https://doi.org/10.21859/ModCareJ.23.3.56

Modern Care Journal

journal homepage: https://mcj.bums.ac.ir/

Volume 23, Issue 3

July 2026

Review Article

Artificial Intelligence and Body Alignment: A Bibliometric Analysis Mapping the Boundaries from 2015 to 2025

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Received: 2025/11/23
Revised: 2026/06/05
Accepted: 2026/06/20

ABSTRACT

Context: The assessment of human body alignment (the position of body segments relative to each other) and body posture has long been a cornerstone of health sciences. Among these traditional approaches, the use of artificial intelligence (AI) is being touted as a powerful tool in various assessments of clients and the delivery of healthcare. This study aimed to examine and analyze the bibliometrics of AI and body alignment.

Evidence Acquisition: Bibliometric data were retrieved up to August 2025 from the Scopus database using the keywords "Artificial Intelligence" and "Body Alignment." After screening for relevance, including publication type and completeness of bibliographic information, 586 studies were included. The selected records were imported into the RStudio software. The installed Bibliometrix R package (version 4.0.0) for Windows 10 (64-bit) was used to draft an appropriate network analysis, visual display, and structural information.

Results: A total of 586 studies were analyzed in this bibliometric study. These studies were published in 333 independent sources from 2015 to 2025 and were written by 3710 authors. The annual publication rate of articles was 49.74%, and their average document age was 1.87 years. The top ten relevant journals, most relevant authors, most relevant affiliations, countries' scientific production, keyword analysis, and trend topics were extracted and reported for this study.

Conclusions: Research on AI applications in body alignment has grown steadily over the past decade, revealing emerging topics and potential clinical applications. Continued interdisciplinary collaboration and real-world evaluations are required to advance this field responsibly.

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Keywords: Artificial intelligence, Bibliometrics, Posture, Review

How to Cite: Sheikhhoseini R. Artificial Intelligence and Body Alignment: A Bibliometric Analysis Mapping the Boundaries from 2015 to 2025. Mod Care J. 2026;23(3):56-68. https://doi.org/10.21859/ModCareJ.23.3.47

1.Context

The assessment of human body alignment, posture, and physical status has long been a cornerstone of health sciences (1). This assessment is used as an indicator of overall well-being, musculoskeletal integrity, and functional capacity (2). The prevalence of postural abnormalities has surged, with sedentary lifestyles, ergonomic challenges, and an aging population (3, 4). This may contribute to widespread musculoskeletal disorders (MSDs). According to epidemiological studies, poor posture plays a crucial role in the development of MSD conditions such as chronic low back pain (5), spinal scoliosis (6), and thoracic hyperkyphosis (7). For instance, the World Health Organization estimates that MSDs account for a significant portion of disability-adjusted life years (8). Therefore, to enhance public health programs, it is necessary to underscore the urgent need to develop robust postural evaluation methods (9). Meanwhile, early detection and intervention in postural deviations may be helpful to prevent long-term complications (10), enhance quality of life (11), and reduce healthcare burdens. Recognizing that different communities face these health-related issues, postural evaluation has gained attention both as a diagnostic tool and as a preventive strategy for health maintenance and rehabilitation (12).

Postural evaluation contains various domains that are tailored to specific objectives and methodologies (13). For instance, posture analysis is essential for optimizing work environments and preventing work-related injuries in the field of ergonomics (14). Ergonomic assessments, using several tools, such as the Rapid Upper Limb Assessment (15) or the Ovako Working Posture Analysis System (16), assess static and dynamic postures. These assessments can be used to reduce risks from repetitive strain or awkward positions. Based on this need, different methods have been developed to assess posture and body alignment, including photogrammetric and radiological techniques (17). Photogrammetry is a non-invasive method utilizing photographic measurements (18). It enables precise measurement of body angles, curvatures, and asymmetries (19). The advantage of this method is that it allows for the assessment of body alignment without exposure to X-rays. In contrast, there are X-ray-based assessment methods (20). These methods are more accurate but carry the risk of X-ray radiation (21). However, the calculation of body angles in both methods may be done manually or with the help of software. Manual methods are more likely to have errors, but software methods are more accurate. Using both measurement methods is time-consuming. Therefore, recently, artificial intelligence (AI) has been given more attention for faster and more accurate evaluation of these processes (22).

Among these traditional approaches, the use of AI is being touted as a powerful tool in the various assessments of clients and the delivery of healthcare (23). Various AI tools, such as machine learning (ML) (24), deep learning (DL) (25), and computer vision, are used for this purpose. The use of AI to assess body alignment and overall posture is recommended because it can overcome the limitations of conventional methods (26, 27). Traditional assessments often rely on the assessor's subjective judgments or laborious manual measurements. This calls into question the repeatability and validity of the data obtained. In contrast, AI reduces these issues by using algorithms that process large datasets with high accuracy and speed (28). Given that the use of AI has been at the center of attention of health professionals in the last decade, its use in assessing body alignment in both the field of postural assessment and in medical interventions, orthopedic surgeries, and radiographic diagnoses of body alignment. Therefore, reviewing the process of studying this field can provide useful information for researchers in this field.

Bibliometric studies are quantitative studies of scientific literature (29). This may contain metrics, such as citation counts, co-authorship networks, keyword co-occurrences, and knowledge gaps. Bibliometric analyses provide a systematic, data-driven method to map a research field. They can pinpoint major topics, uncover patterns of cross-disciplinary collaboration, and track how interests shift over time. These qualities make bibliometric methods well-suited to examining AI applications in posture and body alignment assessment. Despite this rapid growth, the existing literature remains highly fragmented, with studies dispersed across multiple disciplines, journals, and application domains. To date, there has been no comprehensive bibliometric analysis that systematically maps the global research landscape of AI applications in body alignment and posture assessment.

2. Objectives

Without such an overview, it is difficult for researchers, clinicians, and policymakers to understand how the field has evolved, where research activity is concentrated, which topics are emerging, and which populations or regions remain underrepresented. However, it seems necessary to present a comprehensive review and bibliography that follows the trajectory from 2015 to 2025. Therefore, the objectives of this study were to examine and analyze the bibliometrics of AI and body alignment.

3. Evidence Acquisition

3.1. Study Design

This bibliometric study aimed to analyze and review the existing literature on AI and body alignment. Bibliometric studies analyze scientific publications using quantitative and statistical methods. These studies identify research trends, researcher collaboration networks, and the impact of scientific journals by drawing a "knowledge map." A knowledge map is a visual representation of relationships among articles, authors, keywords, and institutions in a research field. In this study, the knowledge map was produced using the Bibliometrix R package (version 4.0.0) in RStudio. The primary importance of these analyses lies in identifying emerging research areas, measuring scientific performance, and assisting decision-makers in allocating resources optimally. As a result, these studies serve as a strategic guide for planning in the field of science and technology.

3.2. Search Strategy

The Scopus database was selected as a bibliometric data source for this study. The Scopus database is one of the foremost scientific article indexing databases in the world. This database indexes articles, books, and credible conferences in various fields. Table 1 presents the search strategy. Considering that the bibliographic information of scientific databases, such as Scopus and Web of Science, differs, merging data obtained from these two databases for analysis in bibliometric software is not feasible. Therefore, in the present study, only the Scopus database was selected, as it appears to contain a larger and more comprehensive number of articles. Furthermore, given that the term "posture" is used across various scientific fields and contexts, the search was necessarily restricted to articles related to the medical domain to improve accuracy.

Table 1: Search Procedures and Criteria

Items	Description
Database	Scopus
Keywords	"Artificial Intelligence" and "Body Alignment"
Search fields	Title, Abstract, Keywords
Search strategy	(TITLE-ABS-KEY ((postur* OR Alignment OR Malalignment OR deformity OR abnormality))) AND (TITLE-ABS-KEY (Artificial intelligence)) AND (LIMIT-TO (SUBJAREA, "MEDI")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English"))
Type of publications	Journal articles
Timespan	2015:2025
Language	English

3.3. Selection Criteria

Only original research articles published in English between 2015 and 2025 in the medical field were considered for inclusion. Studies were required to explicitly address both AI and body alignment in their title, abstract, or keywords and have complete bibliographic information, including abstract and keywords. The excluded papers were reviews, systematic reviews, meta-analyses, conceptual papers, editorials, letters, and conference abstracts, as well as publications outside the defined topic or language, or with incomplete bibliographic information.

3.4. Data Extraction

Given that in bibliometric analysis, the only requirement is to determine whether an article exists within the relevant field (and that subsequent stages of a systematic review are not conducted, as all steps are carried out with the aid of specialized software), the potential for researcher bias is significantly reduced. Consequently, for this study, the screening of articles was performed by a single author. Nevertheless, to reduce the likelihood of errors during the article screening process, the author meticulously reviewed the titles and abstracts of all retrieved articles. Moreover, the author has extensive experience in conducting and publishing numerous studies in the form of review articles, meta-analyses, and bibliometric studies in English. On August 19, 2025, 1570 scientific documents were extracted based on the above-mentioned keywords from the Scopus database to Excel 2016 software (as a .csv file format). Then, the author screened the searched papers. Using the Preliminary guideline for reporting bibliometric reviews of the biomedical literature (BIBLIO), the author evaluated the title, abstract, and keywords of all included records. Further, based on the protocol, only relevant studies that combined AI and body alignment were selected. Publications without DOIs, abstracts, and keywords were excluded.

3.5. Data Synthesis and Analysis

After screening, the selected records were imported into RStudio software version 3. The installed Bibliometrix R package (version 4.0.0) for Windows 10 (64-bit) was used to draft an appropriate network

[DOI: 10.21859/ModCareJ.23.3.47]

analysis, visual display, and structural information. After uploading the raw data file, the analyses were performed automatically in this software, and the author used these analyses and graphs in the article. Then, the most cited authors, countries, affiliations, publications, and articles in the study field were extracted. In addition, the most effective patterns of co-authorship, co-occurrence of authors, keywords, and co-citations were derived. The minimum number of articles or citations in network analysis was considered as follows: author network: minimum 2 articles per author; co-citation network: minimum 5 citations per article; keyword co-occurrence: minimum 3 occurrences per keyword. Microsoft Excel version 2016 was used to export data and record selection. Figure 1 illustrates the flow diagram for the data extraction in this study. The author selected the articles, screened all retrieved records for relevance, applied inclusion and exclusion criteria, and ensured that only studies combining AI and body alignment were included. For interpreting results, although analyses and network visualizations were generated using the Bibliometrix R package, the author critically analyzed and contextualized the findings, identifying key authors, journals, collaborations, and emerging research trends.

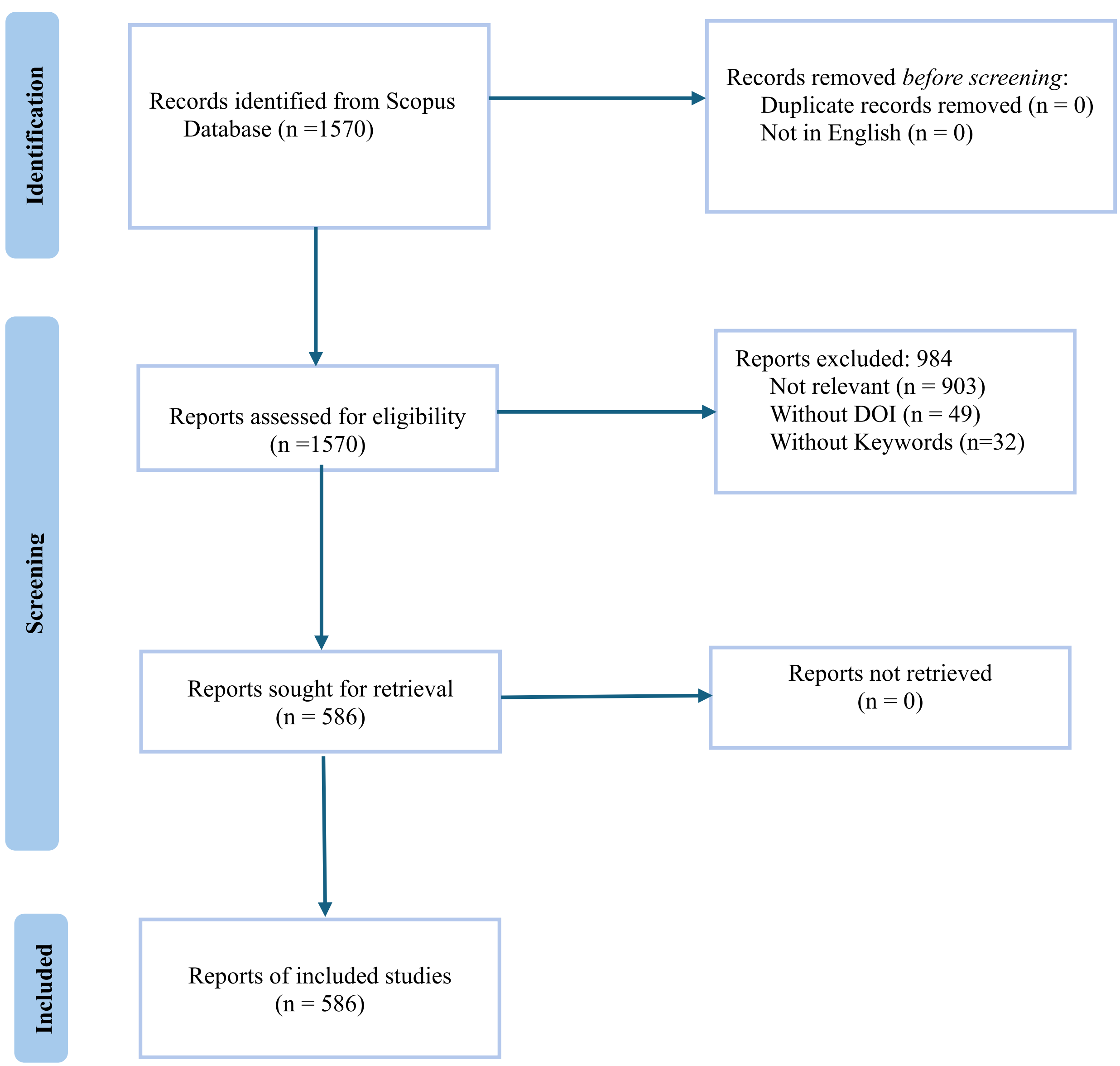

Figure 1: Identification Studies via Flow Diagram

[DOI: 10.21859/ModCareJ.23.3.47]

4. Results

4.1. Data Characteristics

In this bibliometric study 1570 studies were analyzed. These studies were published in 333 independent sources from 2015 to 2025 and were written by 3710 authors. The annual publication rate of articles was 49.74%, and their average document age was 1.87 years. Of these documents, 21 articles were single-authored, and the average number of authors per article was 7.39. Also, 29.69% of the documents were produced internationally with the participation of at least two different countries. The high average number of co-authors per document (7.39) and the substantial share of international co-authorships (29.69%) reveal a research structure built on multidisciplinary teamwork, yet the low average citation count (10.72) suggests that clinical impact and cross-domain recognition are still maturing.

4.2. Annual Growth Rate

As mentioned, this is a new area that has attracted researchers' attention. The growth chart of published articles in the last decade shows that the number of articles published in the Scopus database has been continuously increasing from 2015 to 2025. This shows that this area is the focus of researchers' attention and demonstrates the need for more research in this field. (Figure 2). The sustained upward trend from 2015 to 2025 confirms that AI applications in body alignment are rapidly growing research priorities. However, the near-exponential rise also points to a gap: most work remains recent (average document age 1.87 years), leaving little room for longitudinal validation or replication.

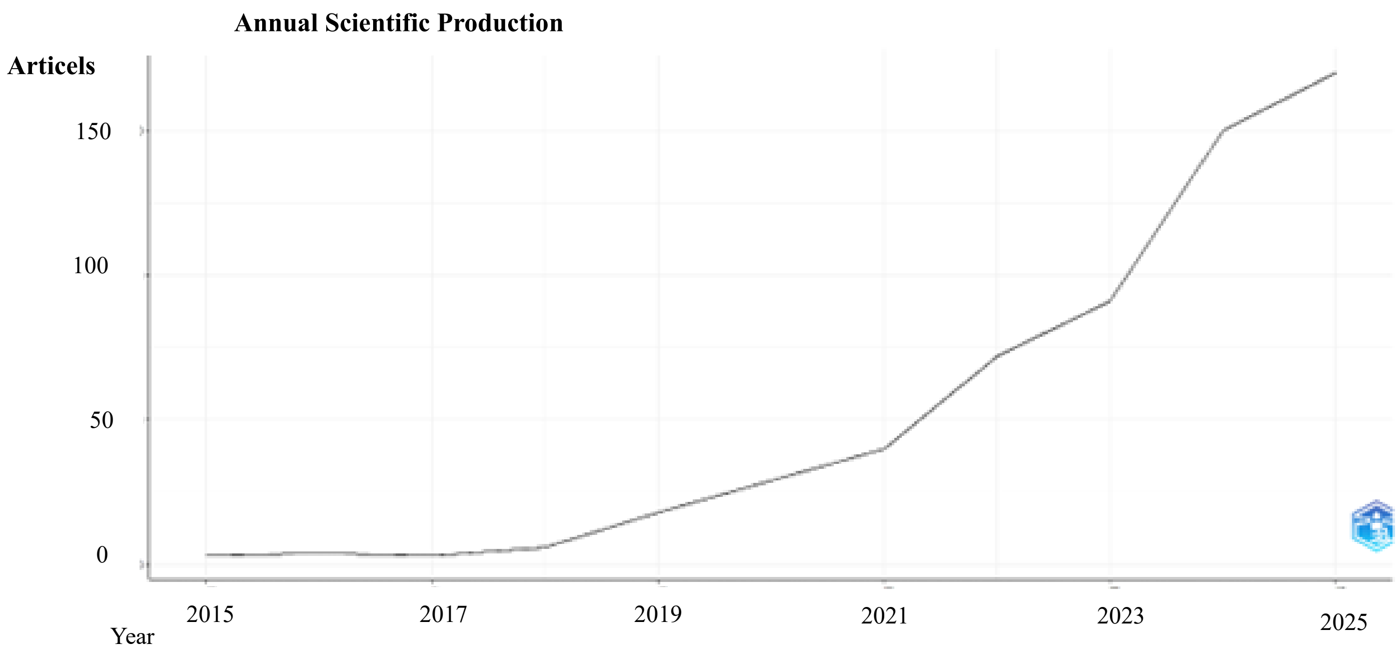

Figure 2: Annual Growth Rate in the Field of Artificial Intelligence and Body Alignment

4.3. Major Journals and Disciplines

To obtain the top 10 journals in the field of AI and body alignment, journals with the highest number of published articles in this field were determined. These journals were indexed in the Scopus database, and the analysis was conducted between 2015 and 2025. Therefore, there may be more relevant journals that are indexed in other reputable scientific databases but are not in Scopus. Leading the list is the "Journal of Clinical Medicine" with 14 articles, followed by the "Computers in Biology and Medicine" with 12 articles and "European Radiology" with 10 articles. The next seven journals on the list are "Institute of Electrical and Electronics Engineers (IEEE) Journal of Biomedical and Health Information" (9 articles), "European Spine Journal" (8 articles), "IEEE Transactions on Neural Systems and Rehabilitation" (8 articles), "International Journal of Environmental research and Public Health" (8 articles), "Biomedical Signal Processing and Control" (7 articles), "International Journal of Medical Information" (7 articles), and "Journal of Arthroplasty" (7 articles). The dominance of clinical medicine, radiology, and spine journals shows that the field prioritizes diagnostic and surgical applications over preventive or community-based research. Notably absent are high-impact engineering or computer

[DOI: 10.21859/ModCareJ.23.3.47]

science journals, suggesting that methodological AI innovations are not yet fully integrated into mainstream body alignment research.

4.4. Leading Researchers and Institutions

By analyzing documents related to the fields of AI and body alignment in the Scopus database, the 10 authors with the highest number of published articles during this time period were identified. These authors include, respectively, Wang Y with 17 articles, Yang L with 9 articles, Kim H with 8 articles, Li J with 8 articles, Zhang Y with 8 articles, Li X with 7 articles, Chen J with 7 articles, Chen Y with 6 articles, LI H with 6 articles, and Park J with 6 articles. The activity of these authors between 2015 and 2025 is shown in Figure 3. As shown in the figure, the highest production of articles in this field occurred after 2020. This finding could be due to the excessive attention governments and scientists around the world have paid to the field of AI in recent years.

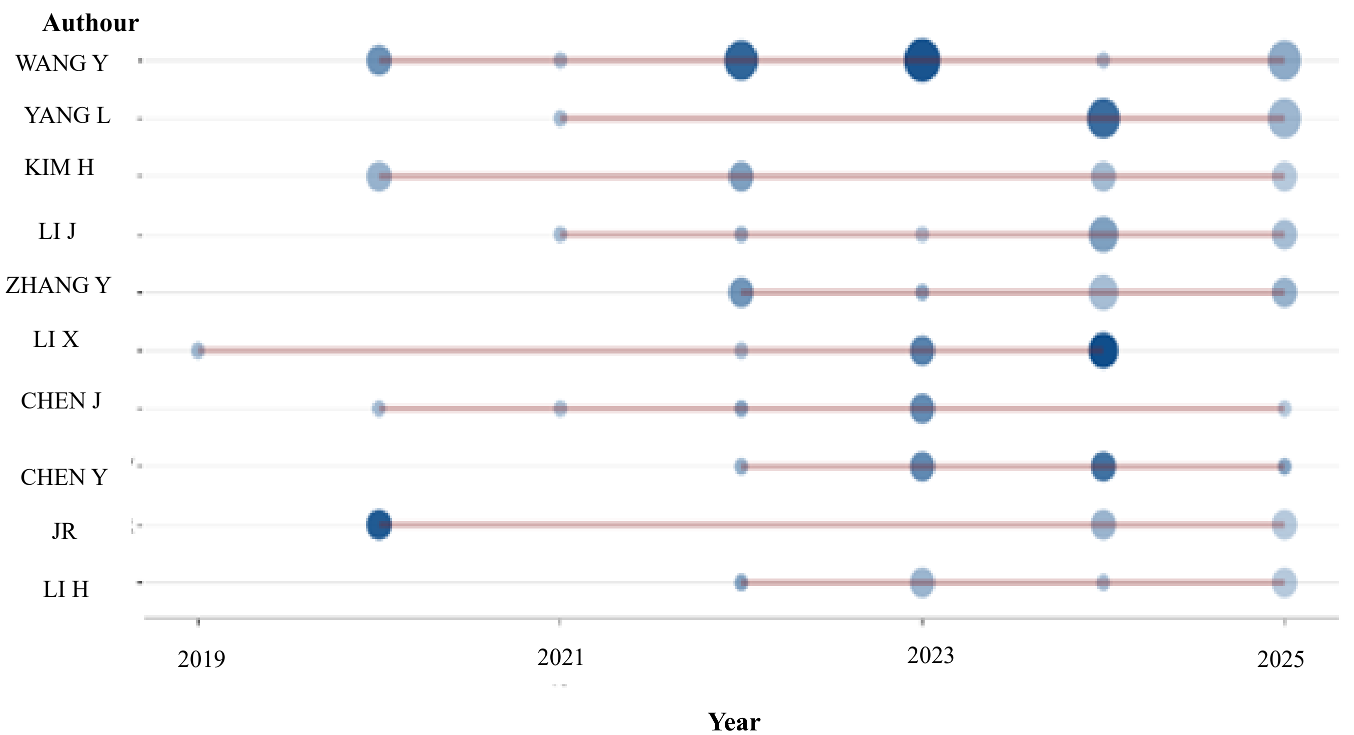

Figure 3: Authors' Production Over Time on the Scope of Artificial Intelligence and Body Alignment

Most top-producing authors began publishing in this field after 2020, indicating a recent influx of research interest rather than a long-standing specialty. The concentration of output among a few authors (e.g., Wang Y with 17 articles) reveals a lightly distributed collaboration structure, which may limit the diversity of methodological approaches.

By analyzing the documents available in the Scopus database, we investigated which institutions or universities had the highest number of published articles in the field of AI and body alignment. The top affiliations were Fudan University, which published 50 articles in the field of AI and body alignment during this period. After this university, the following affiliations had the highest number of published articles in this field. University College Dublin with 45 articles, Sichuan University with 40 articles, Harvard Medical School with 37 articles, the University of California with 33 articles, Sungkyunkwan University School of Medicine with 32 articles, the Icahn School of Medicine at Mount Sinai with 29 articles, Stanford University with 29 articles, the University of California San Diego with 29 articles, and Hospital for Special Surgery with 28 articles. Figure 4 shows the publication rate of articles by these ten top affiliations between 2015 and 2025. Attention to this field began in 2018 in these institutions and reached its peak in 2025. Although this year has not yet ended, more articles in this field may be published by the end of the year. The predominance of elite academic medical centers, particularly from the United States and China, reflects a highly concentrated research capacity. This structural imbalance raises a priority gap: less-resourced institutions and low- and middle-income countries remain largely absent from knowledge production, which may bias AI tools toward populations and clinical settings in high-income regions.

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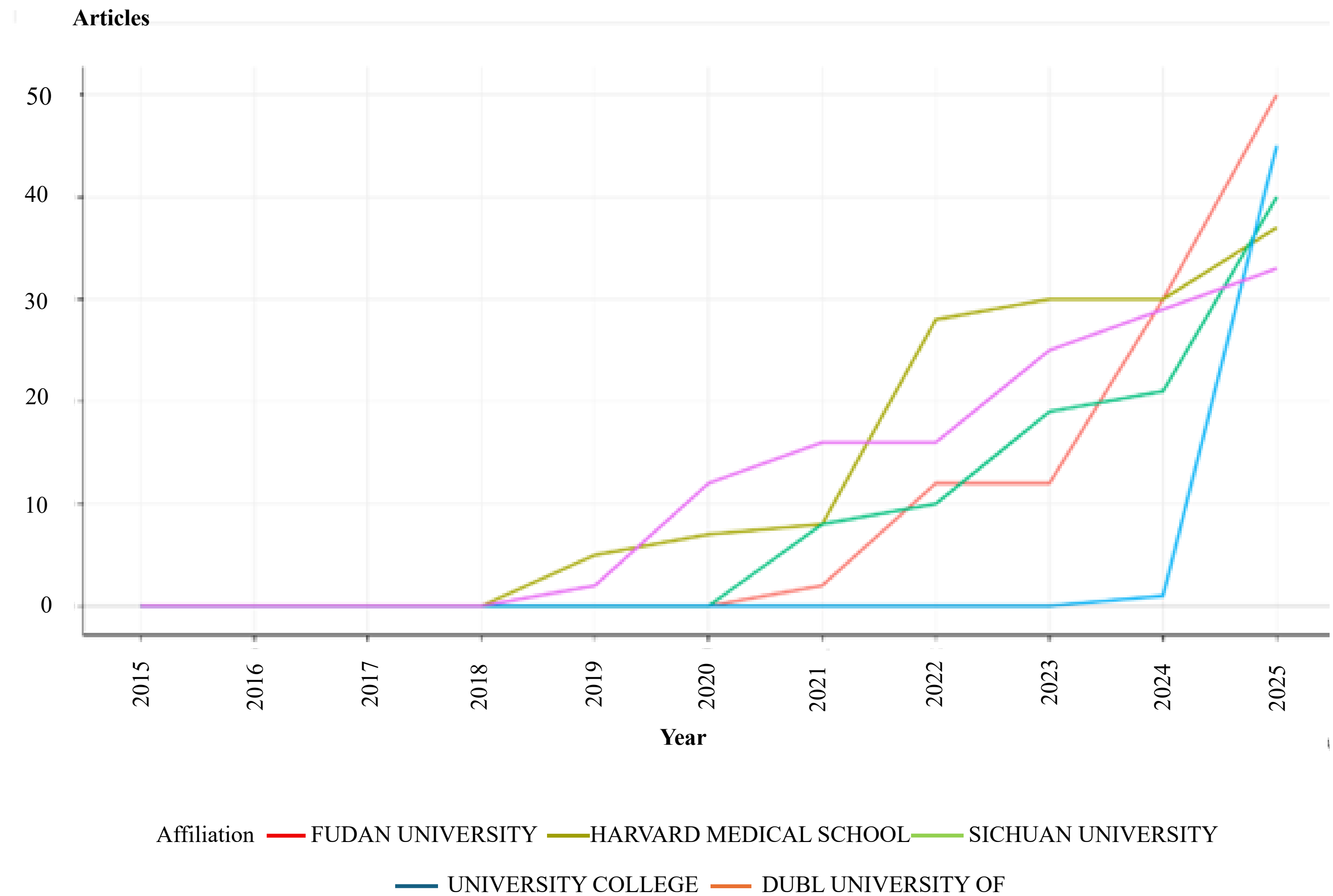

Figure 4: Production Over Time of the Top Ten Affiliations on the Topic of Artificial Intelligence and Body Alignment

4.5. *Geographic Production and Collaboration Networks*

In this analysis, we extracted the top ten countries with the largest number of authors in this field. Among them, the three countries with the highest number of authors in the published articles were the United States, China, and the United Kingdom, with 1197, 670, and 226 authors, respectively. After that, seven countries are followed, respectively, by South Korea with 224 authors, Germany with 209 authors, France with 160 authors, Italy with 158 authors, Japan with 137 authors, India with 126 authors, and Canada with 96 authors. The geographical concentration in North America, East Asia, and Western Europe defines a core-periphery structure in which the Middle East, Africa, and Australia are nearly invisible. This pattern creates a critical gap: AI models trained primarily on data from these regions may not generalize to other populations, and local posture-related health priorities remain understudied. As mentioned, these countries include America, Europe, and East Asia. Countries in the Middle East, Africa, or Australia were not included. In addition, Figure 5 shows the Country Collaboration Map. This image shows the level of cooperation between different countries on this issue. It is also demonstrated that this is an international issue in which international cooperation between leading countries in this field is clearly visible.

The collaboration map shows dense links among the US, China, and European countries, but sparse or missing connections with lower-income regions. This structure facilitates rapid innovation within the core network but also reinforces research silos, limiting the transfer of AI tools to underserved areas where postural disorders are often underreported.

4.6. *Conceptual Structure*

Figure 6 shows the keywords with the highest number of repetitions in articles in the field of AI and body alignment. The more times a word is repeated in the selected articles, the greater the chance that these words will appear in the text. The most frequently used keywords in these articles included: AI, human, article,

[DOI: 10.21859/ModCareJ.23.3.47]

female, male, humans, adult, deep learning, controlled study, and middle-aged. Meanwhile, less attention has been paid to the use of AI in examining the body alignment of children and the elderly.

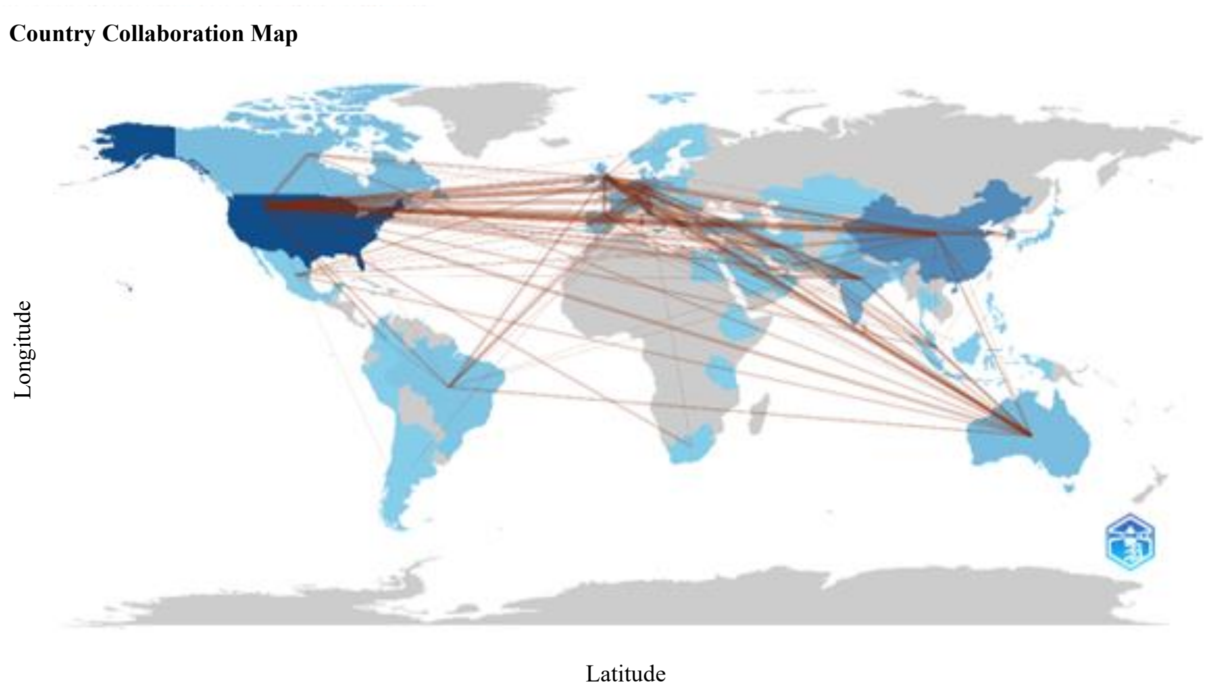

Figure 5: The Country Collaboration Map

The prominence of terms, such as "adult," "female," and "male" alongside the absence of "child," "adolescent," or "elderly," reveals a clear age-related gap. Current research prioritizes working-age adults, leaving pediatric and geriatric populations (both highly vulnerable to postural abnormalities) severely underrepresented.

4.7. *Evolution of Research Trends*

Trending topics show how researchers have been interested in these topics over the past decade. Interestingly, this analysis clearly shows that in 2015, the greatest focus was on the use of AI in "automated pattern recognition" and "data mining". However, over time and in recent years, their most common use has been for clinical and surgical purposes. As is clear, from now on, we will see more use of AI tools in assessing physical condition, clinical decision-making, increasing accuracy in medical and surgical interventions, and treatment planning (Figure 7

Figure 6: The Word Cloud of Keywords Used in the Selected Studies

[DOI: 10.21859/ModCareJ.23.3.47]

The evolution from "automated pattern recognition" (2015) toward "clinical decision making" and "surgical planning" (2025) indicates a structural shift from technical exploration to applied clinical integration. Nevertheless, the absence of terms related to implementation science, cost-effectiveness, or regulatory frameworks highlights a priority gap: real-world validation and scalable deployment remain underexplored.

5. Discussion

The results of this bibliometric analysis highlight how research on AI and body alignment has unfolded, capturing both the fast rise in academic attention. From 2015 to 2025, publications multiplied at an exceptional rate, with much of the output clustered in top journals and driven by major research centers in the United States, China, and Europe. The analysis highlights several dominant directions, such as the rapid advancement of AI in clinical practice, ongoing gaps in methodology and population coverage, and the increasing globalization of scholarly collaboration.

Two central findings emerge from this bibliometric analysis. First, the thematic shift from technical exploration to clinical application defines the field's evolution. Between 2015 and 2020, research focused on automated pattern recognition and data mining. After 2020, deep learning, surgical planning, and clinical decision support became dominant. This transition confirms that AI for body alignment has moved from proof-of-concept to practice-oriented investigation. Nevertheless, the gap between technical development and clinical validation remains. Few studies have reported prospective trials or regulatory approvals.

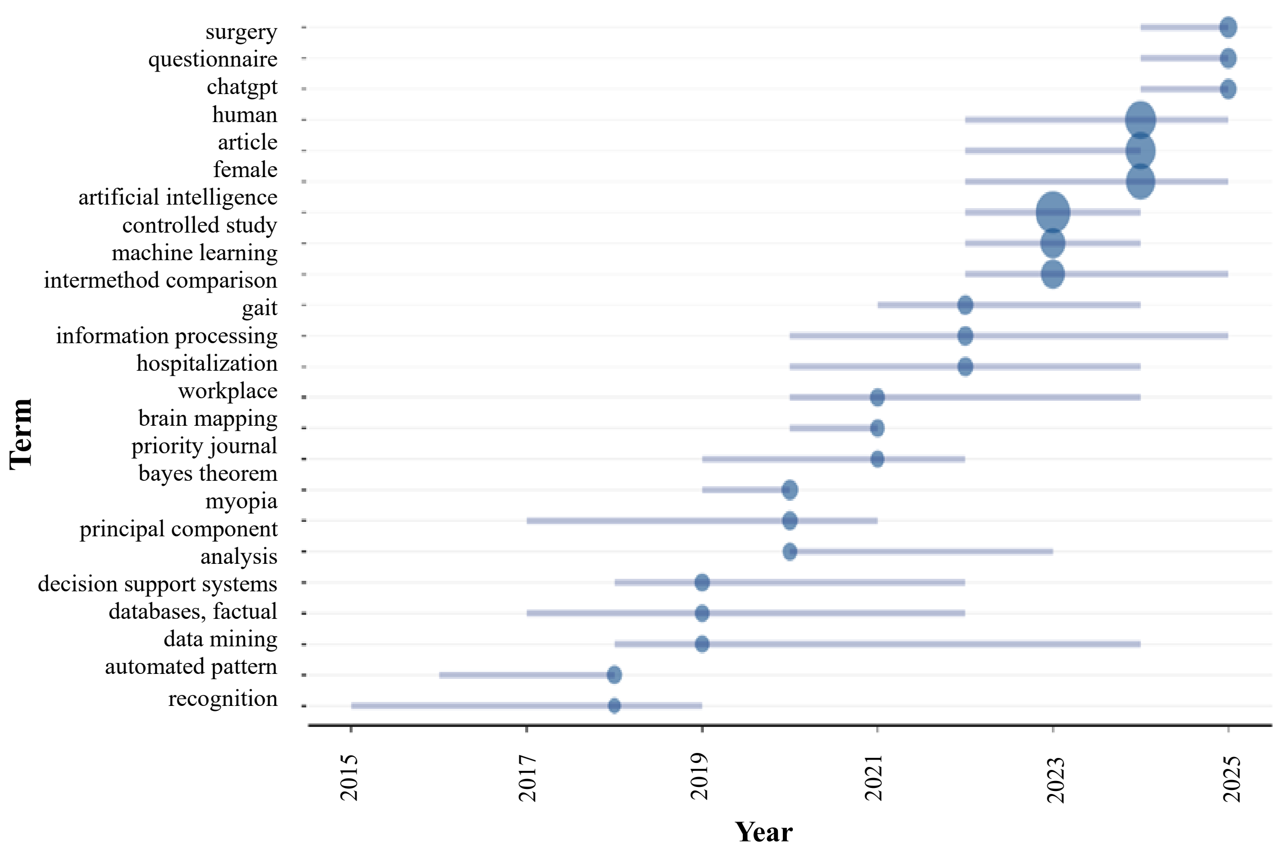

Figure 7: Trend Topics Regarding Artificial Intelligence and Body Alignment

Second, geographic concentration is a structural feature and a major limitation. The United States, China, and Europe account for over 80% of authors and affiliations. Low- and middle-income countries, as well as entire continents such as Africa and the Middle East, are nearly absent from the collaboration network. This imbalance threatens generalizability. AI models trained predominantly on Western and East Asian populations may underperform in other ethnic or socioeconomic groups. Therefore, geographic concentration is not merely a descriptive pattern but a core gap that future research must address.

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An annual growth rate approaching 50% suggests the field is still in a phase of rapid expansion and far from maturity. During the early years of the period studied, AI research was largely exploratory, concentrating on tasks such as pattern recognition, data mining, and conceptual modeling (30, 31). The 49.74% annual growth rate means that publications doubled every two years, and the average document age of 1.87 years confirms that most research is very recent, indicating a young, rapidly expanding field with limited long-term evidence. These early efforts reveal a phase of experimentation, where computational tools were just beginning to be applied to biomechanics and postural analysis. Our trend assessment reveals a clear turning point after 2020, when attention shifted toward more clinically oriented domains, decision support, surgical integration (32), and rehabilitation practices (33, 34). This transition parallels the broader movement in healthcare toward precision medicine and the incorporation of AI into everyday clinical operations (35, 36). Several contextual drivers likely contributed to this acceleration. The COVID-19 pandemic accelerated the spread of wearable technology, AI-driven diagnostic systems, and remote monitoring tools due to the global shift toward digital health (37). Advances in computer vision and DL have made it possible for researchers to measure posture from images and videos with greater accuracy, opening up new possibilities for healthcare providers as well as consumer-oriented applications.

The strong concentration of research output in North America, East Asia, and parts of Europe reflects broader global patterns in AI research and access to advanced computational infrastructure. However, the limited contribution from low- and middle-income regions raises concerns regarding the generalizability of AI-based body alignment models. Since AI performance is closely tied to the diversity of training data, this imbalance may limit the clinical applicability of current systems across different populations. Posture-related conditions affect people worldwide; however, the underrepresentation of certain regions raises questions about how well AI models, mostly trained on Western and East Asian data, can generalize. Since AI systems rely on the variety of their input data (38), limited representation can lead to bias and lower accuracy when the models are used with populations outside the main training groups. Also, the keyword mapping indicates that current research emphasizes adult cohorts, while children and older adults remain underexplored. This imbalance is noteworthy, as both groups are particularly vulnerable. Insufficient attention to these populations not only diminishes the clinical applicability of findings but also threatens to widen existing health disparities. Thematic trends show a transition from initial AI applications centered on data processing and analytics toward more advanced clinical and surgical implementations. This trend shows growing trust in the reliability of AI-generated insights and a readiness to use these tools in key decision-making contexts.

Furthermore, the accelerating body of research on AI applications in body alignment carries important consequences for healthcare practice. To begin with, AI has the potential to increase both precision and efficiency in posture evaluation (26, 28), reducing dependence on subjective clinical judgment. This advancement could be especially valuable in primary care, where early detection of musculoskeletal disorders can guide preventive strategies. Additionally, AI-based posture monitoring offers opportunities in rehabilitation and telehealth by supporting remote oversight of patient recovery and compliance with therapeutic regimens (39, 40). In addition, successful integration into routine practice will depend on rigorous validation studies, regulatory clearance, and cost-effectiveness assessments, areas in which current bibliometric evidence suggests relatively little progress to date.

5.1. Strengths, Limitations, and Future Directions

This bibliometric review has certain limitations, even though it provides insightful information. Relevant work published elsewhere may be overlooked because the study only considers English-language publications indexed in Scopus. Delays or gaps in the indexing of recent studies may also impact projections through 2025. It is essential to recognize that the domain of AI application is inherently interdisciplinary; therefore, the findings of this research cannot be confined to a single specific research domain. The main objective of this study was to investigate the relationship between AI and body posture; therefore, terms, such as DL, ML, or computer vision were not used in the search strategy. Finally, research using alternative terms for posture or AI methods may have been overlooked due to the reliance on specific keywords in the search.

5.2. Conclusions

This bibliometric analysis highlights the growing role of AI in evaluating and managing body alignment, tracing a decade of swift growth in publication numbers and expanding research themes. Also, the results point to substantial opportunities for clinical integration. Looking ahead, advancing this field will require sustained interdisciplinary partnerships, rigorous testing in real-world clinical settings, and greater global participation to ensure that AI-driven

[DOI: 10.21859/ModCareJ.23.3.47]

approaches deliver tangible benefits for musculoskeletal health and overall quality of life.

Statements

AI Use Disclosure: The author declares that no artificial intelligence was used in the production of the content for this article. The text was checked for grammar and clarity with the help of Grammarly Premium.

Authors' Contribution: Original idea, writing the manuscript, protocol development, abstracting data, and preparing the manuscript: R. Sh.

Conflict of Interests: The authors declared no conflicts of interest.

Data Availability: The data used in this study will be sent to the requester within one week if requested to the author.

Funding/Support: The researchers did not receive any financial support.

Informed Consent: This research is a bibliometric study and was not conducted on human participants. Therefore, informed consent is not required.

References

1. Petermann XB, Meereis ECW. Postural body: a systematic review about assessment methods. Man Ther Posturology Rehabil J. 2016: 14:273. [DOI:10.17784/mtprehabjournal.2016.14.273]
2. Rosário JL. Biomechanical assessment of human posture: a literature review. J Bodyw Mov Ther. 2014;18(3):368–73. [PMID: 25042306]. [DOI: 10.1016/j.jbmt.2013.11.018]
3. Shehada MS, Karimi N, Baraghoosh P, Mohammadi F, Ahmadi A. Prevalence and Factors Associated with Postural Abnormalities in Male Students of Tehran Universities: A Cross-sectional Study. Phys treat. 2023;13(2):77–86. [DOI:10.32598/ptj.13.2.560.1]
4. Kiruthika S, Rekha K, Preethy G, Abraham M. Prevalence of postural dysfunction among female college students-a qualitative analysis. Biol Med (Aligarh). 2018;10(1): 421. [DOI:10.4172/0974-8369.1000421]
5. Kripa S, Kaur H. Identifying relations between posture and pain in lower back pain patients: a narrative review. Bull Fac Phys Ther. 2021;26(1):34. [DOI:10.1186/s43161-021-00052-w]
6. Li C, Zhao Y, Yu Z, Han X, Lin X, Wen L. Sagittal imbalance of the spine is associated with poor sitting posture among primary and secondary school students in China: a cross-sectional study. BMC Musculoskelet Disord. 2022;23(1):98. [PMID: 35090408]. [PMCID: PMC8800310]. [DOI:10.1186/s12891-022-05021-5] [DOI: 10.1186/s12891-022-05303-y]
7. Grimes P, Legg S. Musculoskeletal disorders (MSD) in school students as a risk factor for adult MSD: a review of the multiple factors affecting posture, comfort and health in classroom environments. J Hum Environ Syst 2004;7(1):1–9. [DOI:10.1618/jhes.7.1]
8. Sebbag E, Felten R, Sagez F, Sibilia J, Devilliers H, Arnaud L. The world-wide burden of musculoskeletal diseases: a systematic analysis of the World Health Organization Burden of Diseases Database. Ann Rheum Dis. 2019;78(6):844–8. [PMID: 30987966]. [DOI:10.1136/annrheumdis-2019-215142]
9. Barassi G, Di Simone E, Galasso P, Cristiani S, Supplizi M, Kontochristos L, et al. Posture and health: are the biomechanical postural evaluation and the postural evaluation questionnaire comparable to and predictive of the digitized biometrics examination? Int J Environ Res Public Health.2021;18(7):3507. [PMID: 33800610]. [PMCID: PMC8038060]. [DOI: 10.3390/ijerph18073507]
10. Alrowili AN, Alanazi KHH, Aldowihi RJ, Alsharari SM, Alrajraji HSM, Alkuwaykibi SHG, et al. Physiotherapy for Postural Disorders: A Comprehensive Review of Treatment Modalities. J. int. crisis risk commun. research 2023;6(S12): 232–253. [DOI:10.63278/jicrcr.vi.34311]
11 Araujo LGL, de Oliveira GJPL, Rodrigues VP. RISK FACTORS AND INTERVENTION MEASURES FOR POSTURAL CHANGES AND THE IMPACT ON QUALITY OF LIFE: A LITERATURE REVIEW. Revista Ibero-Americana de Humanidades Ciências e Educação 2025;11(2):719–27. [DOI:10.51891/rease. v11i2.15241]
12. Bennett JP, Lim S. The Critical Role of Body Composition Assessment in Advancing Research and Clinical Health Risk Assessment across the Lifespan. J Obes Metab Syndr. 2025;34(2): 120-137. [PMID: 40194886]. [PMCID: PMC12067000]. [DOI: 10.7570/jomes25010. 13]
13. Roggio F, Musumeci G. The progression of human posture concept and advances in postural assessment techniques. Boll. Accad Gioenia Nat Sci. 2023;56(386): FP616–FP38. [DOI:10.35352/gioenia. v56i386.113]
14. Odebiyi DO, Okafor UAC. Musculoskeletal disorders, workplace ergonomics and injury prevention. In: Korhan O, editor. Ergonomics - New Insights. IntechOpen; 2023. [DOI: 10.5772/intechopen.106031]
15. McAtamney L, Corlett N. Rapid upper limb assessment (RULA). InHandbook of human factors and ergonomics methods 2004 Aug 30 (pp. 86-96). CRC Press. [URL:https://www.taylorfrancis.com/chapters/edit/10.1201/9780203489925-16/rapid-upper-limb-assessment-rula-lynn-mcatamney-nigel-corlett16]
16. Scott GB, Lambe NR. Working practices in a perchery system, using the OVAKO Working posture Analysing

System (OWAS). Appl Ergon. 1996;27(4):281–4. [PMID: 15677069].
[DOI: 10.1016/0003-6870(96)00009-9]
17. Porto AB, Okazaki VHA. Procedures of assessment on the quantification of thoracic kyphosis and lumbar lordosis by radiography and photogrammetry: A literature review. J Bodyw Mov Ther. 2017;21(4):986–94. [PMID: 29037657].
[DOI: 10.1016/j.jbmt.2017.01.008]
18. Ey-Chmielewska H, Chruściel-Nogalska M, Frączak B. Photogrammetry and its potential application in medical science on the basis of selected literature. Adv Clin Exp Med. 2015;24(4):737–41. [PMID: 26469121]. [DOI:10.17219/acem/58951]
19. Furlanetto TS, Sedrez JA, Candotti CT, Loss JF. Photogrammetry as a tool for the postural evaluation of the spine: A systematic review. World J Orthop. 2016;7(2): 136-48. [PMID: 26925386]. [PMCID: PMC4757659].
[DOI: 10.5312/wjo. v7. i2.136.20]
Janssens K. X-ray based methods of analysis. In: Janssens K, Van Grieken R, editors. Non-Destructive Microanalysis of Cultural Heritage Materials. Amsterdam: Elsevier; 2004. p. 129-226. (Comprehensive Analytical Chemistry; vol. 42).
[URL: https://www.sciencedirect.com/science/article/abs/pii/S0166526X0480008421]
20. Janssens K. X-ray based methods of analysis. In: Janssens K, editor. Modern methods for analysing archaeological and historical glass. Chichester: Wiley; 2013. p. 79-128.
[URL: https://onlinelibrary.wiley.com/doi/abs/10.1002/9781118314234.ch5]
22. Topol EJ. High-performance medicine: the convergence of human and artificial intelligence. Nat Med. 2019;25(1):44–56. [PMID: 30617339].
[DOI: 10.1038/s41591-018-0300-7]
23. Ghaffar Nia N, Kaplanoglu E, Nasab A. Evaluation of artificial intelligence techniques in disease diagnosis and prediction. Discov Artif Intell. 2023;3(1):5. [PMID: 40478140]. [PMCID: PMC9885935].
[DOI: 10.1007/s44163-023-00049-5]
24. Sharma N, Sharma R, Jindal N. Machine learning and deep learning applications-a vision. Global Transitions Proceedings. 2021;2(1):24–8.
[DOI:10.1016/j.gltp.2021.01.004]
25. Miotto R, Wang F, Wang S, Jiang X, Dudley JT. Deep learning for healthcare: review, opportunities and challenges. Brief Bioinform. 2018;19(6):1236–46. [PMID: 28481991]. [PMCID: PMC6455466].
[DOI: 10.1093/bib/bbx044]
26. Roggio F, Trovato B, Sortino M, Musumeci G. A comprehensive analysis of the machine learning pose estimation models used in human movement and posture analyses: A narrative review. Heliyon. 2024;10(21). e39977. [PMID: 39553598]. [PMCID: PMC11566680].
[DOI: 10.1016/j.heliyon. 2024.e39977]
27. Roggio F. Advancements in Non-Invasive Screening Techniques for Human Posture and Musculoskeletal Disorders. [doctoral dissertation]. [Palermo]: University of Palermo; 2024.
[URL: https://iris.unipa.it/handle/10447/63259328]
28. Hong Z, Hong M, Wang N, Ma Y, Zhou X, Wang W. A wearable-based posture recognition system with AI-assisted approach for healthcare IoT. Future Gener Comput Syst. 2022; 127:286–96. [PMID: 34366521]. [PMCID: PMC8340934].
[DOI: 10.1016/j.future.2018.04.037]
29. van Doorslaer L. Bibliometric studies. In: Angelelli CV, Baer BJ, editors. Researching translation and interpreting. London: Routledge; 2015. p. 168–76.
[URL: https://www.routledge.com/Researching-Translation-and-Interpreting/Angelelli-Baer/p/book/9780415732543]
30. Trujillo J, Davis KC, Du X, Damiani E, Storey VC. Conceptual modeling in the era of Big Data and Artificial Intelligence: Research topics and introduction to the special issue. Data Knowl Eng. 2021; 135:101911.
[URL:https://www.sciencedirect.com/science/article/abs/ pii/S0169023X21000380]
31. Bawack RE, Fosso Wamba S, Carillo KDA. A framework for understanding artificial intelligence research: insights from practice. J Enterp Inf Manag. 2021;34(2):645–78.
[DOI: 10.1108/JEIM-07-2020-0284]
32. Lanotte F, O'Brien MK, Jayaraman A. AI in rehabilitation medicine: opportunities and challenges. Ann Rehabil Med. 2023;47(6):444–58. [PMID: 38093518]. [PMCID: PMC10767220].
[DOI: 10.5535/arm.23131]
33. Salamati S, Ebrahimi E, Rashidy P, Alavi M. Efficacy of AI-Based Pilates on Motor Performance and Fear of Falling in Older Adults. J Adv Para Sport Sci. 2025;5(1):114–22.
[DOI: 10.32604/mcb.2024.0xxxxx]
34. Sheikhhoseini R, Ebrahimi E, Eslami R, Piri H. Validation of Artificial Intelligence-prescribed Exercise Programs for Improving Upper Crossed Syndrome and Dynamic Knee Valgus. J Clin Res Paramed Sci. 2025 ;14(2): e164713.
[DOI: 10.5812/jcrps-164713]
35. Alsobhi M, Sachdev HS, Chevidikunnan MF, Basuodan R, KU DK, Khan F. Facilitators and barriers of artificial intelligence applications in rehabilitation: a mixed-method approach. Int J Environ Res Public Health. 2022;19(23):15919. [PMID: 36497993]. [PMCID: PMC9737928].
[[DOI: 10.3390/ijerph192315919]
36. Ebrahimi E, Sheikhhoseini R, Eslami R, Piri H. Are Artificial Intelligence-Prescribed Exercise Programs Valid for General Health and Weight Loss? J Adv Para Sport Sci. 2025;5(2):241–65. [PMID: 36497993]. [PMCID: PMC9737928].
[DOI: APSS/apss.2025.2072473.1013]
37. Neravetla AR, Nomula VK, Mohammed AS, Dhanasekaran S. Implementing AI-driven diagnostic decision support systems for smart healthcare. In:2024 15th International Conference on Computing

Communication and Networking Technologies (ICCCNT). Kamand, India: IEEE; 2024. p. 1-6. [DOI: 10.1109/ICCCNT61001.2024.1072532338]

38. Zha D, Bhat ZP, Lai K-H, Yang F, Jiang Z, Zhong S, et al. Data-centric artificial intelligence: A survey. ACM Comput Surv. 2025;57(5):1–42. [DOI: 10.1145/371111839]
39 Khalid UB, Naeem M, Stasolla F, Syed MH, Abbas M, Coronato A. Impact of AI-powered solutions in rehabilitation process: Recent improvements and future trends. Int J Gen Med. 2024; 17:943–69. [PMID: 38495919]. [PMCID: PMC10944308]. [DOI: 10.2147/IJGM.S453903]
40. Monge J, Ribeiro G, Raimundo A, Postolache O, Santos J. AI-based smart sensing and AR for gait rehabilitation assessment. Information. 2023;14(7):355. [DOI:10.3390/info14070355]