high, regardless of treatment or retainer modality.
- Additionally, satisfaction in adult AOB patients was also high, regardless of retention type or regimen.
- Extractions and less initial lower incisor proclination were associated with higher stability only in patients undergoing fixed appliance treatment.

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SUPPLEMENTAL DATA

Appendix available online.

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