

# Professional perceptions of the benefits of orthodontic treatment

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**SUMMARY** The aim of this study was to assess general dental practitioners' and orthodontists' perceptions of the benefits of orthodontic treatment. A specially designed questionnaire was sent to a random sample of 150 general dental practitioners (GDPs) and all orthodontists in Northern Ireland (excluding hospital practitioners) with a postgraduate qualification ( $n = 29$ ). There was a 93 per cent response rate by the general dental practitioners and all but one specialist practitioner returned the questionnaire.

The questionnaire comprised 14 visual analogue scales (VAS) whereby participants were asked to rate the importance of various possible dental health and psychosocial benefits of orthodontic treatment. In addition to the VAS, the influence of dentist variables such as number of years since qualification, orthodontic cases completed, referral rates and attendance at postgraduate lectures were examined.

When ratings on the 14 dental health and psychosocial scales were examined overall, GDPs rated an improvement in self-esteem while orthodontists considered an improvement in physical attractiveness as the most important benefit of orthodontic treatment.

Even though psychosocial variables received the highest ratings, examination of the mean ratings (and 95 per cent confidence intervals) revealed that some dental health factors were also rated highly by both groups. While the results do indicate an encouraging awareness of the psychosocial benefits of orthodontic treatment, they also suggest that both GDPs and orthodontists have an unrealistic expectation of the dental health gain likely to result from orthodontic treatment.

## Introduction

The health gain resulting from the correction of malocclusion is frequently defined in terms of improvement in oral health as well as enhanced psychosocial well-being. In the early period of the development of the orthodontic speciality the importance of orthodontic treatment in improving oral function and reducing susceptibility to dental caries and periodontal disease was often emphasized (Shaw *et al.*, 1980a,b; Buckley, 1981; Griffiths and Addy, 1981). However, the results of subsequent longitudinal studies provided little evidence to support the view that orthodontic treatment had a significant impact in reducing oral disease (Addy *et al.*, 1988; Helm and

Peterson, 1989; Shaw *et al.*, 1991a). Although an association has been demonstrated between prominent incisors and traumatic injury (Järvinen, 1979) and pathological migration in adulthood (Thilander, 1984), only extreme variations in other occlusal features are considered to represent a true risk to dental health (Shaw, 1988). It has been concluded that malocclusion has little if any impact on diseases of the teeth or supporting structures (Proffit and Fields, 2000).

In contrast, the field of social psychology has provided increasing evidence to support the psychosocial benefits of orthodontic intervention. Unattractive physical appearance may evoke an unfavourable social response (Shaw *et al.*, 1991b)

and facial aesthetics have been shown to be a significant determinant of self-perception (Tung and Kiyak, 1998). Well-aligned teeth and a pleasing smile carry positive status at all social levels, whereas irregular or protruding teeth carry negative status (Shaw, 1981, 1985). From the patients' perspective the most important motivation for orthodontic treatment is an improvement in appearance (Tulloch *et al.*, 1984) and the main reason patients seek orthodontic treatment is to minimize psychosocial problems related to their dental and facial appearance (Burden and Pine, 1995).

In the light of the above research, it is clear that in the vast majority of orthodontic patients the health gain is psychosocial in nature and cannot be represented in terms of a reduction in the prevalence of dental disease or a diminution in susceptibility. In fact to do so could be construed as misinforming patients and has important implications for those who access patients to orthodontic care and those who provide orthodontic treatment.

The research described in this paper investigated whether general dental practitioners (GDPs) and orthodontists are likely to make a realistic assessment of the health gain achieved through orthodontic treatment.

## Subjects and methods

### *The sample*

All orthodontists in Northern Ireland (excluding hospital practitioners) who held a postgraduate orthodontic qualification ( $n = 29$ ) were included in this study. A random sample of 150 from the 635 GDPs in Northern Ireland was also selected from central public health records using random numbers generated in the Statistical Package for the Social Sciences (SPSS, Version 9; SPSS Inc., Chicago, Illinois).

### *The questionnaire*

A thorough search of the orthodontic and psychology literature was undertaken to identify the reported beneficial outcomes of orthodontic treatment. Fourteen reported beneficial effects

were found, six were related to the potential oral health gain and eight reported beneficial outcomes related to enhanced psychosocial well-being. The potential oral health gain included a reduction in susceptibility to caries, temporomandibular dysfunction (TMD), periodontal disease, improved oral function, a reduction in oral discomfort, and a reduction in difficulty with cleaning. The reported psychosocial benefits of orthodontic treatment were improvement in physical attractiveness, self-esteem, self-confidence, social attractiveness, self-image, social interaction, career prospects, and a reduction in teasing incidents.

Using the 14 possible outcome variables listed above as prompts, fourteen 100 mm visual analogue scales (VAS) were constructed with the ends of the scales defined by the following anchor statements: no reduction/great reduction, no improvement/great improvement, or no enhancement/great enhancement. Figure 1 illustrates the question and VAS used to assess each respondent's perception of the reduction in the risk of caries resulting from orthodontic treatment. To reduce the potential of response bias the anchor statements were reversed on some of the VAS. The psychosocial and oral health variables were not organized into two separate groups but were mixed randomly together in the questionnaire. This precaution was taken to reduce the likelihood of respondents identifying the study hypothesis. Participants were asked to read each question carefully and then place a mark on the horizontal line of the 100 mm VAS. In addition to the above questions each participant was asked to record the date when they obtained their primary dental qualification, and the number of postgraduate lectures/courses that they attended in the previous year. The GDPs were also asked to record how many fixed or removable appliance

Do you think that successfully completed orthodontic treatment will reduce the risk of caries?

no reduction ————— great reduction

**Figure 1** Example of a visual analogue scale as used in the questionnaire.

treatments they completed in the previous year (0, 1–2, 3–6, 7–9, 10–15, 16–30, >30, >50, >100, >200, >300, or >400), and the number of children and adults they had referred to an orthodontist in the previous year.

The questionnaire was initially piloted among 10 GDPs who were not included in the main study. This initial study revealed minor difficulties in interpretation, which were amended in the final questionnaire. The questionnaire was then mailed to the GDPs and orthodontists together with a stamped addressed return envelope. A free pen was included as an incentive to respond. A second questionnaire was sent to non-respondents 1 month later.

On receipt of the completed questionnaires, the ratings recorded on the VAS were measured from the negative anchor statement by the same person using a ruler accurate to 0.1 mm.

Data analysis was performed using SPSS. The degree of concordance among practitioners was evaluated using non-parametric statistical techniques. The relationship between the ratings scored and practitioner variables were analysed using linear regression. Ratings on the 14 VAS were each analysed as dependent variables in the multiple linear regression analysis using a forward stepwise technique. The explanatory variables entered into the analysis included gender, number of years since obtaining primary dental qualification, number of postgraduate lectures attended, number of orthodontic cases completed and the number of children and adults referred to an orthodontist for treatment in the previous year. The number of years since initial qualification was recoded for analysis into an ordered categorical scale using the following categories: 0–5 years; 6–10 years; 11–15 years; 16–20 years; 21–30 years; and 31 years or more.

## Results

### *The response*

Of the 29 orthodontists who were sent the questionnaire 28 (97 per cent) replied. Sixteen (57 per cent) were male and 12 (43 per cent) were female. The response rate among the GDPs was also high with 139 (93 per cent) returning

**Table 1** The characteristics of the orthodontists and general dental practitioners.

	Mean	Range
<b>Orthodontists (n = 28)</b>		
Years since completing primary degree	16–20	2–47
Number of postgraduate lectures attended in previous year	9	2–26
<b>General Dental Practitioners (n = 139)</b>		
Years since completing primary degree	16–20	1–40
Number of postgraduate lectures attended in previous year	7	0–26
Number of orthodontic treatments completed in previous year	3–6	0–200
Number of children referred to an orthodontist	54	0–300
Number of adults referred to an orthodontist	4	0–25

completed questionnaires. Ninety-six (69 per cent) were male and 43 (31 per cent) were female.

### *The characteristics of the sample*

The mean values (and range) for the practitioner variables are reported in Table 1.

### *The General Dental Practitioners*

The mean ratings recorded by the GDPs are shown in Table 2. The three highest mean scores were recorded for psychosocial outcomes, improved self-esteem, physical attractiveness, and self-confidence (Table 2). Increased ease in cleaning teeth followed these three psychosocial factors as the top-rated oral health outcome. The possible beneficial effect of orthodontic treatment in reducing TMD problems received the lowest mean score (Table 2).

The level of concordance (agreement) among the GDPs when rating the possible beneficial effects of orthodontic treatment was analysed using Kendall's *W*-test. This analysis revealed that there was only a weak level of concordance ( $W = 0.34$ ).

Linear regression analysis showed that the number of years since qualification and the frequency of attendance at postgraduate lectures/

**Table 2** Mean score and 95 per cent confidence intervals for each visual analogue scale rating by general dental practitioners.

Benefit of treatment	Mean score	Confidence intervals (95 per cent)
Improves self-esteem	81.9	79.8–84.0
Improves physical attractiveness	80.4	77.9–82.8
Improves self-confidence	79.6	77.3–81.8
Easier to clean teeth	73.6	71.1–76.1
Reduces teasing incidents	73.2	70.3–76.2
Reduces periodontal disease	62.9	59.1–66.7
Improves self-image	61.5	56.6–66.5
Reduces caries	60.7	56.8–64.6
Improves oral function	59.8	56.4–63.3
Improves social interaction	59.3	56.0–62.6
Improves social attractiveness	54.0	49.3–58.7
Improves career prospects	52.6	48.9–56.4
Reduces oral discomfort	47.9	44.3–51.4
Reduces TMD problems	44.8	41.1–48.6

courses were the only dentist variables found to influence the scores awarded. Dentists who were qualified longer were more likely to consider that orthodontic treatment reduced susceptibility to dental caries than younger dentists ( $t = 4.25$ ,  $P < 0.001$ ). Conversely, dentists who were more recently qualified were more likely to rate a reduction in susceptibility to periodontal disease more highly than the older dentists ( $t = -3.72$ ,  $P < 0.001$ ). The dentists who attended fewer postgraduate lectures in the previous year rated the benefit of orthodontic treatment in reducing oral discomfort more highly than those who attended a greater number of lectures ( $t = -2.04$ ,  $P < 0.05$ ). These postgraduate courses/lectures had been conducted in all areas of dentistry and had not generally led to a postgraduate qualification.

No significant relationship was found between any of the dentist variables and the scores awarded for the possible psychosocial benefits of orthodontic treatment.

### *The Orthodontists*

The mean ratings recorded by the orthodontists are reported in Table 3. The top four mean ratings were awarded to psychosocial factors: improved physical attractiveness, self-esteem,

**Table 3** Mean score and 95 per cent confidence intervals for each visual analogue scale rating by orthodontists.

Benefit of treatment	Mean score	Confidence intervals (95 per cent)
Improves physical attractiveness	85.3	82.0–88.6
Improves self-esteem	82.9	77.0–88.9
Improves self-confidence	80.1	74.2–86.1
Reduces teasing incidents	75.5	69.6–81.4
Easier to clean teeth	63.3	54.7–71.9
Improves social attractiveness	61.9	51.7–72.1
Improves self-image	61.4	50.3–72.6
Improves career prospects	60.7	51.6–69.9
Improves social interaction	58.9	48.8–69.0
Improves oral function	56.0	47.8–64.2
Reduces periodontal disease	51.8	40.7–62.8
Reduces oral discomfort	42.1	32.4–51.9
Reduces caries	41.3	31.8–50.8
Reduces TMD problems	32.2	23.5–41.0

self-confidence, and a reduction in teasing incidents. Following these four the top-rated oral health factor was again increased ease in cleaning the teeth (Table 3). Like the GDPs the possible beneficial effect of orthodontic treatment in reducing TMD problems received the lowest mean score (Table 3).

Analysis revealed a moderate level of concordance among orthodontists when rating the possible beneficial effects of orthodontic treatment ( $W = 0.53$ ).

The number of years since qualification and attendance at postgraduate lectures were the only orthodontist variables found to influence the scores awarded. Linear regression analysis showed that the number of years since obtaining their primary dental qualification was found to influence the scores awarded by the orthodontists for a number of the oral health outcomes. Orthodontists who were qualified for a greater length of time rated the benefit of orthodontic treatment in reducing caries ( $t = 3.64$ ,  $P < 0.001$ ) and periodontal disease ( $t = 4.74$ ,  $P < 0.001$ ), improving oral function ( $t = 3.67$ ,  $P < 0.001$ ) and reducing oral discomfort more highly than younger orthodontists ( $t = 4.34$ ,  $P < 0.001$ ). In contrast, the younger orthodontists who obtained their primary qualification more recently were more likely to feel that orthodontic treatment

made it easier for patients to clean their teeth ( $t = -2.06$ ,  $P < 0.05$ ).

Significant relationships were detected between the orthodontist variables and the scores awarded for some of the psychosocial outcomes. Orthodontists who were qualified more recently rated improved self-esteem ( $t = -2.0$ ,  $P < 0.05$ ) and improved self-confidence ( $t = -2.61$ ,  $P < 0.05$ ) more highly than their more senior colleagues.

There was also a significant relationship between the scores awarded for improved self-image and the frequency of attendance at postgraduate lectures. The ratings for improved self-image increased as attendance at postgraduate lectures increased ( $t = 2.13$ ,  $P < 0.05$ ).

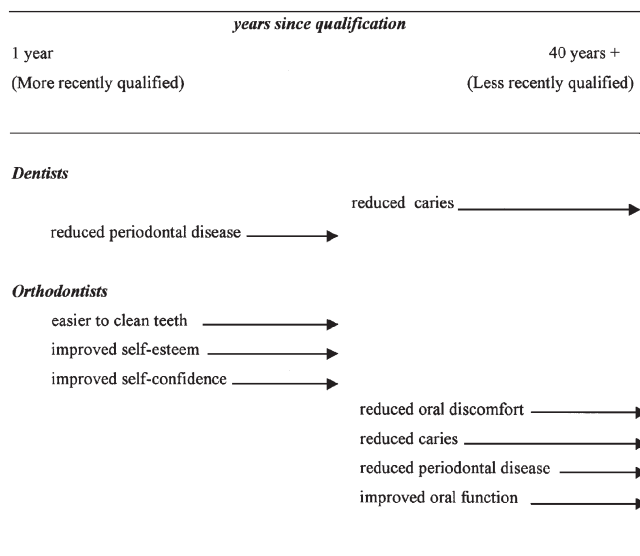
The outcome variables, which showed a significant relationship with time since qualification for both the GDPs and orthodontists are illustrated in Figure 2. The confidence intervals of the mean ratings recorded by the GDPs and the orthodontists are presented graphically in Figures 3 and 4, respectively. As one would expect the 95 per cent confidence intervals were wider among the smaller orthodontist population.

## Discussion

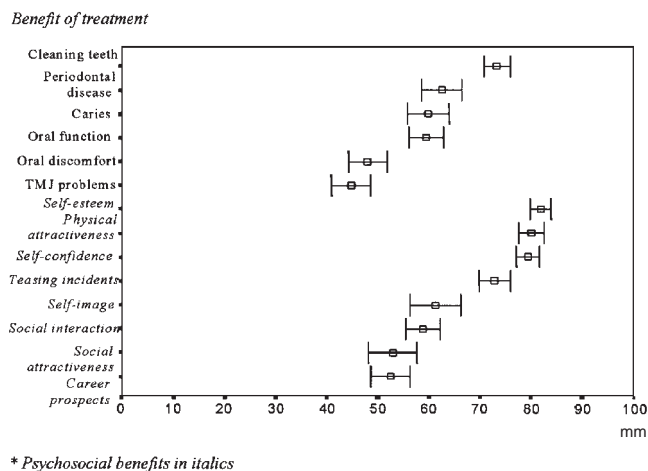
This study investigated the understanding among dentists and orthodontists of the health gains

associated with successfully completed orthodontic treatment. Although care should be exercised in directly extrapolating these results, it is not unreasonable to assume that the beliefs held by dentists and orthodontists could influence the advice they give to potential patients and their parents.

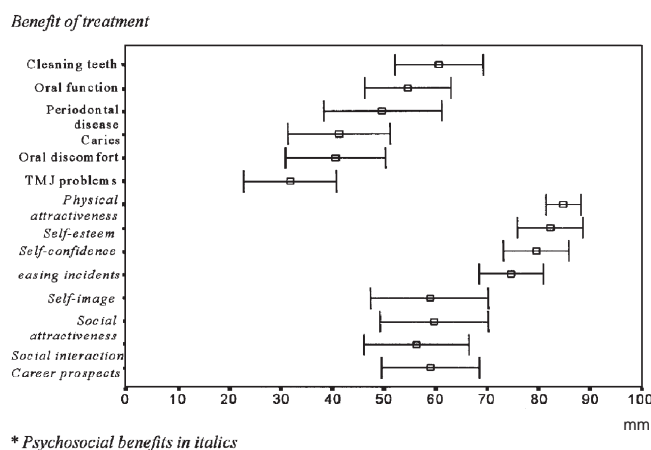
The strong influence of the GDP in influencing patients' and their parents' decision to undergo orthodontic treatment has been confirmed in numerous studies (Dorsey and Korabick, 1977; Shaw *et al.*, 1979; Gosney, 1986; Lervik and Haugejorden, 1988; Salonen *et al.*, 1992; Pietilä and Pietilä, 1994; Richmond *et al.*, 1994). The advice given by GDPs carries with it the strong implicit message that the proposed treatment is both worthwhile and necessary (Shaw *et al.*, 1991c). It is therefore important that GDPs as well as orthodontists have a clear understanding of the health gain likely to accrue from orthodontic treatment. The advice given by both groups on the likely benefits of orthodontic treatment should be evidence-based. It is particularly important that referring dentists and orthodontists do not imply directly or indirectly that orthodontic treatment will reduce a patient's susceptibility to dental disease. Except for a small number of extreme malocclusions such as a deep traumatic overbite traumatizing



**Figure 2** The ratings awarded which showed a significant relationship with the number of years since qualification.



**Figure 3** Mean scores and ninety-five per cent confidence intervals of the benefits of orthodontic treatment rated by general dental practitioners.



**Figure 4** Mean scores and ninety-five per cent confidence intervals of the benefits of orthodontic treatment rated by specialist orthodontic practitioners.

the gingival tissues, such advice could be misleading. The potential exists that patients who have no aesthetic concerns will request orthodontic treatment with the mistaken belief that this will increase the longevity of their dentition.

Mouradian *et al.* (1999) have stressed the need to discuss the main ethical issues associated with orthodontic treatment. These include sharing information in an open fashion with patients and, where appropriate, their parents about the potential benefits and risks of orthodontic treatment. In the vast majority of orthodontic

patients these benefits can only be described in psychosocial terms.

VAS were used in this study to gather data because they provide an easily understood method of collecting information from a large number of dentists and orthodontists. Melzack (1985) highlighted the advantages of VAS, particularly their simplicity, sensitivity, and reproducibility. Miller and Ferris (1993) concluded, on the basis of a comprehensive review, that the use of the VAS is a reliable and valid technique.



The results of this study show that among both GDPs and orthodontists the top-rated benefits of orthodontic treatment were psychosocial factors. For both groups the top three factors were improved self-esteem, self-confidence, and physical attractiveness. However, although the level of agreement concerning the benefits of orthodontic treatment was moderate for the orthodontists, the dentists showed only a weak level of agreement. This reveals that a greater degree of uncertainty exists among GDPs concerning the beneficial effects of orthodontic treatment.

Examination of Figures 3 and 4 shows that many of the oral health factors received high ratings from both the dentists and orthodontists and followed closely behind the psychosocial factors. Both groups rated the beneficial influence of orthodontic treatment in improving teeth cleaning, and reducing caries and periodontal disease relatively highly. These results indicate that although the dentists and orthodontists are aware that the primary benefits of orthodontic treatment are psychosocial in nature, they also believe that it will reduce susceptibility to dental disease. A number of factors might explain this apparent contradiction of the published evidence. A key factor is likely to be the educational experience of the dentists and orthodontists at both undergraduate and postgraduate levels. An additional factor might be the degree of ambiguity that often exists in the literature and among dental teachers about the relationship between orthodontic treatment and oral health.

Perhaps one of the most interesting findings in this study is the relationship between the number of years since qualification and the ratings awarded. The more recently qualified GDPs were more likely to consider that orthodontic treatment reduced susceptibility to periodontal disease while the older dentists believed that caries susceptibility was reduced. This finding might reflect the change in the prevalence of dental diseases (Murray, 1996). When the older dentists received their initial training, dental caries was the major dental disease, and it is likely that a connection was made between improved dental alignment and a reduction in dental caries. With the reduction

in dental caries in many populations, treating periodontal disease has become more important and this is reflected in dental school curricula. It is likely that during the training of the younger dentists more emphasis was placed on the potential of orthodontic treatment to reduce cleaning difficulty thereby reducing susceptibility to periodontal disease.

The orthodontists who were qualified for longer were more likely to suggest that orthodontic treatment reduces susceptibility to dental disease. These results most likely reflect the prevalent opinion at the time these orthodontists received their postgraduate education. However, the postgraduate orthodontic training of the younger orthodontists coincided with the appearance in the literature of longitudinal studies that failed to endorse the dental health benefits of orthodontic treatment (Shaw *et al.*, 1980a,b; Sadowsky and BeGole, 1981; Mohlin and Thilander, 1984; Sadowsky and Polson, 1984). Compared with their more senior colleagues, the younger orthodontists rated the psychosocial benefits of orthodontic treatment more highly.

The frequency of attendance at postgraduate lectures also seems to have influenced the ratings awarded. GDPs who attended fewer postgraduate lectures rated reduced oral discomfort more highly than their colleagues who attended more lectures. It is also interesting to note that the orthodontists who attended more postgraduate lectures gave higher ratings for improved self-image than their less assiduous colleagues. This might reflect a better understanding of the benefits of orthodontic treatment resulting from a greater participation in postgraduate education.

The high ratings awarded for the oral health benefits of orthodontic treatment, particularly among the dentists and older orthodontists, identifies an educational deficit. It is important that health professionals who refer patients for orthodontic treatment provide accurate and evidence-based information about both the risks and benefits of treatment (Mouradian *et al.*, 1999). In the light of this study it is apparent that the potential exists for prospective orthodontic patients and their parents to be misinformed about the genuine benefits of orthodontic treatment.

Orthodontic and dental educators at both undergraduate and postgraduate level should make greater efforts to reduce the confusion that exists. When discussing the potential health gain which might follow orthodontic treatment, the focus should be on published scientific evidence rather than erroneous historical assumptions.

## Conclusions

Both GDPs and orthodontists rated the psychosocial gain from orthodontic treatment more highly than the dental health gain. However, both groups still felt that orthodontic treatment reduces susceptibility to dental disease. The beliefs held by the dentists and orthodontists concerning the benefits of orthodontic treatment were related to the number of years since initial qualification.

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