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Orthodontists' and patients' preferences in website design in the selection of an orthodontic practice: a comparative study

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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Abstract

ORTHODONTISTS' AND PATIENTS' PREFERENCES IN WEBSITE DESIGN IN THE SELECTION OF AN ORTHODONTIC PRACTICE: A COMPARATIVE STUDY

By Taylor R. Brown, D.D.S.

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

Virginia Commonwealth University, 2018

Thesis Director: Bhavna Shroff, D.D.S, M.D.Sc.
Program Director, Department of Orthodontics

Objective: To determine which website characteristics are preferred by orthodontists, adult patients, and parents of patients.

Materials and Methods: 1,000 active members of the American Association of Orthodontists and 750 active orthodontic patients/parents were sampled. Participants rated the importance of website characteristics, indicated presence of those characteristics on the current website, and ranked sample website images. Preferences were compared between orthodontist and the patient/parent group using t-tests and sample websites were compared using ANOVA models and Tukey's adjusted post-hoc tests. Significance level was set at 0.05.

Results: 11 of the 16 website features showed significant differences between patients/parents and orthodontists. Participants preferred sample websites with images of people, information at the top of the page, and an 'about the doctor' page with a greater amount of information.

Conclusion: This study showed significant differences in preferences between orthodontists and patients/parents, by gender, and between adult patients and parents of adolescent patients.

Introduction

The Internet has transformed how people acquire information about businesses. Before the inception of the Internet, information was gathered on businesses through phone book listings, direct mail, word of mouth, or by contacting that business directly in person or via telephone.¹ The first web browser was created in 1990, and became publicly available a year later. Internet use expanded quickly over the next several years, and by the year 2000 the Internet revolution was rapidly developing, with information processing growing at exponential rates.² By 2010, 76% of American adults used the internet, and in 2016 nearly 9 out of 10 American adults used the Internet to gather information, connect with one another, and conduct their day-to-day lives.³

A website is a place on the internet that contains information about a business, a person, or an organization, and it usually consists of web pages joined by hyperlinks.⁴ Websites appeal to visitors due to the fact that they are often highly interactive and show appealing displays through multimedia technologies.⁵ In addition to acquiring information, people look at websites to help them form an opinion about a business or service, or to make a purchase. Total e-commerce sales for 2016 were estimated at \$394.9 billion, an increase of 15.1 percent ($\pm 1.8\%$) from 2015.⁶

Websites are most appealing to users when aesthetics, usability, and purpose are appropriately balanced.^{7,8} There are many ways to influence users' perception of a website including moving animations, size of items, images, color, text style, and positioning.⁹ An important factor influencing the way in which users view a website is visual hierarchy, or the arrangement of the elements on the page.¹⁰ It has been shown that images of faces attract website users' attention, and can serve as an entry point for information that is located in their

close proximity.^{7,9} A consumer's impression of a company as a whole can be significantly influenced by the design of the company's website.¹¹ Visual appeal has been recognized as an important factor in determining a website's quality and a good predictor of a user's intention to purchase an item or revisit the website.¹² An aesthetically appealing website is important in developing the trust of visitors.¹³ In a study on website design, it was noted that a pleasant looking website was more trustworthy, even if other factors were lacking.¹⁴

Hospitals and health systems understand the benefits of making websites more user-friendly to patients. Hospital websites provide information about conditions, treatment, and follow-up, and can help create a positive image of the organization.¹⁵ Thoughtful and intentional website design allows these organizations to make maneuvering complex health encounters more appealing to patients. Hospitals use website design to market themselves to consumers with organized strategies. Ford et al showed that a hospital's website quality (readability, content, graphics, etc.) is strongly and positively related to the consumers' willingness to recommend the facility to others.¹⁵

An orthodontic practice website serves many of the same purposes as a hospital website. In the area of marketing and advertising, the orthodontist's website was considered the most important factor influencing a pediatric dentist referral.¹⁶ Longoria et al showed that informative websites are important factors in the selection of an orthodontist, along with display of before-and-after photos and a referral from a pediatric dentist.¹⁷

Potential patients go online to research orthodontists, thus a robust and appropriate online presence is essential for attracting new patients.¹ During interaction in the office, patients prefer a practice where the orthodontist appears competent, knowledgeable, and confident and the office space is clean and sterile.¹⁷ Just as patients have preferences concerning the appearance of

the practice and the orthodontist in person,¹⁸ they have preferences concerning the appearance of an orthodontic practice website. In an increasingly competitive market, orthodontists should consider all factors that may influence the choice of provider,¹⁸ in person and online.

There is no shortage of information available on website design, and web design firms urge business owners to create custom made websites created and coded specifically for them. In contrast, there are website templates available on the internet at no cost. There is a wide range in the cost to create and maintain a custom small business website, depending on how it is set up and what features are built into it. Smartphones are now the primary device used to access the internet.¹⁹ It is necessary for websites to be mobile optimized, allowing them to interface with smartphones and tablets. Some designers advocate for a mobile first design pattern in which the website is built with simplicity in mind for mobile devices first, prior to incorporating features specific to larger screens such as personal computers.¹⁹ The wide range in pricing and features leaves many orthodontists questioning which features are important and which ones will not be of significant impact.

While editorials exist and opinions on the subject of website design are abundant, no data is available in the orthodontic literature displaying patients' preferences of information on orthodontic websites. The purposes of this study were (1) to determine which website features and designs are preferred by orthodontists, adult patients, and parents of patients, (2) to compare preferences between orthodontists, adult patients, and parents of patients, and (3) to compare importance scores of different features to presence of those specific features on practice websites. The null hypothesis was that there is no difference in website preferences between the orthodontist group and the patient/parent group.

Materials and Methods

After approval from the Virginia Commonwealth University Institutional Review Board, a parallel pair of original surveys was sent to orthodontists, adult orthodontic patients, and parents or guardians of minor aged patients. Orthodontists (n=1,000) randomly selected from all active members of the American Association of Orthodontists (AAO) were mailed the orthodontist questionnaire packet, which included an introductory cover sheet with instructions to complete the survey. A second mailing was sent out 6 weeks later to those who did not respond to the first mailing. 750 adult patients and the parents of child/adolescent patients were asked to complete the patient questionnaire packet, which included an introductory cover sheet with instructions to complete the survey.

The group consisting of adult orthodontic patients and parents or guardians of minor aged patients (patient/parent group) was selected from 15 different orthodontic practices, including the Orthodontic Clinic at Virginia Commonwealth University School of Dentistry. The remaining 14 orthodontic practices were selected from the current members of Virginia Orthodontic Education and Research Foundation. The foundation members who participated were distributed throughout the United States. Each of the 15 orthodontic practices distributed 50 surveys to patients and parents. Front desk personnel were instructed to distribute surveys to all patients and parents until the 50 surveys had been distributed. The first round of mailing was sent out in May 2017, the second round of mailing was sent out in July 2017. The practices were informed to stop distributing surveys in September 2017. Data were collected and recorded until October 2017.

In the paper-based survey, orthodontists and patients/parents were asked to answer questions related to the design of an orthodontic practice website. The survey was separated into sections. For the first section, the subjects were given various features in website design and asked to answer corresponding to the level of importance they placed on that feature when selecting an orthodontist. The list of features is shown in Appendix 1. Both groups participated by recording their responses on a 0-10 scale. The scale was labeled with 0 being “least important” and 10 being “most important.” These features were selected based on available literature on website design^{7,10,19} and after consultation with Sesame Communications, a dental website design firm. For the second section, the orthodontists and patients/parents were asked a yes/no follow-up question regarding whether or not that specific factor was present on that practice website. For the third section, the survey included images of different websites and participants were asked to rank the different sample website images with 1 being “most preferred” and 3 being “least preferred.” Finally, the last section gathered information on practice and patient/parent demographics.

Statistical Methods

Descriptive statistics (counts and percentages) were used to describe respondent demographics. Preferences were compared between orthodontists and patients/parents using t-tests and sample websites were compared using repeated measures ANOVA models and Tukey’s adjusted post-hoc tests. Associations between percent reporting feature on website and average ranking of features were determined using linear regression and correlation. Significance level was set at 0.05. SAS EG v.6.1 (SAS Institute Inc., Cary, NC) was used for all analyses.

Results

A total of 113 orthodontists responded to the survey for a response rate of 11%. 72% of responding orthodontists were male, and 28% were female. 80% of responding orthodontists were between the ages of 35-64, and were evenly distributed across that age range. 39% were board certified, and they were roughly evenly spread across AAO Constituencies. 70% of respondents practiced in communities with between 2,500 and 500,000 people. The majority of orthodontists reported being in a solo practice setting (78%). Only 3% of respondents reported employment in a Dental Service Organization (DSO). While a majority of responding orthodontists has practiced orthodontics for 16 years or more (65%), 20% had been practicing between 6 and 10 years. Full demographics are given in Table 1.

Table 1: Demographics of Orthodontist Respondents

	n	%
Response Rate:	113	11%
Age:		
25-34	8	7%
35-44	33	29%
45-54	27	24%
55-64	30	27%
65+	15	13%
Gender:		
Male	81	72%
Female	31	28%
Are you currently ABO certified?		
No	69	61%
Yes	44	39%
How many years have you practiced orthodontics?		
0-5	10	9%
6-10	22	20%
11-15	7	6%
16-20	18	16%
21-25	16	14%
26-30	13	12%
31+	26	23%
Which best describes your current practice situation:		
Solo Practice	87	78%
Group Practice	15	13%
Dental Service Organization (DSO)	3	3%
Other (Please Describe)	7	6%
Please indicate the community size of your practice:		
Small Town (Less than 2,500)	5	4%
Town/Small city (2,500-50,000)	37	33%
Large City (50,001-500,000)	41	37%
Metropolitan (more than 500,000)	29	26%

Orthodontists were asked on a scale from 0-10 how involved they were in the design of their current website and the average response was 6.8 (SD=3.0). Case starts between 2015 and 2016 were similar. For 2015, 57% of orthodontists reported more than 200 case starts, for 2016, 58% of orthodontists reported more than 200 case starts. When asked about current workload, the largest group (58%) provided care to all those requesting appointments and did not feel overworked, while just 4% were too busy to treat all persons requesting appointments. Full practice metrics are given in Table 2.

Table 2: Orthodontist Practice Metrics

	n	%
Please describe your current workload?		
Too busy to treat all persons requesting appointments	4	4%
Provided care to all who requested appointments but felt overworked	15	14%
Provided care to all who requested appointments- did not feel overworked	64	58%
Not busy enough	28	25%
How many case starts did your practice have in 2015?		
< 150	25	23%
151-200	22	20%
201-250	21	19%
251-300	8	7%
301-350	13	12%
351+	22	20%
How many case starts did your practice have in 2016?		
< 150	23	22%
151-200	22	21%
201-250	12	11%
251-300	8	8%
301-350	16	15%
351+	24	23%
How many total orthodontists make up your practice:		
1	79	71%
2	22	20%
3	4	4%
4	5	4%
6+	2	2%

Four hundred one responses were collected from adult patients and parents or guardians of minor patients in orthodontist offices for an overall response rate of 53%. Most respondents were female (82%) and between the ages of 35-54 (68%). Almost all (99%) had at least a high school diploma or GED, and the majority (58%) had a Bachelor’s degree or higher. 79% lived in communities with a population between 2,500 and 500,000 people, 51% of which lived in communities of 2,500-50,000 people. Full patient/parent demographics are given in Table 3.

Table 3: Demographics of Adult Patients and Parents of Patients

	n	%
Response Rate:	401	53%
Age:		
18-24	33	8%
25-34	53	14%
35-44	145	37%
45-54	123	31%
55-64	29	7%
65+	9	2%
Gender:		
Male	69	18%
Female	320	82%
Please indicate the highest level of education you have completed:		
Haven't graduated High School	5	1%
High School/GED	155	40%
Bachelors	158	41%
Masters	54	14%
Doctorate	11	3%
Please indicate the size of the community you live in:		
Small Town (Less than 2,500)	47	12%
Town/Small city (2,500-50,000)	193	51%
Large City (50,001-500,000)	107	28%
Metropolitan (more than 500,000)	34	9%

21% (n=73) of respondents were adults who were there for their own treatment. 79% (n=274) of respondents were at the office for the care of their child. Those who answered not applicable (siblings, nannies, etc.) were excluded from this question. The age of children being treated was most often 11-16 (78%). The majority of respondents also reported they or their dependent was being treated with traditional metal braces (75%) rather than the esthetic alternatives (clear aligners or ceramic braces, 25%). Respondents were asked if the practice website played a role in their decision to seek treatment at their current practice. There was a significant difference in whether or not the website was an important factor (p-value=0.0035)

between adult patients and parents of patients. Specifically, 42% of adult patients agreed/strongly agreed that the website was an important factor in provider selection compared to 20% of those obtaining treatment for a child (Figure 1). When asked how many practice websites they visited before coming to their current practice, 56% stated that they did not visit any websites. 28% visited 1-2 websites, 10% visited 3, and 6% visited 4 or more websites. Full treatment factors are given in Table 4.

Figure 1: Rating of Website Importance in Provider Decision between Adult Patients and Parents

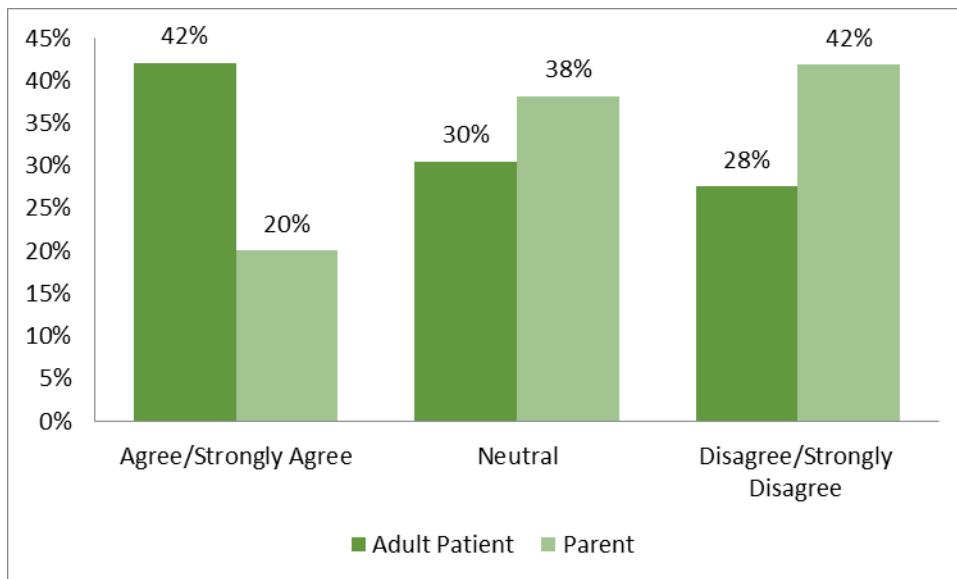


Table 4: Treatment Factors for Adult Patients and Parents of Patients

	n	%
Please indicate if you are seeking care for yourself or for your dependent:		
Self	73	21%
Dependent	274	79%
Age of Child/Children (if applicable):		
7 or younger	3	1%
8-10	36	12%
11-13	134	44%
14-16	104	34%
17+	22	7%
Not Applicable	4	1%
Please check the box with the type of orthodontic appliance you or your child is expecting for treatment:		
Traditional Metal Braces	276	75%
Clear Aligners/Invisalign®	68	18%
Ceramic Braces	25	7%
Please indicate how many orthodontists' websites you visited before coming to this practice:		
0	210	56%
1	54	14%
2	53	14%
3	37	10%
4+	24	6%

The first portion of the survey asked respondents to rate how important (on a scale from 0-10) they felt various features of an orthodontist office website were. The five most highly rated features in the orthodontist group were: (1) the website is mobile optimized so it can be viewed on a computer, tablet, or smartphone, (2) the website has an ‘about the doctor’ section where it shows a picture of the orthodontist and describes his/her education and background, (3) the website shows directions to the practice, (4) the website comes up in the top 3 when searching for an orthodontist, and (5) the website shows pictures of the practice.

The five most highly rated features in the patient/parent group were: (1) the website contains information about a particular treatment option, (2) the website has an ‘about the doctor’ section where it shows a picture of the orthodontist and describes his/her education and background, (3) the website shows directions to the practice, (4) the website is mobile optimized so it can be viewed on a computer, tablet, or smartphone, and (5) the website shows the orthodontist is a diplomate of the American Board of Orthodontics.

Both the patient/parent group and providers shared three of the five highest rated items. These included a mobile-optimized website, an ‘about the doctor’ section with picture, and directions to the practice. However, there were significant differences in the perceived importance between orthodontists and parents/patients for many of the features. Orthodontists rated the following significantly higher than guardians/patients: mobile optimized (9.4 vs 8.7, p-value=0.0002), ‘about the doctor’ section (9.2 vs 8.9, p-value=0.05), coming up in top 3 in a search engine (8.8 vs 8.1, p-value=0.0032), and having links to social media (7.4 vs 6.0, p-value<0.0001). The Patient/parent group rated the following items significantly higher than orthodontists: information about treatment options (9.0 vs 8.2, p-value=0.0002), actual patient before/after pictures (8.4 vs 6.8, p-value<0.0001), provider is ABO certified (8.4 vs 5.2, p-value<0.0001), online payments feature (8.1 vs 5.0, p-value<0.0001), search feature (8.0 vs 4.9, p-value<0.0001), online appointment scheduler (7.6 vs 4.8, p-value<0.0001), and an online chat feature for support (5.3 vs 3.5, p-value<0.0001).

There was no significant difference between the orthodontist group and the patient/parent group for the following website items: shows directions to the practice, shows pictures of the practice, contains a summary of the aims and values of the practice, shows ways in which the practice gives back to the community, and contains video testimonials of actual patients of the

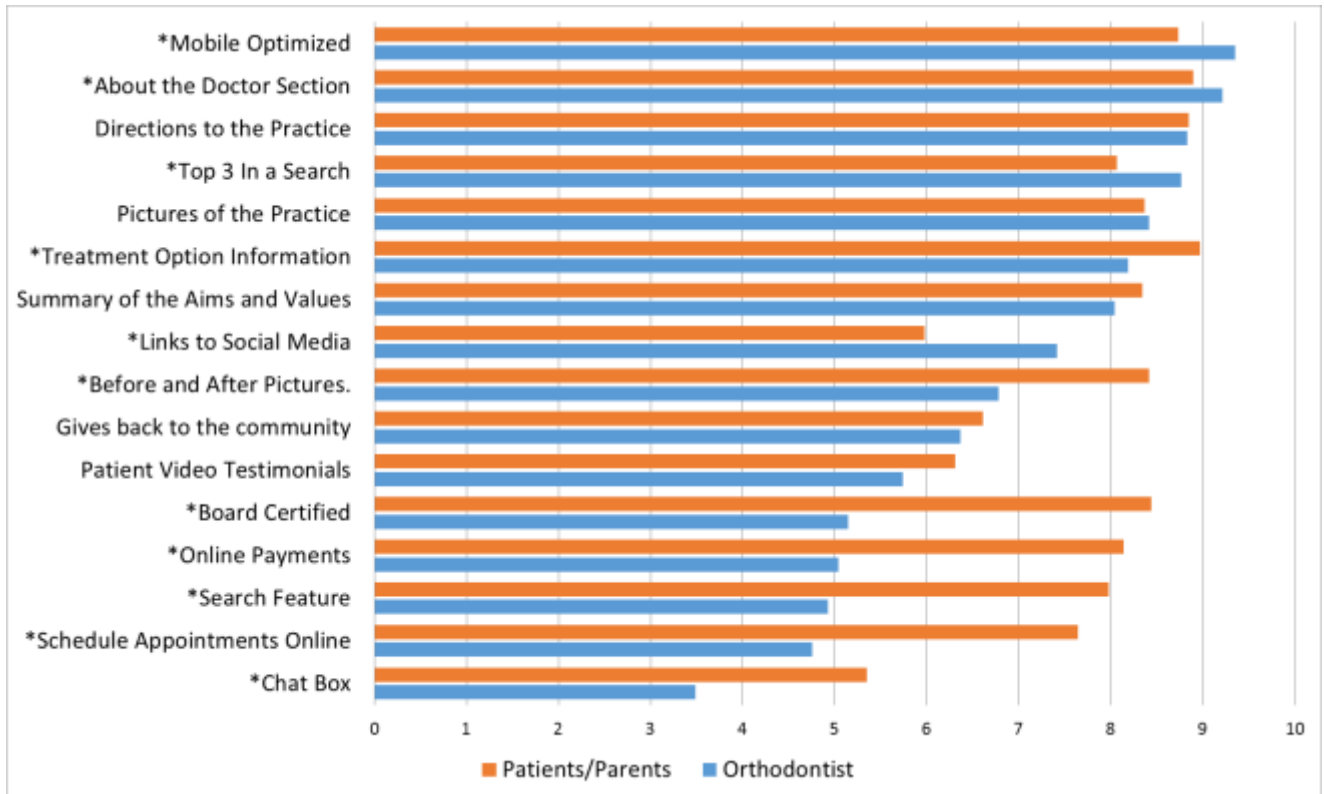
practice. Full results for importance of factors are given in Table 5. Figure 2 shows graphic representation of the data. Feature descriptions are shortened in Table 5 and Figure 2. Full descriptions of the features can be viewed in Appendix 1.

Table 5: Comparison of Importance Ratings for Website Features between Orthodontists and Guardians/Patients

Feature	Orthodontists	Parents	P-value	
Mobile Optimized	9.35	8.73	0.0002	*
‘About the Doctor’ Section	9.21	8.9	0.0495	*
Directions to the Practice	8.83	8.85	0.9368	
Top 3 in a Search	8.77	8.07	0.0032	*
Pictures of the Practice	8.42	8.37	0.7984	
Treatment Option Information	8.19	8.97	0.0002	*
Summary of Practice Aims and Values	8.04	8.34	0.1677	
Links to Social Media	7.42	5.98	<0.0001	*
Before and After Pictures	6.78	8.42	<0.0001	*
Gives Back to the Community	6.37	6.61	0.364	
Patient Video Testimonials	5.74	6.31	0.0554	
Board Certified	5.15	8.44	<0.0001	*
Online Payments	5.04	8.14	<0.0001	*
Search Feature	4.93	7.98	<0.0001	*
Schedule Appointment Online	4.76	7.64	<0.0001	*
Chat Box	3.49	5.35	<0.0001	*

* Significant difference (P<0.05) between orthodontist group and patient/parent group

Figure 2: Comparison of Importance Ratings between Orthodontists and Patients/Parents



*Significant difference ($P < 0.05$) between orthodontist group and patient/parent group

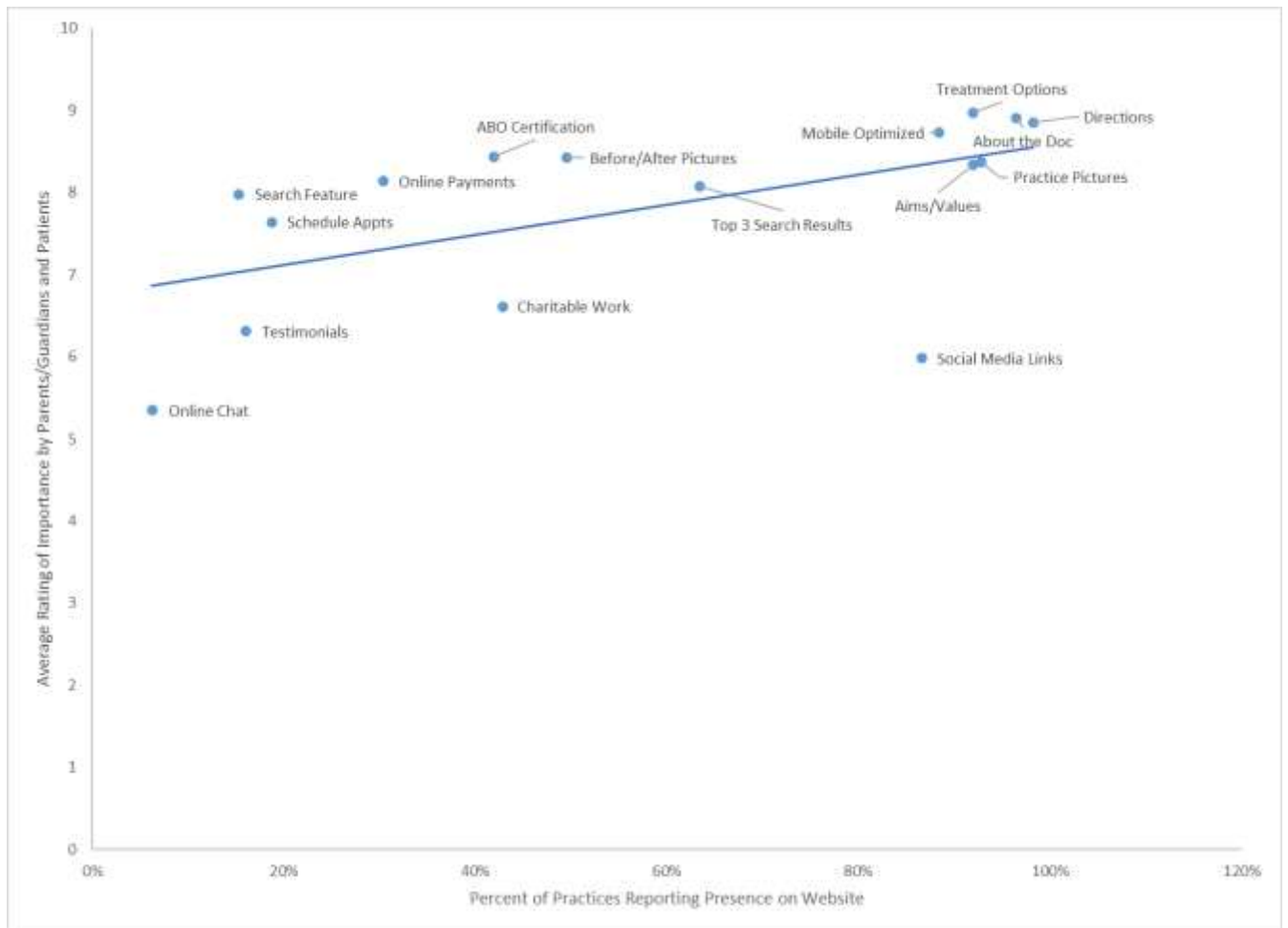
Among the patient/parent group, there was a difference in the ratings based on whether the respondent was obtaining orthodontic treatment for themselves or their child. Adult patients rated the aims and values of the practice (8.8 vs 8.1, $p\text{-value}=0.0276$) and the ways the practice gives back to the community (7.1 vs 6.4, $p\text{-value}=0.0371$) higher than those who were there for children. All other features showed no significant difference between the two groups.

There was also a difference in the ratings between sexes in the parent/patient group. Male respondents in the patient/parent group rated online appointment schedulers significantly higher than females (8.6 vs 8.3, $p\text{-value}<0.0001$). Female respondents in the patient/parent group rated before and after pictures (8.5 vs 7.9, $p\text{-value}=0.0166$) and the ‘about the doctor’ section (9.0 vs

8.5, p -value=0.0155) significantly higher than males. All other features showed no significant difference between the two groups.

Both the orthodontist group and the patient/parent group were asked to report whether or not the different website features were present on their own website (orthodontists) or the website of the practice they were attending (patients/parents). To assess whether or not practice websites were addressing the important features for the patient/parent group, the correlation between the percent of practices with a feature and the average rating from the patient/parent group was calculated. This demonstrated the relationship between what the patient/parent group preferred to see on an orthodontic website and what was actually displayed on orthodontic websites. There was a significant positive correlation between the patient/parent group importance scores and the percent of orthodontists' websites containing the given feature ($r=0.55$, p -value=0.0265). Figure 3 demonstrates the linear relationship between the patient/parent group preferences and presence of features reported by orthodontists. Items above the line indicate where the patient/parent group reported higher importance than the percentage of orthodontists with that feature present on their website.

Figure 3: Linear Association between Patient Importance Scores and Orthodontist-Reported Presence on Website



The presence of each of the features on an orthodontist’s website was used to examine whether there was a relationship with his or her practice workload. Two features were found to be significantly associated with practice workload. Practices that reported their website did not appear in the top 3 when searching online had a higher rate of reporting not busy enough (44%), whereas practices that reported appearing in the top 3 in a search had a lower rate (14%) of not being busy enough (p-value=0.007). The other feature associated with increased workload was accepting payments online, where 33% of respondents without the feature on their website reported not being busy enough compared to just 3% of those with the feature (p-value=0.018). No other website features showed statistically significant associations between presence on the practice website and practice workload. Significant results are given in Table 6.

Table 6: Comparison of Workload and Presence of Website Features (Significant Associations)

	Too busy to treat all persons requesting appointments	Provided care to all who requested appointments but felt overworked	Provided care to all who requested appointments- did not feel overworked	Not busy enough	p-value *
Top 3 in a search					0.007
Yes	4%	17%	64%	14%	
No	2%	7%	46%	44%	
Make payments online					0.018
Yes	9%	18%	65%	9%	
No	1%	12%	54%	33%	
*p-value for chi-squared test for association between presence of feature and workload					

Sample website images were presented to patients and orthodontists, who were asked to rank the images. Different design features were adjusted, allowing respondents to rank them and identify features they preferred over others. When presented with sample websites with various modifications, respondents were able to identify their most preferred website feature. There were no significant differences between orthodontists and patients but there were significant differences in the rankings of the sample websites.

Sample homepages with varying background images were presented to participants to rank. Participants in both groups ranked in the following order: (1) homepage with an image of smiling patients (i.e. group of teenagers), (2) image of the doctor, and (3) image of the office. Next, sample homepages with the banner in varying locations were presented to participants to rank. The banner is the bar that contains menu options that link to other features of the website. Participants in both groups ranked in the following order: (1) banner at the top of the page, (2) banner at the bottom of the page, (3) banner missing and replaced by a menu button.

Next, sample homepages with the map and contact information in varying locations were presented to participants to rank. Participants in both groups ranked in the following order: (1) map and contact information at top of the page, (2) map and contact information at the bottom of the page, and (3) map and contact information missing.

The header of the homepage was then modified and presented to participants in different formats to rank. The header was located at the top of website and typically contained practice information such as directions to the practice, contact information, practice name, logo, and the banner. Participants in both groups ranked in the following order: (1) the standard (1/6th of the homepage) header (2) a widened (1/3rd of the homepage) header with a larger practice logo and (3) the absence of header replaced by buttons placed directly on the homepage image.

Last, the ‘about the doctor’ page was modified and presented to patients to rank. Participants in both groups ranked in the following order: (1) a smaller picture of the doctor with more amount of text, in paragraph form and (2) a larger picture of the doctor with less amount of text, in bullet form. Full results for all image rankings are given in Table 7.

Table 7: Results from Comparison of Sample Websites to Determine Ideal Features

	P-value*	Average Rank (1=Most Preferred; 3=Least Preferred)	Tukey's HSD
Home Page Image	<0.0001		
Teens Smiling		1.52	A
Doctor		2.15	B
Office		2.33	C
Banner Position	<0.0001		
Top		1.50	A
Bottom		1.98	B
No Banner		2.42	C
Map and Contact Info	<0.0001		
Top		1.54	A
Bottom		1.80	B
No Map/Contact Info		2.64	C
Heading Type	<0.0001		
Standard Heading		1.60	A
Wide Heading		1.80	B
No Heading		2.58	C
'About the Doctor'	0.0018		
Small Picture, Paragraph Text		1.43	A
Large Picture, Bullet Text		1.57	B

*P-value test from repeated measures regression model to test difference in ranks while adjusting for respondent type

**Images with different letters were rated significantly different based on Tukey's adjusted post hoc tests

Discussion

According to the AAO membership data, there were 8,255 active orthodontists practicing in the United States in 2017.²⁰ Of these, 73% were male, 27% were female. The study sample consisted of 72% male, 28% female, which aligned closely with the AAO membership. Orthodontists in all geographic regions were represented. However, orthodontists practicing in the southern region had the largest representation in our study sample. The largest group of respondents had been practicing over 30 years (23%). The second largest group of respondents had been practicing for 6-10 years (20%). This category includes representation from millennials. The millennials are the largest generation in US history, even bigger than the baby boomers. This group consists of those born between 1980 and 1995.²¹ According to Patterson, millennials make up 23% of practicing orthodontists in the United States.²²

The response rate for orthodontists was 11% (n=113). This response rate was within the normal range, which a previous study on surveys to dentists reported to be between 11% and 26%.²³ Although the response rate was on the low end of the normal range, all efforts were made to achieve the highest response rate possible. The survey was mailed, and research has shown that response rates were highest among dentists if surveys were mailed.²³ The sample group in this study reflected the membership of the AAO for all categories provided by the AAO membership data.²⁰

According to the AAO membership data, the majority of practicing orthodontists (86.7%) practice in an orthodontist-owned single or group practice.²⁰ Our data showed 91% working in a solo or group practice. 3% of respondents reported being affiliated with a Dental Service

Organization (DSO), which aligns with the AAO membership (3.2%). According to the ADA Health Policy Institute, 8.3% of general dentists were affiliated with DSOs in 2016.²⁴

In this study, 25% of orthodontists reported being not busy enough, and only 4% reported being too busy to treat all persons requesting appointments. According to the 2017 JCO Orthodontic Practice Study, 36% of orthodontists reported not being busy enough, and only a small percentage (2%) of orthodontists reported being too busy.²⁵ Our findings agree with the JCO study that there are more orthodontists not busy enough than too busy. The results of this study provide insight for orthodontists who are looking to increase their workload by improving their websites.

For the patient/parent group, the majority of respondents were females who were present at the orthodontic office for the treatment of their dependent. The majority of patients were teenagers as demonstrated by our results. 78% of children being treated were between the ages of 11-16. However, the number of adult patients per practice is growing. National data shows that from 2012 to 2014, the average number of adult patients in treatment grew from 125 to 145 per practice.²⁰

The use of clear aligners has increased over the past several years, and is steadily increasing by 1-2% per year.²⁶ Traditional metal braces were still the most common appliances (75%) used for treatment among our sample, with clear aligners at 18% of our sample. Over half of respondents didn't visit any websites before starting treatment. However, 30% visited more than 1 website, indicating that there was a sizable percentage of those were shopping around online and not relying solely on word of mouth.

The goal of web design is to guide visitors along the path that the designer has in mind.²⁷ This path will vary widely depending on the reason a consumer visits a website. The goal of a

retailer may be for the consumer to make an online purchase. The goal of a media outlet may be for the reader to linger on the site and visit other articles. Different still, the goal of orthodontic practice websites may be to provide valuable information, help to shape expectations, influence provider selection, and build a positive reputation.¹⁵ An appropriately designed website will not only enhance the patient experience, but also increase the new patient flow to the practice.²⁸

This study explored the preferences of orthodontists as well as those seeking orthodontic care. Areas were brought to light where orthodontists are meeting or exceeding demand, as well as areas where orthodontists have room to improve.

One feature that orthodontists ranked significantly higher than patients was the presence of links to social media on the website. This is of little surprise, as orthodontists are consistently informed that social media is important in attracting new patients and may be an effective marketing tool.²⁹ Jorgensen stated in a recent editorial that there are 3 pillars of online marketing: (1) a practice Web site, (2) paid advertising, and (3) social media.¹ Although a social media presence is established as an important feature of the marketing plan for a practice, our data show that patients do not place very much importance on social media links on an orthodontic practice website. In fact, patients rated the importance of links to social media as the second to least important feature on the questionnaire. It may be that patients visit practice websites seeking specific information and only immerse themselves in the practice culture through social media.

Patients and parents visit orthodontic websites to discern the quality of treatment offered by the practice. This is shown in their desires to see information about treatment options, board certification status, and before and after pictures of actual patients.

The highest-ranked feature in the patient/parent group was information about a particular treatment option. In a study done by Kivitz, it was displayed that individuals today are taking responsibility for their own health by gathering information on the internet, and that information gathered online complements information delivered by medical professionals.³⁰ Orthodontists can use this information to the advantage of their patients by offering homecare instructions and information about treatment online. For example, orthodontists can display information on how to reduce white spot lesions, a common undesirable side effect of orthodontic treatment, the incidence of which has been reported to be as high as 97%.^{31,32}

Patients and parents rated certification by the American Board of Orthodontics as important information to have on an orthodontic website. Among the patient/parent group, it was the fifth highest ranked feature of the sixteen offered. Interestingly, it was ranked as the twelfth highest among orthodontists, displaying a large discrepancy. This was also the feature with the largest discrepancy between orthodontists and patients/parents. The role of the American Board of Orthodontics is to strengthen the specialty, as well as protect the public and promote clinical excellence.³³ Board certification gives patients a standard to measure against to ensure the orthodontist is highly qualified.

Patients and parents preferred to see pictures of actual patients before and after orthodontic treatment. For the patient, this may be an indicator of the quality of treatment they will receive. For the orthodontist, this may serve as a means of providing social proof for potential patients. According to the principle of social proof, one way that individuals determine appropriate behavior for themselves in a situation is to examine the behavior of others.³⁴ Viewing pictures of people in the same cohort who have undergone successful treatment may prompt visitors of the website to do the same. The high desire of patients/parents to see before

and after images combined with the ability of orthodontists to display esthetically pleasing cases should make this feature ubiquitous on orthodontists' websites.

Orthodontists consistently underestimated the importance of convenience factors for patients/parents on an orthodontic website. This was shown both in their ranking and in their implementation of these features on their practice websites. These factors were the ability to make payments online, presence of a search feature, the ability to schedule appointments online, and presence of a chat box.

The dollars spent on e-commerce have continued to grow over time, reflecting a growing comfort level with online payments.⁶ Online payment solutions have also been shown to improve patient satisfaction levels and positively impact the practice bottom line.³⁵ Orthodontists who facilitate the ability for patients to make payments online will be meeting a patient demand and will likely see the benefit of patients more satisfied with their websites.

In addition to the finding that website users were drawn to faces, Djamasbi et al found that website users' eyes were drawn to the search feature.^{7,10} Patients rated the presence of a search feature significantly more important than orthodontists did. A well-functioning search feature that allows patients to navigate an orthodontist's website efficiently will facilitate a better online patient experience.

Patients rated the ability to schedule appointments online significantly more important than orthodontists did. This represents an area where orthodontists may be placing lower importance on a website feature as a result of the difficulty in implementation. The traditional model for scheduling is to have the orthodontic office keep strict control of the schedule to allow the most efficient use of time. Different days and times may even be set apart for certain procedures. Giving patients control over the schedule may reduce the efficiency with which

patients are seen, and the control over the schedule orthodontic offices presently enjoy. It is evident from the data that this is a feature patients desire and orthodontists are not implementing.

Orthodontists and patients/parents agreed that the presence of a chat box was the least important feature. However, the number rating assigned to the importance was statistically different between the two groups, in which patients/parents rated the presence of a chat box more important than orthodontists did.

Among respondents in this study, adult patients viewed the website as a more important factor than parents of patients. 42% of adult patients agreed/strongly agreed to the website being an important factor compared to 20% of parents. Compared to parents of child patients, adults at the office for their own treatment placed more importance on a website containing a summary of the aims and values of the practice. They also preferred a website that showed ways in which the practice gives back to the community. It is interesting to note that adults undergoing orthodontic treatment felt more strongly about the practice's credibility and values. This situation is not unique to orthodontics. One study revealed that when consumers viewed a retail store as a 'prestige' store over a 'discount' store, they perceived salespeople to be more credible, perceived products to be of higher quality, and showed greater intention to make a purchase.³⁶ Previous research showed that when corporations participate in philanthropy it does have an overall positive effect on consumer perception of corporate brand image, but does not affect purchasing decisions.³⁷

There was a difference in website preferences between males and females. Males placed more importance on the ability to schedule appointments online. Females placed more importance on before and after pictures of actual patients, and the 'about the doctor' section. This may be because of a fundamental difference that men are more task oriented and women are

more inclined to seek further information on a website. Richard et al reported that men are more likely to participate in item-specific processing tasks, and to limit their information gathering when seeking to accomplish a task.³⁸ Women, however, pursued all available information, elaborating on their findings. They continued to explore websites for other related information.³⁸ In addition to this fundamental difference, our data showed that women were at the orthodontic practice more often than men whether they were there for their own treatment or the treatment of their child. Women may be more responsible for selecting the practice than men, and thus feel a greater duty to ensure high quality treatment is offered there.

The positive linear regression shows that for most features, orthodontic websites were on track with what patients/parents desire. This was not true for all features. The most meaningful part of the graph to orthodontists is the section of the graph above the line of best fit. This displays areas where the demand for certain website features by patients/parents was greater than the current implementation of these features by orthodontists. The features above the line on Figure 3 display areas where orthodontists have room to improve. Notably, multiple convenience factors fell into this category. When combined, the ability to schedule appointments online, the ability to make online payments, and the presence of a search feature showed an average importance rating of 7.92 by patients/parents, and only a 21% implementation rate by orthodontists. When the ability to make online payments was present on the orthodontic website, practices were much less likely to report not being busy enough. The other area that deserves greater attention on orthodontic practice websites is evidence of the quality of treatment patients will receive. When combined, board certification status and before/after pictures of actual patients of the practice showed an average importance rating of 8.43 by patients/parents, and only a 46% implementation rate by orthodontists.

Participants in both groups ranked a homepage with a picture of smiling patients as most preferred, a picture of the doctor second, and a picture of the orthodontic office last. Djamasi et al showed in an eye tracking study that people are drawn to images of faces when looking at a website.⁷ This was supported by our data, as the homepage images most preferred had images of people in them. When determining what should be on a website, it would be wise for orthodontists to consider images of people first.

Participants preferred a banner, map, and contact information all on the top of the homepage. They preferred the layout with the greatest amount of information in the header. When given the option between header sizes, they chose the height that contained all of the pertinent information, but not one so large that it infringed on the main homepage image. One parent reported in the free-form comments section “I want to be able to find contact info/address quickly.” Previous research has shown that website users tend to focus on the top of the page, therefore it is important to place information at the top of the page that will be most useful to website visitors, such as contact information and address.¹⁰ This reiterates that patients desire information first and foremost when visiting a practice website, and placing it in an area that patients can find quickly and easily is preferable to them.

Since an ‘about the doctor’ page was rated so highly by patients and orthodontists alike, it is useful to explore what goes into making this page favorable. Participants were given a choice between an ‘about the doctor’ page emphasizing a picture vs. one emphasizing information. Users preferred an ‘about the doctor’ page with more information, selecting the option with the smaller picture and more text. This was the smallest difference between orthodontists and patients/parents rankings for any of the sample images, but was still significantly different.

Many of the website features in this study are not only present on orthodontic websites, but also dentistry, healthcare and even general retail and consumer business websites. The findings are most applicable to the field of orthodontics as the population studied consisted of orthodontists and patients/parents at an orthodontic office. Orthodontics is largely esthetic, so features such as before and after pictures and treatment options may have been rated more highly in this study than they would have if the study had been done in other dental or healthcare fields. Also, the website images shown were specifically of an orthodontic practice website.

No previous objective studies have investigated the website preferences of orthodontists, orthodontic patients, and parents of patients. The results of this study showed that orthodontists and patients/parents differ in their website preferences. Our data provided clear guidelines on important features to include on orthodontic websites. This information may be used to optimize orthodontic practice websites and enhance the patient experience. Some features were so highly rated that they are indispensable to orthodontic websites. Still others were rated so low that it is difficult to justify their existence on a website. Orthodontists should avoid putting too much confidence in opinions of self-proclaimed website experts who do not rely on data for their recommendations. Further studies on the subject of website design are needed to elaborate on website preferences among patients, parents of patients, and orthodontists.

Conclusions

- Orthodontic patients/parents differ from orthodontists in their website preferences for many features.
- When deciding on images to place on a website, orthodontists should first choose to display images of people.
- Orthodontists can improve their websites by displaying evidence of high quality treatment and implementing convenience features.
- Patients/parents prefer to see orthodontic website layouts with the greatest amount of information.
- Respondents prefer banner, map, and contact information at the top of the page.

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Appendices

Appendix 1: List of Website Features Written Out

Feature
The website is mobile optimized, so it can be viewed and navigated properly on a computer, tablet, or smartphone.
The website has an about the doctor section where it shows a picture of and describes the orthodontist.
The website shows directions to the practice.
The website comes up in the top 3 when I searched for an orthodontist in my town.
The website shows pictures of the practice.
The website contains information about a particular treatment option that patients are seeking (invisalign, ceramic braces, etc.).
The website contains a summary of the aims and values of the practice.
The website has links to social media (facebook, twitter, instagram, etc.).
The website shows pictures of actual patients before and after orthodontic treatment.
The website shows ways in which the practice gives back to the community.
The website contains video testimonials from actual patients of the practice.
The website shows that the orthodontist is a diplomate of the American Board of Orthodontics.
The website allows me to make payments online.
The website has a search feature.
The website allows me to schedule appointments online.
The website has a chat box where I could chat with a real person online about the practice.