Artificial Intelligence in Human Resources: A Systematic Review

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Abstract

This Artificial Intelligence (AI) has emerged as a fundamental driver of digital transformation in organizations, particularly in the field of human resource management (HRM). This study aims to examine the main AI techniques applied in HR functions, identifying their most common uses, benefits, implementation challenges, and the key factors influencing their adoption. The research follows a systematic literature review methodology, guided by the PRISMA 2020 framework to ensure transparency, rigor, and reproducibility. The central objective is to understand how AI contributes to strategic talent management and which organizational, technological, and ethical factors shape its successful adoption. The hypothesis suggests that effective integration depends not only on technological availability but also on digital skills development, ethical governance, and cultural readiness within organizations. The findings show that AI is predominantly used in recruitment, performance evaluation, and attrition prediction, where tools like machine learning and natural language processing improve speed, consistency, and predictive accuracy. Benefits include increased efficiency, support for decision-making, and the potential to mitigate human bias. However, several challenges persist, such as data quality limitations, algorithmic bias, employee resistance, and insufficient regulatory frameworks. Adoption is more likely when organizations invest in digital infrastructure, promote transparent practices, and provide training for HR professionals.

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This study contributes a conceptual framework that maps AI techniques to HR functions, benefits, barriers, and adoption conditions. It also highlights the need for further empirical research to validate these findings across different organizational contexts, cultures, and regions. The insights aim to support both academic exploration and practical implementation in human talent management.

Keywords: Digital transformation; talent management; talent selection; performance evaluation; automation

Introduction

Artificial intelligence (AI) is a pivotal component in the digital transformation of companies, effecting changes in operations and strategic decision-making through the analysis of large volumes of data, machine learning, and task automation. AI has been demonstrated to optimise processes, reduce costs, and improve efficiency in a variety of sectors (Palos-Sánchez et al., 2022). In the domain of human resources, its impact is increasing, facilitating talent selection and retention, the personalisation of learning and professional development, as well as performance management and workforce planning (Qamar et al., 2021).

AI has been employed in the field of talent management to automate various processes, including the recruitment of suitable candidates through the utilisation of algorithms. Additionally, predictive analytics has been utilised to anticipate future turnover needs and thereby enhance employee satisfaction (Gélinas et al., 2022). Moreover, tools such as chatbots and virtual assistants have been shown to enhance the efficiency of internal communication and address queries, thereby reducing the operational demands on human resources personnel. However, the implementation of AI in these processes faces challenges such as data quality, fairness in algorithmic decision-making, and employee reaction to automation (Tambe et al., 2019).

Current trends demonstrate an increase in the utilisation of AI for data-driven decision-making, with a particular focus on reducing bias in candidate selection and evaluation. The implementation of deep learning facilitates the conception of bespoke strategies that enhance the employee experience and cultivate a more equitable and efficient work environment. In this context, AI is being established as a vital resource for the strategic management of human talent in the digital age.

The advent of artificial intelligence has precipitated a paradigm shift across diverse sectors, with its implementation in human resources yielding a duality of advantages and challenges. However, the dissemination of knowledge regarding AI in this field is limited, which hinders its structured implementation. Current studies analyse a variety of applications, including automated recruitment, predictive performance analytics, and the enhancement of the employee experience. However, these approaches are isolated and lack a framework for understanding their relationship and their combined impact on talent management (Bujold et al., 2024; Nawaz et al., 2024).

A significant challenge in the realm of AI research in human resources pertains to the absence of a consensus regarding optimal methodologies for its implementation. The methodological approaches employed vary, and there is an absence of clearly defined standards, creating uncertainty about the effectiveness of these tools in different organizational settings. Moreover, the extant literature demonstrates lacunae with regard to the ethical and technical challenges of AI in talent selection, development and retention. The automation of HR decisions gives rise to questions of fairness, transparency and employee acceptance, which requires a more profound and methodical analysis (Faheem et al., 2024; Sithambaram & Tajudeen, 2023).

In light of this scenario, a structured analysis is required to organise knowledge about the applications, benefits, and limitations of AI in HR. The absence of a consolidated perspective hinders the evaluation of its genuine impact on talent management, thereby impeding the formulation of strategies that optimise its benefits and mitigate its

risks. The identification of these research gaps is of crucial importance if progress is to be made towards a more informed and efficient adoption of AI in HR. In this regard, the objective of this research is to analyse the main artificial intelligence techniques applied in human talent management, identifying their most common uses, benefits, challenges, and factors that influence their adoption. In order to achieve this objective, the research is guided by a series of questions that facilitate the structuring of the analysis of artificial intelligence in human talent management:

- What are the main artificial intelligence techniques used in human talent management?
- What are the most common applications of artificial intelligence in human resources processes?
- What are the documented benefits of using artificial intelligence in human talent management?
- What are the main challenges and limitations in implementing artificial intelligence in people management?
- What factors influence the adoption of artificial intelligence in human talent management?

This study provides a comprehensive overview of the application of artificial intelligence in the field of human resources management, addressing both the theoretical underpinnings of such applications and the practical challenges associated with their implementation. The present study contributes to the analysis of AI adoption from an organizational and technological perspective, thereby facilitating a more structured understanding of its implications. Furthermore, it fills gaps in the literature by integrating disparate knowledge and providing relevant information for HR researchers and practitioners, facilitating informed decision-making on the strategic use of these technologies in human talent management.

Methodology

The present research constitutes a systematic literature review, the methodology of which is outlined in the PRISMA 2020 statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The methodology employed is founded on the principles of transparency, rigour, and reproducibility, thereby ensuring a systematic and objective approach to the identification, selection, and synthesis of studies. The PRISMA 2020 framework offers a structured approach to the identification, evaluation and reporting of scientific findings, ensuring coherence and comprehensiveness. In this review, the guidelines were applied to analyse the use of artificial intelligence in human resources. The present field requires methodological clarity due to its conceptual and applied diversity. The implementation of PRISMA 2020 guarantees an organised process that adheres to international standards (Page et al., 2021).

Eligibility criteria

Eligibility criteria ensured thematic coherence and scientific quality. Included were peer-reviewed studies in English or Spanish, original articles, reviews, and case studies, focused on AI in talent management, recruitment, training, performance, and data use. Selection was guided by technological and organizational descriptors in titles.

Exclusion occurred in three stages: removing duplicates or incomplete records; excluding studies without full-text access; and discarding those lacking methodological depth or relevance. This ensured a rigorous and relevant sample.

Sources of information

This review used Scopus and Web of Science for their broad thematic coverage and editorial rigour. Scopus (Elsevier) includes over 25,000 titles across disciplines and offers tools for citation analysis and trend identification in AI and HR. Web of Science (Clarivate) features rigorously selected indexes like SCIE and SSCI, supporting interdisciplinary research on technological and organizational issues. Combining both databases ensured a balanced,

representative search, reducing language, regional, and disciplinary bias, as supported by Asubiaro, Onaolapo, and Mills (10).

Search strategy

The search strategy followed the inclusion criteria, using Boolean operators and descriptors related to AI and HR. Scopus used:

TITLE ("artificial intelligence" OR "machine learning" OR "deep learning" OR "AI-driven" OR "algorithmic decision-making") AND TITLE ("human resource management" OR "HRM" OR "talent management" OR "workforce management" OR "people analytics" OR "employee performance" OR "recruitment" OR "hiring process" OR "personnel selection").

Web of Science used a similar structure with adapted syntax. Filters by year, language, and type were iteratively applied to ensure thematic relevance.

Selection process

The selection followed three stages: deduplication in Excel, screening titles/abstracts, and full-text review. Two researchers independently applied criteria, resolving differences by consensus. Aligned with PRISMA 2020, the process used a flowchart to guide each step (Figure 1).

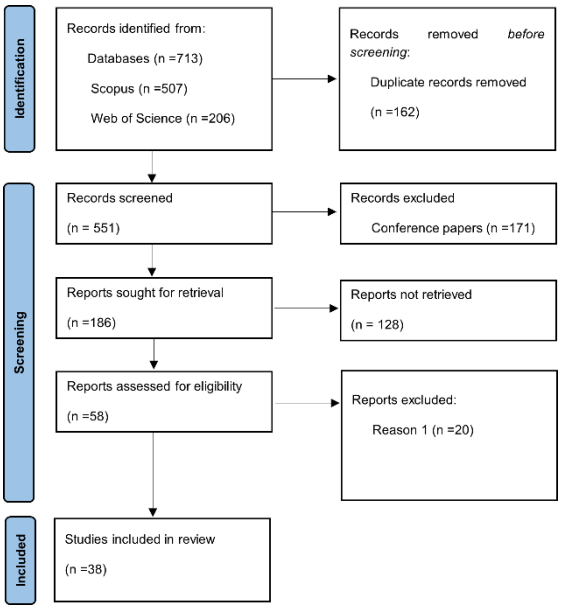

Figure 1. PRISMA flowchart. Prepared by the authors based on Scopus and Web of Science.

Data processing

Data were processed in an Excel matrix recording author, year, country, study type, methodology, AI use, and findings. Filters revealed frequencies, locations, and trends. Cross-validation ensured consistency, supporting systematic and reliable data organization.

Risk of bias

Bias was addressed through systematic methods, including reputable databases, strict criteria, and independent reviews. However, some risks remain: excluding grey literature, limited search terms, reliance on structured engines, and potential reporting bias from selective publication.

Results

This study identifies organizational, technological, and human factors affecting AI adoption in talent management. Key elements include organization size, digital maturity, tech availability, innovation-driven leadership, and infrastructure investment. HR staff's perceived usefulness, ease of use, culture, and leadership support shape adoption speed and success.

Title	Authores
A review paper on artificial intelligence at the service of human resources management	Berhil, Benlahmar & Labani (Berhil et al., 2020)
A UTAUT-Based Framework for Analyzing Users' Intention to Adopt Artificial Intelligence in Human Resource Recruitment: A Case Study of Thailand	Tanantong & Wongras (Tanantong & Wongras, 2024)
An analysis of the literature about the application of artificial	Rezzani, Caputo & Cortese

intelligence to the recruitment and personnel selection	(Rezzani et al., 2020)
An artificial intelligence algorithmic approach to ethical decision-making in human resource management processes	Rodgers (Rodgers et al., 2023)
An investigation of crowdsourcing methods in enhancing the machine learning approach for detecting online recruitment fraud	Nanath & Olney (Nanath & Olney, 2023)
Applicants' perception of artificial intelligence in the recruitment process	Horodyski (Horodyski, 2023a)
Architecting the future: exploring the synergy of AI-driven sustainable HRM, conscientiousness, and employee engagement	Jia & Hou (Jia & Hou, 2024)
AI-assisted HRM: Towards an extended strategic framework	Malik (Malik et al., 2023)
Artificial intelligence and public sector human resource management in South Africa: Opportunities, challenges and prospects	Chilunjika, Intauno, & Chilunjika (Chilunjika et al., 2022)
Artificial Intelligence in Tactical Human Resource Management: A Systematic Literature Review	Votto (Votto et al., 2021)
Artificial Intelligence: The Present and Future of Human Resources Recruitment and Selection Processes †	Martín-Hernández (Martín-Hernández, 2023)
Artificial Intelligence-Driven Talent Management System: Exploring the Risks and Options for Constructing a Theoretical Foundation	Faqihi & Miah (Faqihi & Miah, 2023)
Assisting artificial intelligence adoption drivers in human resources management: a mediation model	Al Qahtani & Alsmairat (Qahtani & Alsmairat, 2023)
Critical exploration of AI-driven HRM to build up organizational capabilities	Böhmer & Schinnenburg (Böhmer & Schinnenburg, 2023)
Design and interactive performance of human resource management system based on artificial intelligence	Gong (Gong et al., 2022)
Discriminated by an algorithm: a systematic review of discrimination and fairness by algorithmic decision-making in the context of HR recruitment and HR development	Köchling & Wehner (Köchling & Wehner, 2020)
Empirical analysis of the role of artificial intelligence in human resources recruitment and selection	Nain & Shankar Shyam (Nain & Shyam, 2024)
Employees recruitment: A prescriptive analytics approach via machine learning and mathematical programming	Pessach (Pessach et al., 2020)
Evolving uses of artificial intelligence in human resource management in emerging economies in the global South: some preliminary evidence	Kshetri (Kshetri, 2021)
Generative Artificial Intelligence in Business: Towards a Strategic Human Resource Management Framework	Chowdhury, Budhwar, & Wood (Chowdhury et al., 2024)
Human-Centric Multimodal Machine Learning: Recent Advances and Testbed on AI-Based Recruitment	Peña (Peña et al., 2023)
Improving measurement and prediction in personnel selection through the application of machine learning	Koenig, Sczesny & Moser (Koenig et al., 2023)
Integrating Artificial Intelligence in Human Resource Management: A SmartPLS Approach for Entrepreneurial Success	Surya Wuisan (Wuisan et al., 2023)
Integrating artificial intelligence into a talent management model to increase the work engagement and performance of enterprises	Rožman, Oreški, & Tominc (Rožman et al., 2022)
Machine learning applications to personnel selection: Current illustrations, lessons learned, and future research	Campion and Campion (Campion & Campion, 2023)
Machine Learning-Assisted Competency Modeling for Human Resource Management Jobs	Cao & Zhang (Cao & Zhang, 2022)
Machine Learning-Driven Enterprise Human Resource Management Optimization and Its Application	Sun (Sun, 2022)
New Perspectives for Human and Artificial Intelligence Interactions for Leadership e-Recruitment	Anghel (Anghel, 2023)

Personalized human resource management via HR analytics and artificial intelligence: Theory and implications	Huang (Huang et al., 2023)
Recruiter's perception of AI-based tools in recruitment	Horodyski (Horodyski, 2023b)
Recruitment IN THE TIMES OF MACHINE LEARNING	Rab-Kettler & Lehnervp (Rąb-Kettler & Lehnervp, 2019)
Reducing subgroup differences in personnel selection through the application of machine learning	Zhang, S. (Zhang et al., 2023)
Responsible Artificial Intelligence in Human Resources Technology: An innovative inclusive and fair by design matching algorithm for job recruitment purposes	Delecraz (Delecraz et al., 2022)
Socially Responsible Artificial Intelligence Empowered People Analytics: A Novel Framework Towards Sustainability	Chang & Ke (Chang & Ke, 2024)
The adoption of artificial intelligence in human resources management practices	Nawaz (Nawaz et al., 2024)
The critical role of HRM in AI-driven digital transformation: a paradigm shift to enable firms to move from AI implementation to human-centric adoption	Fenwick, Molnar, & Frangos (Fenwick et al., 2024)
The role of artificial intelligence recruitment and quality to explain the phenomenon of employer reputation	Kot (Kot et al., 2021)
Unbiased employee performance evaluation using machine learning	Nayem & Uddin (Nayem & Uddin, 2024)

Table 1. Studies included in the research. Prepared by the authors based on Scopus and Web of Science.

Figure 2 illustrates the predominant artificial intelligence techniques employed in human resources, categorised according to their frequency of appearance in the reviewed studies. Machine Learning is mentioned 31 times, followed by Deep Learning with 18 mentions and Natural Language Processing with 17. Chatbots are mentioned in 13 studies, while the term 'supervised learning' appears in 11. It is evident that HR Analytics Systems, Recommendation Systems and Predictive Analytics have an intermediate share. It is evident that a paucity of literature exists on computer vision, backpropagation algorithms, generative AI, and other associated techniques.

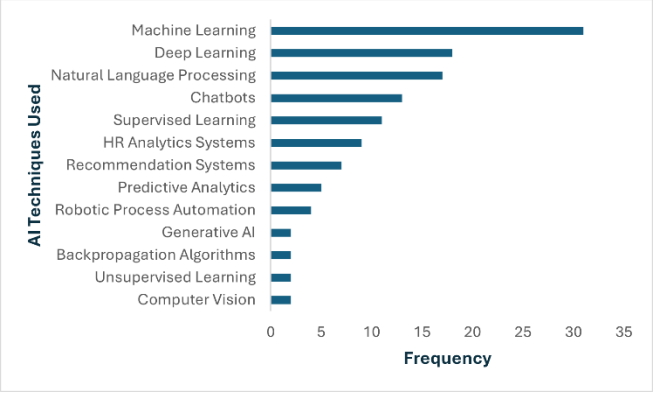

Figure 2. AI techniques in human resources. Prepared by the authors based on Scopus and Web of Science.

Figure 3 presents the frequency of functional processes in AI-HR studies. Recruitment and Selection leads (28), followed by Candidate Evaluation (15), Performance Management (14), and Resume Screening (11). HR Administration, Employee Development, and Training also show notable frequencies. In contrast, Attrition Prediction and Bias Mitigation appear less often, with only two mentions each.

Figure 3 presents the frequency of functional processes in AI-HR studies. Recruitment and Selection leads (28), followed by Candidate Evaluation (15), Performance Management (14),

and Resume Screening (11). HR Administration, Employee Development, and Training also show notable frequencies. In contrast, Attrition Prediction and Bias Mitigation appear less often, with only two mentions each.

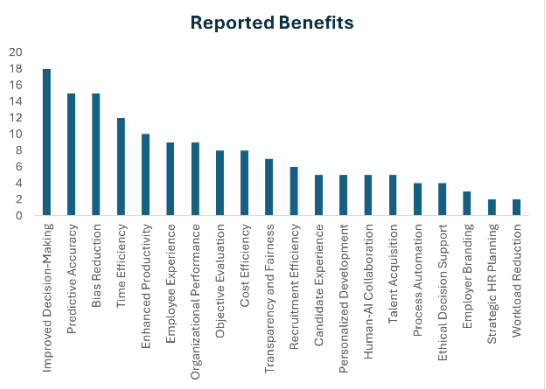

Figure 4. Reported benefits of using AI in HR. Prepared by the authors based on Scopus and Web of Science.

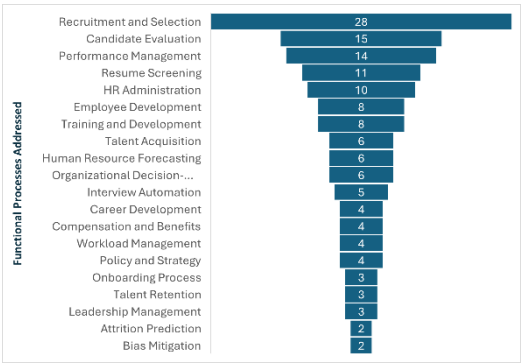

Figure 5 presents a radial chart illustrating barriers to AI implementation in HR. Each axis represents a barrier, with radius length indicating frequency. Data quality and algorithmic bias appear most frequently, positioned at the periphery, while less common barriers like integration challenges and cultural resistance are closer to the center

Figure 5. Barriers to Implementing Artificial Intelligence in Human Resources. Prepared by the authors based on Scopus and Web of Science.

Figure 6 shows the frequency of AI adoption conditions in HR. "Data Governance" and "Ethical Framework" are the most cited, while "Organizational Culture", "Digital Skills Training", "Transparency and Explainability", and "Organizational Readiness" also appear prominently. In contrast, "Technological Motivation", "HR Strategy Alignment", and "Managerial Support" are less frequently reported.

Figure 6: Conditions for AI adoption in human resources. Prepared by the authors based on Scopus and Web of Science.

The study's findings were structured around the research questions, identifying key AI techniques, functional processes, benefits, barriers, and adoption conditions. The most common techniques and processes reflect core application areas. Additionally, the main benefits and constraints of AI adoption were highlighted, along with essential conditions that facilitate its effective organizational integration

Discussion

This discussion summarizes the findings on AI in HR, aligning them with existing research and supporting a conceptual framework for future use. It outlines theoretical, policy, and practical

implications for talent management, acknowledges methodological limitations, and proposes future research to improve the framework's applicability across organizational contexts.

Analysis of results

Current AI techniques in HR include machine learning, deep learning, NLP, and chatbots, confirming its growing role in automating recruitment (12). Rodgers et al. (14) stress ethical talent management through intelligibility and accountability.

Despite the focus on recruitment, areas like attrition prediction and bias mitigation remain underexplored (11). AI's value lies in decision-making and bias reduction (18), though its effects on cost-efficiency and employee experience need further study (11).

Challenges include data quality and algorithmic bias (16), while system integration and cultural resistance reflect limited attention to stakeholder perceptions (21).

Adoption conditions such as data governance and ethical frameworks dominate, alongside organizational culture, digital skills, and transparency. Less emphasized factors include technological motivation, HR strategy alignment, and managerial support (13, 14).

Comparison of results with other studies

Our findings align with prior research in key areas. Data governance and ethical frameworks are the most cited adoption conditions, supporting Berhil et al. (11). Organizational culture and digital skills training also appear frequently, in line with Ossiannilsson et al. (48), especially post-COVID-19.

Conversely, barriers like technological motivation and managerial support are less frequent, suggesting ethics and governance are now prioritized (49). While Köchling and Wehner (26) highlight discrimination risks, our study emphasizes transparency and explainability within ethical safeguards.

Finally, Votto et al. (20) focus on recruitment and appraisal; we extend this by showing that governance, culture, skills, and ethics are central to AI integration across all HR functions.

Proposed conceptual framework

As shown in Figure 7, the conceptual framework for AI adoption in human resources consists of five components: AI techniques, functional processes, benefits, implementation barriers, and adoption conditions. Each element reflects research findings and illustrates how techniques relate to affected processes, reported benefits, obstacles, and the conditions necessary for successful AI integration in talent management.

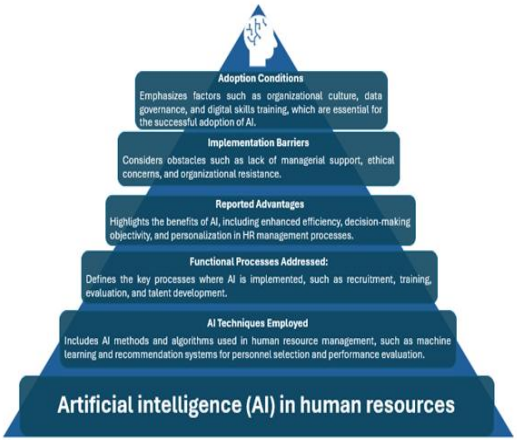

Figure 7. Conceptual framework for AI adoption in HR. Prepared by the authors.

Implications

This study has theoretical, policy, and practical implications. It presents a framework that reveals research gaps and key organizational factors in AI adoption, supports policies on ethics, training, and governance, and offers guidance for HR professionals, particularly in recruitment and risk management like algorithmic bias.

Limitations

This study faces methodological limitations due to reliance on secondary sources and lack of primary data, affecting generalizability and validation. The frequency-based approach may overlook emerging

factors. Future research with diverse samples and case studies is recommended to refine the framework.

Lines of future research

This study suggests future research on underexplored techniques like explainable AI and deep learning, focusing on their ethical and practical implications. The framework also needs empirical validation through case studies and interviews. Additionally, examining the influence of culture, governance, and digital skills, along with the role of ethical standards and public policy, would enhance the model's applicability across diverse organizational contexts.

Conclusions

The integration of AI within the domain of human resources constitutes a multifaceted environment, encompassing both prospects and challenges. This study demonstrates that, despite the increasing utilisation of advanced techniques such as machine learning and natural language processing, significant barriers including data quality and algorithmic biases persist. Despite the extensive documentation of these challenges within the extant literature, they must not be permitted to constrain the capacity of AI to enhance pivotal processes, such as the selection and evaluation of candidates. Instead, these challenges should serve as a catalyst for the development of ethical and transparent solutions.

It is emphasised that factors such as data governance and ethical frameworks are essential for successful AI adoption, underscoring the need for more structured integration within organizations.

Furthermore, it is imperative to acknowledge the pivotal role of organizational culture and the imperative for comprehensive digital skills training. It is crucial to recognise that technological prowess alone does not ensure success; rather, it necessitates profound and comprehensive organizational change.

While the results of this study provide a solid foundation, the lack of empirical validation highlights the need for additional research to contrast these findings in more diverse contexts. It is recommended that future studies explore emerging techniques and analyse the effects of AI on organizations of different sizes and sectors. This would serve to enrich the conceptual framework and expand its applicability to diverse organizational realities.

Author contributions

The contributions of the authors to this work are as follows: M. R. M-E., J. C. P-V., A. V-A., S. C-A., G. A. M. L., and A. G. conceptualized and designed the study. M. R. M-E., J. C. P-V., and S. C-A. performed data collection. A. V-A., G. A. M. L., and A. G. conducted the analysis. M. R. M-E. and A. V-A. contributed to writing the manuscript. All authors reviewed and approved the final version of the manuscript.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement:

The data availability statement for this study has been duly registered and archived in the Zenodo open data repository, a repository recognized for its commitment to the accessibility and preservation of scientific data. The data and materials supported by this study are publicly available and can be accessed at the following DOI link: https://doi.org/10.5281/zenodo.15465358

Ethical Approval.

All participants were provided with consents that highlight their voluntary participation, how the data will be used in the research and how their confidentially will be maintained during and after the study.

Consent to participate.
Consents were obtained from the participants' parents to maintain the ethical standards within this study

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