



A Bibliometric Analysis Of Psychological Measurement In Sports: Mapping Global Trends, Collaborations, Thematic Developments

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Psychological measurement tools are fundamental in sports psychology for assessing mental toughness, performance anxiety, motivation, and resilience in athletes. Despite increasing research in this field, a comprehensive bibliometric analysis of global trends, collaboration networks, and thematic developments remains limited. This study conducts a bibliometric analysis of 489 Scopus-indexed articles published between 1977 and 2025 to examine publication trends, key contributors, and thematic structures. Results indicate that the United States (32.5%), United Kingdom (15.8%), Germany (9.6%), and Canada (7.3%) are the leading contributors, with emerging research from Slovenia (2.1%) and Uruguay (1.7%). Institutional collaborations highlight strong interdisciplinary ties, particularly between the Center for Addictive Disorders and the Faculty of Medicine and Health. Co-authorship analysis identifies Nikos Ntoumanis (98 publications) and Jennifer Cumming (76 publications) as pivotal researchers, while citation network analysis highlights influential clusters led by Joan L. Duda (4,532 citations) and Andreas Ivarsson (3,215 citations). Bradford's Law identifies *Psychology of Sport and Exercise* and *Journal of Applied Sport Psychology* as core journals. Thematic mapping reveals that mental toughness (18.4%) and resilience (14.7%) are dominant topics, while psychometrics (6.3%) and competitive anxiety (5.1%) remain underexplored. These findings provide strategic insights for enhancing global research collaboration, bridging psychological theory and practice, and guiding future research directions in sports psychology.

Kata Kunci: Sports psychology; psychological measurement; bibliometric analysis; psychometric tools; thematic mapping

INTRODUCTION

Sport psychology plays a crucial role in understanding the psychological factors that influence athletes' performance and well-being. Concepts such as mental toughness, performance anxiety, motivation, and resilience are key in helping athletes manage competitive pressure and maintain optimal performance (Ramolale, Malette, & Ju, 2021; Vella-Fondacaro & Romano-Smith, 2023). To assess these aspects, various psychological measurement tools have been developed, including the Mental Toughness Questionnaire (MTQ) and the Sport Anxiety Scale (SAS) (Parra-Martinez & Wai, 2023). These instruments allow for a systematic analysis of athletes' mental conditions, enabling more effective psychological interventions.

However, despite the widespread use of these tools in research and sports practice, there remain limitations in systematically mapping how they are applied globally across different sports disciplines and cultural contexts. This results in a lack of understanding regarding the extent to which these tools have been adapted and validated across diverse athletic populations. Moreover, although many studies focus on the development and validation of psychological measurement tools, most remain restricted to specific populations without considering their broader applicability (Zhou et al., 2022). The absence of systematic analyses of publication trends and scientific collaboration patterns further complicates the understanding of how these tools evolve and how research in this field is geographically distributed (Xu et al., 2024).

Over the past few decades, there has been a significant increase in publications related to psychological measurement tools in sport psychology, reflecting a growing emphasis on the mental aspects of athletic performance (Liu, Wassell, Liu, & Zhang, 2022). However, without a comprehensive analysis, identifying key scientific contributions, the most active countries and institutions, and the evolution of research themes remains a challenge. Additionally, the shifting paradigm in sport psychology, which increasingly highlights athletes' mental well-being, raises concerns about the extent to which existing measurement tools can accurately capture athletes' psychological dynamics and whether further development is necessary (Brockett et al., 2024). Therefore, a systematic mapping of

publication trends, academic collaboration networks, and thematic distribution is crucial for identifying research gaps and shaping future developments.

This study introduces a novel approach by applying bibliometric analysis to map publication trends, academic collaboration patterns, and thematic distribution in research on psychological measurement tools within sport psychology. Unlike previous studies that primarily focused on the development and validation of individual measurement tools, this research aims to provide a broader perspective on how these tools are utilized and how they evolve across various studies (Azizan & Rahayu, 2024). Using Scopus data, this study identifies publication growth, researcher and institutional collaboration networks, and thematic trends that reflect the evolution of research in this field. This approach will uncover key scientific contributions and guide future studies in developing more accurate, valid, and relevant measurement tools for various athlete populations (Parra-Martinez & Wai, 2023).

The study aims to conduct a bibliometric analysis of research on psychological measurement tools in sport psychology to understand publication trends, academic collaboration patterns, and thematic distribution in this domain. The analysis includes identifying leading countries and institutions and evaluating collaboration networks among researchers to determine the contributions of individual scholars and academic groups in advancing the field. Additionally, this study analyzes citation patterns to assess the academic impact of specific research and applies Bradford's Law to evaluate literature distribution, identifying the leading journals in the field. Thematic mapping is also conducted to reveal dominant topics, emerging research trends, and underexplored areas in this discipline.

Furthermore, this study explores the relationships between topics using a Conceptual Structure Map based on Multiple Correspondence Analysis (MCA) to understand the connections between psychological measurement methods and their applications in enhancing athletic performance. By doing so, this research is expected to provide broader insights into the development of psychological measurement studies in sport psychology, supporting the advancement of more effective measurement tools for athletes at various levels of competition (Checa, Bohórquez, Arnau, & Tomás, 2023).

METHODOLOGY

This study adopts a quantitative approach based on bibliometric analysis to identify research trends, academic collaboration patterns, and thematic distribution in sport psychology studies, particularly those related to psychological measurement tools (Liu et al., 2022). Bibliometric analysis is utilized to evaluate publication growth, researcher collaboration networks, and the dominant themes emerging in this field (Zhou et al., 2022).

The data is obtained from the Scopus database using the following search query: TITLE-ABS-KEY (("psychological test" OR "psychometric tool" OR "assessment scale" OR "psychological instrument" OR "questionnaire" OR "psychological evaluation") AND ("athlete" OR "athletes" OR "elite athletes" OR "competitive athletes" OR "sports participants") AND ("sports psychology" OR "mental toughness" OR "performance anxiety" OR "motivation in sports" OR "resilience in athletes")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")), which initially yielded 577 documents.

After filtering based on the publication period from 1977 to 2025, 489 relevant documents were selected for further analysis. The collected data was extracted in CSV format and processed using OpenRefine to clean metadata, remove duplicates, and filter out publications that did not meet the research criteria. This step aimed to enhance the accuracy of bibliometric analysis by ensuring that only valid and relevant documents were included in the study (Abed et al., 2023; Akhmad, 2025).

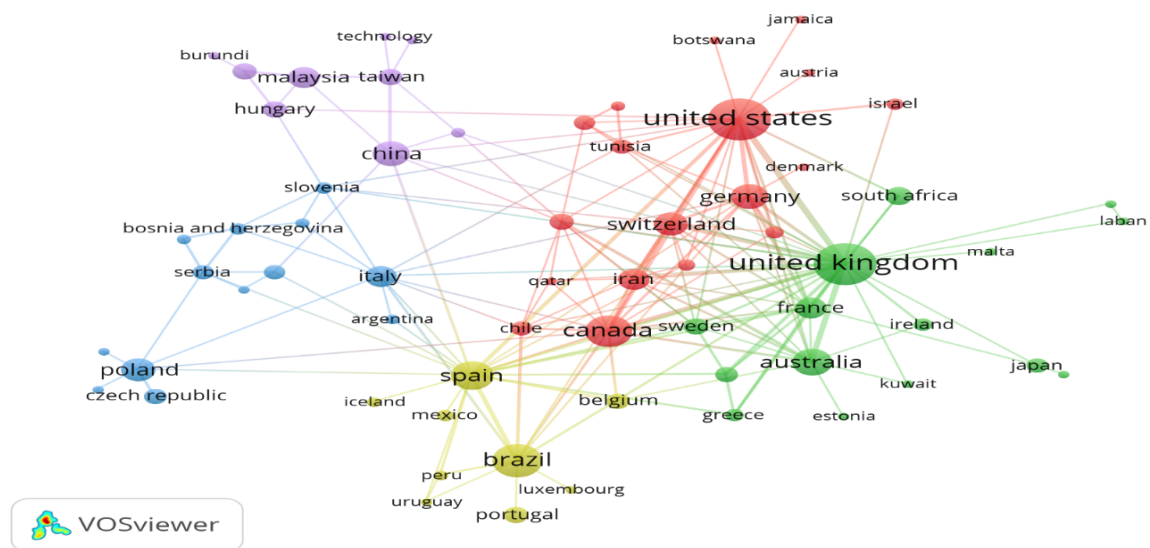
Table 1. Inclusion and exclusion criteria

Category	Criteria
Inclusion	- Final, full-text journal articles.
Exclusion	- English-language documents to ensure consistency in analysis within the global academic community. - Studies explicitly discussing psychological measurement tools in sport psychology, including mental toughness, performance anxiety, sports motivation, and athlete resilience - Articles with complete metadata, including title, abstract, keywords, citation information, and author affiliations for bibliometric analysis.
Exclusion	- Articles from non-academic journal sources (e.g., conference proceedings, books, editorials, or technical reports) that have not undergone rigorous peer review. - Early access publications or those without a final version to ensure data quality and stability. - Articles without direct relevance to athletes or sports participants, such as general psychology research without a specific application in sports. - Documents with incomplete metadata, inaccessible content, or duplicates within the database, which could affect the validity of the analysis.

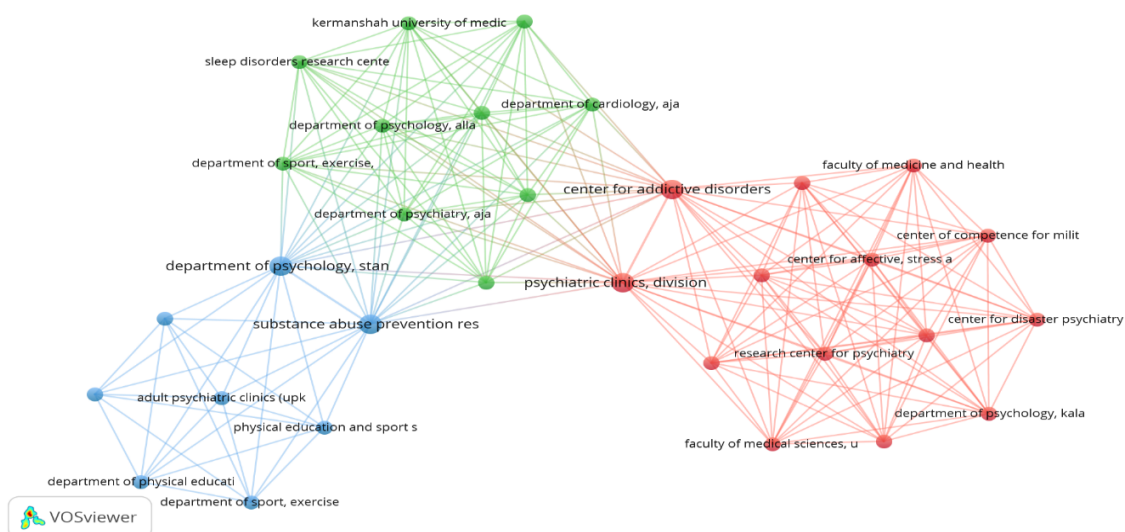
Table 2. Applications of bibliometric analysis

Application	Main Function	Usage in Research
Bibliometrix R-package	R-based bibliometric analysis	Systematically processes bibliometric data, calculates publication metrics (e.g., number of documents, annual growth, H-Index), and identifies research trends and academic collaboration patterns
Biblioshiny	Visual interface of Bibliometrix	Visualizes publication statistics, generates thematic maps, conducts factor analysis using Multiple Correspondence Analysis (MCA), and identifies key literature sources based on Bradford's Law.
VOSviewer	Mapping collaboration and citation networks	Analyzes relationships among authors, institutions, and countries through co-authorship and co-citation networks, and visualizes scientific collaboration to understand academic cooperation patterns.

RESULTS AND DISCUSSION

**Figure 1. Visualization of international collaboration network based on bibliometric data**

The international collaboration network in sport psychology is primarily dominated by the United States, the United Kingdom, Germany, and Canada, with the U.S. serving as the central hub. Germany and Canada act as strategic intermediaries, facilitating global research connections, while the United Kingdom and France strengthen intercontinental collaborations. In East Asia, China, Malaysia, and Taiwan emerge as leading contributors, reflecting the region's growing research presence in the field.

**Figure 2. Visualization of institutional collaboration network**

The research collaboration network in mental health and psychiatry involves key institutions such as the Center for Addictive Disorders and the Department of Psychiatry. The Faculty of Medicine and Health and the Research Center for Psychiatry focus on clinical psychiatry and military psychology, contributing to specialized research in these fields. Cross-cluster interactions strengthen strategic connectivity, facilitating interdisciplinary collaboration and advancing the study of mental health through shared expertise and resource integration. This network highlights the institutional landscape and the key players driving mental health research.

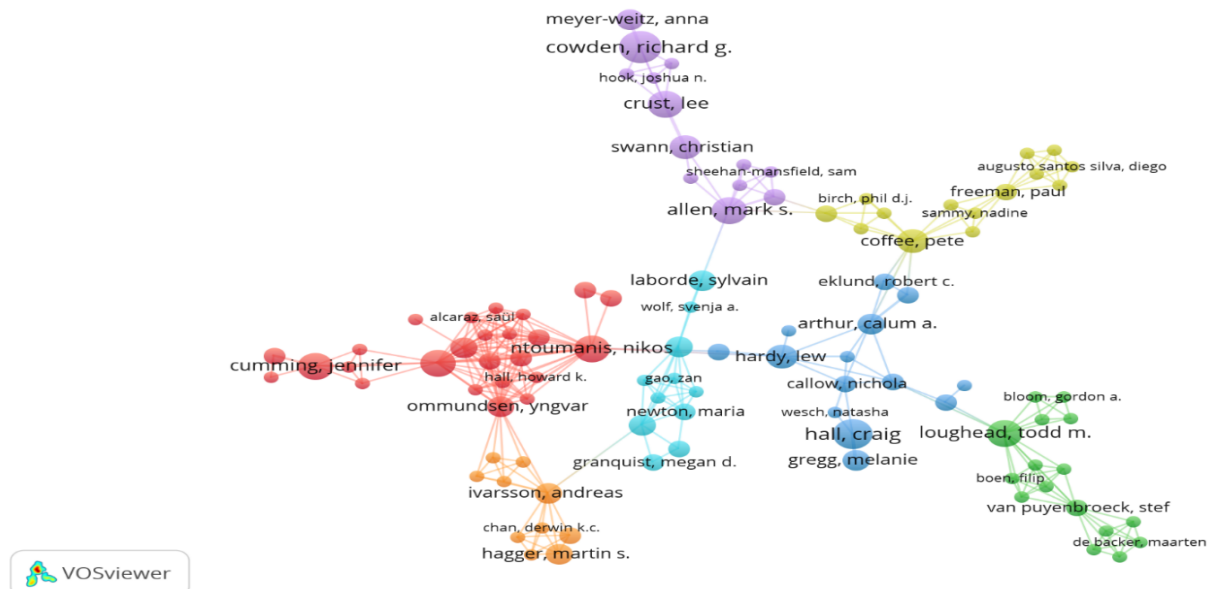


Figure 3. Visualization of researcher collaboration network in scientific publications

The research collaboration network in sport psychology highlights co-authorship relationships within key research clusters. Ntoumanis and Cumming are integrated into studies on sport psychology and athlete motivation, while Hagger and Ivarsson focus on social psychology. Hall and Gregg specialize in sports skills research, with Ntoumanis and Hagger serving as bridging figures connecting different clusters.

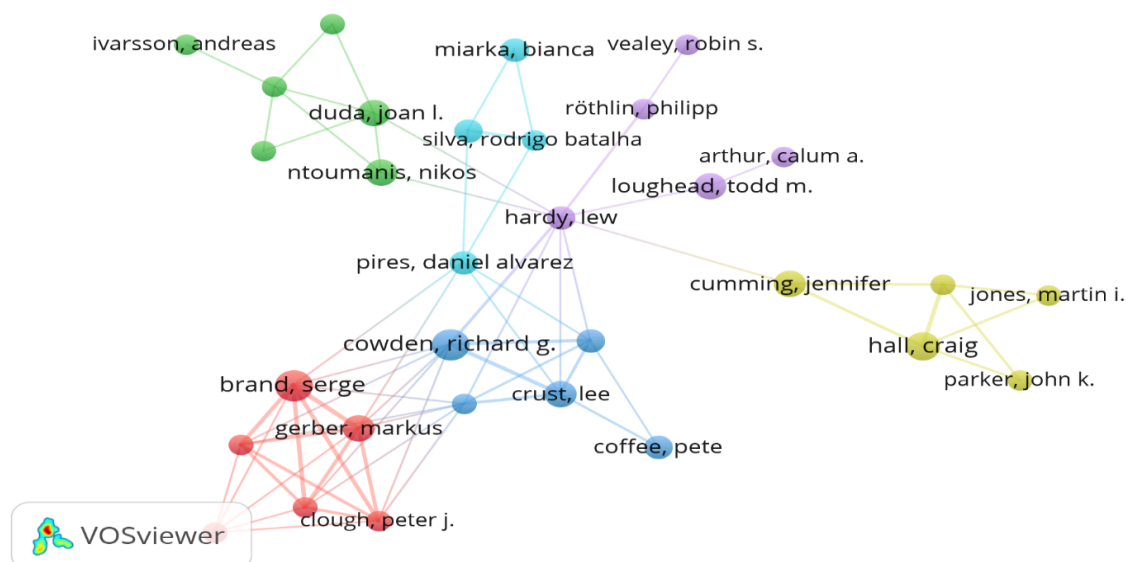


Figure 4. Visualization of author citation network based on citation patterns

The citation network in sport psychology research reveals key clusters. Ntoumanis, Duda, and Ivarsson dominate studies on motivation and behavioral interventions, while Brand and Gerber focus on mental health. Hall and Cumming examine athlete motivation, with Cumming and Hardy acting as bridging figures that strengthen research connections across clusters.

Table 3. Top ten most global cited documents

No	Paper	Total Citations	TC per Year	Normalized TC
1	REINBOTH M, 2006, PSYCHOL SPORT EXERC	352	17,60	3,47
2	MAHONEY MJ, 1977, COGN THER RES	349	7,12	1,00
3	HOLLEMBEAK J, 2005, J APPL SPORT PSYCHOL	226	10,76	2,58
4	CALLOW N, 2009, J APPL SPORT PSYCHOL	190	11,18	2,45
5	CONNAUGHTON D, 2008, J SPORTS SCI	187	10,39	4,17
6	NIXDORF I, 2016, FRONT PSYCHOL	155	15,50	5,31
7	SHEARD M, 2009, EUR J PSYCHOL ASSESS	145	8,53	1,87
8	ALLEN MS, 2011, J SPORTS SCI	140	9,33	2,76
9	ARDERN CL, 2012, J SCI MED SPORT	138	9,86	3,45
10	IVARSSON A, 2013, J SPORT REHABIL	138	10,62	3,06

The ten most highly cited documents demonstrate significant contributions to sport psychology. Reinboth M (2006) has 352 citations, followed by Mahoney MJ (1977) with 349 citations. Nixdorf I (2016) stands out with the highest Normalized TC (5.31). Other articles contribute to mental health and the development of athletic performance.

Table 4. Table top ten authors sources local impact

No	Author	H Index	G Index	M Index	Total Citation	No of Publication	Publication Year
1	COWDEN RG	6	8	0,5	178	8	2014
2	PIEPIORA P	5	8	1	96	8	2021
3	GREGG M	4	4	0,2	119	4	2006
4	ALLEN MS	3	3	0,2	191	3	2011
5	CHAN DKC	3	3	0,2	162	3	2011
6	CRUST L	3	3	0,188	120	3	2010
7	GUCCIARDI DF	3	3	0,176	142	3	2009
8	NICHOLLS AR	3	3	0,158	163	3	2007
9	AJILCHI B	2	2	0,286	44	2	2019
10	AKBAR A	2	2	0,667	20	2	2023

The ten most influential authors in sport psychology have been identified based on citation impact and productivity. Cowden RG has an H-Index of 6 with 178 citations, while Piepiora P demonstrates rapid growth. Gregg M, Allen MS, and Chan DKC contribute consistently, whereas Akbar A stands out with rapid growth since 2023.

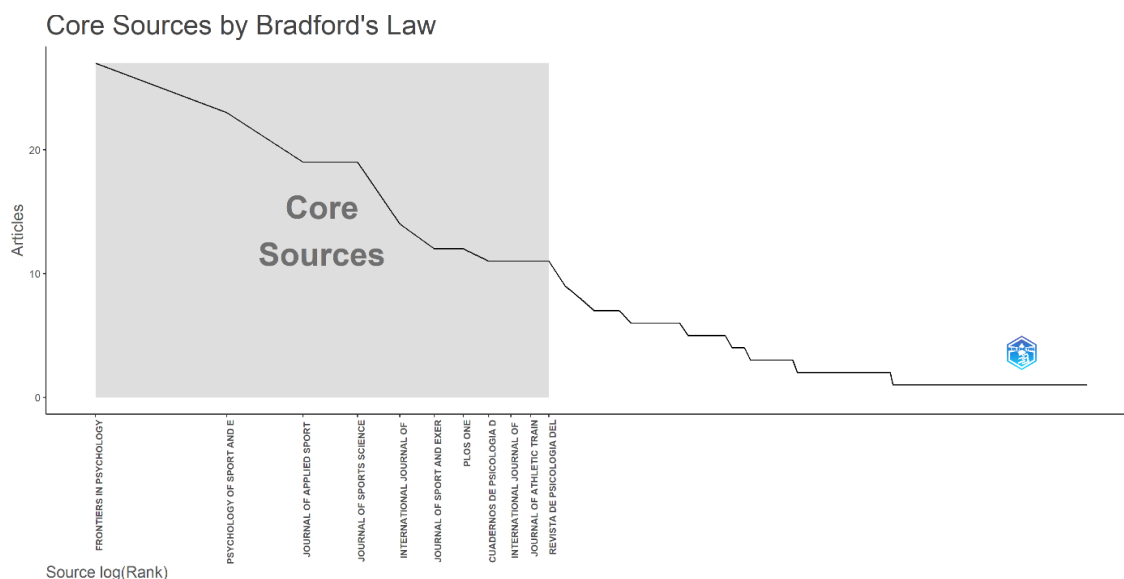


Figure 5. Distribution of core sources based on Bradford's Law

The graph illustrates the distribution of core sources in sport psychology research according to Bradford's Law. Psychology of Sport and Exercise, Journal of Applied Sport Psychology, and Journal of Sports Science dominate the field. Publications outside the core journals decline significantly, reinforcing the key role of certain journals in the dissemination of scientific research

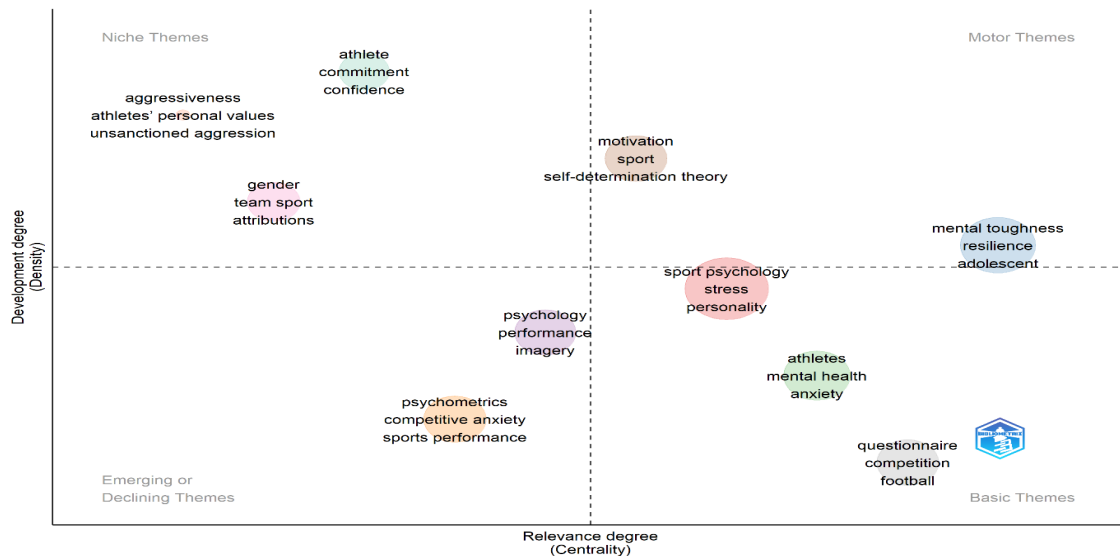


Figure 6. Thematic map, based on author's keywords

The Strategic Diagram maps sport psychology research themes based on relevance and development. Mental toughness and resilience are rapidly evolving, while athlete commitment remains limited. Basic themes such as competition require further exploration. Psychometrics and competitive anxiety are undergoing shifts. Sport psychology serves as the central link connecting various research themes.

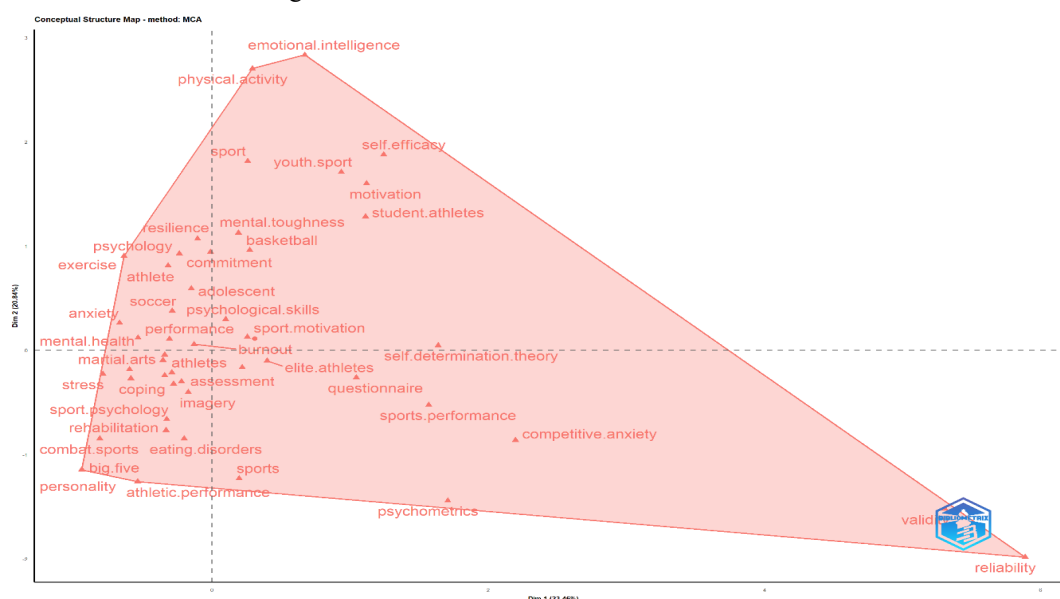


Figure 7. Factorial analysis of the relationships between various key concepts using Multidimensional Scaling (MDS)

This map visualizes the conceptual relationships in sport psychology research using Multiple Correspondence Analysis (MCA). Sports performance and competitive anxiety bridge theory and application, while sport motivation and mental toughness integrate various research aspects. Validity and psychometrics form the foundation of technical studies, guiding researchers in determining strategic research directions.

DISCUSSION

The international collaboration network in sport psychology is dominated by the United States, the United Kingdom, Germany, and Canada. The U.S. serves as the central hub, while the U.K. connects Europe and the Asia-

Pacific region. Brazil, Spain, and Portugal collaborate regionally, whereas China, Malaysia, and Taiwan lead innovation in East Asia (Ayala, Nelson, Bartholomew, & Plummer, 2022; Liu et al., 2022). Countries such as Slovenia and Uruguay, though still on the periphery of the network, have the potential to expand collaborations in the future. This visualization provides strategic insights for researchers in selecting research partners and for policymakers in designing evidence-based policies to strengthen cross-national scientific cooperation (D'Ambrosi, Kambhampati, Vishwanathan, Vaish, & Vaishya, 2023).

Institutional collaboration in mental health, psychiatry, and sport psychology demonstrates strategic relationships among various research centers (Johnson, Cormier, Kowalski, & Mosewich, 2023). The Center for Addictive Disorders and the Department of Psychiatry play key roles in studies on addiction and mental health, while the Faculty of Medicine and Health focuses on military stress. The Substance Abuse Prevention center addresses substance misuse. Cross-cluster collaborations enhance a holistic approach, supporting policy development and research funding in sport psychology (Parra-Martinez & Wai, 2023). The researcher collaboration network analysis identifies key individuals who play a crucial role in the development of sport psychology research. Researchers such as Nikos Ntoumanis and Jennifer Cumming are positioned at the core of the research network, connecting various thematic clusters focused on athlete motivation and behavioral theories. Another cluster, led by Martin S. Hagger and Andreas Ivarsson, demonstrates close collaboration in social theory and athlete behavior (Shekhar & Shah, 2023). Meanwhile, Craig Hall and Melanie Gregg contribute to the development of sports skills and psychological interventions aimed at enhancing athletic performance. These findings highlight that cross-researcher collaborations play a significant role in expanding research scope and enhancing academic relevance within the global scientific community (Ramolale et al., 2021).

The citation network reveals that Ntoumanis, Duda, and Ivarsson are influential in sport psychology, while Brand and Gerber focus on athlete mental health. Hall and Cumming study motivation and sports skills. This visualization uncovers theoretical developments and research interconnections, contributing to a comprehensive understanding of sport psychology (Akbar et al., 2023; Petersen, 2024). The ten most highly cited documents highlight key research contributions in sport psychology. Reinboth M (2006) has 352 citations, demonstrating a significant influence on psychological theories in sports. Mahoney MJ (1977) reflects long-term impact, while Nixdorf I (2016), with the highest Normalized TC (5.31), indicates strong relevance in contemporary research (Kopp, Reichert, & Jekauc, 2021). Among researchers, Cowden RG has the greatest impact, with an H-Index of 6 and 178 citations since 2014. Piepiora P and Gregg M demonstrate high productivity, while Akbar A shows promising potential since 2023.

The H-Index and M-Index analysis help identify influential researchers and track the evolution of contributions within the scientific community (Vella-Fondacaro & Romano-Smith, 2023). This information is highly valuable for identifying emerging researchers and exploring future collaboration opportunities in sport psychology. The distribution of core journals, based on Bradford's Law, indicates that Psychology of Sport and Exercise and the Journal of Applied Sport Psychology dominate the sport psychology literature. Core journals play a crucial role in the dissemination of scientific knowledge, helping researchers select relevant publications and assisting academic institutions in formulating subscription strategies to access high-quality literature (Zhang et al., 2023).

The thematic map generated from the author keyword analysis indicates that mental toughness, resilience, and adolescents are the primary themes in sport psychology research. Some topics, such as psychometrics and competitive anxiety, require further exploration (Ajilchi, Mohebi, Zarei, & Kisely, 2022). This diagram serves as a strategic guide for researchers and policymakers in allocating research resources to the most rapidly developing areas. Through this mapping, research trends can be directed toward topics with broader practical impact in theoretical development and sport psychology applications. The Conceptual Structure Map from Multiple Correspondence Analysis (MCA) shows that validity and psychometrics are closely related to methodology, while emotional intelligence and motivation focus on athlete applications. Sports performance and competitive anxiety bridge theory and practice, supporting applied research to enhance athletes' well-being and performance. (Garcia-Mas et al., 2022).

CONCLUSION

This study provides a comprehensive bibliometric analysis of global trends, institutional collaborations, and research networks in sports psychology and mental health. The key findings highlight the dominant contributions of countries such as the United States, the United Kingdom, Germany, and Canada, with emerging nations like Slovenia and Uruguay showing significant potential for future collaboration. The study also reveals the importance of interdisciplinary institutional collaborations, particularly between mental health and psychiatry departments, in advancing research in sports psychology, especially in areas like addiction and mental health.

The analysis of researcher collaboration networks underscores the pivotal roles of key figures, such as Nikos Ntoumanis and Jennifer Cumming, in bridging various research clusters, thereby strengthening both theoretical foundations and practical applications in sports psychology and motivation. Additionally, the citation network analysis identifies influential documents and authors that have shaped the development of the field, while also emphasizing the

dominance of core journals, such as *Psychology of Sport and Exercise* and *Journal of Applied Sport Psychology*, in disseminating essential research.

This study contributes to the existing body of knowledge by providing a broader understanding of the evolution of psychological measurement tools in sports psychology, highlighting emerging trends and areas that require further exploration, such as psychometrics and competitive anxiety. The findings underscore the significance of fostering international and interdisciplinary collaborations to enhance the quality and relevance of future research in sports psychology.

Future research should focus on the development of more accurate and valid psychological measurement tools, particularly in relation to mental toughness and competitive anxiety, which are underexplored in the current literature. Additionally, further studies should aim to strengthen the integration of fundamental psychological theories with practical applications in sports contexts, ensuring that psychological interventions effectively address the mental well-being of athletes at all levels of competition. This study provides valuable insights for researchers and policymakers in directing future research efforts and collaborations, ensuring a more profound and impactful contribution to the field of sports psychology.

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