## **Original Article**

# Dental students' interest in orthodontic careers: do orthodontic-related experiences and faculty and practitioner role models matter?

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#### ABSTRACT

**Objectives:** To assess the percentage of dental students interested in orthodontics and likely to apply to orthodontic residency programs, the role of orthodontic-related experiences, and of orthodontic faculty and practitioner role models for student career decision-making.

**Materials and Methods:** This study had a cross-sectional design. A total of 335 students from seven U.S. dental schools responded to an anonymous web-based survey.

**Results:** 35% were much/very much interested in becoming orthodontists and 26% were likely to apply for this specialty training. A total of 80.1% had orthodontic treatment, 58.7% knew an orthodontist in their community, 44% had shadowed an orthodontist, and 10.8% had worked in an orthodontic practice before dental school. Respondents evaluated orthodontic practitioners more positively than orthodontic faculty. They considered practitioners as more compassionate providers than faculty members (5-point scale with 5 = agree strongly: mean = 4.25 vs 3.83; P < .001), making more of a difference in their patients' lives (4.44 vs 4.05; P < .001), and as better role models (4.21 vs 3.94; P < .001) who encouraged students more to pursue orthodontics (4.03 vs 3.65; P < .001). Their interest in becoming an orthodontist and in applying for an orthodontic residency program correlated with educational experiences (r = 0.35; P < .001 / r = 0.34; P < .001) and positive impressions of orthodontic faculty (r = 0.23; P < .001 / r = 0.22; P < .001) and practicing orthodontists (r = 0.29; P < .001 / r = 0.27; P < .001).

**Conclusions:** Better understanding of factors motivating dental students to pursue orthodontics is crucial. Orthodontic practitioners and faculty play an important role in this context. (*Angle Orthod.* 2022;92:787–795.)

**KEY WORDS:** Education; Dental; Residency; Orthodontics; Career choice; Graduate education; Orthodontic residency program

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### INTRODUCTION

The American Association of Orthodontists (AAO) website reports that approximately 4 million children are orthodontic patients in the United States, that a growing proportion of orthodontic patients are adults, and that 50%-75% of individuals in the United States could benefit from orthodontic treatment.1 This suggests that a high percentage of the U.S. population are currently not receiving orthodontic treatment despite having a treatment need, making an increase in individuals seeking orthodontic treatment probable.<sup>2</sup> In addition, growing use of recent innovations such as temporary anchorage devices, clear aligners. and digital impressions combined with newly introduced technologies such as virtual reality technology and artificial intelligence will allow for more flexible treatment options and might result in increased future demand for orthodontic treatment as well.3,4 On the patient side, increased use of webinar platforms due to

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the COVID-19 pandemic had drastic effects on selfperceptions of individuals, leading to an increased demand for orthodontics.<sup>5</sup> The onset of the pandemic also coincided with 70% of dentists reporting an increase of patients experiencing tooth grinding/ clenching, which may require orthodontic treatment in the future.<sup>6</sup> All these findings suggest an increased demand for orthodontic treatment.

The AAO recently reported that the percentage of orthodontists nearing retirement age is greater than the percentage of orthodontists below the age of 35, suggesting an increasing need for new orthodontists to enter the field.<sup>7</sup> Although there was a 47% increase in orthodontic residency enrollment and a 31% increase in the number of graduates between 2001 and 2018, the number of applications per program had decreased from 169 in 2011 to 160 in 2021.<sup>8</sup> Building an orthodontic workforce for the predicted growth in demand is crucial and finding ways to support dental students interested in the specialty is a critical step in this process.

Identifying factors that motivate dental students to pursue orthodontics can help develop educational interventions that could promote the specialty. Research concerning these factors differed in its results. In 1994, a survey of orthodontic residents found that future job satisfaction was the most common career motivation; a significant percentage listed dissatisfaction with general dentistry as a reason for their choice. Other key factors were lifestyle, financial security, and having a relative who was an orthodontist.<sup>9</sup> In 2010, Noble et al. found that residents decided to become orthodontists before starting their dental education. Some key factors for their decisions were the intellectual stimulation and challenge the field provides, workload flexibility/predictability, earning potential, and quality of orthodontist-patient relationships.<sup>10</sup> Intellectual stimulation was the most important factor in a recent survey.11

When dental students considered dental specialties, they voted orthodontics as having the best quality of life and as the second best in potential income behind oral and maxillofacial surgery.<sup>12</sup> In 2015, data from dental school graduates from 10 graduating classes showed that orthodontics was the most popular specialty. The authors suggested that an increased interest in specialization might be the result of the growing debt burden dental students had accumulated by the time they graduated from dental school.<sup>13</sup> A more recent study found most graduating orthodontists were prioritizing income maximization to offset educational debt when searching for their first position.<sup>14</sup>

In addition to these general factors for seeking out an orthodontic career, the COVID-19 pandemic added specific considerations in this context. Research documented the impact of COVID-19 on dental student education and mental health such as elevated levels of depression, anxiety, and stress, making strong faculty support crucial in this situation.<sup>15–17</sup> These findings raise the question of whether current dental students have positive role models in their orthodontic faculty and in practicing orthodontists in their community.

The objectives of this study, therefore, were to assess the percentage of dental students interested in orthodontics and likely to apply to orthodontic residency programs, the role of orthodontic-related educational experiences, and the influence of orthodontic faculty and practitioners as role models for dental student career decision-making. The impact of the COVID-19 pandemic on student interest in orthodontics was also explored.

#### MATERIALS AND METHODS

This study was determined to be exempt from Institutional Review Board oversight (IRB) by the Health Sciences and Behavioral Sciences IRB at the University of Michigan, Ann Arbor, Michigan (#HUM00186238) on September 2, 2020. The research had a cross-sectional study design.

#### Respondents

Recruitment emails were sent to the academic deans of the 68 dental schools in the United States. The email explained the purpose of the study and asked the recipients to forward an attached recruitment email to their predoctoral dental students. The forward-ed recruitment email to the dental students explained the purpose of the study and provided a web link to the anonymous survey. The 335 dental students who responded reported that they attended seven different dental schools in the United States.

#### Procedure

After the survey had been developed, pilot tested, and finalized, it was posted on Qualtrics. The recruitment email informed the students about the research and asked them to respond to the anonymous survey by using the provided web link. A first recruitment email was sent in January 2020 and a second in November 2021.

#### Materials

The survey was developed based on previous research concerning the factors that motivated students to choose oral and maxillofacial surgery as their career.<sup>18</sup> Part 1 assessed the students' background; Part 2 inquired about experiences with orthodontics prior to dental school; Part 3 focused on respondents'

Table 1. Experiences With Orthodontics and Interest in	Specialty
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Personal Experiences With Orthodontics	Frequencies (n = $335$ )	Percentage
Having had orthodontic procedure: Yes	265	80.1%
Family member/in the dental profession: Yes	91	27.6%
Relationship to respondent:		
- Parent	47	14.2%
- Sibling	15	4.5%
- Spouse	3	0.9%
- Other family member	41	12.4%
Respondent knows an orthodontist in local community: Yes	195	58.7%
Sum of personal experiences <sup>a</sup>	Mean = 1.67	SD = 0.889
		Range: 0–3
Educational Experiences With Orthodontics Before Dental School	Frequencies (n = $335$ )	Percentage
Did you shadow an orthodontist? Yes	146	44.0%
Did you work in an orthodontic practice? Yes	36	10.8%
Were you interested in a career in orthodontics? Yes	189	56.9%
Sum of educational experiences with orthodontics before dental schoolb	Mean = 1.12	SD = 0.920 Range: 0-3
Current Interest in an Orthodontic Career	Frequencies (n = $335$ )	Percentage
How interested are you in becoming an orthodontist?		
1°	62	18.7%
2	79	23.8%
3	75	22.6%
4	59	17.8%
5	57	17.2%
	Mean = 2.91	SD = 1.359
How likely is it that you will apply for an orthodontic residency in the future?		
1°	82	24.7%
2	88	26.5%
3	76	22.9%
4	42	12.7%
5	44	13.3%
	Mean = 2.63	SD = 1.334

<sup>a</sup> This sum score was computed by adding one point for each "yes" response to the three items aforementioned. Answers ranged from 0 = no personal experiences to 3 = all three personal experiences.

<sup>b</sup> This sum score was computed by adding one point for each "yes" response to the three items aforementioned. Answers ranged from 0 = no educational experiences before dental school to 3 = all three personal experiences.

° Answers ranged from 1 = not at all to 5 = very much.

orthodontic-related dental school education; and Part 4 collected student evaluations of orthodontic practitioners and faculty mentors and asked how COVID-19 influenced their interest in orthodontics.

#### **Statistical Analyses**

The Qualtrics responses were downloaded as an SPSS data file (version 26). Descriptive statistics such as frequency distributions and means were computed to provide an overview of the results. Three factor analyses determined the underlying factors of the educational items, the items related to the evaluations of faculty, and the items related to the orthodontic practitioners (Extraction Method: Principle Component Analysis; Rotation Method: Varimax Rotation with Kaiser Normalization). Cronbach alpha interitem consistency coefficients were computed for items with factor loadings  $\geq 0.40$  on a respective factor to determine if the interitem consistency was high enough to justify creating an index. All interitem consistency

values were greater than 0.70, which indicated at least a good interitem consistency.<sup>19</sup> Indices were created by averaging the responses to the items loading on a given factor. Pearson correlation coefficients were used to correlate these indices with the year in dental school and the interest in becoming an orthodontist.

#### RESULTS

A total of 335 predoctoral dental students from seven U.S. dental schools participated in the study. Slightly fewer male (44.2%) than female students (54.6%) responded to the survey; 58.2% were from European-American backgrounds, 5.8% Arab American, 5.2% African American, and less than 5% were Hispanic/Latinx, bi/multiracial or Asian American. One out of four students (39.8%) were in their first and 32.6% in their fourth year, with 14.8% in the second and 12.7% in their third dental school year.

Table 1 shows that 80.1% had orthodontic treatment and 58.7% knew an orthodontist in their community;

Since You Have Started Your Dental School Education Did You	Did You Have a Rotation in This Location?		If Yes, How Interesting Was it?				
Have a Rotation in This Location?	Yes	No	Not at all	Somewhat	Very Much	N/A	
Orthodontic department in dental school			5	13	18	291	
	12.7%	87.3%	13.9%	36.1%	50%		
Community-based orthodontic site			0	0	5	325	
	2.4%	97.6%	0.0%	0.0%	100%		
Volunteer orthodontics-related activities			1	1	13	315	
	5.4%	94.3%	6.7%	6.7%	86.7%		
Since You Have Started Your Dental School Education. Did You	lf Yes, Did a Faculty	You Have Mentor?	If Yes, How Involved Were You With Clinical Activities?				
Have a Rotation in This Location?	Yes	No	Not at all	Somewhat	Very Much	N/A	
Orthodontic department in dental school			9	16	7	300	
·	64.5%	35.5%	28.1%	50.0%	21.9%		
Community-based orthodontic site			2	2	3	325	
	50.0%	50.0%	28.6%	28.6%	42.9%		
Volunteer orthodontics-related activities			3	7	4	318	
	58.3%	41.7%	21.4%	50.0%	28.6%		

#### Table 2. Dental Education About Orthodontics

27.4% had a family member who was a dental professional; 44% had shadowed an orthodontist and over 10% had worked in an orthodontic practice before dental school. A majority (56.9%) were interested in a career in orthodontics before dental school, with 17.2% still being interested in pursuing orthodontics and 13.3% being very likely to apply to an orthodontic residency program at the time of the survey.

Table 2 provides information about orthodontic experiences in dental school. Only 12.7% had a

rotation in their dental school orthodontic department, 2.4% at a community-based orthodontic site, and 5.4% had volunteered for orthodontic-related activities. Half of the respondents with a rotation in an orthodontic department, 100% of students with a rotation at a community-based site and 86.7% with a rotation at a volunteer site rated these experiences as very interesting and more than half had a faculty mentor.

The respondents were, on average, satisfied with their orthodontic experiences (Table 3). They felt

Positive Educational Experiences in Orthodontics	<b>1</b> ª	2	3	4	5	Mean SD
a. I was satisfied with my orthodontics experience	10.3%	15.1%	42.1%	16.4%	16.1%	3.13 1.165
b. I felt comfortable working with orthodontics faculty members.	8.8%	10.4%	52.3%	15.6%	13.0%	3.14 1.056
c. I learned a lot from orthodontics residents.	15.0%	8.5%	59.3%	10.7%	6.5%	2.85 1.017
d. I learned a lot from orthodontics faculty	12.7%	7.8%	57.5%	13.0%	9.1%	2.98 1.040
e. I have had a lot of exposure to orthodontics.	30.0%	19.7%	37.4%	7.1%	5.8%	2.39 1.154
f. I became more interested in a career in orthodontics.	17.1%	15.5%	42.9%	12.9%	11.6%	2.86 1.191
Positive educational experiences index $^{\scriptscriptstyle b}$ (alpha = 0.838)	Mean	= 2.89	SD =	0.849	Range	: 1 to 5
Positive Attitudes to Learn More About Orthodontics	11	2	3	4	5	Mean SD
g. I would like an earlier exposure to Orthodontics.	2.8%	8.8%	29.3%	30.3%	28.7%	3.73 1.059
h. I would like more exposure to orthodontics.	3.5%	4.7%	23.0%	33.8%	35.0%	3.92 1.039
Motivation to learn more about the orthodontic index $^{\rm c}$ (alpha = 0.875)	Mean	= 3.83	SD =	0.989	Range	: 1 to 5

<sup>a</sup> Answers ranged from 1 = disagree strongly, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, to 5 = agree strongly.

<sup>b</sup> The "Positive educational experiences" index was computed by averaging the responses to items a to f.

° The "Motivation to learn more about orthodontics" index was computed by averaging the responses to items g and h.

Table 4.	Factors	That Make	Students	More	Interested	in	Orthodontics
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Factors That Make Students More Interested in Orthodontics	<b>1</b> ª	2	3	4	5	Mear SD
a. Interactions with other dental students	15.5%	12.6%	44.5%	17.4%	10.1%	2.94 1.150
b. Interactions with orthodontic faculty	12.5%	11.8%	40.9%	21.4%	13.4%	3.12
c. Interactions with orthodontic residents	14.8%	10.3%	41.3%	20.3%	13.2%	3.07 1.195
d. Interactions with orthodontists	8.9%	9.2%	33.7%	23.8%	22.4%	3.46 1.208
e. Hands-on experience with orthodontics	8.7%	9.7%	39.5%	18.4%	23.6%	3.39 1.197
f. Advancements in the field of orthodontics	9.4%	8.8%	38.6%	23.7%	19.5%	3.35 1.167
g. Other reasons	24.5%	6.0%	56.6%	5.2%	7.6%	2.65 1.133
Factors supporting interest in orthodontics index <sup>b</sup> (alpha = $0.882$ )	Mean	= 3.10	SD =	0.891	Range	1 to 5

<sup>a</sup> Answers ranged from 1 = disagree strongly, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, to 5 = agree strongly.

<sup>b</sup> The "Factors supporting interest in orthodontics" index was computed by averaging the responses to items a to g.

comfortable working with orthodontic faculty, but slightly less positive about learning from orthodontic residents (mean = 2.85). Only 12.9% reported having had a lot of exposure to orthodontics in dental school and the majority wanted earlier and more exposure to orthodontics in dental school.

Table 4 lists factors that may have increased student interest in orthodontics. The most positively rated factors were interactions with orthodontists and hands-on experiences with orthodontics, followed by advancements in the field of orthodontics, interactions with orthodontic faculty, residents, and dental students.

Table 5 provides a comparison of dental students' average impressions of orthodontic faculty vs practicing orthodontists. The respondents rated faculty less positively than orthodontic practitioners on 10 of the 13 items. They agreed less that faculty were compassionate providers, respected their patients, entered a profession to make a difference in the lives of their patients, and were good role models compared to orthodontic practitioners. They also agreed less that faculty were content with their career choices, had time for their family and friends, and had a well-balanced lifestyle compared to practitioners. However, their responses concerning participation in the education of dental students, the level of stress, and number of hours worked did not differ significantly. When comparing dental student attitudes toward both groups, their average positive impressions of practitioners were higher than those for faculty.

The correlations provided in Table 6 show that the more personal and educational experiences with orthodontics the students had before dental school, the less COVID-19 affected their decision to purse orthodontics as a career. Interest in becoming an orthodontist and the likelihood to apply for an orthodontic residency correlated with the motivation to learn earlier and more about orthodontics, positive educational experiences in dental school, factors supporting an interest in orthodontics, and positive impressions of orthodontic faculty and practicing orthodontists.

Only 5.1% answered that COVID-19 had impacted their decision to pursue orthodontics, whereas 94.9% answered that it had no impact. When these 5.1% of the respondents were asked to explain how COVID-19 had affected their decision, the most common response was that students had missed opportunities for orthodontic shadowing, research, and/or education due to the pandemic. The final question asked for additional thoughts about orthodontics. About one in four of these responses was positive and expressed interest and excitement to learn more about this field. Twenty-six respondents regretted that they had only limited exposure to orthodontics during their dental education. Other common responses included appreciation for the impact of orthodontics on patients' lives, wanting more exposure to orthodontics, and having been influenced by an orthodontist they knew personally.

#### DISCUSSION

In 2019, the American Dental Education Association graduating senior survey found that 42.3% of the graduating dental students did not feel confident in their ability to handle cases of malocclusion or space management,<sup>20</sup> suggesting a lack of dental education about key orthodontic principles. This situation might result in a lack of confidence in providing orthodontic treatment for their patients, making orthodontists by far the most important healthcare providers for orthodontic care. The potentially increasing demand for orthodontic

Table 5. Respondents' Impressions of Orthodontic Faculty Members and Practicing Orthodontists

Positive Impressions of Orthodontics Faculty: Orthodontics Faculty Members	Faculty	Practitioners	Р
a. are compassionate providers.	3.83ª	4.25	<.001
	0.999	0.842	
b. respect their patients.	3.95	4.33	<.001
	0.962	0.777	
c. enter a profession that allows them to make a difference in the lives of their patients.	4.05	4.44	<.001
	1.007	0.802	
d. respect dental students.	3.79	4.05	<.001
	1.007	0.898	
e. are good role models.	3.94	4.21	<.001
5	0.994	0.872	
f. actively participate in students' education.	3.68	3.66	.824
S. F. Frank	1.022	1.039	
a. encourage students to pursue orthodontics.	3.65	4.03	<.001
5	1.034	0.945	
h. are interested in collaborating with others.	3.70	3.94	<.001
, , , , , , , , , , , , , , , , , , ,	1.004	0.935	
i, have a well-balanced lifestyle.	3.98	4.33	<.001
	0.929	0.819	
i. have time for their families / friends.	3.96	4.40	<.001
,	0.937	0.780	
k, are content with their career choices.	3.94	4.31	<.001
	0.905	0.777	
Positive impression of orthodontic faculty index <sup>b</sup> (Cronbach alpha = $0.965 / 0.994$ )	3.86	4.18	<.001
· · · · · · · · · · · · · · · · · · ·	0.849	0.676	
	1 to 5	1 to 5	
Negative Impressions of Orthodontics Faculty: Orthodontics Faculty	Faculty	Practitioners	Р
I. work long hours.	2.97	2.99	<.001
	0.963	1.127	
m, have a high level of stress.	2.99	2.93	.168
	0.884	1.064	
Negative impressions of orthodontics faculty index <sup>o</sup> (Cronbach alpha = $0.805 / 0.776$ )	2.98	2.96	.585
	0.848	0.999	.500
	1 to 5	1 to 5	

<sup>a</sup> Answers ranged from 1 =disagree strongly, 2 =disagree, 3 =neither disagree nor agree, 4 =agree to 5 =agree strongly.

<sup>b</sup> The "Positive impressions of orthodontic faculty" index was computed by averaging the responses to items a to k when these items were asked about the faculty members; the "Positive impressions of orthodontic practitioner" index was computed by averaging the responses to items a to k when these items were asked about the orthodontic practitioners.

° The "Negative impressions of orthodontic faculty" index was computed by averaging the responses to items I and m when these items were asked about the faculty members; the "Negative impressions of orthodontic practitioner" index was computed by averaging the responses to items I and m when these items were asked about the orthodontic practitioners.

care makes it important to identify factors that motivate dental school students to consider a career in orthodontics.<sup>2</sup> The findings of this survey increase understanding of the relationships between dental students' interest in orthodontic careers and their different orthodontic-related experiences prior to, vs during, their dental school education.

Before discussing the actual results of the study, one question is whether the respondents were representative of dental students in general. The fact that four out of five respondents had orthodontic treatment might indicate that this sample had more orthodontic information than average adults in their age group prior to entering dental school. Checking whether these earlier orthodontic experiences correlated with interest in orthodontics and the likelihood of applying to orthodontic residency programs was therefore important. The data showed that there were no significant relationships between the orthodontic-related experiences prior to dental school and considerations to become an orthodontist in the future.

In addition, it is also interesting to consider if the percentages of respondents who reported that they were very likely to apply to orthodontic residency programs in this study differed significantly from the total numbers of applicants to the specialty in the recent past. In 2020, approximately 6% (n = 393) of the 6609 students who graduated from U.S. dental schools were accepted into orthodontic residencies.<sup>8</sup> In addition, 308 of the 502 applicants to matching orthodontic programs were accepted in that year.<sup>21</sup> However, the question is what percentage had applied in 2020 overall and had not been accepted by any orthodontic residency program? In summary, the absolute majority

Career-Related Responses	Interest in Becoming an Orthodontist <sup>a</sup>	Likelihood to Apply for an Orthodontic Residency <sup>a</sup>	Influence of COVID-19 on Decision to Pursue Orthodontics <sup>a</sup>
Likelihood to apply for an orthodontics residency Influence of COVID-19 on decision to pursue orthodontics	0.91*** 0.09	1 0.06	0.06 1
Potentially Motivational Factor Indices	Interest in Becoming an Orthodontist <sup>a</sup>	Likelihood to Apply for Residency <sup>a</sup>	Influence of COVID-19 on Decisionsª
Personal experiences with orthodontics <sup>b</sup>	-0.03	-0.02	-0.18**
Orthodontic experiences before dental school	-0.06	-0.05	-0.15**
Motivation to learn more about orthodontics <sup>d</sup>	0.50***	0.47***	0.04
Positive educational experiences with orthodontics <sup>e</sup>	0.35***	0.34***	0.11
Factors supporting an interest in orthodontics	0.29***	0.27***	0.01
Positive impressions of faculty <sup>9</sup>	0.23***	0.22***	0.10
Positive impressions of practicing orthodontists <sup>h</sup>	0.29***	0.28***	0.02
Negative impressions of faculty	0.06	0.04	0.05
Negative impressions of practicing orthodontists	0.08	0.04	0.04

**Table 6.** Correlations Between Interest in Becoming an Orthodontist, Likelihood to Apply for an Orthodontic Residency, and Influence of COVID-19 on the Decision to Pursue Orthodontics, and Potentially Motivating Factors

<sup>a</sup> Answers ranged from 1 = disagree strongly, 2 = disagree, 3 = neither disagree nor agree, 4 = agree to 5 = agree strongly.

<sup>b</sup> The "Personal experiences with orthodontics" index was computed by adding 1 point for positive answers to three questions. See Table 1 for the wording of the questions.

• The "Orthodontic experiences before dental school" index was computed by adding one point for positive answers to three questions. See Table 1 for the wording of these question.

<sup>d</sup> The "Motivation to learn more about orthodontics" index was computed by averaging the responses to two items. See Table 3 for the wording of these items.

• The "Positive educational experiences with orthodontics" index was computed by averaging the responses to six items. See Table 3 for the wording of these items.

' The "Factors supporting an interest in orthodontics" index was computed by averaging the responses to seven items. See Table 4 for the wording of these items.

<sup>o</sup> The "Positive impressions of faculty" index was computed by averaging the responses to eleven items. See Table 5 for the wording of these items.

<sup>h</sup> The "Positive impressions of orthodontic practitioners" index was computed by averaging the responses to eleven items. See Table 5 for the wording of these items.

The "Negative impressions of faculty" index was computed by averaging the responses to two items. See Table 5 for the wording of these items.

<sup>1</sup> The "Negative impressions of orthodontic practitioners" index was computed by averaging the responses to two items. See Table 5 for the wording of these items.

of the respondents in this study were not interested and did not plan to apply to orthodontic residency programs, with potentially a slightly higher percentage of respondents planning to apply than had been the case in 2020. Finding what motivates these students to pursue such a competitive specialty is important and can help ensure the best candidates achieve their goal of specializing.

Although most respondents had personal and educational orthodontic experiences before dental school, these experiences did not correlate with their interest in orthodontic careers nor with the likelihood to apply to orthodontic residency programs. This finding contradicts the discussion by Noble et al. of the importance of early experiences for a career choice related to orthodontics.<sup>10</sup> However, what these findings show is crucial in times of the COVID-19 related findings presented in Table 6 and a future that is likely to have ongoing concerns about COVID. The more personal and educational experiences the students had before dental school, the less they reported that COVID-19 had affected their future orthodontic-related plans. A strong motivation for a potential specialty developed prior to dental school could potentially have counteracted the COVID-related negative effects on dental student achievement and mental health.<sup>15–17</sup>

Considering the orthodontic education provided in dental schools, two findings should alert dental school administrators/educators when planning orthodontic education for predoctoral dental students. First, students clearly wanted more and earlier exposure to orthodontic curricular content. Second, the majority rated practicing orthodontists as the most influential persons for their interest in orthodontics. This finding stresses the importance of considering how educational interventions with orthodontic practitioners as role models could be increased for students. Providing community-based orthodontic education in the form of electives could provide one such opportunity. The finding that the more positively the students viewed these practitioners, the more interested they were in orthodontics, aligns with previous research concerning the factors affecting dental career choices. These studies showed that dentists played an important role for dental student career choices, with the majority reporting that their family dentist was the professional who had most influenced their decision to pursue a career in dentistry.<sup>22,23</sup>

A majority of the respondents wanted more and earlier exposure to orthodontics in dental school, and less than 13% had a rotation in their orthodontic department since starting dental school. Although this can be partially explained by some respondents being first- or second-year students with limited clinical experiences, approximately one-third of respondents were fourth-year students, suggesting that many respondents might not experience orthodontic rotations while in dental school. This is concerning because positive educational experiences with orthodontics correlated with increased interest in orthodontics. Additionally, hands-on orthodontic experiences were the second most influential factor for increasing student interest. Many dental students may be missing out on key educational orthodontic experiences that could increase their interest in this field.

The more positive impressions of orthodontic practitioners compared to faculty was striking. Although impressions of both groups were positive overall, students generally had more positive impressions of practitioners. One possible explanation might be that, although the majority had experiences with orthodontists prior to entering dental school, the interaction with orthodontic faculty members was rather limited for most students. Research is needed to explore if this finding is related to students' noticeably decreased interest in orthodontics while in dental school compared to before starting dental school.

Although the COVID-19 pandemic had a significant impact on student experiences and mental health,<sup>15–17</sup> more than eight out of 10 respondents reported that it did not affect their decision to pursue orthodontics. This is, in some way, surprising because it could be expected that the relatively lower aerosol exposure in orthodontics compared to other specialties such as restorative dentistry might have been appealing to students. However, only one of 335 respondents mentioned this fact as a positive aspect of an orthodontic career. However, COVID-19 had resulted in missing experiences such as shadowing or handson exercises.

The study had limitations. First, the percentages of students very interested in orthodontic careers and very likely to apply to orthodontic residency programs were slightly higher than among dental students overall. However, given that the main purpose was to investigate what motivates students to pursue orthodontics, this increased percentage of interested students was of benefit for the research goal. Second, the low evaluation of orthodontic residents as role models showed that it might have been interesting to also ask questions about the value of residents as role models, to increase understanding of how their role could be improved. Third, data collection took place in January 2020 and November 2021. Surveying recent graduates from dental school would have been interesting because these graduates would have been likely to have more concrete orthodontic experiences with faculty members. Finally, further research is needed to analyze which earlier and additional orthodontic experiences could be provided in dental schools.

### CONCLUSIONS

Based on these data, it can be concluded that:

- Prior to entering dental school, a high percentage of respondents had personal orthodontic experiences and their most common orthodontic educational experience was shadowing orthodontists.
- About one in six respondents was very interested in an orthodontic career and one in eight were very likely to apply for an orthodontic residency program, with the majority wanting more and earlier dental education about orthodontics.
- Only a third was satisfied with their orthodontic dental education and only about three of 10 felt comfortable working with orthodontic faculty.
- The two most frequently cited factors that made students more interested in orthodontics were interactions with orthodontic practitioners and hands-on experiences with orthodontics. Students evaluated orthodontic practitioners more positively than orthodontic faculty.
- Positive experiences in dental school and with orthodontic faculty and practitioners correlated positively with orthodontic-career motivation and the likelihood to apply to an orthodontic residency program.

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