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Comparison of treatment management between orthodontists and general practitioners performing clear aligner therapy

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Dentistry at Virginia Commonwealth University.

By

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May 2016

ACKNOWLEDGEMENT

I would like to thank the VCU Department of Orthodontics for giving me the opportunity to learn and grow in this supportive, clinically and academically outstanding program. I would especially like to extend my appreciation to Dr. Bhavna Shroff for her guidance and unwavering dedication to my project and my development as an orthodontist. She went above and beyond the call of duty to ensure I was successful in the things I set out to achieve. I would also like to thank Drs. Steven Lindauer, Eser Tüfekçi, Al Best, and Caroline Carrico for their advice and expertise, and my co-residents for making the last two years such a productive, enjoyable experience. Finally, I am so grateful to my family, especially my husband Brendan, for their love and support as I have worked towards my goal of becoming an orthodontist.

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ABSTRACT

COMPARISON OF TREATMENT MANAGEMENT BETWEEN ORTHODONTISTS AND GENERAL PRACTITIONERS PERFORMING CLEAR ALIGNER THERAPY

By Alexandra Damerau Best, D.M.D.

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science
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Virginia Commonwealth University, 2016

Thesis Director: Bhavna Shroff, D.M.D., M.Dent.Sc., MPA
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The purpose of this study was to investigate differences in case confidence, treatment management, and Invisalign® expertise between orthodontists and general dentists. A survey was mailed to 1,000 randomly selected orthodontists and general dentists, respectively, who are Invisalign® providers, and results were analyzed. The results indicated that orthodontists treated significantly more Invisalign® cases and received more Invisalign® training than general dentists ($P < 0.0001$). After adjusting for experience (years in practice, hours of training, total number of cases treated), there were significant differences in confidence for 4 of the 6 cases ($P \leq 0.0019$). There was no difference in the use of IPR between groups. However, significant differences were found for the remaining treatment management techniques. In particular, orthodontists were significantly more likely to prescribe Class II elastics, to use a combination of fixed appliances and Invisalign®, and to believe that a greater percentage of their cases would have had better outcomes if treated with conventional braces ($P < 0.0001$). In conclusion, orthodontists and general dentists are electing to treat a variety of malocclusions with Invisalign® with similar confidence, but different utilization of recommended auxiliaries.

INTRODUCTION

Invisalign®, introduced by Align Technology Inc in 1997, is an orthodontic system composed of a series of removable clear aligners which sequentially move teeth based on computerized models. Although Invisalign® was originally marketed solely to orthodontists, Align Technology agreed to make Invisalign® available to general dentists as well after a class action lawsuit in 2000.¹ As the company began to market aggressively to orthodontists, general practitioners, and consumers, the use of Invisalign® increased dramatically, with over 3 million total patients completing treatment by March 2015.² Despite its popularity, there has been controversy regarding case selection, treatment management, and training requirements related to Invisalign®.^{3,4} While some studies have addressed each of these issues individually, there is a gap in the literature relating treatment management to initial selection criteria and educational background.

As society places a growing emphasis on appearance, more people are seeking orthodontic treatment than ever before, particularly esthetic alternatives like clear aligners.⁵ To satisfy the growing demand for Invisalign®, Align offers several certification courses throughout the year. A dental practitioner may become an Invisalign® provider by completing either the one-day “Invisalign® Fundamentals” course for general dentists or the “Clear Principles” course for orthodontists. These lectures are intended to teach practitioners how to select cases for treatment with clear aligners, understand how the aligners work, become familiar with the software that directs the treatment plan, and provide resources for further information and training.⁶ However, a 2010 study by Vicéns and Russo demonstrated that the majority of

orthodontists and general practitioners did not feel confident in using Invisalign® after initial certification.³

It seems that Invisalign® expertise is gained or defined by the number of cases treated. To assist consumers in choosing an Invisalign® provider who has acquired more experience since initial certification, Align Technology defines providers by the number of cases they have completed. A “Preferred Provider” has completed at least 10 total cases, a “Premier Provider” has completed at least 50, an “Elite” at least 300, and a “Top 1% Doctor” at least 800 total cases.⁷ While these designations quantify experience level, educational background is not considered and all doctors, orthodontists and general dentists alike, are free to treat cases of any difficulty.

Selecting the proper cases to treat with this system is a critical therapeutic decision. Studies have shown that the aligners are able to correct certain malocclusions successfully while others may pose a greater challenge. Kravitz et al.⁸ demonstrated that certain movements, such as lingual constriction, were more predictable, while others, such as extrusion, were less predictable. Since that study was published, however, Align has continued to develop new tools for the clear aligner system that may challenge these parameters. The Invisalign® G3, G4, G5, and G6 innovations incorporate precision cuts, optimized attachments, and a new aligner material, among other advancements, to aid in the treatment of more complex cases.

To investigate case selection, Vicéns and Russo³ surveyed orthodontists and general dentists to see whether they believed a series of 6 unique malocclusions could be treated with Invisalign®. The authors also asked the doctors to identify how much experience should be necessary to treat each case. The results of this study showed that significant variations existed in

case selection between the two groups of practitioners. Specifically, general dentists would not treat a Class I malocclusion with a large diastema with Invisalign® while orthodontists would, and orthodontists would not treat a Class II case with this treatment modality while general dentists would. In addition, neither group would use the clear aligners to resolve severe crowding.

While research has shown that differences exist between orthodontists and general dentists regarding the use of Invisalign® to treat cases with primarily Class I malocclusions, a comparison of case confidence involving more complex malocclusions has not been investigated. In addition, there has not been research which compares treatment management and Invisalign® experience between the two groups of practitioners. Thus, the purposes of this study were (1) to determine how confident orthodontists and general dentists are in treating moderate to severe malocclusions with Invisalign®, (2) to explore differences in treatment management between orthodontists and general dentists, and (3) to compare Invisalign® expertise between the two groups and associate differences in Invisalign® experience with the responses to the case confidence and treatment management portions of the survey. The null hypothesis was that there would be no difference in case confidence, treatment management, and Invisalign® expertise between orthodontists and general dentists.

MATERIALS AND METHODS

An original 23-question survey was developed for orthodontists and general dentists to explore differences in Invisalign® use between the two groups. It was customized so that orthodontists and general dentists were asked the same questions, in two similar and parallel surveys (Appendix 8). The survey consisted of 3 sections: case selection, treatment management, and background information.

The case selection portion asked participants to evaluate 6 unique cases presented based on 5 intraoral photographs (center, maxillary occlusal, mandibular occlusal, right buccal, and left buccal). Specifically, the survey asked orthodontists and dentists how confident they felt in treating each of the cases with Invisalign® on a scale of “very confident” to “never treat this case with Invisalign®”; which were scored 2 and -2 respectively, with responses between scored in 1 unit intervals (i.e. 2, 1, 0, -1, -2). The cases were chosen from the initial records of patients at the Virginia Commonwealth University Department of Orthodontics and represented a variety of malocclusions which had not yet been examined for case confidence in previous literature. Inclusion criteria were: (1) fully erupted permanent dentition; (2) 5 intraoral photographs of adequate quality available; (3) treatment protocols using clear aligner therapy for the selected clinical conditions present on the Invisalign® Doctor’s Website.⁹ Exclusion criteria were: (1) missing teeth; and (2) inadequate records available.

Case 1 displayed a Class I malocclusion with a deep 100% overbite, retroclined maxillary incisors, mild maxillary spacing, and mild mandibular crowding. Case 2 presented with a Class I malocclusion, 2mm midline diastema, partial anterior crossbite, left posterior crossbite, and mild maxillary/mandibular spacing. Case 3 demonstrated a Class I malocclusion with normal overbite

and overjet and mild maxillary/mandibular crowding. Case 4 was a Class I malocclusion with severe maxillary/mandibular crowding and increased overjet. Case 5 demonstrated a Class I malocclusion with an anterior open bite and mild maxillary/mandibular crowding. The final case, Case 6, demonstrated a Class II malocclusion with a deep bite and mild maxillary/mandibular crowding.

In the treatment management section of the questionnaire, providers were asked information about their typical protocols for treating patients with Invisalign®, including techniques such as elastic use, IPR, and refinements. Lastly, the background section gathered information on the practice demographics, Invisalign® training, and orthodontic education of the doctors in the study. The multiple choice options for the number of cases treated were divided so that the Invisalign® status of the providers could be determined, as denoted by the Invisalign® Tier Levels (See Appendix 1).⁷

Following approval from the Institutional Review Board (IRB) of Virginia Commonwealth University, the survey was sent out in two mailings, four weeks apart, to a group of orthodontists (N=1,000) and general dentists (N=1,000) who are Invisalign® providers in the United States. The orthodontists and general dentists were randomly selected from the Invisalign® provider database. The surveys were sent by mail with a cover message and business reply envelope enclosed by a third party, the VCU mailing service. The mailed surveys were assigned numbers only known to the third party so that the second blast of surveys would only be sent to those who had not yet responded.

The resulting data were entered blindly into REDcap, a browser-based software for electronic data capture, by two individuals. Each individual checked 10% of the data entries for the other researcher 3 weeks later to ensure accuracy.

All data were collected and recorded without identifiers and then analyzed. Chi-square tests were used to determine whether there were significant differences in case confidence, treatment management, and Invisalign® training between orthodontists and general dentists. The study also looked for associations between confidence with Invisalign® and specialty (orthodontists, general dentists), while adjusting for various experience covariates (years in practice, hours of training, and number of cases treated). These associations were tested using linear models. All post-hoc pairwise comparisons were performed using a Tukey-Kramer adjustment for multiple comparisons.

RESULTS

1,000 surveys each customized for orthodontists and general dentists were mailed, and a total of 603 responses were received. 374 orthodontists and 229 general dentists responded, for a response rate of 37% and 23%, respectively.

Demographics

There was no significant difference found in the number of years in practice between orthodontists and general dentists. However, significant differences were noted for the remaining demographic parameters (total Invisalign® cases treated ($P < 0.0001$), active Invisalign® cases in the past 12 months ($P < 0.0001$), hours of additional Invisalign® training ($P < 0.0001$), and participation in the Invisalign® Summit ($P = 0.0003$).

The results of the survey showed that orthodontists treated significantly more cases in the past 12 months, with 51% treating 50 or more cases, while 16% of general dentists treated 50 or more cases (likely Premier Preferred Providers). Orthodontists have also treated significantly more total Invisalign® cases, such that 49% of orthodontists reported treating 300 or more cases, while only 10% of general dentists reported the same value (likely Elite Preferred Providers). In addition, 72% of orthodontists received more than 15 hours of additional training pertaining to Invisalign® after initial certification compared to 56% of general dentists. Lastly, 47% of responding orthodontists attended the Invisalign® Summit compared to 18% of general dentists. Table 1 shows the complete distribution of respondents for these demographic variables, broken down by specialty.

Table 1: Demographics

How many years have you been practicing?	GP	Ortho	P-value (Chi-Sq)
1-10 years	21%	23%	0.95
11-20 years	30%	27%	
21-30 years	28%	29%	
31-40 years	15%	15%	
More than 40 years	6%	6%	
How many active Invisalign® cases have you treated in the last 12 months?			
0-9	13%	2%	<0.0001
10-49	72%	47%	
50-99	11%	24%	
100-199	3%	20%	
200 or more	3%	8%	
How many Invisalign® cases have you treated in total?			
0-9	0%	1%	<0.0001
10-49	26%	7%	
50-299	64%	45%	
300-799	7%	33%	
800 or more	3%	16%	
How many hours of additional training pertaining to Invisalign® have you received after initial certification?			
0-5 hours	11%	7%	0.0003
6-10 hours	18%	9%	
11-15 hours	16%	13%	
More than 15 hours	56%	72%	
Did you attend an Invisalign® Summit?			
Yes	18%	47%	<0.0001

Case Selection

Each of the 6 cases was analyzed to determine how confident the orthodontists and general dentists were in treating them with Invisalign®, while adjusting for experience. The unadjusted distribution of case confidence by specialty is depicted in Figure 1. Overall, both groups were relatively confident treating all cases except Case 4 (severe crowding), and the greatest difference in confidence was associated with Case 6 (Class II), for which general dentists appeared more confident. Table 2 displays which variables were statistically

significantly associated with overall mean confidence for each case. To summarize this table, there was a significant difference in confidence between orthodontists and general dentists for four of the six cases (Cases 1 (deep bite), 3 (mild crowding), 4 (severe crowding), and 6 (Class II)). The significance of years in practice varied, with statistically relevant associations only for Cases 1 (deep bite) and 6 (Class II). For all of the cases presented, confidence was significantly associated with the total number of cases treated by the surveyed Invisalign® providers. Finally, training hours were significantly associated with confidence for Cases 2 (posterior crossbite), 4 (severe crowding), 5 (anterior open bite), and 6 (Class II).

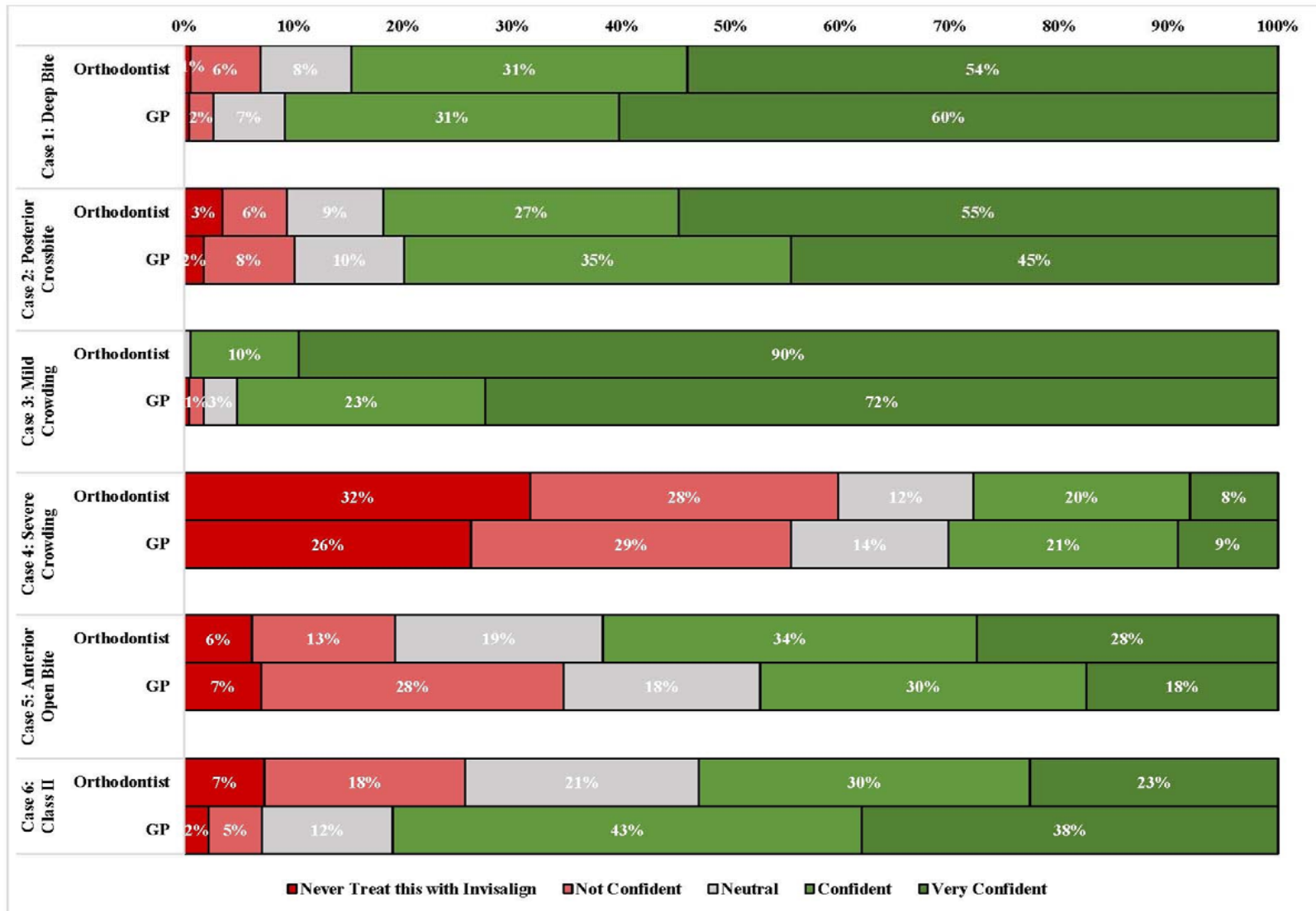


Figure 1: Case Confidence Unadjusted for Experience

Table 2: Model Results of Case Selection

	P-value*			
	Specialty	Years in Practice	Number of Cases	Training Hours
Case 1: Deep Bite	0.0001†	0.028†	0.0032†	0.5219
Case 2: Posterior Crossbite	0.0829	0.0836	<.0001†	0.0061†
Case 3: Mild Crowding	0.0019†	0.1821	0.0049†	0.0642
Case 4: Severe Crowding	<.0001†	0.0706	<.0001†	<.0001†
Case 5: Anterior Open Bite	0.6571	0.3796	<.0001†	<.0001†
Case 6: Class II	<.0001†	0.0044†	<.0001†	0.006†

*P-value from multiple linear regression

†Statistically significant association with overall mean confidence

Case 1 (deep bite):

For Case 1, there was a significant association between confidence and specialty, years in practice, and number of cases treated, as shown in Figure 2. The relationship between amount of training and confidence was not statistically significant. The model results indicate that while adjusting for the experience variables, general dentists were significantly more confident in treating this case with Invisalign® than orthodontists (P=0.0001, adjusted 95% CI: 0.15, 0.47) (Table 2). In terms of years in practice, there was a significantly lower average confidence for individuals who have practiced 11-20 years when compared to those with 31-40 years of experience (Figure 2). The total number of cases treated was associated with an overall increase in confidence, and there was a significant difference in confidence between those who treated fewer than 50 cases and those who treated 300 or more cases (P<0.02) (Figure 2). See Appendix 2.

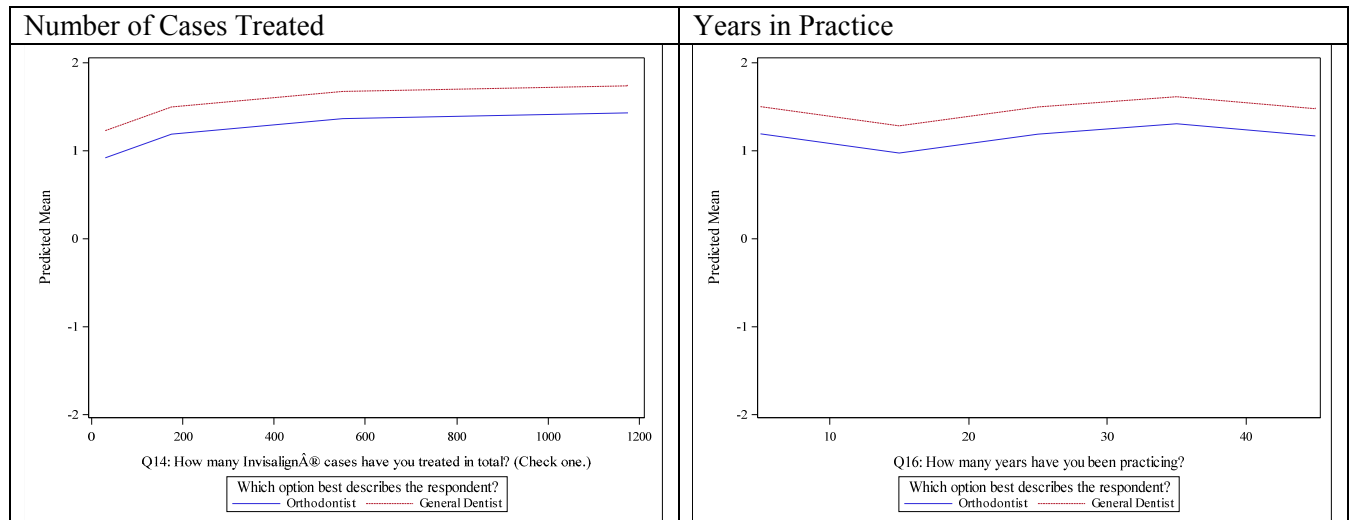


Figure 2: Predicted Mean Confidence by Specialty for Case 1
Predicted Mean Confidence by Specialty for Case 1 with regard to Number of Cases Treated (holding Years in Practice at 21-30 years and Hours of Training at 11-15 hours) and Years in Practice (holding Number of Cases Treated at 50-299 and Hours of Training at 11-15 hours)

Case 2 (posterior crossbite):

After adjusting for experience, there was no significant difference in confidence between the two specialties in treating Case 2, as shown in Figure 3 (P=0.0829, adjusted 95% CI:-0.35, 0.02). Both groups were confident to very confident in using Invisalign®. Confidence in treating this case was most influenced by total number of cases treated and amount of training (Table 2). The number of cases treated was associated with an overall increase in confidence and a significant difference in confidence between those who treated less than 50 cases and those who treated 300 or more cases (P≤0.0161). Those with 6-10 hours of training had a significantly lower average confidence in this case than those with more than 15 hours of training (P=0.0113), but there were no other significant differences. See Appendix 3.

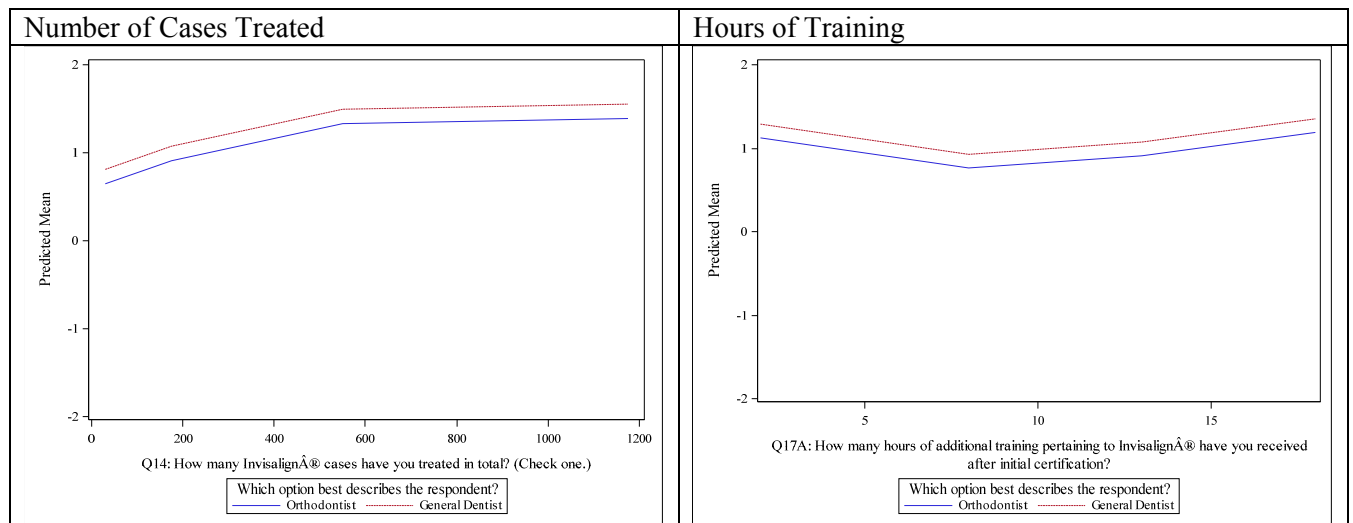


Figure 3: Predicted Mean Confidence by Specialty for Case 2
 Predicted Mean Confidence by Specialty for Case 2 with regard to Number of Cases Treated (holding Years in Practice at 21-30 years and Hours of Training at 11-15 hours) and Hours of Training (holding Number of Cases Treated at 50-299 and Years in Practice at 21-30 years)

Case 3 (mild crowding):

The purpose of this case was to serve as a control since the malocclusion is considered ideal to treat with Invisalign® after initial certification.⁹ There was a significant increase in average confidence for orthodontists as compared to general dentists after adjusting for experience (P=0.0019, adjusted 95% CI: 0.05-0.23). In addition to specialty, the total number of cases treated was also associated with a difference in overall confidence in Invisalign®. Specifically, those who had treated less than 50 cases had significantly lower confidence than those who had treated 300 or more cases (Figure 4). See Appendix 4. Note the predicted means in Figure 4, show that both specialties were confident to very confident treating a mild crowding case with Invisalign®, and orthodontists were consistently, but marginally, more confident than general dentists.

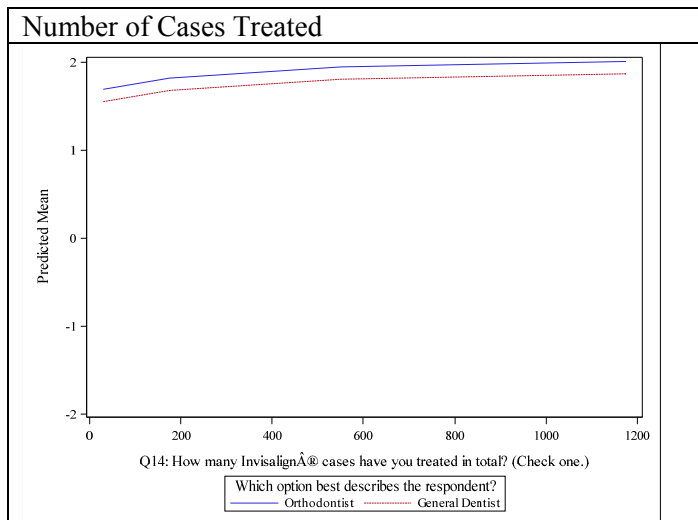


Figure 4: Predicted Mean Confidence by Specialty for Case 3
Predicted Mean Confidence by Specialty for Case 3 with regard to Number of Cases Treated (holding Years in Practice at 21-30 years and Hours of Training at 11-15 hours)

Case 4 (severe crowding):

For Case 4, there was a significant increase in average confidence for general dentists as compared to orthodontists, after adjusting for experience ($P < 0.0001$, adjusted 95% CI: 0.30-0.76), although overall confidence was lower than the other cases presented. As shown in Figure 5, there was also a significant positive association between confidence and the number of cases treated and amount of training ($P < 0.0001$). Respondents who treated more than 300 cases were on average more confident than those who treated less than 300. Similarly, there was a significant increase in confidence between those who had more than 15 hours of additional Invisalign® training and those who had less. See Appendix 5.

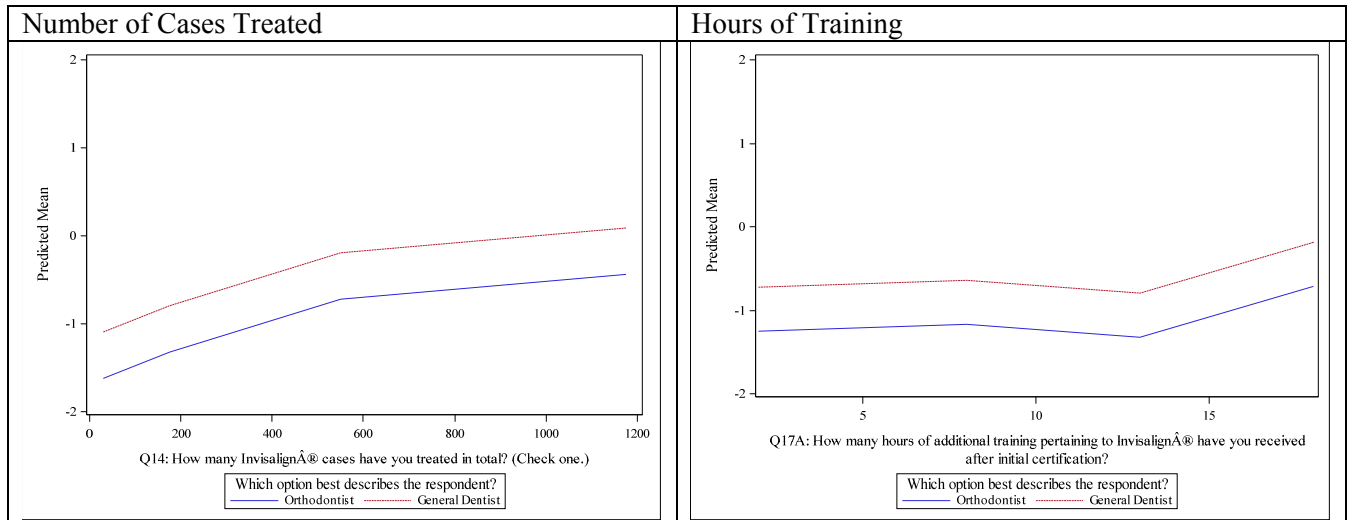


Figure 5: Predicted Mean Confidence by Specialty for Case 4
Predicted Mean Confidence by Specialty for Case 4 with regard to Number of Cases Treated (holding Years in Practice at 21-30 years and Hours of Training at 11-15 hours) and Hours of Training (holding Number of Cases Treated at 50-299 and Years in Practice at 21-30 years)

Case 5 (anterior open bite):

As depicted in Figure 6, there was no significant difference in confidence for general dentists and orthodontists in treating Case 5 after adjusting for various experience variables ($P=0.6571$, adjusted 95% CI: $-0.25-0.16$). Confidence in treating this case was primarily associated with the total number of cases treated and training, as shown in Table 2 ($P<0.0001$). The lowest average confidence was found to be in those who had treated 10-49 cases, followed by 50-299 cases, and significantly higher confidence was noted for those who had treated 300 or more cases. As with Case 4, those with more than 15 hours of training experience had significantly higher average confidence treating this case with Invisalign® than those with less. See Appendix 6.

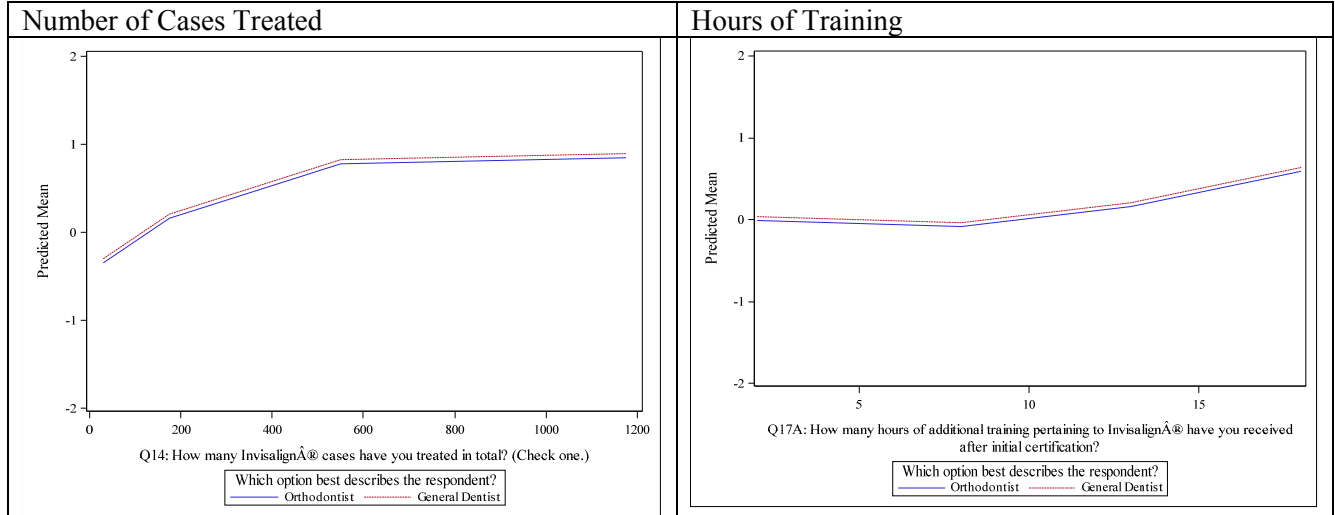


Figure 6: Predicted Mean Confidence by Specialty for Case 5
Predicted Mean Confidence by Specialty for Case 5 with regard to Number of Cases Treated (holding Years in Practice at 21-30 years and Hours of Training at 11-15 hours) and Hours of Training (holding Number of Cases Treated at 50-299 and Years in Practice at 21-30 years)

Case 6 (Class II):

For the final case, Case 6, there was a significantly greater average level of confidence for general dentists as compared to orthodontists ($P < 0.0001$, adjusted 95% CI: 0.84-1.23), after adjusting for experience. Additionally, years in practice, total number of cases treated, and amount of training were associated with significant differences in average confidence (Figure 7). There was a significant difference between those who had 1-10 years of experience and those with 11-20, where those with 11-20 were significantly less confident on average than those with 1-10 years of experience ($P = 0.007$). Average confidence also significantly increased for those who treated over 50 cases. In terms of hours of training, those with 11-15 hours of training had significantly lower average confidence than those with more than 15 hours of training ($P = 0.0127$), but there were no other significant differences. See Appendix 7.

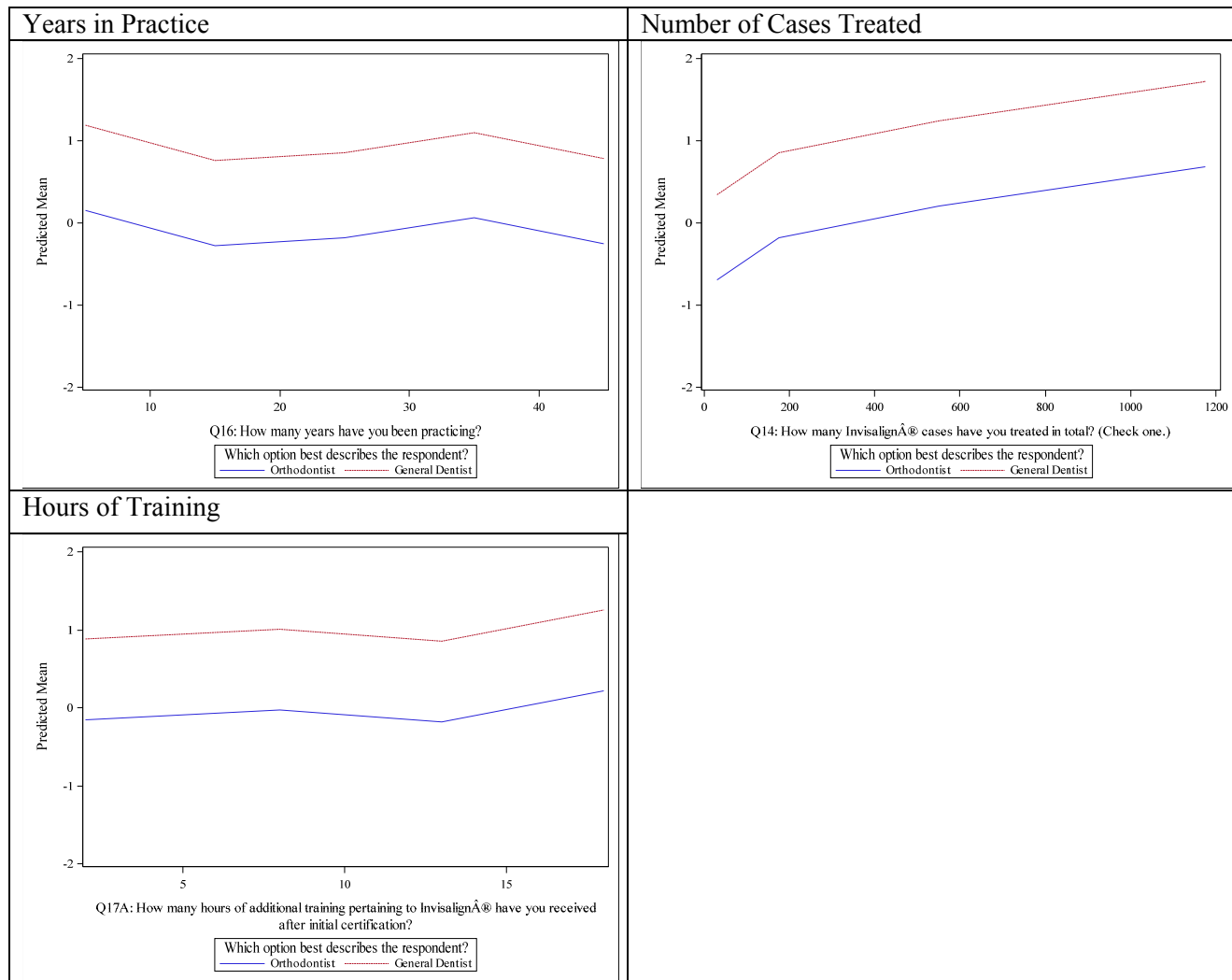


Figure 7: Predicted Mean Confidence by Specialty for Case 6

Predicted Mean Confidence by Specialty for Case 6 with regard to Years in Practice (holding Number of Cases at 50-299 and Hours of Training at 11-15), Number of Cases Treated (holding Years in Practice at 21-30 years and Hours of Training at 11-15 hours), and Hours of Training (holding Number of Cases Treated at 50-299 and Years in Practice at 21-30 years)

Treatment Management

The treatment management portion of the survey investigated some of the techniques orthodontists and general dentists who are Invisalign® providers used to treat their cases.

Table 3 and Table 4 depict the percentage use of various techniques and auxiliaries by the two groups.

There was no significant difference in the use of interproximal reduction (IPR) between orthodontists and general dentists, and almost all doctors (98%) reported performing IPR when indicated ($P=0.1502$).

In contrast, there was a significant difference in the use of the remaining auxiliaries and supplemental techniques addressed in the treatment management questions. Specifically, there was a statistically significant difference in the amount of time spent reviewing the ClinCheck®, with orthodontists spending more time than general dentists ($P=0.0081$). There was also a significant difference in the use of all types of elastics ($P<0.0001$). Overall, 93% of orthodontists compared to 41% of general dentists reported using interarch elastics to aid in correction of the malocclusion. In particular, 92% of orthodontists utilized Class II elastics, while only 37% of dentists did.

Orthodontists were significantly more likely to treat extraction cases ($P=0.0003$), although of note were the 20 free-form responses from orthodontists written next to the extraction question clarifying that they only do lower incisor extractions. Orthodontists were also more likely to use a combination of fixed appliances and Invisalign® ($P<0.0001$). There was a statistically significant difference in the use of refinements between the specialties as well ($P<0.0001$). In particular, 42% of orthodontists submitted refinements on >75% of their cases, while only 17% of general dentists did so with the same frequency. A significant difference was

found in the timing of refinements too ($P=0.0252$), but the majority of orthodontists and general dentists tended to wait until after finishing a complete set of aligners. It should be noted that 44 responses to the question asking the provider to specify when he/she typically does refinements were discarded because these responders chose multiple options. Orthodontists also typically scheduled more time between patient appointments, with the majority (66%) recalling their patients every 8 or more weeks. General dentists, in contrast, reported seeing their patients more frequently, with about 60% of the group employing a 6 week recall pattern.

Orthodontists were twice as likely (relative risk: 1.93 (1.35, 2.76)) to use lingual attachments to aid in the tracking of teeth ($P=0.0001$). There was also a statistically significant difference in the use of Invisalign Teen® between orthodontists and general dentists (87% vs 58%, $P<0.0001$).

Regarding patient consultations, orthodontists were more likely to tell a patient that his/her case was too complex for Invisalign® ($P<0.0001$), but were also more likely to offer Invisalign® as a treatment option once they determined the patient was a good candidate for clear aligners ($P=0.0043$). Lastly, orthodontists were more likely to believe that their treatment outcomes would have been improved if their patients had been treated with conventional braces instead of Invisalign® ($P<0.0001$).

Table 3: Treatment Management by Specialty: Techniques and Auxiliaries

	% Usage		P-value (Chi-sq)
	Orthodontist	General Dentist	
Do you use IPR?	99%	98%	0.1502
IPR: Anterior Region	99%	93%	0.0002
IPR: Posterior Region	54%	64%	0.014
Interarch Elastics	93%	41%	<0.0001
Class II	92%	37%	<0.0001
Class III	82%	16%	<0.0001
Crossbite	41%	10%	<0.0001
Vertical or Box	44%	11%	<0.0001
Extractions	65%	50%	0.0003
Combination of Fixed/Invisalign®	78%	23%	<0.0001
Lingual Attachments	28%	14%	0.0001
Invisalign® Teen	87%	58%	<0.0001
How often do you use refinements?			<0.0001
Never	0%	0%	
0-25% of cases	9%	27%	
26-50% of cases	22%	35%	
51-75% of cases	27%	21%	
More than 75% of cases	42%	17%	
When do you typically do refinements?			0.0252
If one tooth stops tracking	8%	12%	
If multiple teeth stop tracking	19%	25%	
Before I have finished the first set of aligners	13%	8%	
After I have finished a complete set of aligners	60%	55%	

Table 4: Treatment Management: Patient Systems

	% Usage		P-value (Chi-sq)
	Orthodontist	General Dentist	
How often do you see the patient?			<0.0001
4 weeks	3%	15%	
6 weeks	30%	62%	
8 weeks	42%	19%	
>8 weeks	24%	4%	
Time reviewing/changing ClinCheck®			0.0081
Usually make no changes	1%	3%	
0-15 mins	37%	44%	
16-30 mins	41%	37%	
31-45 mins	17%	9%	
>45 mins	5%	7%	
How often do you tell a patient that his/her case is too complex for Invisalign®?			<0.0001
Less than 25%	58%	80%	
26-50%	31%	17%	
51-75%	8%	1%	
>75%	3%	1%	
How often do you ask a patient if they would prefer Invisalign® if you feel they are a good candidate?			0.0043
Less than 25%	7%	4%	
26-50%	8%	9%	
51-75%	14%	24%	
>75%	72%	63%	
What percent of cases would have had better outcomes with conventional braces?			<0.0001
Less than 25%	65%	87%	
26-50%	17%	7%	
51-75%	11%	3%	
>75%	7%	2%	

DISCUSSION

The results from this study provided insight into differences in case confidence and treatment management between orthodontists and general dentists who are Invisalign® providers and related these differences to variations in expertise. After adjusting for experience, general dentists were more confident in treating a deep bite, severe crowding, and Class II malocclusion, while orthodontists were more confident in treating a mild crowding case. There was no difference in confidence for the treatment of a unilateral posterior crossbite or an anterior open bite. In general, case confidence increased with increasing Invisalign® experience.

Demographics

Overall, orthodontic respondents had more Invisalign® experience than general dentists. Specifically, their responses indicated they have completed significantly more cases than general dentists and have treated more active cases in the last 12 months. Based on the number of reported cases and the Invisalign® Tier Levels, it is reasonable to assume that most of the general dentists who responded were designated as “Preferred Providers” or “Premier Preferred Providers” by Invisalign®, while most orthodontists were “Premier Preferred Providers” or “Elite Preferred Providers.”⁷ This could partly be due to the fact that orthodontists were allowed to obtain Invisalign® certification 4 years before general dentists, although given that both specialties have been involved in using this treatment modality for almost 15 years, it is unlikely to be the cause today.¹ In addition, a greater percentage of orthodontists reported receiving more than 15 hours of additional Invisalign® training after initial certification compared to general dentists. There may be more continuing education lectures related to clear aligners at orthodontic

meetings compared to general dentistry conferences, which typically offer many diverse lecture topics unrelated to tooth movement.

Overall, due to the heterogeneity in demographics, differences in case confidence were determined after adjusting for these experience variables (years in practice, hours of training, and total number of cases treated).

Case selection

Variations in case confidence between the specialties were found for Cases 1, 3, 4, and 6, after adjusting for experience. However, these differences were small, and the overall trend seemed to be that general dentists and orthodontists were selecting Invisalign® cases with similar confidence, yet using vastly different auxiliaries and supplemental techniques.

Case 1 (deep bite) would likely be treated with fixed appliances using intrusion mechanics for the anterior teeth and/or extrusion mechanics for the posterior teeth, depending on the gingival display and facial esthetics. Intrusion mechanics may include an intrusion arch or anterior bite plane, while extrusion mechanics may involve posterior vertical elastics or a reverse curve archwire.¹⁰ The results of this study indicate that general dentists were marginally more confident in treating Case 1 with Invisalign® than orthodontists with similar experience, but were significantly less likely to use auxiliaries to aid in posterior extrusion, such as vertical elastics, compared to orthodontists. Orthodontists may have been more hesitant to treat this case because they understand the challenges of deep bite correction due to their experience and advanced training in biomechanics.¹¹ Forces required for intrusion of incisors are higher than those for extrusion, regardless of the type of appliance, and the use of Invisalign® presents an additional challenge since previous literature found the mean accuracy of tooth intrusion to be

41.3% when the average amount of intrusion attempted was 0.72mm.⁸ Finally, orthodontists may have witnessed relapse of molar extrusion cases due to high occlusal forces, an effect that is amplified by a clear aligner's tendency to cause posterior intrusion.¹² Thus, the slightly higher confidence of general dentists in treating the deep bite without the use of auxiliaries may indicate that they are not aiming to establish an ideal 1-2mm of overbite, while orthodontists may be more wary of the limitations of treating a deep bite with Invisalign®.

Case 2 (posterior crossbite), according to Boyd, can be effectively corrected by clear aligners because they disocclude the teeth, although he advises that crossbites of skeletal origin should be treated by orthopedic or surgical means.¹³ If a patient turns down a surgical option, maintaining a posterior crossbite in an adult is an acceptable compromise,¹⁴ a treatment objective used by several general dentists and orthodontists according to their free-form handwritten comments. Correction of dental crossbites, on the other hand, may be supplemented with the use of crossbite elastics if arch expansion and dental proclination are insufficient.¹⁰ The results of this study showed that general dentists and orthodontists were both confident in treating Case 2, and that there was no difference in confidence among the specialties, implying that general dentists and orthodontists were treating similar cases. However, orthodontists were more likely to use crossbite elastics than general dentists, perhaps because they are aware that excessive expansion or constriction of dental arches to achieve the ideal transverse relationship would introduce significant arch instability.¹⁶

Case 3 (mild crowding) was meant to serve as a control since it could likely be treated without any auxiliaries, and thus Invisalign® providers of all experience levels should feel comfortable treating it after initial certification. Accordingly, both specialties were confident treating this case, although orthodontists were slightly more so. What lead to the separation in

confidence was the fact that all orthodontic respondents reported they were confident or very confident, while a very small percentage of general dentists reported they were neutral, not confident, or would never treat this case with Invisalign®. A potential explanation for this finding is that some general dentists may have thought treatment was unnecessary, or they may have felt they could not meet the patient's esthetic demands. To support this hypothesis, one free-form comment from a general dentist stated "Does this case need treatment?"

Case 4 (severe crowding) would likely be treated with conventional braces by extracting 4 bicuspid teeth to alleviate the crowding, followed by elastic use to maintain Class I canine and molar relationships during space closure. The results of this survey demonstrated that general dentists were significantly more confident than orthodontists in treating this case, after adjusting for experience, but less than or equal to 50% of dentists reported prescribing extractions, using elastics, or employing a combination of fixed appliances and Invisalign®.

If Case 4 were treated without extractions, it would require significant arch expansion and proclination of the teeth beyond their stability and periodontal health. If extractions were prescribed for Case 4, an understanding of the proper moment to force ratios needed during treatment would be critical to the stability and success of this case since teeth tend to tip into extraction spaces, the bite deepens as space is closed, and anchorage control is critical.¹⁷ Orthodontists receive advanced training in all of these biomechanical considerations and have experience using elastics and obtaining root parallelism with fixed appliances. Thus, they may be more comfortable prescribing elastics with Invisalign® and may prefer to use fixed appliances to achieve more bodily tooth movement during space closure, especially since root parallelism is a limitation of Invisalign® treatment.¹⁸ The higher level of confidence of general dentists in treating Case 4 without auxiliaries, in contrast, suggests that their goals during treatment of

severe crowding cases with extractions may be focused on just straightening the teeth. Given that Invisalign® recently released its G6 First Premolar Extraction protocol, new research will be needed to investigate whether more providers begin to extract teeth and whether extraction space closure is more predictable.

For the treatment of Case 5 (anterior open bite), clear aligners have been suggested as a viable and even preferable alternative to fixed appliances because the double thickness of the aligners, in combination with the patient's biting force, intrudes the posterior teeth and thus aids in bite closure.¹² The results of this survey demonstrated general dentists and orthodontists were similarly confident in treating an open bite, after adjusting for experience. As with all of the cases, confidence increased with experience, possibly because clinicians may have witnessed the success of posterior intrusion with aligners as they treated more cases and received more training.

The final case, Case 6 (Class II) required molar classification, typically achieved using Class II elastics or an alternative non-compliant device.¹⁷ According to Djeu et. al in 2005, Invisalign® received poorer scores using the ABO objective grading system for large anteroposterior corrections compared to conventional braces.⁴ However, since the results of that study were published, Align Technology introduced Invisalign® G3 with Precision Cuts to accommodate the use of elastics for A-P correction. With the use of auxiliaries, more doctors were willing to attempt molar classification, with many reports of success.^{19,20}

This survey demonstrated that orthodontists were significantly less confident in treating a case with a Class II malocclusion compared to general dentists, although they were significantly more likely to use Class II elastics. Alternatively, several orthodontists noted in a free-form comment that they were confident treating the case, but they would not correct the Class II

relationship. Others mentioned that they would use a fixed appliance such as a molar distalizer before beginning treatment to achieve a Class I relationship first. This hesitation to treat a Class II malocclusion with Invisalign® may be due to their experience with conventional braces. Research has shown that treating a Class II Division 1 patient can take an average of 5 months longer than a Class I malocclusion,²¹ and that treatment time may be influenced by a variety of factors, including the type of Class II corrector used, number of months of elastic wear, compliance, and average time between appointments.²²

Given that general dentists were more confident in treating Class II malocclusions in the survey, but only 37% reported using Class II elastics, perhaps they were not trying to correct the classification. Vicéns and Russo, who also found that general dentists were more likely to treat a Class II discrepancy in their study, hypothesized that they may have different treatment objectives as a result of their varied educational background.²³ In other words, general dentists who treat Class II malocclusions without the appropriate auxiliaries may aim for esthetic alignment and disregard classification correction. Since experience with elastic use is uncommon in dental school, general dentists likely receive training for this auxiliary from orthodontic or Invisalign® continuing education courses and other resources found on Align's website. Orthodontists, on the other hand, receive their training from the above resources in addition to a 2-3 year specialty program, and may better understand the need for elastics or an alternative Class II corrector to achieve an ideal Class I molar relationship. In addition, orthodontists may be more focused on occlusion rather than just esthetics, and so their treatment objectives may result in their decreased confidence demonstrated for Case 6 in the survey.

To summarize the results of case confidence, in general, Invisalign® providers who completed a greater number of cases had greater confidence, and those who had more years in

practice were more confident. It was shown that orthodontists and general dentists were electing to treat a variety of moderate to severe malocclusions with Invisalign® with similar confidence, but different utilization of recommended auxiliaries, perhaps demonstrating a difference in treatment goals and overall esthetic results.

Treatment management:

The treatment management portion of the survey found differences between orthodontists and general dentists in every parameter except the use of IPR. Conflicting with the findings of this research, Barcoma et al. demonstrated in a 2014 study that general dentists were less comfortable with performing IPR for orthodontic reasons while orthodontists believed the esthetic and occlusal benefits offset the potential but unlikely increased risk of tooth decay.²³ The present survey found no difference in the use of IPR between the two groups, with virtually every respondent performing IPR in the anterior and/or posterior region. This discrepancy may be because the study by Barcoma et al. included all general dentists, while this survey included only general dentists who are Invisalign® providers. Invisalign® providers may be more open to removing a minimal amount of enamel for the orthodontic benefit of relieving crowding, avoiding extractions, or improving esthetics.

While significant differences were noted for each of the remaining questions pertaining to auxiliaries and supplemental techniques, a few are particularly noteworthy since they may suggest differences exist in treatment goals and/or outcomes between the specialties. For example, orthodontists tended to spend more time reviewing the ClinCheck®, and they were more likely to do refinements than general dentists. Since orthodontists receive 2-3 years of specialty training related to the diagnosis and treatment of malocclusions, learning to detail wires and employing auxiliaries to achieve ideal occlusions, they may be more critical of the final

position of the teeth. They may spend more time adding auxiliaries such as precision cuts for elastics or lingual attachments for teeth that are not tracking. Alternatively, general dentists may have different goals for the patients they are treating that do not require as many minute changes, so that refining the ClinCheck® is less critical.

Another noteworthy result was that orthodontists were significantly more likely than general dentists to prescribe all types of elastics and more likely to use a combination of fixed appliances and Invisalign®, although the timing of bracket placement varied. As previously mentioned, dentists may be more hesitant to use elastics due to their unfamiliarity or because they may not be attempting to achieve ideal Class I occlusions if anteroposterior correction is needed. Orthodontists, on the other hand, are accustomed to and comfortable using elastics with fixed appliances based on their residency training, while most general dentists do not offer orthodontics in their practices.²⁴ In addition, orthodontists may use fixed appliances more often because they are slightly more likely to prescribe extractions and can achieve space closure and root parallelism more reliably with brackets and wires.

While the orthodontists responding to the survey had more experience overall treating Invisalign® cases, they were statistically more likely to believe better treatment outcomes could have been achieved if fixed appliances were used instead of clear aligners. Through their additional years of specialty training, orthodontists become experts in the diagnosis and treatment planning of tooth movement and alignment, historically with predominantly fixed appliances. Thus, it is possible that orthodontists are more critical of tooth position than general dentists, as well as more comfortable correcting malalignment with brackets, wires, and appliances.

Few objective studies have investigated the efficacy of Invisalign® since its incorporation of the G3, G4, G5, and G6 Innovations. The results of this study show that both orthodontists and general dentists are electing to treat a variety of moderate to severe malocclusions with Invisalign®, but there are differences in case confidence, treatment management, and expertise. Thus, more studies are needed to establish revised strengths and limitations of treatment with Invisalign®, and more training is indicated to ensure that Invisalign® providers are confident and successful in treating their diverse patient pools.

CONCLUSIONS

- Among Invisalign® providers, orthodontists reported having completed significantly more total cases, more cases in the last 12 months, and having received more training than general dentists.
- There was a significant difference in Invisalign® case confidence between orthodontists and general dentists for several malocclusions. General dentists were more confident than orthodontists in treating deep bite, severe crowding, and Class II malocclusions.
- In general, case confidence increased with increasing Invisalign® experience.
- Orthodontists were more likely to use auxiliaries and supplemental techniques such as elastics, lingual attachments, extractions, and refinements than general dentists.
- Orthodontists were more likely to perceive better outcomes could be achieved for their patients with fixed appliances versus Invisalign®.
- Overall, it was shown that orthodontists and general dentists are electing to treat a variety of moderate to severe malocclusions with Invisalign® with similar confidence, but different utilization of recommended auxiliaries, perhaps demonstrating a difference in treatment goals and, hence, in overall outcomes.

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APPENDICES

Appendix 1: Invisalign® Tier Levels

Membership Tier Qualifications:		
Tier Level	Historical Qualifying Shipments	Semi-Annual Shipments
Preferred Provider	10	5
Premier Preferred Provider	50	25
Elite Preferred Provider	300	50
Top 1%	800	100

Invisalign® offers an Advantage Program to its doctors based on the total number of treatments they have started and the number treated in the past 12 months, such that a higher number of starts leads to lower laboratory fees and other benefits. However, a certain number of cases must be submitted semiannually to maintain the given tier level status.

Appendix 2: Case 1 Pairwise Comparison

Case 1: Deep Bite				
Experience Measure	Comparison		Estimated difference (adjusted 95% CI)	Adj P*
Years in Practice	1-10 years	11-20 years	0.22 (-0.06,0.5)	0.2004
	1-10 years	21-30 years	0 (-0.28,0.29)	1.0000
	1-10 years	31-40 years	-0.11 (-0.45,0.22)	0.8881
	1-10 years	More than 40 years	0.02 (-0.45,0.5)	0.9999
	11-20 years	21-30 years	-0.21 (-0.47,0.04)	0.1402
	11-20 years	31-40 years	-0.33 (-0.64,-0.03)	0.0254†
	11-20 years	More than 40 years	-0.2 (-0.65,0.26)	0.7627
	21-30 years	31-40 years	-0.12 (-0.42,0.18)	0.8207
	21-30 years	More than 40 years	0.02 (-0.43,0.47)	1.0000
	31-40 years	More than 40 years	0.14 (-0.34,0.61)	0.9331
Number of Cases	0-9	10-49	-0.98 (-2.64,0.67)	0.4819
	0-9	50-299	-1.25 (-2.9,0.4)	0.2312
	0-9	300-799	-1.43 (-3.09,0.23)	0.1296
	0-9	800 or more	-1.49 (-3.17,0.19)	0.1090
	10-49	50-299	-0.27 (-0.57,0.03)	0.1111
	10-49	300-799	-0.45 (-0.82,-0.07)	0.0109†
	10-49	800 or more	-0.51 (-0.97,-0.05)	0.0213†
	50-299	300-799	-0.18 (-0.43,0.08)	0.3126
	50-299	800 or more	-0.24 (-0.59,0.11)	0.3379
	300-799	800 or more	-0.06 (-0.43,0.3)	0.9890

*Tukey's Adjustment for multiple comparisons

†Adjusted P-value<0.05

Appendix 3: Case 2 Pairwise Comparisons

Case 2: Posterior Crossbite; Diastema				
Experience Measure	Comparison		Estimated difference (adjusted 95% CI)	Adj P*
Number of Cases				
	0-9	10-49	-0.06 (-2.02,1.9)	1.0000
	0-9	50-299	-0.32 (-2.27,1.63)	0.9916
	0-9	300-799	-0.74 (-2.71,1.23)	0.8418
	0-9	800 or more	-0.8 (-2.79,1.19)	0.8082
	10-49	50-299	-0.26 (-0.62,0.1)	0.2662
	10-49	300-799	-0.68 (-1.13,-0.24)	0.0003†
	10-49	800 or more	-0.74 (-1.29,-0.2)	0.0020†
	50-299	300-799	-0.42 (-0.72,-0.12)	0.0014†
	50-299	800 or more	-0.48 (-0.9,-0.06)	0.0161†
	300-799	800 or more	-0.06 (-0.49,0.37)	0.9959
Hours of Training				
	0-5 hours	6-10 hours	0.36 (-0.11,0.84)	0.2052
	0-5 hours	11-15 hours	0.21 (-0.25,0.68)	0.636
	0-5 hours	More than 15 hours	-0.06 (-0.47,0.35)	0.9773
	6-10 hours	11-15 hours	-0.15 (-0.57,0.27)	0.8052
	6-10 hours	More than 15 hours	-0.43 (-0.78,-0.07)	0.0113†
	11-15 hours	More than 15 hours	-0.28 (-0.6,0.04)	0.1047

*Tukey's Adjustment for multiple comparisons

†Adjusted P-value<0.05

Appendix 4: Case 3 Pairwise Comparisons

Case 3: Control				
Experience Measure	Comparison		Estimated difference (adjusted 95% CI)	Adj P*
Number of Cases				
	0-9	10-49	0.27 (-0.66,1.2)	0.9312
	0-9	50-299	0.14 (-0.78,1.07)	0.9934
	0-9	300-799	0.02 (-0.92,0.95)	1.0000
	0-9	800 or more	-0.05 (-0.99,0.9)	0.9999
	10-49	50-299	-0.13 (-0.3,0.04)	0.2386
	10-49	300-799	-0.26 (-0.47,-0.04)	0.0090†
	10-49	800 or more	-0.32 (-0.58,-0.06)	0.0075†
	50-299	300-799	-0.13 (-0.27,0.02)	0.1092
	50-299	800 or more	-0.19 (-0.39,0.01)	0.0726
	300-799	800 or more	-0.06 (-0.27,0.14)	0.9202

*Tukey's Adjustment for multiple comparisons

†Adjusted P-value<0.05

Appendix 5: Case 4 Pairwise Comparisons

Case 4: Severe Crowding				
Experience Measure	Comparison		Estimated difference (adjusted 95% CI)	Adj P*
Number of Cases	0-9	2. 10-49	-0.55 (-2.98,1.87)	0.9712
	0-9	50-299	-0.85 (-3.27,1.56)	0.8708
	0-9	300-799	-1.45 (-3.89,0.98)	0.4762
	0-9	800 or more	-1.74 (-4.2,0.73)	0.3043
	10-49	50-299	-0.3 (-0.74,0.15)	0.3530
	10-49	300-799	-0.9 (-1.45,-0.35)	<.0001†
	10-49	800 or more	-1.18 (-1.86,-0.51)	<.0001†
	50-299	300-799	-0.6 (-0.97,-0.23)	0.0001†
	50-299	800 or more	-0.88 (-1.4,-0.36)	<.0001†
	300-799	800 or more	-0.28 (-0.81,0.25)	0.5941
Hours of Training	0-5 hours	6-10 hours	-0.08 (-0.67,0.51)	0.9837
	0-5 hours	11-15 hours	0.07 (-0.5,0.65)	0.9886
	0-5 hours	More than 15 hours	-0.54 (-1.04,-0.03)	0.0336†
	6-10 hours	11-15 hours	0.15 (-0.37,0.67)	0.8699
	6-10 hours	More than 15 hours	-0.45 (-0.89,-0.01)	0.0400†
	11-15 hours	More than 15 hours	-0.61 (-1,-0.22)	0.0004†

*Tukey's Adjustment for multiple comparisons

†Adjusted P-value<0.05

Appendix 6: Case 5 Pairwise Comparisons

Case 5: Anterior Open Bite				
Experience Measure	Comparison		Estimated difference (adjusted 95% CI)	Adj P*
Number of Cases				
	0-9	10-49	0.03 (-2.15,2.2)	1.0000
	0-9	50-299	-0.48 (-2.65,1.69)	0.9742
	0-9	300-799	-1.1 (-3.28,1.09)	0.6432
	0-9	800 or more	-1.17 (-3.38,1.05)	0.5998
	10-49	50-299	-0.51 (-0.91,-0.11)	0.0050†
	10-49	300-799	-1.13 (-1.62,-0.63)	<.0001†
	10-49	800 or more	-1.19 (-1.8,-0.59)	<.0001†
	50-299	300-799	-0.62 (-0.95,-0.28)	<.0001†
	50-299	800 or more	-0.69 (-1.15,-0.22)	0.0006†
	300-799	800 or more	-0.07 (-0.55,0.41)	0.9951
Hours of Training				
	0-5 hours	6-10 hours	0.07 (-0.45,0.6)	0.984
	0-5 hours	11-15 hours	-0.17 (-0.69,0.35)	0.8304
	0-5 hours	More than 15 hours	-0.6 (-1.06,-0.15)	0.0040†
	6-10 hours	11-15 hours	-0.24 (-0.71,0.22)	0.5314
	6-10 hours	More than 15 hours	-0.67 (-1.07,-0.28)	<.0001†
	11-15 hours	More than 15 hours	-0.43 (-0.78,-0.08)	0.0098†

*Tukey's Adjustment for multiple comparisons

†Adjusted P-value<0.05

Appendix 7: Case 6 Pairwise Comparisons

Case 6: Deep Bite; Class II				
Experience Measure	Comparison		Estimated difference (adjusted 95% CI)	Adj P*
Years in Practice	1-10 years	11-20 years	0.43 (0.08,0.78)	0.0070†
	1-10 years	21-30 years	0.33 (-0.02,0.69)	0.0817
	1-10 years	31-40 years	0.09 (-0.33,0.51)	0.9782
	1-10 years	More than 40 years	0.41 (-0.2,1.01)	0.3539
	11-20 years	21-30 years	-0.1 (-0.41,0.22)	0.9246
	11-20 years	31-40 years	-0.34 (-0.72,0.05)	0.1125
	11-20 years	More than 40 years	-0.02 (-0.6,0.55)	1.0000
	21-30 years	31-40 years	-0.24 (-0.62,0.13)	0.3967
	21-30 years	More than 40 years	0.07 (-0.5,0.64)	0.9969
	31-40 years	More than 40 years	0.32 (-0.29,0.92)	0.6052
Number of Cases	0-9	10-49	-1.23 (-3.3,0.84)	0.4800
	0-9	50-299	-1.74 (-3.81,0.32)	0.1418
	0-9	300-799	-2.13 (-4.21,-0.05)	0.0414†
	0-9	800 or more	-2.61 (-4.71,-0.5)	0.0066†
	10-49	50-299	-0.51 (-0.89,-0.13)	0.0023†
	10-49	300-799	-0.9 (-1.37,-0.43)	<.0001†
	10-49	800 or more	-1.38 (-1.96,-0.8)	<.0001†
	50-299	300-799	-0.39 (-0.7,-0.07)	0.0088†
	50-299	800 or more	-0.86 (-1.31,-0.42)	<.0001†
	300-799	800 or more	-0.48 (-0.94,-0.02)	0.0345†
Hours of Training	0-5 hours	6-10 hours	-0.13 (-0.63,0.38)	0.9171
	0-5 hours	11-15 hours	0.03 (-0.47,0.52)	0.9989
	0-5 hours	More than 15 hours	-0.37 (-0.81,0.06)	0.1208
	6-10 hours	11-15 hours	0.15 (-0.29,0.6)	0.8119
	6-10 hours	More than 15 hours	-0.25 (-0.62,0.13)	0.3288
	11-15 hours	More than 15 hours	-0.4 (-0.74,-0.06)	0.0127†

*Tukey's Adjustment for multiple comparisons

†Adjusted P-value<0.05

Appendix 8: Surveys to Orthodontists and General Dentists

Case selection and treatment management by Invisalign® providers Orthodontist Questionnaire



We invite you to participate in the following survey, which investigates differences in case selection and treatment management by general dentists and orthodontists who are Invisalign®* providers. The survey also includes several questions related to educational background and Invisalign® training. All responses are anonymous. The survey should take about 10 minutes to complete, and you may stop taking it at any time if you wish. We truly appreciate your participation.

Case Selection:

Please select how confident you feel in treating each of the following cases (1-6) with Invisalign®.

1.



Very confident

Confident

Neutral

Not confident

Never treat this case
with Invisalign®

2.



Very confident

Confident

Neutral

Not confident

Never treat this case
with Invisalign®

3.



Very confident

Confident

Neutral

Not confident

Never treat this case with Invisalign®

4.



Very confident

Confident

Neutral

Not confident

Never treat this case with Invisalign®

5.



Very confident

Confident

Neutral

Not confident

Never treat this case with Invisalign®

6.



Very confident

Confident

Neutral

Not confident

Never treat this case
with Invisalign®

Treatment management:

1. How much time do you spend reviewing and/or changing the ClinCheck before initial approval? (Check one.)
 - I usually don't make changes to the ClinCheck
 - 0-15 minutes
 - 16-30 minutes
 - 31-45 minutes
 - More than 45 minutes

2. Do you use IPR during treatment, and if so, where do you perform it? (Check all that apply.)
 - Yes
 - In the anterior region
 - In the posterior region
 - No

3. Do you use interarch elastics for anteroposterior correction of occlusion in your treatment plan? (If so, check all that apply.)
 - Yes
 - Class II elastics
 - Class III elastics
 - Crossbite elastics
 - Vertical elastics or box elastics
 - No

4. Do you treat patients with a combination of Invisalign® and fixed appliances? (If so, check all that apply.)
 - Yes
 - Start with fixed appliances followed by Invisalign®
 - Start with Invisalign® and then use fixed appliances for finishing the case
 - Fixed posterior segments concurrently with anterior Invisalign®
 - No

5. Do you treat extraction cases with Invisalign®? (Check one.)
- Yes
 - No
6. Do you do refinements of your cases during treatment? (Check one.)
- Never
 - On 0-25% of my cases
 - On 26-50% of my cases
 - On 51-75% of my cases
 - On more than 75% of my cases
7. If you do refinements, when do you typically do them? (Check one.)
- If one tooth stops tracking
 - If multiple teeth stop tracking
 - Before I have finished the first set of aligners
 - After I have finished a complete set of aligners
8. How often do you see the patient in the clinic during treatment? (Check one.)
- Once every 4 weeks
 - Once every 6 weeks
 - Once every 8 weeks
 - More than 8 weeks between appointments
9. Do you place attachments on the lingual of teeth as well as the facial to aid in tracking? (Check one.)
- Yes
 - No
10. Do you use Invisalign Teen®? (Check one.)
- Yes
 - No
11. How often do you tell a patient that his/her case is too complex for Invisalign® when they request it? (Check one.)
- Less than 25% of the time
 - 25-50% of the time
 - 51-75% of the time
 - More than 75% of the time

12. How often do you ask a patient whether they are interested in getting Invisalign® when you've determined they are a good candidate for this treatment option? (Check one.)

- Less than 25% of the time
- 25-50% of the time
- 51-75% of the time
- More than 75% of the time

13. In retrospect, what percentage of your completed Invisalign® cases do you believe would have had better outcomes if they had been treated with conventional braces? (Check one.)

- Less than 25%
- 25-50%
- 51-75%
- More than 75%

Demographics:

14. How many Invisalign® cases have you treated in total? (Check one.)

- 0-10
- 11-50
- 51-300
- 301-800
- More than 800

15. How many active Invisalign® cases have you treated in the last 12 months? (Check one.)

- 1-10
- 11-50
- 51-100
- 101-300
- More than 301

16. How many years have you been practicing orthodontics? (Check one.)

- 1-10 years
- 11-20 years
- 21-30 years
- 31-40 years
- More than 40 years

17. How many hours of additional training pertaining to Invisalign® have you received after initial certification, and have you attended the Invisalign® Summit? (Check the # of hours and whether you attended the Summit.)

- 0-5 hours
- 6-10 hours
- 11-15 hours
- More than 15 hours
- Attended Invisalign® Summit

Case selection and treatment management by Invisalign® providers General Dentist Questionnaire



We invite you to participate in the following survey, which investigates differences in case selection and treatment management by general dentists and orthodontists who are Invisalign®* providers. The survey also includes several questions related to educational background and Invisalign® training. All responses are anonymous. The survey should take about 10 minutes to complete, and you may stop taking it at any time if you wish. We truly appreciate your participation.

Case Selection:

Please select how confident you feel in treating each of the following cases (1-6) with Invisalign®.

1.



Very confident Confident Neutral Not confident Never treat this case with Invisalign®

2.



Very confident Confident Neutral Not confident Never treat this case with Invisalign®

*Registered trademark of Align Technology, Inc.
 2560 Orchard Pkwy, San Jose, CA 95131; www.aligntech.com



Very confident

Confident

Neutral

Not confident

Never treat this case with Invisalign®

4.



Very confident

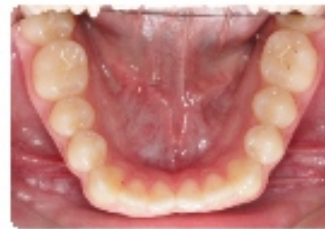
Confident

Neutral

Not confident

Never treat this case with Invisalign®

5.



Very confident

Confident

Neutral

Not confident

Never treat this case
with Invisalign®

6.



Very confident

Confident

Neutral

Not confident

Never treat this case
with Invisalign®

Treatment management:

1. How much time do you spend reviewing and/or changing the ClinCheck before initial approval? (Check one.)
 - I usually don't make changes to the ClinCheck
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 - 16-30 minutes
 - 31-45 minutes
 - More than 45 minutes
2. Do you use IPR during treatment, and if so, where do you perform it? (Check all that apply.)
 - Yes
 - In the anterior region
 - In the posterior region
 - No
3. Do you use interarch elastics for anteroposterior correction of occlusion in your treatment plan? (If so, check all that apply.)
 - Yes
 - Class II elastics
 - Class III elastics
 - Crossbite elastics
 - Vertical elastics or box elastics
 - No
4. Do you treat patients with a combination of Invisalign® and fixed appliances? (If so, check all that apply.)
 - Yes
 - Start with fixed appliances followed by Invisalign®

- Start with Invisalign® and then use fixed appliances for finishing the case
 - Fixed posterior segments concurrently with anterior Invisalign®
 - No
5. Do you treat extraction cases with Invisalign®? (Check one.)
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6. Do you do refinements of your cases during treatment? (Check one.)
- Never
 - On 0-25% of my cases
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- If one tooth stops tracking
 - If multiple teeth stop tracking
 - Before I have finished the first set of aligners
 - After I have finished a complete set of aligners
8. How often do you see the patient in the clinic during treatment? (Check one.)
- Once every 4 weeks
 - Once every 6 weeks
 - Once every 8 weeks
 - More than 8 weeks between appointments
9. Do you place attachments on the lingual of teeth as well as the facial to aid in tracking? (Check one.)
- Yes
 - No
10. Do you use Invisalign Teen®? (Check one.)
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11. How often do you tell a patient that his/her case is too complex for Invisalign® when they request it? (Check one.)
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 - 51-75% of the time
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- More than 75%

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14. How many Invisalign® cases have you treated in total? (Check one.)

- 0-10
- 11-50
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- 301-800
- More than 800

15. How many active Invisalign® cases have you treated in the last 12 months? (Check one.)

- 1-10
- 11-50
- 51-100
- 101-300
- More than 301

16. How many years have you been practicing general dentistry? (Check one.)

- 1-10 years
- 11-20 years
- 21-30 years
- 31-40 years
- More than 40 years

17. How many hours of additional training pertaining to Invisalign® have you received after initial certification, and have you attended the Invisalign® Summit? (Check the # of hours and whether you attended the Summit.)

- 0-5 hours
- 6-10 hours
- 11-15 hours
- More than 15 hours
- Attended Invisalign® Summit

VITA

Alexandra Best was born on August 10, 1988 to Randall and Corinne Best, and was raised in Buffalo, New York along with her younger brother, Ryan. She graduated from Nichols High School in 2006, and went on to receive her Bachelors of the Arts Degree in Spanish from Princeton University in June 2010. After completing her undergraduate work, Ali continued to pursue her childhood dream of becoming an orthodontist, attending the University of Florida College of Dentistry and receiving her Doctor of Dental Medicine in 2014. As the last step in fulfilling her career goals, Ali was elated and so grateful to be accepted to Virginia Commonwealth University for completion of her orthodontics residency. She received a Certificate of Orthodontics and Master of Science in Dentistry in 2016. Ali plans to work as an associate while her husband attends business school at MIT in Boston, MA, and then hopes to return to Virginia and eventually own her own practice.