

Title: A Systematic Review of Graph Neural Network in Healthcare-Based Applications: Recent Advances, Trends, and Future Directions

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Abstract: Background: Despite the large number of studies that have been done in this area, there is still a gap in the literature when it comes to comparing the orthodontic tooth movement (OTM) efficacy of Invisalign and fixed orthodontic appliances. The primary objectives of this study were to evaluate and compare the efficacy of Invisalign and fixed orthodontic appliances in terms of the amount and rate of OTM. Specifically, the study aimed to determine if there was a statistically significant difference between these two treatment modalities in achieving OTM and to assess whether treatment duration differs significantly between Invisalign and traditional fixed appliances. This investigation seeks to address the existing gaps in the literature by providing a clear comparison based on recent empirical evidence, thereby contributing to more informed treatment decisions in orthodontic practices.

Methodology: Relevant MeSH keywords and Boolean operators were selected by a team of reviewers to search several online databases for papers that were in accordance with the objectives of our review.

Results: At the end of the search protocol, 10 studies were deemed to be eligible for inclusion in the review. The pooled analysis revealed a statistically significant reduction in treatment time for patients using Invisalign compared to those with fixed appliances, with a total OR of 0.61 [95% CI 0.43, 0.85]. No significant heterogeneity was detected ($I^2 = 0\%$), and the test for overall effect was significant ($Z = 2.86, p=0.004$). Furthermore, a nonsignificant trend favoring Invisalign was shown, with an odds ratio of 1.43 and a confidence interval that included 1 (0.97, 2.10). The p value was 0.07, and there was negligible heterogeneity among studies, as indicated by an I^2 of 0%.

Conclusion: Based on the findings from the selected studies, it can be concluded that Invisalign and fixed orthodontic appliances have similar overall efficacy in eliciting OTM. However, Invisalign treatment requires significantly less time to complete than fixed orthodontic appliances. Despite these observations, further studies are required to explore the long-term stability of OTM achieved with Invisalign and fixed orthodontic appliances.

Registration and Protocol: Registration was done in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards (CRD42023405593). The research protocol was created to meet the goals and was properly filed with PROSPERO; however, it has not been prospectively registered. **Keywords:**

Keywords: Invisalign; brackets; fixed appliances; tooth movement.

DOI: [10.1155/sci5/4268902](https://doi.org/10.1155/sci5/4268902)

<https://pubmed.ncbi.nlm.nih.gov/39618690/>