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BIBLIOMETRIC INSIGHTS INTO NLP RESEARCH: GLOBAL TRENDS AND FUTURE IMPLICATIONS FOR SPORTS PSYCHOLOGY

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Abstract. Over the past four decades, the application of Neuro-Linguistic Programming (NLP) has expanded significantly, attracting considerable interest from researchers worldwide. Despite the proliferation of research across various disciplines, comprehensive reviews that map global trends in NLP research remain limited. Consequently, this study aims to evaluate the evolution and contributions of NLP research over time, and to identify the key topics, leading researchers, prominent institutions, and influential countries involved in its development. This study employs a literature review methodology using the Scopus database as of September 27, 2024, with the keywords "neuro-linguistic" and "programming." Bibliographic data from 280 publications were exported in CSV format, processed using Excel, and analyzed with VOSviewer software to map networks and visualize findings. The results of the study are as follows: (1) NLP research output peaked in 2018, with over 20 documents published that year; (2) the most cited article is titled *"Machine Learning Approach to Personality Type Prediction Based on the Myers–Briggs Type Indicator";* (3) the researcher contributing the most to this field is Tosey, with nine publications; (4) the United Kingdom and Europe exhibit a high concentration of NLP research and robust collaboration networks; (5) in the Scopus database, articles constitute the majority of documents, comprising 62.9% of the total publications; (6) NLP research is predominantly concentrated in the social sciences and computer science domains, where NLP techniques are utilized for developing technologies such as chatbots, text analysis, and linguistic data processing. The findings indicate that NLP holds substantial potential for application in psychology and the social sciences. However, its application in the domain of sports remains underexplored. This represents a significant opportunity to implement NLP in sports, particularly for mental training and enhancing athletic performance.

Keywords: Neuro-Linguistic Programming (NLP); sports psychology; bibliometric

INTRODUCTION

Neuro-Linguistic Programming (NLP) was developed during the 1970s at the University of California, Santa Cruz, by Richard Bandler, a mathematics and computer science student, and John Grinder, a linguistics professor, who served as its primary founders and contributors (Abraham and Therese 2024; Ahmadzadeh, Badami, and Aghaei 2019; Bakr 2022; Doğan 2023; Hijazi 2012; Javadi and Asl 2020; Ochilova 2024; Sandua 2024; Savarledavar and Kuan 2017; Witkowski 2010), NLP is a methodology designed to influence cognition and behavior by utilizing patterns of language and behavior (Amirhosseini and Kazemian 2020; Boughattas, Ben Salha, and Moella 2022). This approach focuses on identifying and applying techniques that have proven successful for others, with the objective of replicating these outcomes in one's own experiences (Rohach and Wisecup 2022).

For nearly half a century, NLP has garnered widespread popularity, with its global application demonstrating its acceptance within mainstream psychological practices (Kotera and Sweet 2019). Characterize NLP as a hybrid model within sport psychology, integrating elements from psychodynamic theories, cognitive-behavioral frameworks, and humanistic approaches (Hill 2021; Rhea and Reel 2001). NLP highlights the interplay between neurological processes, language, and behavior (Sandua 2024). Its techniques aim to reframe thought patterns and emotional responses, enhance communication, establish effective relationships, and promote personal development, ultimately leading to greater success across various life domains (Sandua 2024).

NLP has practical applications in numerous fields, including health, education, therapy, business, and sports. Within sports contexts, NLP serves as a psychological tool to enhance athletes' mental skills, such as mitigating anxiety, fostering self-confidence, and regulating emotions during competitions (Boughattas, Ben Salha, and Moella 2022). In Indonesia, many young athletes face stress due to rigorous training, high expectations, and inadequate psychological support. Anxiety can serve as either a positive or negative factor depending on how athletes manage their emotions. Therefore, appropriate psychological support and mental training are key to optimizing athletes' performance in competitions (Fadilah et al. 2024). NLP techniques, such as *anchoring*, can help these athletes manage stress, maintain focus, and cultivate a resilient, positive mindset. Research by Erniza & Hamidah (2014) demonstrates that NLP significantly enhances

cognitive functions and reduces stress by enabling athletes to adjust their mindsets and emotional responses, thereby promoting composure and concentration during competitions.

Additionally, NLP emphasizes the use of sensory systems-visual, auditory, and kinesthetic—to create internal representations that shape athletes' behaviors (Einspruch and Forman 1985; Grosu et al. 2014; Mhanna et al. 2024). Studies indicate that NLP interventions lead to significant improvements in psychological skills, which directly influence athletic performance. For instance, Jannah (2012) found that NLP supports athletes in setting clear and specific goals, thereby improving motivation and providing direction in both training and competition, particularly benefiting 100-meter sprinters. Furthermore, NLP techniques can be tailored to individual athletes' psychological profiles and customized based on factors such as gender and personal responsiveness (Florina et al. 2015).

The core principle of NLP is *modeling*, which involves replicating the effective cognitive and behavioral patterns of high-performing individuals (Grosu et al. 2014). Despite the rapid growth of NLP research over the past four decades, comprehensive bibliometric reviews that map global research trends remain scarce. Bibliometrics is a quantitative analysis method used to measure and describe patterns within scientific literature based on publication and citation data (Apriliyanti and Alon 2017), with the aim of identifying patterns, trends, and relationships within research in a specific field (Rachmat et al. 2024). This method has proven valuable for offering a broad and detailed understanding of specific research topics (Febrianty et al., 2024).

This study seeks to assess the progression and impact of Neuro-Linguistic Programming (NLP) research over time, while identifying the central themes, influential researchers, key institutions, and leading countries contributing to NLP's advancement. The findings are intended to offer fresh insights into the future direction and potential applications of NLP research, aiding researchers and practitioners in comprehending NLP concepts and their global applications. This understanding can facilitate the effective application of NLP within the domain of sports psychology. Through the use of bibliometric co-citation analysis, cartographic mapping, and content analysis of existing literature, this article aims to bridge the research gap in NLP meta-analyses.

METHOD

Materials

This research presents a bibliometric analysis of Neuro-Linguistic Programming (NLP) using data sourced from the Scopus literature database. Scopus is among the largest curated databases of abstracts and citations, offering extensive global and regional coverage of scientific journals, conference proceedings, and books. Only high-quality data are indexed through a stringent content selection process and periodic reassessment by an independent Content Selection and Advisory Board (Baas et al. 2020).

According to literature on bibliometric methodologies, Zupic & Čater (2015) outline a systematic five-step approach for science mapping using bibliometric analysis, which includes study design, data collection, data analysis, data visualization, and interpretation. Data for this study were gathered from Scopus on September 27, 2024, using the keywords "neuro-linguistic" and "programming." The collected publications span the period from 1981 to 2024 to encompass relevant historical data, given that NLP research remains a developing field. To ensure comprehensive coverage, the search encompassed NLP research across multiple disciplines. Therefore, Scopus was selected as the primary database for this bibliometric analysis.

Procedures and Data Analysis

In the initial stage, bibliographic data from 280 publications were extracted from Scopus and saved in CSV (comma-separated values) format. This dataset includes details such as author names, institutional affiliations, article titles, keywords, abstracts, and citation metrics. The CSV file was processed using Excel and subsequently imported into VOSviewer software for network mapping and data visualization. VOSviewer, a tool designed for bibliographic data analysis, enables the identification of author collaboration patterns, emerging research trends, and keyword networks (McAllister, Lennertz, and Atencio Mojica 2022), offering a user-friendly interface for interpretation (van Eck and Waltman 2017).

The final step in the bibliometric study involves interpreting the visualizations. Two critical aspects should be noted during this phase. First, bibliometric methodology differs from traditional literature reviews, meta-analyses, and systematic reviews by focusing on comprehensive analyses that reveal the broader structure of academic literature, uncover relationships and influences among studies, and offer novel perspectives to advance knowledge within the field. Second, the interpretation of

bibliometric results should be conducted objectively and not solely based on alignment with previous research findings. Nevertheless, retrospective analyses of related fields can help contextualize past developments and inform potential future research directions. Therefore, careful consideration is required during the interpretation phase.

RESULT

Annual Publications

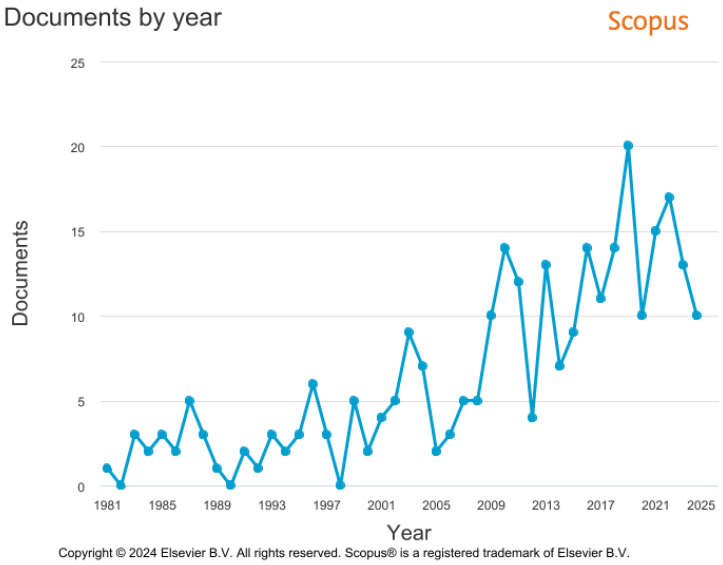

Fig 1. Research Productivity Based on the Number of Documents Published Per Year

This graph provides an overview of research productivity by illustrating the number of documents published annually, with an emphasis on significant growth in recent decades. The graph's pattern shows clear fluctuations, with certain years experiencing a rapid increase in the number of publications, followed by temporary declines before rising again. From 1981 to the mid-1990s, the number of published documents remained below five per year, indicating relatively low publication activity. In the early 2000s, there was a slight increase, with annual publications ranging between five and ten documents. After 2010, a notable surge in publication numbers occurred, displaying continuous fluctuations but with an overall upward trend. The peak occurred around 2018, with more than 20 documents published. After 2018, publication numbers exhibited fluctuations, maintaining relatively high figures despite a slight decline in recent years. Overall, the long-term trend in this graph demonstrates significant growth

in publication numbers, particularly from around 2005 onward. More detailed information on the most frequently sought documents each year can be seen in the subsequent journal graph.

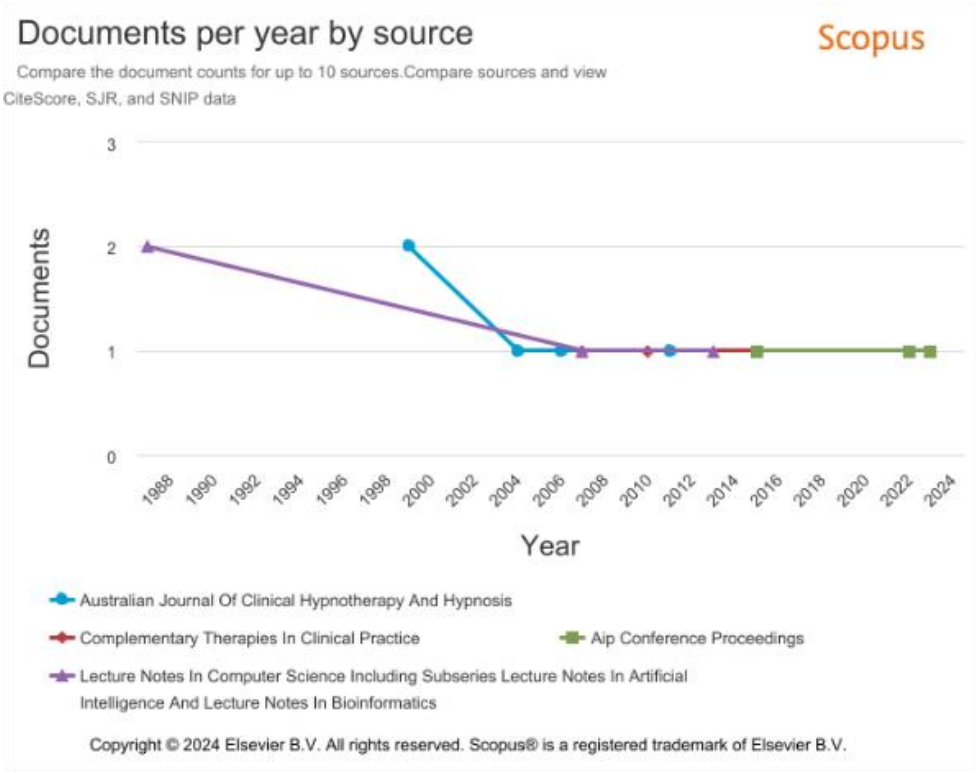

Fig 2. Annual Documents by Source

This figure shows the number of documents published per year categorized by source (journals). The primary sources of publication include the Australian Journal of Clinical Hypnotherapy and Hypnosis, Complementary Therapies in Clinical Practice, AIP Conference Proceedings, and Lecture Notes in Computer Science. Publications in the Australian Journal of Clinical Hypnotherapy and Hypnosis peaked in 2000 but subsequently declined. During 2000, academic and clinical interest in hypnotherapy was influenced by broader trends in mental health, alternative therapies, and integrative medicine. This journal covers topics such as chronic pain management using hypnosis and biofeedback, hypnotherapy for alcohol addiction, cognitive-behavioral approaches integrated with hypnosis for irritable bowel syndrome, and transference issues in clinical hypnosis (The Australian Journal of Clinical Hypnotherapy & Hypnosis 2024). Therefore, this journal serves as a platform for researchers to publish their findings.

Fig 3. Overview of the Top 10 Articles

This figure displays a bar chart titled "Top 10 Articles," listing the most popular or frequently cited articles, ranked by the number of references or citations. The horizontal axis represents the number of citations or references for each article, with values ranging from 0 to 90. From the chart, it is evident that the article titled *"Machine Learning Approach to Personality Type Classification Based on Neuro-Linguistic Programming (NLP)"* is the most frequently cited. This article holds significant influence due to its relevance to technological trends, where machine learning is employed to predict personality types based on the Myers–Briggs Type Indicator (MBTI). This approach has garnered attention from many researchers, particularly those in psychology, computer science, and social sciences. Furthermore, combining traditional MBTI methods with machine learning technology offers an innovative perspective, enhancing the exploration of connections between psychology and artificial intelligence.

Scopus Analysis by Authors

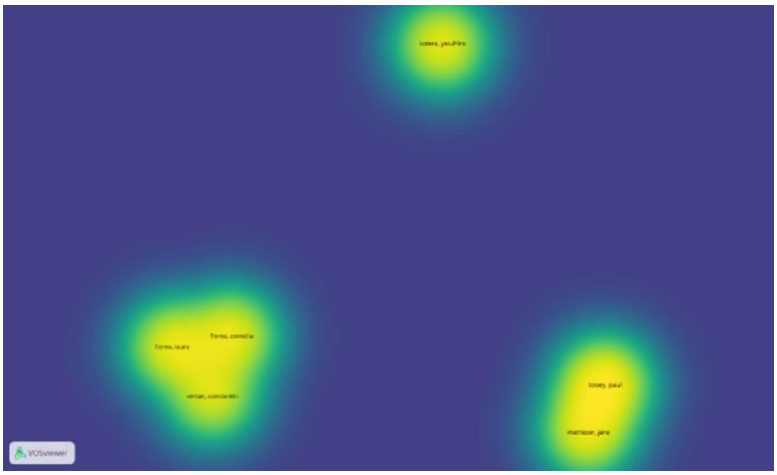

Fig 4. Visualization of Author Collaboration Density Map

The figure above presents a density map visualization of author collaboration using VOSviewer. This visualization illustrates three distinct groups of authors engaged in scientific collaboration. The group comprising Corneliu Florea, Laura Florea, and Constantin Vertan is the most densely connected and active in collaboration. This is indicated by the brighter yellow areas, reflecting higher collaboration intensity compared to other author groups. Paul Tosey and Jane Mathison also display yellow areas, though less intense than the first group, suggesting they are active collaborators but to a lesser extent. In contrast, Yasuhiro Kotera shows a more independent working style, as evidenced by the lighter green area. Overall, this visualization highlights the varying patterns of collaboration among authors, even though the specific field of research is not explicitly mentioned.

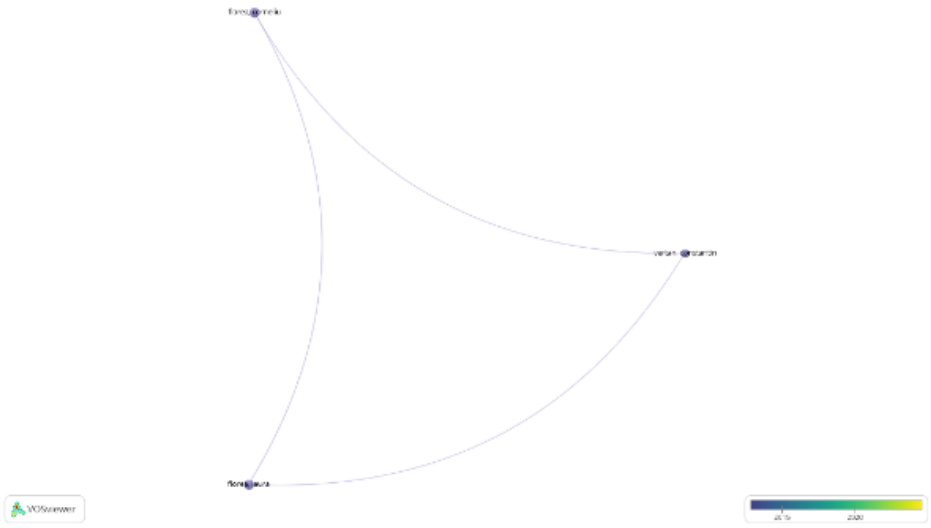

Fig 5. Visualization of Co-authorship Network

The figure above shows a co-authorship network visualization produced using VOSviewer, featuring three authors: Corneliu Florea (7 documents), Laura Florea (7 documents), and Constantin Vertan (6 documents). These authors are interconnected, indicating collaboration or co-authorship across several scientific articles. The colors in the visualization range from dark blue (2015) to light yellow (2020), suggesting that the articles involving these three authors were likely published within this time frame. The thin connecting lines imply collaboration on a limited number of articles rather than a large volume of joint publications. Overall, this network depicts collaboration patterns among these primary authors, with Corneliu Florea serving as a significant hub of collaboration.

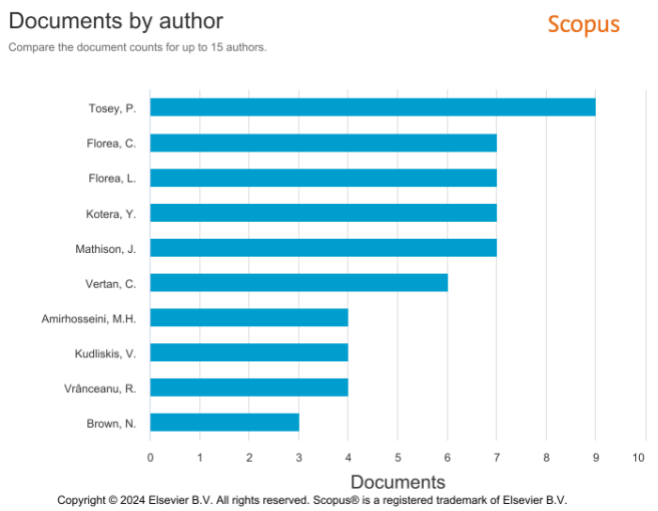

Fig 6. Visualization of Document Output by Various Authors

The figure above, derived from Scopus data, shows a visualization of the number of documents published by various authors, reflecting their research productivity. The visualization compares the document output of ten authors: Paul Tosey, Corneliu Florea, Laura Florea, Yasuhiro Kotera, Jane Mathison, Constantin Vertan, M.H. Amirhosseini, V. Kudliskis, R. Vrânceanu, and N. Brown. In connection with the previous visualizations, Paul Tosey, as the author with the highest number of publications, can be interpreted as an active contributor to the relevant research field, though he collaborates mainly with Jane Mathison. Similarly, Corneliu Florea, Laura Florea, and Constantin Vertan, identified in the earlier figures, also show significant publication output, indicating that their collaboration is reflected in the volume of documents they have published.

Scopus Analysis by Affiliation

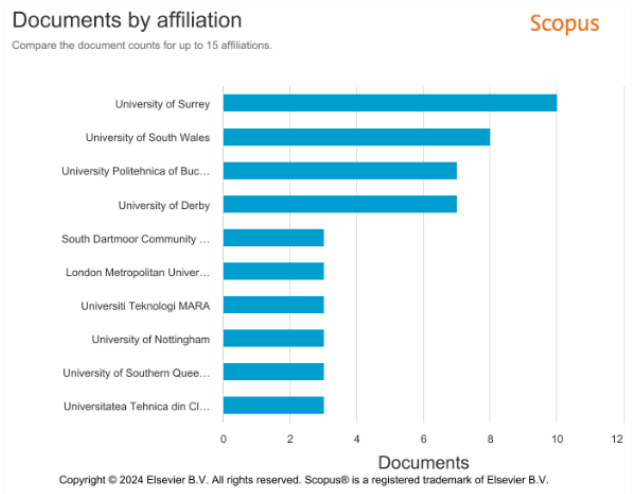

Fig 7. Number of Documents Published by Institutional Affiliation

This figure illustrates the number of documents published according to educational institution affiliations. The University of Surrey ranks highest, with nearly 10 documents published. The University of South Wales and the University Politehnica of Bucharest also show significant contributions, each with around 8 documents. Other institutions, such as the University of Derby, South Dartmoor Community College, and London Metropolitan University, contribute between 5 and 6 documents. Additionally, institutions like Universiti Teknologi MARA and the University of Nottingham each contribute approximately 4 to 5 documents. Overall, the figure highlights a strong concentration of research from universities in the United Kingdom and Europe. These institutions are recognized for their high standards in education and research and benefit from substantial funding from governmental bodies, industries, and international organizations. Furthermore, international collaborations help expand research networks and enhance the impact of their findings.

Scopus Analysis by Country

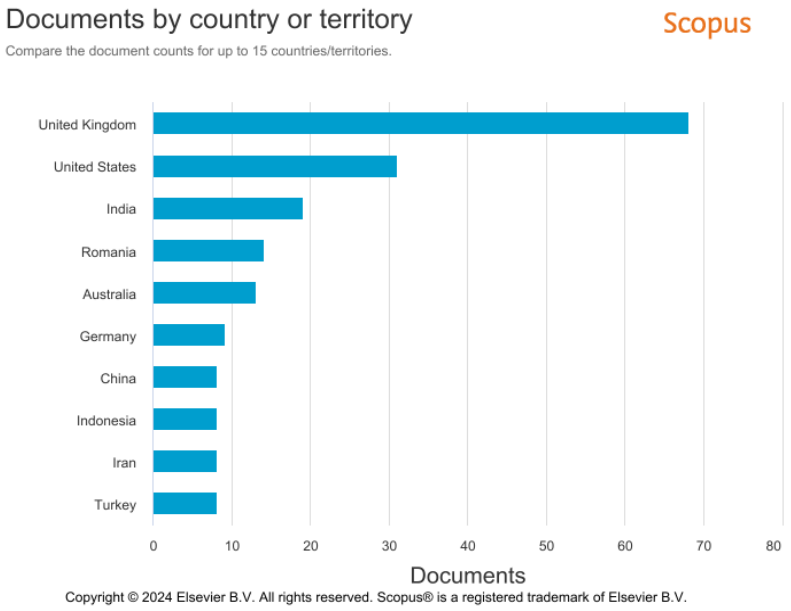

Fig 8. Number of Documents Published by Country or Region

This figure shows the number of documents published by country or region. The United Kingdom leads with approximately 70 documents, followed by the United States with around 50 documents. Countries such as India, Romania, and Australia also make notable contributions, each with between 20 and 30 documents. Meanwhile, countries like Indonesia, China, and Iran contribute between 10 and 15 documents. These findings

indicate that the majority of contributions come from developed nations, with the United Kingdom being the primary contributor to scientific publications.

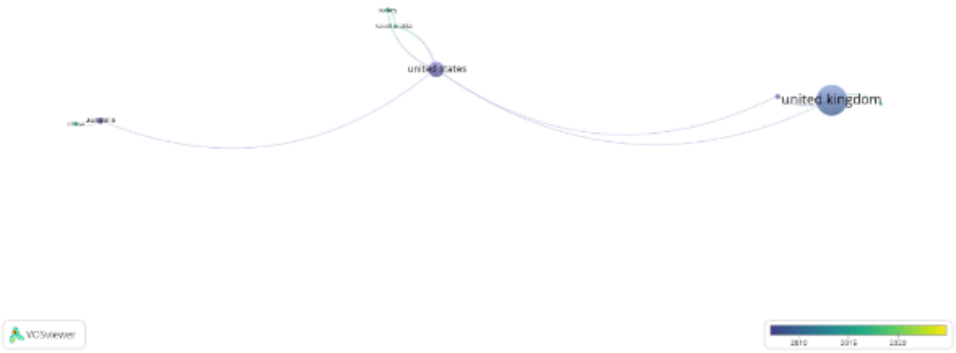

Fig 9. International Research Collaboration Networks

This figure represents the international collaboration networks involved in research. Several countries, including the United States, the United Kingdom, Turkey, Saudi Arabia, China, and Australia, participate in these networks. The United States and the United Kingdom serve as central hubs, exhibiting significant collaborative links with other countries. Turkey and Saudi Arabia show smaller collaborative networks but maintain active engagement with the United States.

Scopus Analysis by Funding Sponsor

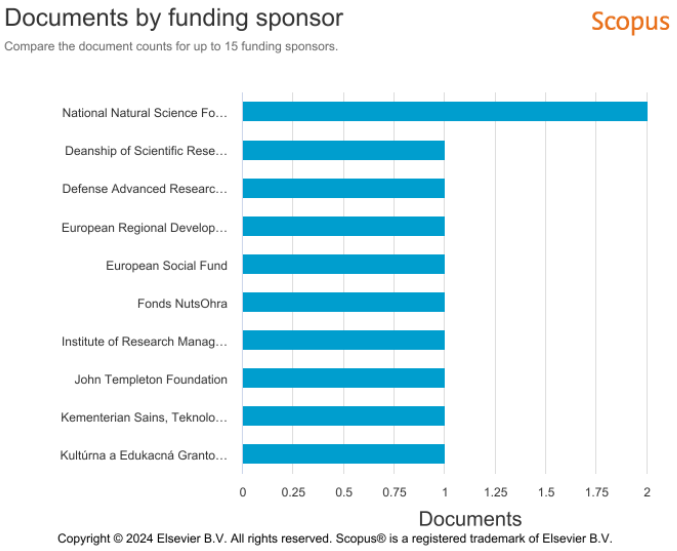

Fig 10. Number of Documents Published by Funding Sponsor

This figure displays the number of documents published based on funding sponsors. The leading funding sponsor is the National Natural Science Foundation, which funded the highest number of documents, totaling two. The sources of funding are diverse, spanning national and international research bodies, which reflects global cooperation in supporting research across various fields. The primary funding institutions predominantly originate from the United States and Europe.

Scopus Analysis by Document Type

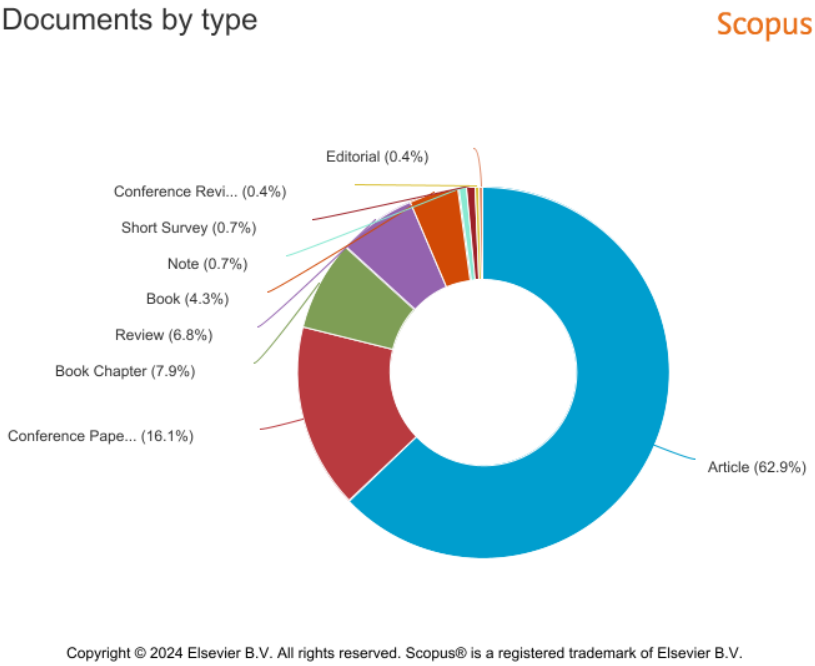

Fig 11. Distribution of Documents by Type in the Scopus Database

This figure presents the distribution of documents by type in the Scopus database. Scientific articles are the most prevalent document type, accounting for 62.9% of the total publications. This indicates that the majority of indexed research outputs are articles published in academic journals. Conference papers rank second, comprising 16.1%, signifying the importance of conference presentations in scholarly communication. Book chapters also contribute significantly, making up 7.9% of the total. Therefore, most of the documents in Scopus are journal articles and conference papers. Other types, such as reviews, book chapters, and books, contribute less, while editorials and notes are rarely published.

Scopus Analysis by Subject Area

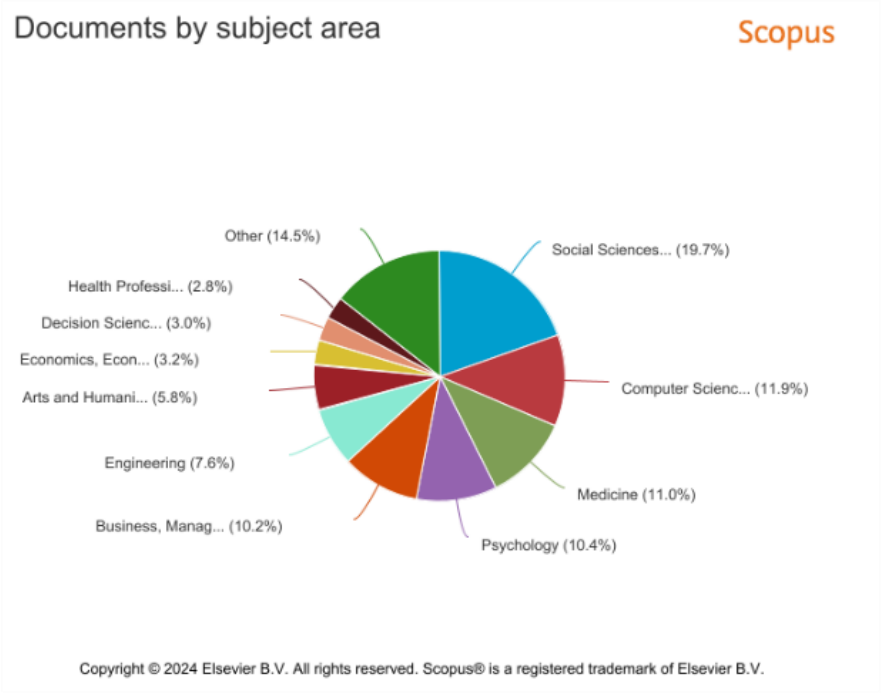

Fig 12. Distribution of Documents Published by Subject Area

This figure shows the distribution of documents by subject area within the Scopus database. The social sciences and computer science fields dominate, comprising 19.7% and 11.9% of publications, respectively. Although psychology and medicine also contribute significantly, sports-related research is not directly represented in the categories provided. NLP is predominantly utilized in social sciences and computer science, where it supports the development of natural language processing technologies such as chatbots, text analysis, and linguistic data processing. In the social sciences, NLP is applied to analyze large datasets from social media or public communication to understand social dynamics and group behavior. In psychology and medicine, NLP is often associated with intervention techniques.

Consequently, NLP's applications are more advanced in the social sciences and computer science due to their broad scope and large-scale data analysis capabilities. In contrast, its use in psychology and medicine tends to be limited to intervention techniques. Therefore, fields like sports psychology remain largely unexplored. Given NLP's focus on the connections between thought patterns, language, and behavior, it holds significant potential for enhancing athletic performance. The data suggest that while NLP is widely applied in psychology and social sciences, its application in sports remains

underdeveloped and warrants further research. This presents a valuable opportunity to implement NLP in sports, particularly for mental training and improving athlete performance through mindset and communication enhancements

DISCUSSION

Based on an analysis of article titles published over the past decade (2014–2024), the term *"neuro-linguistic programming"* and its variations, such as *"NLP,"* appear frequently. This indicates that a substantial amount of research related to Neuro-Linguistic Programming has been conducted between 1981 and 2024. The term *"programming"* also appears often, potentially referring to NLP or other programming methods used across various research contexts. Additionally, the frequent occurrence of the term *"learning"* highlights a strong focus on topics related to education, whether in the context of human learning, machine learning, or educational programs. The words *"analysis"* and *"based"* suggest that many articles perform data-driven or model-based analyses within different scientific approaches. Overall, neuro-linguistic programming, along with themes related to learning and analysis, appears to dominate research trends over the past decade in Scopus, reflecting a strong interest in developing new methodologies and applying NLP across various fields of study. However, the application of NLP in the realm of sports remains limited, despite emerging studies highlighting its potential to enhance athletic performance.

Several studies emphasize the importance of NLP research in the context of sports. For instance, Khurana et al (2023) demonstrated that NLP helps athletes manage pressure, improve focus, and develop a positive mindset. Techniques such as anchoring and visualization enable athletes to better control their emotions and responses during competitions Khurana et al (2023). NLP-based modeling can further enhance athletes' self-awareness and mental clarity, which directly impacts their on-field performance (Grosu et al. 2014).

Psychology plays a crucial role in sports by helping athletes overcome stress, build confidence, and strengthen their concentration skills (Handayani 2019; Kusuma et al. 2024). Competitive sports often produce high levels of stress. NLP techniques such as *reframing* (viewing situations from different perspectives) and *rapport-building* with coaches or teams can assist athletes in managing stress and anxiety (Barber 2021; Chang

2023). Additionally, anchoring and visualization techniques are effective in reducing pre-competition anxiety and maintaining focus on goals (Akbarzadeh, Vaezmousavi, and Zareian 2018; Harris 2024). Research by Boughattas et al. (2022) indicates that NLP helps athletes manage cognitive and somatic anxiety, enhance physical self-esteem, and develop fundamental mental skills such as confidence and focus, ultimately improving their sports performance during competitions. Furthermore, Erniza dan Hamida (2014) found that NLP training reduces competitive stress among student-athletes, highlighting its importance in mental development and competition preparation, which can lead to positive changes in athletic performance.

Neuro-Linguistic Programming (NLP) has also been shown to improve workplace interaction and performance (Rohach and Wisecup 2022). In sports, NLP can enhance communication effectiveness between coaches and athletes, which is crucial for successful training. Coaches who understand the most effective communication methods tailored to athletes' mindsets can maximize training potential.

Based on these studies, it can be concluded that NLP training reduces stress and anxiety while enhancing self-esteem, self-confidence, and focus. The urgency of research in this field is underscored by the need for effective tools to maximize athletes' mental potential, given the psychological pressures they face in training and competition. NLP methodologies focus on goal setting and improving athletes' mental state management (Boughattas, Ben Salha, and Moella 2022). Integrating NLP into sports training programs offers substantial benefits for the development of professional athletes. This suggests that NLP research in sports holds significant potential for further exploration, particularly in optimizing athletes' mental performance and improving their mental health.

Although NLP has been proven effective in fields such as education, therapy, and business, its application in sports remains limited. As mental aspects of sports gain increased attention, nlp presents significant potential to help athletes manage stress, enhance focus, and build confidence. The application of nlp in sports in indonesia has the potential to significantly improve athletes' performance and mental readiness. This is particularly relevant given indonesia's regular participation in international sports events such as the sea games, asian games, and the olympics. Through nlp, athletes can develop a champion’s mindset, enhance confidence, and effectively manage high-pressure situations during competitions.

CONCLUSION

Based on data analysis and a review of the literature, it can be concluded That Neuro-Linguistic Programming (NLP) has garnered significant attention in research over the past decade, particularly in the contexts of learning, analysis, and the development of new methodologies. Nlp demonstrates considerable potential for application in the fields of psychology and the social sciences, although its implementation in sports remains limited. This indicates that there are substantial opportunities for applying nlp in sports, especially in the context of mental training and enhancing athletic performance.

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