

# Does orthodontic treatment before the age of 18 years improve oral health-related quality of life? A systematic review and meta-analysis

Hanieh Javidi, Mario Vettore, and Philip E. Benson  
Sheffield, United Kingdom

**Introduction:** Orthodontics aims to improve oral health-related quality of life (OHRQoL). In this systematic review, we examined the evidence for changes in OHRQoL after orthodontic treatment for patients treated before they were 18 years old. **Methods:** The participants were patients aged less than 18 years. The interventions were nonorthognathic and cleft orthodontic treatment. The comparisons were before and after orthodontic treatment, or nonorthodontic control. The outcomes were validated measures of OHRQoL. The study designs were randomized controlled trials, controlled clinical trials, prospective cohort studies, and cross-sectional or case-control studies. Multiple electronic databases were searched, with no language restrictions; authors were contacted, and reference lists screened. The Newcastle-Ottawa scale was used for quality assessments. Screening, data extraction, and quality assessments were performed by 2 investigators independently. **Results:** We found 1590 articles and included 13 studies (9 cohort, 3 cross sectional, and 1 case control), with 6 in the meta-analyses. All were judged of low or moderate quality. A moderate improvement in OHRQoL was observed before and after orthodontic treatment (n = 243 participants; standardized mean difference, -0.75; 95% CI, -1.15 to -0.36) particularly in the dimensions of emotional well-being (n = 213 participants; standardized mean difference, -0.61; 95% CI, -0.80 to -0.41) and social well-being (n = 213 participants; standardized mean difference, -0.62; 95% CI, -0.82 to -0.43). **Conclusions:** Orthodontic treatment during childhood or adolescence leads to moderate improvements in the emotional and social well-being dimensions of OHRQoL, although the evidence is of low and moderate quality. More high quality, longitudinal, prospective studies are needed. (Am J Orthod Dentofacial Orthop 2017;151:644-55)

The impact of malocclusion on both patients and populations has been explored extensively. Many traditionally held beliefs regarding the dental health implications of malocclusion, such as an increase in caries,<sup>1</sup> periodontal disease,<sup>2</sup> or temporomandibular disorders,<sup>3</sup> are now considered ambiguous and are largely unsupported by the literature. However, it is now recognized that the impact of malocclusion on health must be explored beyond the mere influence that it may have on dental health.<sup>4</sup> The World Health Organisation describes health as a “state of complete

physical, mental and social well-being and not merely the absence of disease or infirmity.”<sup>5</sup> It is therefore unsurprising that over the past decade the use of patient-reported outcomes measures, including measures of oral health-related quality of life (OHRQoL), have been recognized as crucial in identifying the functional, emotional, and social impacts of malocclusion.<sup>6</sup>

As an outcome measure, a fundamental objective of OHRQoL is to provide a subjective evaluation of oral-health status. As a reflection of this, a universally accepted definition of OHRQoL describes it as a measure that focuses on “the impact of oral diseases and disorders on everyday life that a patient or person values, that are of sufficient magnitude, in terms of frequency, severity or duration to affect their experience and perceptions of their life overall.”<sup>7</sup>

Recent systematic reviews have found evidence to suggest that malocclusion impacts negatively on OHRQoL.<sup>8,9</sup> When the individual dimensions of OHRQoL are explored, malocclusion has been found to have no

From the Academic Unit of Oral Health and Development, School of Clinical Dentistry, University of Sheffield, Sheffield, United Kingdom.

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Address correspondence to: Philip E. Benson, Academic Unit of Oral Health and Development, School of Clinical Dentistry, University of Sheffield, Sheffield S10 2TA, Sheffield, United Kingdom; e-mail: [p.benson@sheffield.ac.uk](mailto:p.benson@sheffield.ac.uk).

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significant impact on functional limitations and oral symptoms.<sup>9</sup> The dimensions of emotional and social well-being have been found to be significantly influenced.<sup>9</sup> Not only has the impact of malocclusion been explored, but recently published literature has also sought to establish the effect of wearing orthodontic appliances on OHRQoL.<sup>10</sup> To date, studies have determined that such appliances have a negative impact, particularly on the oral symptoms and functional limitations dimensions. Perhaps these results are unsurprising; one would expect most forms of dental intervention to have a negative impact on OHRQoL during treatment. Moreover, it is logical to assume that it is the subsequent improvement in at least 1 dimension after treatment that drives people to seek and undergo such care.

To date, there is evidence to suggest that malocclusion and subsequent treatment with orthodontic appliances have a negative impact on OHRQoL.<sup>10</sup> It is only appropriate now to question whether completion of orthodontic treatment to correct a malocclusion will lead to an improvement in this multidimensional concept. Identifying whether orthodontic treatment has such a benefit is crucial if we are to safeguard against interventions that have little value and to prevent the wastage of limited health care resources in countries where treatment is funded by the state. To date, this question has not been addressed in the context of a systematic review.

Our aim was to systematically review the current literature to identify changes in OHRQoL before and after orthodontic treatment in children and adolescents.

## MATERIAL AND METHODS

### Protocol registration, conflict of interest, and funding

The protocol for this systematic review was registered on the National Institute of Health Research Database (registration number CRD42014014825; <http://www.crd.york.ac.uk/PROSPERO>). The source of funding was a National Institute for Health Research Academic Clinical Fellowship for the first author.

### Eligibility criteria

The following selection criteria were applied for the review.

1. Participants. Patients aged 17 years or under at the start of their orthodontic treatment. Exclusions were patients with craniofacial syndromes and cleft lip or palate and those who had undergone previous orthodontic treatment (if it was possible to identify them).
2. Interventions. Any form of orthodontic treatment provided in primary, secondary, or tertiary care settings

were included. This included orthodontic treatment that involved extractions, surgical exposure of unerupted teeth, and surgical removal of teeth. Studies involving orthognathic surgery were excluded.

3. Comparator. Studies had to include either assessment of OHRQoL before and after orthodontic treatment or a comparison group of subjects who had not undergone orthodontic treatment. This could include subjects who were not due to undergo orthodontic treatment or patients who were on the waiting list but had not yet started treatment.
4. Outcome measures. The main outcome measure was OHRQoL at any time after orthodontic treatment. The OHRQoL must have been determined using a validated measure such as the Child Perception Questionnaire. Secondary outcome measures included the dimensions of OHRQoL comprising, but not limited to, functional limitations, oral symptoms, emotional well-being, and social well-being.
5. Study design. Randomized and controlled clinical trials, prospective cohort studies, and cross-sectional or case-control studies, with data collection or follow-up periods after orthodontic treatment were to be included.

### Information sources, search strategy, and study selection

The following electronic databases were searched: MEDLINE via OVID (1946 to March week 3 in 2016) (see [Appendix A](#) for the search terms in the search strategy), the Cochrane Oral Health Group's Trials Register (March 2016), the Cochrane Central Register of Controlled Trials (issue 3 of 12, March 2016), EMBASE (1974 to March 2016), PsycINFO (1806 to present), PubMed (inception to March 2016), Scopus (all years to March 25, 2016), and Web of Science (1900 to 2016). No language restrictions were applied. No search of the grey literature was undertaken.

Any systematic and narrative reviews on the topic were assessed, and any studies referenced therein that met the inclusion criteria for this systematic review were included; however, the reviews themselves were not included. The reference lists of eligible studies were also screened for additional relevant research. In addition, authors who are known to have an interest in this field of research were contacted to identify unpublished or ongoing trials.

Assessments of studies for inclusion in the review were performed independently and in duplicate. One author (H.J.) assessed all studies, and the other 2 authors (M.V. and P.E.B.) each assessed half of the retrieved studies. The investigators were not blinded to the

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