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Research Article

The Relationship between Self-Rated Proficiency in Orthodontics and Tested Orthodontic Knowledge of Dentists Using Facebook in the United Kingdom

MJ Rowland-Warmann[1*], Parmjit Singh[2]

[1]Dentist, Smileworks, Liverpool, UK

[2]Professor in Orthodontics, College of Medicine and Dentistry, Birmingham, UK

[*]**Corresponding Author:** MJ Rowland-Warmann, Dentist, Smileworks, Liverpool, UK; Email: drmjrowlandwarmann@gmail.com

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Abstract

Introduction: There has been a rise in orthodontic treatments being undertaken by dentists in the United Kingdom (UK). Levels of orthodontic education vary, and this may impact upon self-rated proficiency and tested knowledge of orthodontics.

Purpose: The study aimed to assess the relationship between self-rated proficiency in orthodontics and tested orthodontic knowledge of dentists in a UK Facebook group, and determine if this was related to the level of orthodontic education.

Materials and Methods: A two-part online survey was sent to dentists who were members of a closed Facebook group (The Dentist UK). Part one asked demographic and attitudinal questions including practice environment, level of orthodontic education and self-rated ability in diagnosis and treatment (proficiency). Part two consisted of questions to test orthodontic knowledge. Eligible participants were placed into one of four groups based on level of education: General Dental Practitioners (GDPs) with single day course completion (group 1), multiple day course completion (group 2), postgraduate course completion (group 3) and specialist level training (group 4).

Results: A total of 102 participants completed the study, of which 38.2% (n=39) did not undertake orthodontic treatments. The remaining participants (n=63; 61.8%) were assigned group 1 (n=32; 50.8%), group 2 (n=8; 12.7%), group 3 (n=13; 20.6%) and group 4 (n=10; 15.9%). Group 1 rated themselves least proficient (mean=3.27), followed by group 2

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(mean=3.71), group 3 (mean=3.9) and then group 4 (mean=4.47). Knowledge test scores were lowest for group 1 (37.8%), then group 2 (60%), group 3 (56.2%) and group 4 (73.5%). Self-rated proficiency significantly predicted accuracy on the knowledge test. The level of education positively correlated with the knowledge test scores.
Conclusions: Test scores for orthodontic knowledge generally increased with increasing levels of self-rated orthodontic proficiency. Those with lower levels of orthodontic education generally performed less well in the orthodontic knowledge test.

Keywords

Orthodontic Treatment; Dentists; Orthodontic Courses; General Dental Practitioners

Introduction

There has been a rise in dentists undertaking orthodontic treatment, in particular, General Dental Practitioners (GDPs) [1]. Between 40-50% of all orthodontic treatments in the United Kingdom are carried out by GDPs [2,3]. Dental curriculums do not extend to providing teaching to the level that the GDPs be deemed competent in providing the full spectrum of orthodontic treatments [4,5]. Furthermore, there have been changes in the undergraduate dental curriculum over time. This has resulted in significant reductions to the numbers of contact hours for orthodontic education reducing from an average of 195 in 1998 to 55 in 2016 [6,7]. Therefore, GDPs wishing to undertake orthodontic treatment should be appropriately trained, competent and confident to carry out orthodontic treatment, and if necessary, refer their cases [3,8].

Additional knowledge in orthodontics can be acquired from a single or multiple day course to enrolment on to a more structured programme that is undertaken over a number of years resulting in a post-graduate certificate, diploma or masters level award. Eligibility for specialist status is usually obtained via the orthodontic specialist training pathway involving around 5,000 hours of dedicated study time over at least three years [3].

Dentists have been known to perceive their orthodontic training quality as low [2]. In one study, 60% of practitioners believed that more training on case selection and treatment planning should be provided [6]. Some authors have found that increased levels of continuing education resulted in more orthodontic cases being treated [9]. Whilst others have observed that the complexity of cases being treated by GDPs may be increasing [10]. The experience of an

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orthodontic practitioner has been found to help determine case complexity, indicating that education and training play a key role in judgement of case severity [7].

Insufficient understanding of orthodontic treatments and an inability to respond to the dynamic orthodontic oral environment could result in unmet patient expectations [3,11,12]. It has also been suggested that with limited knowledge, dentists may not be able to fully explore treatment options, leading to inadequacies in the consent process [4,13].

With the rise in treatment popularity, there is an increase in the number of litigation and regulatory proceedings relating to orthodontic treatment [14,15]. Litigation against GDPs is thought to be as high as 80-90% of all orthodontic cases [12,14]. A Freedom of Information request made in January 2019 revealed that of 426 regulatory cases involving orthodontics brought before the General Dental Council (GDC) in the five-year period to 31 December 2018, 60% (n=256) were against dentists without a specialty in orthodontics [15].

There is currently a lack of clarity on whether the self-rated proficiency in orthodontics is related to the actual level of orthodontic knowledge (which could influence the competency of orthodontic case assessment, diagnosis and treatment). There is also uncertainty on whether self-rated levels of proficiency and actual levels of knowledge vary depending on the extent of orthodontic education. This study aimed to assess the relationship between self-rated proficiency in orthodontics and tested orthodontic knowledge of dentists in a United Kingdom (UK) Facebook group, and determine if this was related to the level of orthodontic education.

Methods

The study took the form of a cross-sectional study of UK dentists using Facebook. The Facebook group 'The Dentist UK' was used for participant recruitment. This is a closed group requiring and an administrator to approve membership. The group also has over 7,800 members who are overwhelmingly dentists registered with the GDC. Ethical approval for was granted by the university ethics committee (BPP/REC/0150715). The online platform Qualtrics (QualtricsXM, Provo, USA) was used to host the study.

The social media platform Facebook could be considered to be broadly representative of the UK dentist population, and male to female distribution within the general population [16,17]. Whilst surveying a Facebook population excludes individuals who are not on the platform, Facebook is known to be the most widely used social media channel across all ages [18].

Considering the whole UK GDP population at 42389 [16]. The sample size for appropriate validity would be 381 at a 5% margin of error and 95% confidence level. This reduced to 367 for the cohort of 7882 members of The Dentist UK group. To obtain a realistic target for

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number of participants, the margin of error was set at 10%, which reduced the sample size to 95 participants [19]. It was expected that some participants would not perform orthodontic treatment in practice. These participants were still included in the total as they would be representative of the total GDP population.

Recruitment was undertaken using an invitation posted as a group post. Potential participants were informed of the purpose of the study with a cover letter. A follow-up post was posted after 14 days and collection of data was completed during a 4-week time period in August 2019. Inclusion criteria required the participants be a member of The Dentist Facebook group, and to declare a GDC number to demonstrate being registered to work in the UK. Duplicate entries matching the same registration number were excluded. No participant identifiable data was collected.

A focus group was formed consisting of the main researcher (MJRW) and 4 experienced orthodontists, after which a 32-item online questionnaire was formulated and piloted. Survey questions were grouped into demographic, self-rated perception and knowledge sections [20]. A combination of closed-ended and multiple-choice questions elicited eligibility criteria (possession of a Facebook profile, GDC number and orthodontic treatment profile), age, gender and education level. The level of education assigned to each participant was into one of 4 groups:

1. GDPs who completed single day orthodontic courses
2. GDPs who completed multiple day orthodontic courses
3. GDPs who completed postgraduate orthodontic courses
4. Dentists who had completed training to orthodontic specialist level

Self-rated perception (attitude) questions asked a participant's perception of their undergraduate orthodontic education and their perceived ability to assess and provide orthodontic treatment. A variable that defines self-rated level of orthodontic proficiency was created by averaging responses to the three self-rated perception questions using the Likert scales (1=poor, 5=excellent) that questioned:

1. Quality of undergraduate orthodontic education participants received
2. Quality of participant's assessment of orthodontic patients for treatment
3. Participant's perceived abilities at providing orthodontic treatment

Twenty multiple-choice knowledge test questions were timed and auto-advanced to control the test environment. These questions were on routine orthodontic subject matters relating to assessment and treatment such as assessment of molar and incisor relationships, eruption sequences, recognition of orthodontic instruments and basic orthodontic mechanics.

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Data was exported into SPSS version 23.0 (SPSS, IBM Corporation, New York, USA). The number of correct responses in the subset of the questionnaire on orthodontic knowledge (maximum score 20) were calculated. To determine whether the two dependent variables (i.e., self-rated proficiency and accuracy in the knowledge test) vary as a function group, a Kruskal-Wallis-Test was used. A pair-wise comparison of the two dependent variables across the four group levels using the Mann-Whitney U test was performed. Regression analysis was applied to test if the level of self-rated proficiency could predict a participant's levels of accuracy on the knowledge test.

Results

A total of 102 participants completed the study. Of these, 39 (38.2%) participants did not carry out orthodontic treatment. Therefore, the number of dentists treating orthodontic cases in the study population was 61.8% (n=63). The total number of GDPs undertaking orthodontics was 52% (n=53) whist orthodontists accounted for 9.8% (n=10). Demographic data is presented in Table 1.

	GDPs with single day course training	**GDPs with multiple day course training**	**GDPs with post graduate course training**	**Specialist level training (orthodontist)**
Group	1	2	3	4
N	32 (50.8%)	8 (12.7%)	13 (20.6%)	10 (15.9%)
Age				
Under 30 Years	7 (21.9%)	0	0	0
30-39 Years	22 (68.8%)	4 (50%)	6 (46.2%)	2 (20%)
40-49 Years	3 (9.4%)	2 (25%)	4 (30.8%)	8 (80%)
50-59 Years	0	1 (12.5%)	3 (23.1%)	0
60-69 Years	0	1 (12.5%)	0	0
Females	15 (46.9%)	1 (12.5%)	6 (46.2%)	4 (40%)
Treatment of Adult Only	29 (90.6%)	2 (25%)	4 (30.8%)	0
Treatment of Children Only	0	0	0	0
Treatment of Adults and Children	3 (9.4%)	6 (75%)	9 (69.2%)	10 (100%)

Table 1: Demographic details of the 63 participants and patient treatment profile. (Thirty-nine (38.2%) participants did not carry out orthodontic treatment).

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Initial analysis was to assess whether the two dependent variables (i.e., self-rated proficiency and accuracy in the knowledge test) vary as a function group. Due to the small and non-homogeneous sample sizes across the four groups, the Kruskal-Wallis-Test was used and it was confirmed the data met the conditions for this test. A significant main effect of group both for the self-rated proficiency ($H = 27.02$; $p < 0.001$) and for the accuracy level ($H = 34.22$; $p < 0.001$) was found.

Using the Mann-Whitney U test, in the self-rated proficiency analysis, group 4 rated themselves as the most proficient (mean=4.47; S.D. 0.36) relative to group 3 (mean=3.9; S.D. 0.47; U=28; $p<0.05$) and group 2 (mean=3.71; S.D. 0.45; U=7; $p<0.01$) and group 1 the least (mean=3.27; S.D. 0.62; U=12; $p<0.001$). Group 3 rated themselves higher relative to group 1 (U=84; $p<0.01$) but not significantly different from group 2 (U=36.5, $p>0.3$). Finally, the difference between group 2 and group 1 showed a numerical difference that was only marginally significant (U=75.5; $p=0.076$). Participants were generally able to adequately assess their level of expertise that broadly corresponded to the participant's level of involvement with orthodontic training as shown in Fig. 1.

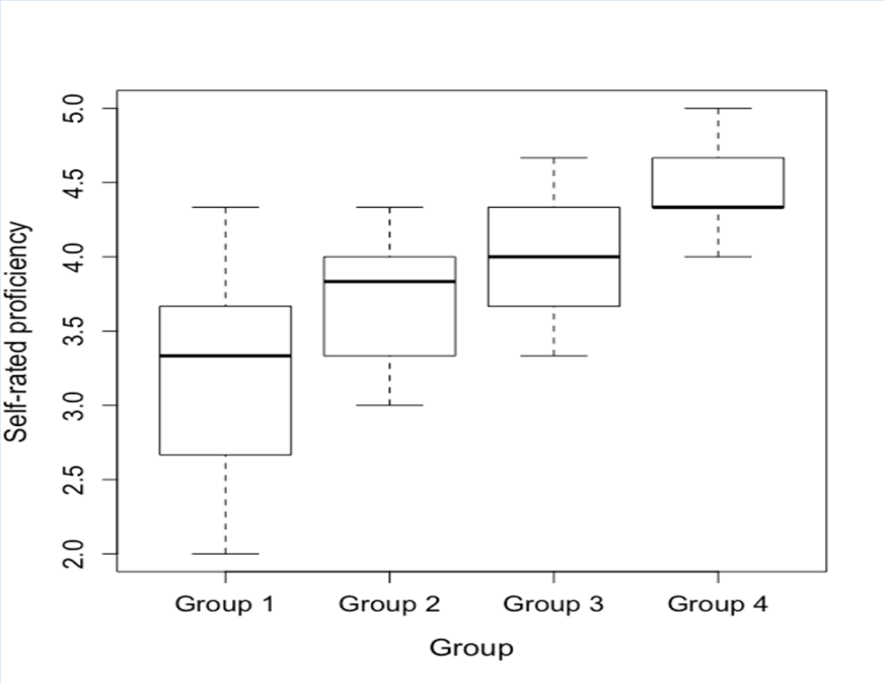

Figure 1: Mean self-rated proficiency levels plotted as a function of group. Error bars represent standard errors of the mean. Scores range from 1 (least proficient) to 5 (most proficient). (Group 1=GDPs who completed single day orthodontic courses, group 2=GDPs who completed multiple day orthodontic courses, group 3=GDPs who completed postgraduate orthodontic courses, group 4=dentists who had completed training to orthodontic specialist level).

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In relation to the knowledge test (maximum score 20), the Mann-Whitney U test showed group 4 to have the highest performance (mean=14.7 (73.5%) correct responses) relative to group 3 (mean=11.23 (56.2%); U=16; $p<0.01$), group 2 (mean=12 (60%); U=9; $p<0.01$) and group 1 (mean=7.56 (37.8%); U=10; $p<0.001$). Participants in group 3 and group 2 did not differ in knowledge test performance (U=42.5; $p>0.4$), but both groups performed significantly better relative to group 1 (every $U>24$, every $p<0.001$) (Fig. 2). There was a gradual increase in the test accuracy with increase in the level of orthodontic expertise (group 1<group 2=group 3<group 4).

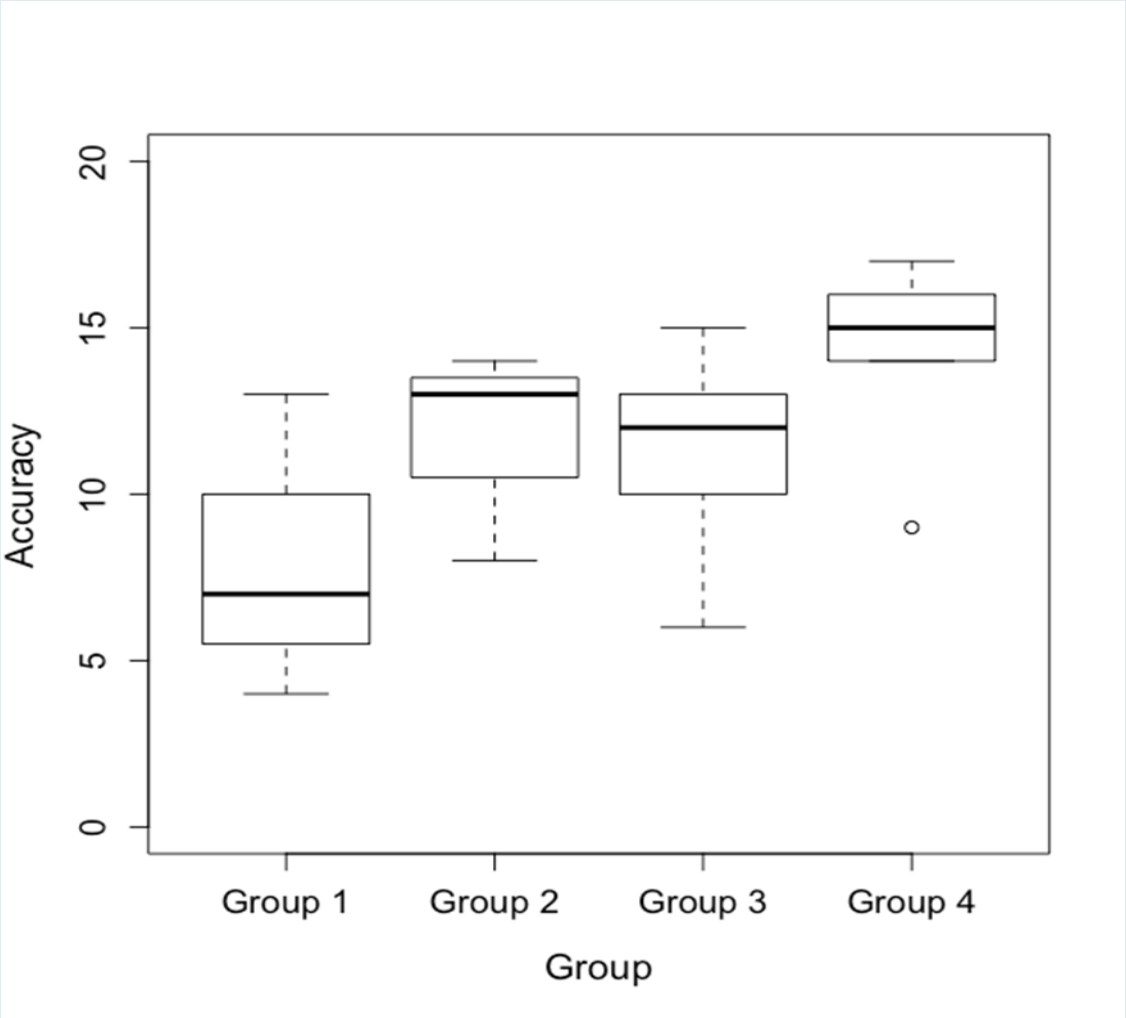

Figure 2: Mean accuracy performance on an explicit knowledge test plotted as a function of group. Error bars represent standard errors of the mean. (Group 1=GDPs who completed single day orthodontic courses, group 2=GDPs who completed multiple day orthodontic courses, group 3=GDPs who completed postgraduate orthodontic courses, group 4=dentists who had completed training to orthodontic specialist level).

Regression analysis was applied to test if the level of self-rated proficiency could predict participants' levels of accuracy on the knowledge test. The results indicated that self-rated

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proficiency level explained 26.1% of total variance (R2=0.261; F(1, 62)=21.51; p < 0.001). Self-rated proficiency significantly predicted accuracy on the knowledge test (β=-0.511; p<0.001) (Fig. 3).

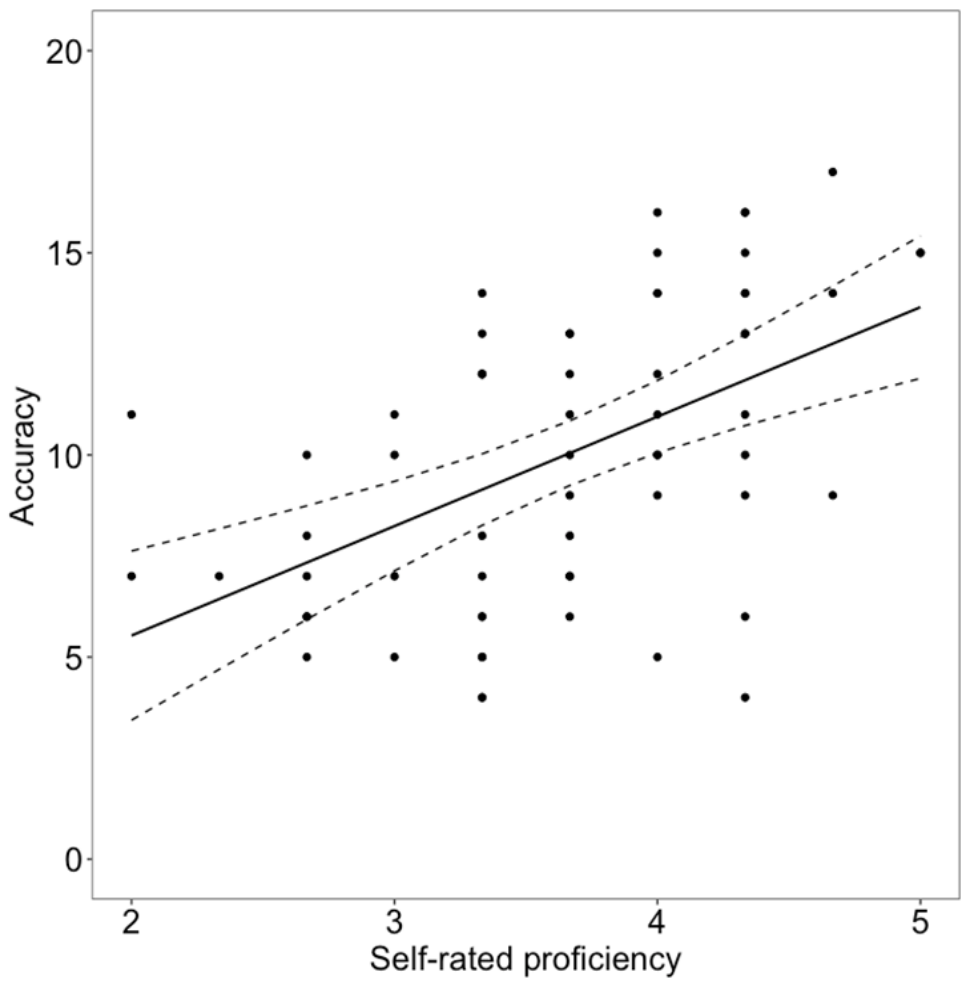

Figure 3: Regression analysis. Scatter plot of accuracy performance and self-rated proficiency. Solid line represents the linear fit of data. Dotted lines represent Confidence Interval at 95%. Proficiency scores 1 (least proficient) to 5 (most proficient). Maximum accuracy score 20.

Discussion

There has been a rise in popularity and social acceptability of orthodontic treatment in the UK. It is thought that 40-50% of all orthodontic cases in the UK are treated by GDPs and it is likely that over half of the UK GDP population perform some kind of orthodontic treatment [2,3].

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This is consistent with the finding of this study that found 52% of GDPs treated orthodontic cases.

There were significant patterns in self-rated proficiency of practitioners with different educational levels with increased contact time in orthodontic education increasing self-rated proficiency. Previous studies have shown that training hours and confidence in treating orthodontic cases directly correlate [9,11].

In turn, self-rated proficiency was found to be an accurate predictor for the knowledge test scores. It is therefore established that self-rated proficiency is closely linked with level and training which positively influences knowledge levels. This is consistent with the findings of studies that assessed perception of orthodontic case complexity by practitioners of varying grades, and found the more senior the operator, the better the judgement of complexity [2,7].

Sixty percent of GDP participants undertaking orthodontic treatment only completed single day courses. This level of education in orthodontics had implications on their knowledge standard. A higher standard of knowledge in questions concerning elements of diagnosis and treatment has been known to result in better patient care as practitioners can appropriately assess the case [2].

The standard of knowledge of GDPs with regards to safety of patients in orthodontic treatment has been questioned [21,22]. Diagnosis and treatment are also known to be the two key issues in civil and regulatory cases involving orthodontic treatment [12,14,15]. GDPs on the whole are more likely to treat adult orthodontic patients for cosmetic purposes and this study found that participants in group 1 overwhelmingly treated only adults (90.6%). Such patients may have higher expectations of their treatment outcome due the fact they are paying fees, and are often more empowered with an increased awareness of their rights and how to complain [2,23,24].

The knowledge test used, although clinically orientated, was a test of knowledge and not an indicator of a participant's ability to treatment plan or carry out clinical activity [7]. Testing of reasoning and practical skill would require a much more extensive survey in future studies. The inclusion of a control group who do not perform any orthodontics would also permit analysis with individuals who have minimal need to call on their orthodontic education in everyday practice.

Whilst the target number of participants for the current study was met, a larger sample size would have enabled more in-depth analysis. A relatively low number of participants were in most groups and there may have been an element of bias, as each group may have comprised mostly well or poorly performing participants. An element of response bias may have

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artificially inflated the scores, as those who consider themselves particularly academic or able would have been more likely to take part in the study.

Other methods for participant enrolment and selection for future studies should be considered in order to be more representative of UK dentists. Whilst the use of Facebook facilitated the collection of answers and response rates for the study, the participants may not be a completely representative of the UK dentist population.

The need for practitioners to treat cases within their competency is reinforced [25]. The formulation of training requirements for GDPs wishing to undertake orthodontic treatment within a recognized framework of competencies is also recommended [26].

Conclusion

Tested orthodontic knowledge in this sample of Facebook's population increased with increasing levels of self-rated perception of orthodontics. Those with lower levels of orthodontic education generally had lower levels of orthodontic knowledge test scores.

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