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Validity of artificial intelligence models in orthodontic diagnosis: A systematic review

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Data extraction.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 8 January 2025 and was last updated on 8 January 2025.

INTRODUCTION

Review question / Objective What is the validity of artificial intelligence tools used for orthodontic diagnosis?

Condition being studied AI has emerged as a new area in dentistry, from scheduling and organizing appointments to supporting clinical diagnosis and treatment planning, AI can complete a variety of basic activities in the dental clinic more accurately, with less staffing, and with fewer mistakes than human counterparts. With the introduction of digital systems, including as intraoral scanners, cone beam computed tomography (CBCT), and software for these devices, orthodontics has seen an amazing technological advancement. The outcome of orthodontic treatment is largely dependent on a clear diagnosis and treatment plan. Orthodontic diagnosis is primarily based on the patient's medical and dental history, clinical examination, study models, and cephalometric radiographs. AI technology can be used by the specialists to improve clinical decision-making, identifying cephalometric landmarks, determining need for orthodontic extractions and the degree of maturation of the cervical vertebra, predicting the facial attractiveness after orthognathic surgery, predicting the need for orthodontic treatment and treatment planning.
The purpose of this systematic review was to describe the validity and range of artificial intelligence-based models that have been employed in orthodontic diagnostics.

METHODS

Participant or population Population => Radiographs, cephalograms, and clinical photographs of patients affecting dental and maxillofacial structures.

Intervention Intervention => AI-based diagnostic models.

Comparator Comparison => Professional assessments and standards.

Study designs to be included Both observational (case control and cohort) and interventional research were taken into consideration for this analysis.

Eligibility criteria Inclusion criteria used for article selection were: Studies with human subjects, Full text, Research studies assessing the positive effects of AI in orthodontic diagnosis.
Among the exclusion criteria were case reports, reviews, animal studies, ineligible outcome measures, ineligible study designs, ineligible populations, and articles written in languages other than English and French.

Information sources We conducted a search using PubMed, ScienceDirect, Google Scholar, Web of Science, and the Cochrane Library to find English and French-language papers that were relevant to our issue, that were published between January 1, 2014, and November 2024. The search method used the following Boolean keywords: machine learning, artificial intelligence (AI), neural networks, orthodontics, and orthodontic diagnostics. These terms were selected because they most accurately reflected the purpose of our investigation.

Main outcome(s) Outcome => Predictive or measurable results including specificity, sensitivity, and accuracy.

Quality assessment / Risk of bias analysis The included articles' quality was evaluated using the standard criteria outlined in the Cochrane Handbook for Systematic Reviews. Patient randomization, blinding, withdrawal/dropout reporting, statistical analysis, sample size estimation, measurement of multiple variables, clear inclusion and exclusion criteria, understandable examiner reliability testing, and clear reporting of all anticipated results were the parameters.

Strategy of data synthesis The data synthesis will use an extraction table displaying the general characteristics of the selected articles. The design will be performed by data extraction as follows: Author, Publication year, Study type, AI application, Results and conclusion.

Subgroup analysis No subgroup analysis.

Sensitivity analysis No sensitivity analysis.

Country(ies) involved Farid Bourzgui : Professor, Orthodontics department, faculty of dental medicine of Casablanca, Hassan II University, Morocco ; Khamlich kenza: Resident, Orthodontics department, faculty of dental medicine of Casablanca, Morocco.

Keywords machine learning, artificial intelligence (AI), neural networks, orthodontics, and orthodontic diagnostics.

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