

# Factors influencing dental practitioners' decision to perform interceptive orthodontic treatment in public and private practice settings in the Tswane metropole, South Africa

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## ABSTRACT

### Introduction

General dentists are often reluctant to perform interceptive orthodontic treatment (IOT) in their practices. As IOT can be of great benefit to some patients, the study aimed to explore the factors that influence the implementation of such treatment.

### Methodology

A sample of 24 general dental practitioners was selected. One-on-one interviews, guided by two questionnaires, were conducted with each of the participants at either their place of work or in a public location. They answered structured questions regarding the treatment plans for five paper patient scenarios to test their knowledge on interceptive orthodontics (IO). The knowledge scores were assessed according to whether the participants were in private or public practice and on a socioeconomic scale according to where they practiced. A second questionnaire focused on the patient confidence levels with respect to performing IOT as well as other practical issues that have a bearing on IOT.

## Results

All the participants in the study achieved a knowledge score over 70% with no statistically significant differences found between the private and public sectors. However, when compared according to the different socioeconomic areas, the practitioners from the middle-income socioeconomic area displayed a lower knowledge score that was statistically significant ( $p=0.029$ ). This group also performed significantly ( $p=0.001$ ) poorer than the other groups when "treating" Case 1.

Seventy-five percent of the participants were very confident regarding their IO diagnosis and treatment planning. However, this confidence was tempered by their confidence (42%) in their undergraduate orthodontic programme.

All the participants acknowledged the importance of timeous IOT, yet only 79% stated that they would have treated the "patients" in their own practices.

Factors affecting the non-delivery of IOT in practice showed that 50% of the dentists expressed no interest in orthodontics, 54% mentioned medical aid remuneration as a negative factor and 58% did not have the practice infrastructure to be able to perform IOT.

## Conclusion

The lack of interest compounded by the practical challenges of finances, practice infrastructure and lack of patient motivation and compliance are the real issues, with patients often being considered for treatment when it is too late for IOT.

Factors influencing dental practitioners' decision to perform interceptive orthodontic treatment in public and private practice settings in the Tshwane metropole, South Africa

## INTRODUCTION

Studies have shown that nearly 30% of the population have some form of malocclusion that warrants orthodontic treatment in order to improve the function and aesthetics of the dentition.<sup>1,2</sup> In the South African context, a 2004 study showed the need for definitive treatment to be 32.3% of 12-year-old children.<sup>3</sup>

Early orthodontic treatment may be deemed as either preventative or interceptive. Preventive orthodontics (PO) can be defined as the branch of orthodontics that prevents orthodontic problems from occurring.<sup>4</sup> Interceptive orthodontics (IO) is the branch of orthodontics concerned

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### Keywords

Dentist, interceptive orthodontics, knowledge, treatment, socioeconomic factors

### Conflict of interest

None

with the implementation of early interventions to reduce or eliminate minor occlusal problems (such as crowding loss of space, habits, developmental anomalies and retained primary teeth) that are currently present.<sup>4</sup> The general dental practitioner plays a key role in the timeous identification and diagnosis of orthodontic problems that could potentially benefit from interceptive orthodontic treatment. It has been suggested that if orthodontic problems are timeously intercepted and appropriately managed during the mixed dentition phase, up to 60% of these malocclusions may be corrected or reduced in severity, ensuring that later treatment is less costly and time consuming.<sup>5,6,7</sup>

Interceptive orthodontic treatment is within the scope of practice of the general dentist. Orthodontic treatment on the UK's NHS is free to everyone under the age of 18 years, if recommended by a dentist or orthodontist.<sup>8</sup> It has been suggested that general practitioners are not comfortable diagnosing and/or performing interceptive orthodontic treatment but they felt that they had the skills to correctly refer patients.<sup>4</sup> Although they had knowledge of the indications and limitations of removable appliances, they did not feel they had the clinical skills to implement the treatment modalities themselves. Thus, the lack of self-confidence, experience and operator skills led to minor interceptive orthodontic treatments (IOT) being referred, or sometimes left until a major malocclusion developed.<sup>4,5,9</sup>

A 2005 survey found that 63% of Irish general dentists were satisfied with the academic component of their undergraduate orthodontic course while only 54% were satisfied with the clinical component.<sup>9</sup> However, 24% of those surveyed would attempt to correct an anterior crossbite while only 15% would fit a space maintainer, suggesting a discrepancy between knowledge and clinical application of interceptive and preventative orthodontic treatment.<sup>10</sup>

A 2009 British survey to assess how general dentists refer patients showed that 52% of dentists were correct in assessing the need for treatment, but only 20% of general practitioners referred patients at the correct time. This study highlighted the fact that there was no proper understanding or insight into suitable case selection or the optimal treatment timing for the implementation of IOT in general dental practice.<sup>11</sup>

Various studies have assessed the orthodontic curriculum at undergraduate level in dental schools across Britain. It was found that there was a significant difference in the content covered, course length in terms of hours dedicated to orthodontics, as well as the way students were assessed and examined across different universities.<sup>4,12,13</sup>

The aim of the current study was to understand the factors that influence the decision of general dentists in the public and private sectors to provide IOT services to their patients in the metropolitan area of Tshwane, South Africa.

The hypothesis was that knowledge, confidence of self-efficacy, attitude, socioeconomic area and certain other factors do play a role in general dental practitioners' decision to perform IOT themselves or whether they refer their patients to an orthodontist.

## METHODOLOGY

### Study sample

A quantitative survey was conducted on a convenience

sample of 24 dentists representing an equal number in the public and private settings with four from each of the three socioeconomic areas. Practicing dentists in the areas were identified from a register and were invited to participate in the research. The first four respondents from each area were included in the study sample. The sample was also selected to represent an equal spread of professional experience (1 to 5, 6 to 10, 11 to 15 and 16 to 20 years, respectively) in each of the areas where the survey was undertaken, namely Danville, Riveria and Waterkloof. Each of these areas represented a different socioeconomic grouping: Danville (lower), Riveria (middle) and Waterkloof (higher).

Five clinical patient paper cases/scenarios and a questionnaire that was adapted from an earlier study<sup>4</sup> was compiled in consultation with an experienced academic specialist orthodontist to test the interceptive orthodontic knowledge of the dentist. An "answer sheet" or memorandum of possible outcomes for each of the scenarios was also drafted (Table 1).

Table 1: Questionnaire 1: the five clinical scenarios/paper cases presented to each participant to test the knowledge component. Each participant completed a separate answer sheet for every scenario.

Paper cases:		
1.	During a routine dental check-up of a 9-year-old patient you notice an anterior crossbite of the 12 and 42. The parents are unaware of the crossbite.	
2.	A 10-year-old scholar presents to you with an increased overjet and a Class II molar relationship. He is also complaining of cold sensitivity on the mesial aspect of all the first primary molars.	
3.	A 10-year-old patient presents to the practice with an anterior open bite and a thumb sucking habit.	
4.	A 13-year-old girl presents to the practice with the 75 still present and not mobile. The 35 is unerupted and the 45 fully erupted. The 75 is in infraocclusion.	
5.	A 10-year-old girl presents with the early loss of the second upper primary molar on the right-hand side. No space maintenance was done for the child.	
Answer sheet (one for each of the five cases)		
	Yes	No
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

A follow-up questionnaire that was also adapted from an earlier study,<sup>4</sup> was posed to the practitioners to obtain information on their thoughts regarding their confidence of self-efficacy, attitude as well as practical factors that may play a role in the decision-making process of whether or not to treat a patient with interceptive orthodontics. The participants were also given the opportunity to comment on other factors that they felt affected the implementation of IOT (Table 2).

Table 2: Questionnaire 2: questions posed to assess confidence levels, attitude, practical issues and other factors that may influence the decision to perform IOT (adapted from an earlier study).<sup>4</sup>

Factor	Question	Not confident	Unsure	Very confident
Confidence of self-efficacy	How confident are you that you have designed the correct treatment plan for the patients?			
	How confident are you that you can carry out the treatment plan for the patients?			
	How confident are you that the chosen treatment option(s) is the correct one?			
	How confident are you that your undergraduate training is sufficient to manage IOT?			
		Yes	No	Why?
Attitude	Would you have treated any of the paper patient cases in your practice?			
	Would you consider it important to carry out IOT in general dental practice?			
	Do you think the patients will be worse off if no IOT is done?			
		Yes	No	Why?
Practical issues	Do you have a keen interest in orthodontics?			
	Does the monetary amount paid by Medical Aids affect your decision to perform IOT?			
	Does the practice's infrastructure support the implementation of IOT?			
<b>Are there any other concerns or reasons that influence your choice to perform IOT in your practice? Please specify:</b>				

**DATA COLLECTION**

In order to assess the practitioners' knowledge, one-on-one interviews lasting 30 minutes were conducted with each participant using questionnaire 1 (Table 1). Knowledge was assessed with the question: "Which procedures do you think should ideally be carried out for this patient?". Each scenario offered the possibility of 10 behaviours and, to each, the practitioner had to answer either yes or no. The responses were compared to those of the expert. No negative marking was implemented. The interviews were conducted by the researcher at the respondent's place of work or in a public location. To ensure anonymity, no personal information or information regarding the participants' practices were recorded. The interviews were identified via a numbering system and stored in a secure, online location to further ensure anonymity.

Confidence of self-efficacy, attitude and other factors pertaining to the delivery of IOT were assessed via questionnaire 2 (Table 2).

**DATA ANALYSIS**

For the assessment of the dentists' knowledge levels, one point was allocated for each correct response. When the selected answers were incorrect, no points were allocated.

This was converted to a percentage for each dentist and was called the knowledge score. For each scenario, the percentage of the overall knowledge score across the sample was calculated as the overall percentage of correct answers given, together with a 95% confidence interval. A knowledge score of higher than 50% was rated as good while 50% was regarded as average. Below 50% was regarded as poor. The overall knowledge across all five scenarios and across the sample was calculated in a similar way, together with a 95% confidence interval. The outcome measure (dependent variable) was the intention to provide the correct behaviour (by selecting the correct procedure to be done), as measured by the knowledge score. The knowledge scores from each scenario were combined into a global knowledge score. Statistical analysis was performed on SAS (SAS Institute Inc, Carey, NC, US), Release 9.4.

Confidence of self-efficacy, attitude and other factors were assessed for each individual based on the answers provided by the general practitioners. Responses were summarised using frequency counts and percentage calculations.

The performances of the dentists in the public and private sectors were compared.-

## RESULTS

Table 3: The knowledge score achieved by each dentist for the 5 paper cases.

Dentist	Percentage correct answers for paper cases					Average across cases
	Case 1	Case 2	Case 3	Case 4	Case 5	
<b>Private sector</b>						
1	80	70	80	60	30	64
2	90	90	60	70	90	80
3	80	50	70	50	60	62
4	100	100	80	100	100	96
5	50	60	80	80	80	70
6	60	70	40	80	60	60
7	50	70	50	40	70	56
8	60	90	60	60	60	66
9	100	50	70	90	60	74
10	70	100	70	90	50	76
11	60	80	60	60	60	64
12	90	80	60	90	100	84
<b>Average</b>	<b>74.2</b>	<b>75.8</b>	<b>65.0</b>	<b>72.5</b>	<b>67.5</b>	<b>71.0</b>

<b>Public sector</b>						
13	60	80	50	70	40	60
14	90	70	70	50	70	70
15	100	80	100	50	60	78
16	80	90	60	70	60	72
17	100	90	80	80	60	82
18	70	90	70	80	70	76
19	50	80	60	50	50	58
20	50	80	50	80	60	60
21	70	90	70	70	60	72
22	90	90	80	60	80	80
23	70	90	70	50	60	68
24	90	80	70	70	60	74
<b>Average</b>	<b>76.7</b>	<b>84.2</b>	<b>69.2</b>	<b>65.0</b>	<b>59.2</b>	<b>70.8</b>
<b>P value*: Private vs Public</b>	<b>0.764</b>	<b>0.146</b>	<b>0.583</b>	<b>0.265</b>	<b>0.228</b>	<b>1.000</b>

\*Fisher's Exact test

Table 4: The knowledge score per paper case across the 3 areas surveyed.

Dentist	Percentage correct answers for paper cases					Average across the cases
	Case 1	Case 2	Case 3	Case 4	Case 5	
<b>Waterkloof area: Higher socioeconomic class</b>						
1	80	70	80	60	30	64
2	90	90	60	70	90	80
3	80	50	70	50	60	62
4	100	100	80	100	100	96
13	60	80	50	70	40	60
14	90	70	70	50	70	70
15	100	80	100	50	60	78
16	80	90	60	70	60	72
<b>Average</b>	<b>85.0</b>	<b>78.8</b>	<b>71.3</b>	<b>65.0</b>	<b>63.8</b>	<b>72.8</b>

Riveria area: Middle socioeconomic class						
5	50	60	80	80	80	70
6	60	70	40	80	50	60
7	50	70	50	40	70	56
8	60	90	60	60	60	66
17	100	90	80	80	60	82
18	70	90	70	80	70	76
19	50	80	60	50	50	58
20	50	80	50	80	40	60
<b>Average</b>	<b>61.3</b>	<b>78.8</b>	<b>61.3</b>	<b>68.8</b>	<b>60.0</b>	<b>66.0</b>
Danville area: Lower socioeconomic class						
9	100	50	70	90	60	74
10	70	100	70	90	50	76
11	60	80	60	60	60	64
12	90	80	60	90	100	84
21	70	90	70	70	60	72
22	90	90	80	60	80	80
23	70	90	70	50	60	68
24	90	80	70	70	60	74
<b>Average</b>	<b>80.0</b>	<b>82.5</b>	<b>68.8</b>	<b>72.5</b>	<b>66.3</b>	<b>74.0</b>
<b>P value*: All three classes</b>	<b>0.001**</b>	<b>0.810</b>	<b>0.378</b>	<b>0.611</b>	<b>0.734</b>	<b>0.029**</b>

\* Fisher's Exact test

\*\* Statistically significant (p value &lt;0.05)

Table 5: The knowledge score per scenario based on years of experience.

Dentist	Percentage correct answers for					Average across all cases
	Case 1	Case 2	Case 3	Case 4	Case 5	
<b>1-5 years of experience</b>						
1	80	70	80	60	30	64
13	60	80	50	70	40	60
9	100	50	70	90	60	74
21	70	90	70	70	60	72
5	50	60	80	80	80	70
17	100	90	80	80	60	82
<b>Average per case</b>	<b>76.7</b>	<b>73.3</b>	<b>71.7</b>	<b>75.0</b>	<b>55.0</b>	<b>70.3</b>
<b>6-10 years of experience</b>						
2	90	90	60	70	90	80
14	90	70	70	50	70	70
10	70	100	70	90	50	76
22	90	90	80	60	80	80
6	60	70	40	80	50	60
18	70	90	70	80	70	76
<b>Average per case</b>	<b>78.3</b>	<b>85.0</b>	<b>65.0</b>	<b>71.7</b>	<b>68.3</b>	<b>73.7</b>
<b>11-15 years of experience</b>						
3	80	50	70	50	60	62
15	100	80	100	50	60	78
11	60	80	60	60	60	64
23	70	90	70	50	60	68
7	50	70	50	40	70	56
19	50	80	60	50	50	58
<b>Average per case</b>	<b>68.3</b>	<b>75.0</b>	<b>68.3</b>	<b>50.0</b>	<b>60.0</b>	<b>64.3</b>

16-20 years of experience						
4	100	100	80	100	100	96
16	80	90	60	70	60	72
12	90	80	60	90	100	84
24	90	80	70	70	60	74
8	60	90	60	60	60	66
20	50	80	50	80	40	60
<b>Average per case</b>	<b>78.3</b>	<b>86.7</b>	<b>63.3</b>	<b>78.3</b>	<b>70.0</b>	<b>75.3</b>
<b>P value*: All years</b>	<b>0.552</b>	<b>0.169</b>	<b>0.781</b>	<b>0.005**</b>	<b>0.284</b>	<b>0.017**</b>

\* Fisher's Exact test

\*\* Statistically significant (p value <0.05)

Table 6: Confidence of self-efficacy of the participants.

Question	Number (%)			
	Very confident	Not confident	Unsure	Total
How confident are you that you have designed the correct treatment plan?	18 (75)	-	6 (25)	24 (100)
How confident are you that you can carry out the treatment plan?	18 (75)	1 (4)	5 (21)	24 (100)
How confident are you that you have chosen the correct treatment option?	18 (75)	-	6 (25)	24 (100)
How confident are you that your undergraduate training is sufficient to manage IOT?	10 (42)	9 (38)	5 (21)	24 (100)
<b>Collective confidence</b>	<b>64 (66.7)</b>	<b>10 (10.4)</b>	<b>22 (22.9)</b>	<b>96 (100)</b>

Table 7: Participants' attitude towards the implementation of IOT.

Question	Number (%)		
	Positive Attitude	Negative attitude	Total
Would you have treated any of the paper patient cases in your practice?	19 (79)	5 (21)	24 (100)
Do you consider it important to carry out IOT in general practice?	24 (100)	-	24 (100)
Do you think patients will be worse off without IOT?	24 (100)	-	24 (100)
<b>Collective attitude</b>	<b>67 (93.1)</b>	<b>5 (6.9)</b>	<b>72 (100)</b>

Table 8: Practical issues affecting the implementation of IOT.

Question	Number (%)		
	Yes	No	Total
Do you have a keen interest in orthodontics?	12(50)	12(50)	24(100)
Does the monetary amount paid by medical aids affect your decision to perform IOT?	13(54)	9(46)	24(100)
Does the practice's infrastructure support the implementation of IO?	14(58)	10(42)	24(100)

## DISCUSSION

The knowledge scores were calculated for all 24 dentists individually, for all five paper cases (Table 3). The average knowledge scores of dentists in the private and public sectors (71.0% and 70.8% respectively) did not differ significantly (Table 3). Only three private and two public sector dentists scored below 50% on one of the five paper cases. Three of these questions related to case 5 which stated: "A 10-year-old girl presents with early loss of the

second upper primary molar on the right-hand side. No space maintenance was done for the child. What would you do for this child?". The correct answer would be to distalise the maxillary first permanent molar on the right-hand side if it was established that space was lost. This could easily be done with a removable distalisation appliance. Subsequently, space maintenance would be needed until the second premolar erupted. Based on the questionnaire, it is possible that the general practitioners who scored

poorly on this case did not think that any treatment or space maintenance was needed, which was clearly not the case. The possibility exists that the dentists might have thought that fixed orthodontic treatment would be needed eventually, once the child is older.

The knowledge scores from Table 3 were re-arranged according to the three areas surveyed and summarised in Table 4. For paper case 1, the knowledge score for the Riveria (middle income) group (61.3%) differed significantly ( $p=0.001$ ) from both the Waterkloof (high income) group (85.0%) and the Danville (low income) group (80.0%). There could possibly be numerous reasons why general practitioners practising in the Riveria area had a significantly lower knowledge score than the other dentists, the most obvious being the small sample size of this study and this may have been compounded by inexperience and/or a lack of interest in the field of orthodontics. However, no statistically significant differences were found between the three areas surveyed in respect to the average percentage of correct answers for cases 2 to 5. The average percentage across all the cases showed that the scores for the Riveria (middle income) group was significantly ( $p=0.029$ ) lower than for the Danville (low income) group (Table 4).

The results of this study correlate closely with the results of a British study in 2016<sup>14</sup> that reported a sufficient level of knowledge of the participants. However, various other studies have concluded that the lack of knowledge was a major reason why dentists did not implement IOT in their practices.<sup>4,9,11</sup> One of these studies showed that 11% perceived themselves to have a good level of knowledge. Some 59% thought their knowledge was average and 30% felt that it was poor.<sup>9</sup>

#### Knowledge vs experience

Table 5 shows that there were no statistically significant differences in the overall knowledge scores between the various categories of experience for cases 1, 2, 3 and 5. However, for case 4, the group with 11-15 years of experience scored 50% which differed significantly ( $p=0.008$ ) from the group that had 1-5 years of experience (score of 75%) and the group ( $p=0.002$ ) with 16-20 years of experience (score of 78.3%). The average knowledge score across all cases also showed that the percentage for the 11-15 years of experience group (64.3%) was significantly ( $p=0.004$ ) lower than the percentage for 16-20 years of experience group ( $p=75.3%$ ). The overall knowledge scores per experience category were as follows:

- 1 to 5 years of experience: 70.3%, with a 95% confidence interval (64.9% to 75.2%)
- 6 to 10 years of experience: 73.7%, with a 95% confidence interval (68.4% to 78.3%)
- 11 to 15 years of experience: 64.3%, with a 95% confidence interval (58.8% to 69.5%)
- 16 to 20 years of experience: 75.3%, with a 95% confidence interval (70.2% to 79.9%)

Knowledge, experience and confidence play a huge role in the management of IOT cases. Borrie et al. (2014)<sup>4</sup> found that of those who felt their knowledge of orthodontics was poor, 28% felt it was due to a lack of clinical practice or experience. Jauhar et al. (2016)<sup>14</sup> reported that final-year students felt that they did not have enough experience to implement orthodontic treatment when they entered practice the following year. Fifty-six percent of the group felt

they needed more exposure and experience to perform fixed orthodontic treatment while 41% wanted more exposure to removable appliances.<sup>14</sup>

#### Knowledge vs confidence

The knowledge scores reflected in Table 3 were lower than the confidence levels with regard to the correctness of the treatment option, the treatment plan and the ability to perform the IOT (Table 6). Table 6 revealed that in 75% of the responses, the dentists indicated that they were very confident that their treatment plans and treatment options were correct and were able to carry out the treatment. Fleming and Dowling (2005)<sup>9</sup> interviewed general dentists and found that:

- 69% felt they could adequately complete an orthodontic assessment
- 96% felt they were capable of referring patients appropriately
- 76% felt they had the knowledge to use removable orthodontic appliances.

However, only 24% of these dentists would attempt to correct an anterior crossbite while 15% would be prepared to fit a space maintainer.<sup>10</sup> This may suggest a lack of confidence which could probably be an important reason for dentists not implementing IOT as part of their normal scope of practice. It also correlates with the findings of Borrie et al. (2014)<sup>4</sup> who reported on practitioners' reluctance to implement IOT due to a lack of confidence.

#### Attitude towards IOT

The findings of this study revealed that in 93.1% of the responses, the dentists expressed a positive attitude towards the implementation of IOT as part of their normal scope of practice (Table 7). The first attitude question asked the participants whether they would have treated any of the paper cases in their own practices. Of the 24 participants, 19 responded positively and 5 negatively. Reasons for answering yes included the following:

- Ease of execution (42%)
- The treatments will be quick to complete (21%)
- They had the skill-set to perform the treatment (13%)
- IOT should be done by a general dentist and not by a specialist (4%)

Only 13% of respondents perceived themselves clinically capable to perform the necessary IO treatment while 63% felt that the treatment would be easy and quick to complete. This compares favourably to the findings in Table 6 which illustrates that 75% of respondents were confident in their diagnosis, treatment plan and treatment. Reasons for answering no included the following:

- Lack of interest in orthodontics (13%)
- Lack of confidence (4%)
- Lack of knowledge (4%)

The second attitude question explored whether the participants considered it important to carry out IOT in a general dental practice. All 24 participants answered yes to this question. Reasons given included:

- A reduction in the complexity of treatment needed at a later stage (38%)
- IOT prevented future orthodontic problems (33%)

- IOT prevented referral of patients outside of the practice (17%)
- It reduced the financial burden on the patients (8%)
- It kept patients and parents happy by attempting to resolve the problems early (4%)

The third attitude question attempted to determine whether general practitioners thought that the patients would be worse off if no IOT was done. All 24 participants answered yes to this question. Reasons given included the following:

- Fixed orthodontic treatment at a later stage is expensive and more complex (25%)
- Orthodontic problems tend to worsen with age (75%).

Jayaprakash et al. (2019)<sup>15</sup> found that practitioners who implement orthodontic treatment in their practices have a better attitude and interest toward the speciality compared to those who do not implement the discipline in their practices.

### Undergraduate training

The knowledge scores may indicate that undergraduate training across all dental schools at South African universities may be adequate; unfortunately, no comparative South African studies could be found. However, only 42% felt that their undergraduate training prepared them sufficiently to manage IOT in practice (Table 6). The remainder of the respondents indicated that they were either not confident (38%) or unsure (21%) with respect to providing IOT. This lack of confidence in their orthodontic grounding may well play a role in quantifying the imbalance between confidence and knowledge. This is well supported by a 2006 British survey of dentists that evaluated undergraduate curricula pertaining to orthodontic knowledge and skills.<sup>16</sup> The study showed that:

- 58% felt the theoretical information they received was adequate
- 45% felt that their practical experience had been relevant to their current practice
- 46% felt that they would be able to treat simple cases with removable appliances
- 40% felt that their undergraduate course could have been improved by gaining more clinical experience

### Other factors influencing the implementation of IOT

Only 50% of the respondents expressed a keen interest in orthodontics (Table 8) yet 75% of them were confident enough to treat the paper cases (Table 6). The reasons why they expressed an interest in orthodontics included the following: they loved working with children (17%), they had success with past treatments and the results were life-changing for the patients (13%), it kept patients in their practices (4%), it was an interesting field (17%). The reasons why they had no interest in orthodontics included the following: they felt that it was difficult to understand the field (21%), it was time-consuming (8%), they did not like orthodontics (8%), or they did not like children (8%).

Forty-two percent of the practitioners were in practices that did not have the infrastructure to support the implementation of IOT, while 58% of respondents reported that they had infrastructural support (Table 8) in the form of good laboratory services, instruments and the radiographic equipment needed to treat IO cases. Unfortunately, questionnaire 2 did not differentiate between the public and private sectors, so no comparisons could be made regarding the infrastructure in the public and private sectors.

Many of the middle-income practices may depend on medical aid schemes which are governed by different rules and regulations. Some medical aids do not cover IOT whereas others may require time-consuming administration in order to approve treatment that is not remunerated to the satisfaction of the practitioner, if remunerated at all. Patients might also be reluctant to cover any costs that the medical aid does not cover in full. Medical aid funding was found to affect the decision to implement IOT in 54% of the responses (Table 9). This confirms the results of other studies that found that financial outcomes played a significant role in the long-term plans of newly qualified dentists and the types of clinical work on which they chose to focus.<sup>17,18</sup> Due to these financial limitations, increased pressure is placed on the dentists to perform simple interceptive procedures early, suggesting that there is a greater need for IOT among patients from the lower socioeconomic group.<sup>19,20</sup>

Furthermore, another important reason for not implementing IOT was a perceived lack of patient compliance and patient fatigue (25%). Sixteen percent of participants felt that the long period of time over which the income is generated made IOT not worthwhile. Patient finances and a low dental IQ of patients were mentioned in 12% of responses. The finding correlated Brattström et al. (1991)<sup>21</sup> findings that the main reason patients terminated treatment was the lack of motivation, while Mussig et al. (2008)<sup>22</sup> stated that socio-emotional factors influenced patient compliance significantly. Factors that were found to influence compliance positively include female patients, individuals with high self-esteem, high achievers and optimistic patients.<sup>23</sup>

### LIMITATIONS

The study only focuses on three areas in Tshwane; researching a broader geographical base will reflect more accurately on the South African situation. The sample size of participants is small; however, to achieve the correct sector and experience spread, a large number of potential participants had to be screened.

The questions and responses to questionnaire 2 did not reflect the experience of the participants or whether they were public or private sector workers.

### CONCLUSION

The knowledge levels of the dentists surveyed were good but inconsistent where confidence levels were concerned. However, all of the respondents understood the value of timeous IOT.

The practical issues such as practice infrastructure, financial remuneration, patient motivation and compliance are the real issues that play a role in the general practitioners' decision to implement IOT on a daily basis.

Half of the dentists surveyed expressed no interest in orthodontics. It may be concluded that because of this lack of interest, which is compounded by the practical challenges, patients are often considered for treatment when it is too late for IOT, resulting in the need for comprehensive orthodontic treatment in the permanent dentition.

Undergraduate programmes need to place increased emphasis on the clinical component of the orthodontic module to reduce the disparity between theory and clinical application. In view of the proposed National Health Insurance legislation, prevention and interception of early orthodontic malocclusions will decrease the orthodontic burden of care.



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