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Exploring the Evolution of Sport Science History Research in the World: A Bibliometric Perspective (1980–2025)

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Abstract

History Sports Science grew as an interdisciplinary field of research in cultural, physiological, and historical aspects of the concept of sport as time progressed. The present study examines worldwide trends in the 4d) academic evolution of sport science history using a bibliometric methodology without pretending to be an exclusive novelty. Descriptive statistics of annual publications, citation counts, top cited works, and publication languages were discussed in detail and presented in the main text. These results reflect the development of the field, the impact of key papers and the internationalization of science. Finally, co-citation, bibliographic coupling and keyword co-occurrence analyses have also been used to detect intellectual connections, thematic structures and collaboration networks among authors. We retrieved data only from the Web of Science to guarantee accuracy, and the VOSviewer was used for bibliometric mapping and visualization. The results reveal the centers of journals, topics and influential researchers in sport science history. Instead of leaving much to the imagination elsewhere, the article has left something substantive on which other scholars, educators, and policy makers may stand with (partly) shared confidence, engaged in continuing to take learning and work in this domain further.

1. Introduction

In the last few decades, the study history of sport science has attracted greater scholarship from the disciplines of sociology, education, medicine, policy studies, and ethics (Funk & James, 2006, Moradi et al., 2023). This growing engagement is symptomatic of a wider awareness of sport as a moving social institution that has both influenced and been influenced by scientific, cultural and political changes over time. As an area of study, the history of sport science encompasses the convergence of a range of disciplinary fields that seek to understand how knowledge for physical performance, training, and athletic development has developed within select historical and institutionalized circumstances (McPherson, 1994; Thorpe, 2009; Thomas, 1994). The sociological underpinnings, moral quandaries, and structural adjustments undergoing sport science have, however, been more critically embraced in recent years, as scholars have revisited how science has shaped experiences of athletes, coaching approaches, and policy (Young, 1993; Waddington, 1996; Allison & Knoester, 2021; Norton, 2024).

Despite this pioneering attempt, the discipline is fragmented, appealing to different methods of analysis and theoretical frameworks that do not always make sense when taken together. This buffet of methodologies involving different types of sounds points at the absence of an overarching conceptual habitat (Dorsch et al., 2023). For instance, Moradi et al. (2023) emphasise the importance of narrative coherence when reassembling policy histories, and Morrison (2023) advocates the use of themed themes such as, performance enhancement, social equity and athlete development to explore the evolving meaning of sport science over time.

Studies in this area have covered a wide range of subdisciplines such as sports medicine (Waldén et al., 2023; Mann & Ravensbergen, 2018), exercise physiology (Girard et al., 2020; Young et al., 2015), physical education (Thomas, 1994; Lavega et al., 2014), sport psychology (Dorris et al., 2012; McAuley et al., 1997), gender and inclusion (Thorpe, 2009; Davenport et al., 2022), bioethics (Pinheiro et al., 2014; Arora et al., 2023), as well as lived experiences of athletes (Allan et al., 2020; Monsonís et al., 2021). Nevertheless, despite its wide-ranging scholarship and the extent of its contents, the historical basis of sport science has not crystallized into a distinctive, stand-alone academically defined discipline. Need for systematic mapping of scholarly knowledge So far, there is a lack of theoretical

reflection, as well as critical literature, regarding the intellectual structure and historical evolution of this contested field, and the emergence of key research clusters that might shape the field and inform institutional approaches (Lohmann et al., 2024; Szot, 2024).

To fill this deficiency, bibliometric analysis becomes a useful instrument to sport scholarship that allows mapping of the scientific production at a large-scale, thematic patterns and collaboration networks. It has been successfully used in wearable technology (Szot, 2024), in youth soccer (Liu et al., 2023), in sport sociology (Boucher, 2023) and in sport psychology (Dorsch et al., 2023). But a bibliometric approach has not yet been used to capture the historical development of sport science as a field of knowledge, so far. This dearth is a significant one when policy in the modern era is increasingly evidential, and yet the perspective of history is invariably representative of the Actors' era and institutional understandings of the sport they are governing or the professions role models they are hoping for their students to become.

In this context, this study focuses on the history of sport science and aims to examine global scientific production on this theme, from 1980 to 2023, using bibliometric tools to map the central research themes, determine leading authors and institutions, and to clarify emerging trajectories. We choose the Web of Science Core Collection as the primary source of literature, because it covers high-quality physical science and humanities journals (Phillips, 2020; Sheng et al., 2024). All data included were cleaned and standardized to improve accuracy and consistency.

1.1. Literature Review

The history of sport science is the systematic and rigorous study of how sport science knowledge has evolved over time, using a multi-faceted lens: physiological, psychological, sociocultural and organizational (Phillips, 2020; Moradi et al., 2023). In recent decades, sport science has developed from a composite of fitness technologies into a multi-faceted field of academic inquiry that continues to change the ways researchers and practitioners within sport and related fields, and the broader community more generally, conceptualize the interface between sport performance, social institutions and cultural norms (Funk & James, 2006; Thorpe, 2009). This change is followed by the spread of niche sub-disciplines such as biomechanics, exercise physiology, sport psychology and sport management

providing unique methodologies and theoretical perspectives (Jonker et al., 2010; Allan et al., 2020).

Although the discipline of sport science has been relatively mature, we argue its history in isolation from one another does not lend itself to a rich and robust 'cross-cutting' dialogue on how knowledge has been built and consecrated over time (Ciomaga, 2013; Sheng et al., 2024).

In addition to hardware, analytical technology too has evolved from primitive statistical calculations to computational techniques such as machine-learning and predictive analytics (Dorris et al., 2012; Arora et al., 2023). Given the ability to identify patterns in big data sets, performance trajectories and predict injury risks, these approaches provide evidence-based information for decision-making in coaching and sports governance (Lindahl et al., 2015; Ferreira et al., 2019). Data-driven research is on the rise, but this trend also raises critical ethical and methodological considerations with respect to data ownership, algorithmic responsibility, and the possible neglect of qualitative and experiential knowledge.

Despite these developments, there is no theoretical framework in the historiography of sport science. It is characteristically fragmented in nature, marked by disciplinary silos, localized focus in certain areas of research, and an array of ideas about what constitutes science knowledge in sport (Tang et al., in press; Dorsch et al., 2023). While some work around how gender, disability, race and SES have and continue to influence the production and application of sport science knowledge has started to the close these knowledge gaps (Thorpe, 2009; Davenport et al., 2022; Allison & Knoester, 2021), there remains a lot of work left to do. Furthermore, ethical discussions surrounding consent of the athlete, medicalization, and long-term welfare are gaining prominence, particularly within high-performance programs (Pinheiro et al., 2014; Arora et al., 2023).

Institutionalization of sport science has been articulated through the creation of specialist journals, academic departments and international research networks (Phillips, 2020; Moradi et al., 2023). These bodies have helped to share ideas, promote cooperation, and make the sector much more visible and credible.

More than ever research in the history of sport science is international and it is work in progress all over the world. This paper makes use of bibliometrics to visualize how research is conducted world-wide from 1980

to 2023. Its objective is to map the main research themes, intellectual networks and development patterns, providing an organized view for researchers, institutions and policymakers interested in understanding how the field has developed and what knowledge is still required.

2. Methodology

For this research, the WoS Core Collection was the main bibliographic source. The WoS database was selected for its broad coverage of peer-reviewed international-related journals, consistent indexing criteria, and common application of bibliometric analysis among sport sciences and related fields (Phillips, 2020; Khatra et al., 2021; Lindahl et al., 2015). Although Scopus and Dimensions also offer useful bibliometric data, we chose WoS to have a comparable and standardized dataset. The choice to use only one database is motivated by concerns about convergence; in other words, we want to ensure coherence in metadata and avoid duplicate information or inconsistencies that can arise from merging data from multiple sources (Ciomaga, 2013).

The search strategy was developed to maximize both relevance and reproducibility. Preliminary exploratory searches determined that the broad term "sport science" brought up much unrelated or partially related material. Consequently, the last search string was generated with different search terms such as ´sport science´, ´history´, ´development´, and ´evolution´. It was in this way that we were able to focus on research explicitly addressing the historical and developmental contexts of the discipline of sport science, as opposed to those on sports physiology, biomechanics, or performance. The period of data gathering was defined from January 1, 1980, to December 31, 2023. This interval was chosen to make the proximity of the previous decades a valid test site for the model, with the cut-off in 2023 avoiding the requirement for speculative long-term projections.

The first search resulted in 1,245 articles. A sequential selection and cleaning process was then applied to reduce the data. First, irrelevant subject categories (e.g., engineering, computer science, or general medicine) were removed. Second, those articles that did not address specific historical, conceptual, or developmental issues related to sport science were excluded. Thirdly, we ruled out those references where bibliographic details were not sufficient for uniform analysis. This procedure reduced the total dataset to 269 articles. Data cleaning and formatting were conducted in Microsoft

Excel in conjunction with unformatted text exports from WoS, in accordance with Phillips (2020) and Lindahl et al. (2015).

The bibliometric analyses were conducted with the support of the package in RStudio, the Bibliometrix package, as well as VOSviewer Software (Version 1.6.18). For the sake of transparency and reproducibility, all thresholds and analysis parameters have been defined a priori. Regarding the co-citation analysis, I only considered documents that had been cited at least 20 times to get robust results and to emphasize intellectual connections among the most-cited works (Small, 1973; Waltman & Van Eck, 2010, 2013). A minimum of 10 common refrences was adopted as a threshold to help identify an active scientific research front without the risk of overfragmenting the network (Jarneving, 2007). We kept author keywords which appeared in at least five papers because frequencies lower than that made the dataset noisy as initial attempts resulted in overly complex and impenetrable word co-occurrence matrices (Callon et al., 1983; Su & Lee, 2010). The visualizations of the risk of CHD were controlled by these thresholds to emphasis the most important associations and at the same time make visualizations interpretable.

Steps of analysis were composed of several stages. The first step consisted of a descriptive analysis to sketch a picture of the field. The variables measured were number of publications per year, number of citations per year, the number of most frequently cited articles and language distribution. These sets of numbers gave some indication of dynamic publication as well as visibility of research in sport science history over the years. The second phase consisted of progressive bibliometric mapping. Co-citation analysis was used to map intellectual links and the classic literature that influenced the historical categorization of sport science. The bibliographic coupling was used to map more recent streams of research and emergent hotspots, complementing a forward-looking approach to the retrospective view provided by co-citation (Text Box: Co-citation, Tang et al., 2022 and Jiménez-García et al., 2020).

3. Findings and Analysis

3.1. Description of the Sample

The bibliometric analysis is performed on a dataset of academic papers collected from the Web of Science Core Collection, comprising the years 1980 to 2023. The end sample were 269 peer-reviewed articles were

collected through a structured search strategy on topic keyword terms to the history, development, and epistemology of sport science (e.g., “sport science history,” and “historical development of sport,” and “the evolution of sport research”). Articles included were restricted to those in the Social Sciences Citation Index (SSCI) and Arts & Humanities Citation Index (A&HCI) to ensure disciplinary fit and academic legitimacy. Full-record format files were then exported and cleaned systematically to eliminate duplicated records, correct author addresses, and standardize institutional and keyword categories by VOSviewer and manual work.

Based on the times of publication, research development of the history of sport science can be divided into three evident periods. The steep slant of the growth curve during the early years of the period 1980–2007 is indicative of a discipline in formation, with an output that was poor but persistent. Readings were beginning to be published, focusing on the sociocultural aspects of sport, the development of physical education as an institution, and the early use of scientific training methods (McPherson, 1994; Thomas, 1994; Young, 1993). The first publication ascertained in this corpus was published in 1984, ringing the academic bell to start its interest in tracing the historical sources of sport science. Research in this field, however, has been fragmented and for the most part insulated by discipline silos like history, sociology, and kinesiology.

Publishing output has reached an all-time high, fueled by new methodological techniques (e.g., digital bibliometrics; Liu et al., 2023), open access infrastructures, as well as increasing scholarly enthusiasm for sustainable and socially responsible sport (Lohmann et al., 2024). The appropriation of wearable technology for performance history (Szot, 2024), and the use of data visualization models to map the development of knowledge, have also increased the methodological arsenal available to the field. As the dataset does not account for anticipated 2025 publications, since that would be arbitrary predictions, a general upward trend until 2023 signals ongoing academic momentum and ever more thematic and methodological variety.

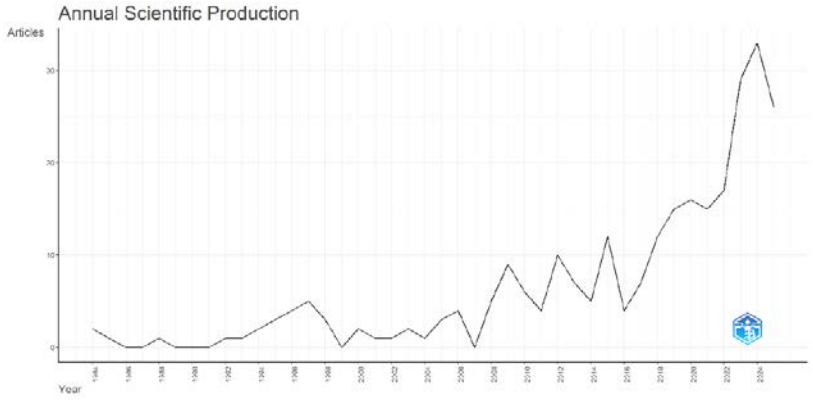

Figure 1. Annual Publication Trends in Sport Science History
Note: Figure 1 displays the number of publications related to sport science history from 1980 to 2025.

While Figure 2 puts this expansion in perspective by showing the annual trends in the number of citations for the topics (which are highly variable from year to year). Notable in this respect are the peaks in citations during the early formative stages, in the years 1993 and 1994, apparently prompted by important studies on the footing of this field (Young, 1993; McPherson, 1994). Throughout the early 2000s, citation activity was strong; particularly, reports on biomechanics and athlete performance monitoring were prevalent (Smith et al., 2000; Jonker et al., 2010). It further considers the average citations per paper per year, as well as the effect of highly cited papers. The goal is to identify if any specific very high-impact studies led to these averages being out of whack or if citation patterns seem even. It's also interesting to note that between this most recent period and the previous one (2016-2020), there was a reduction in the average citations per article. This is likely to be due to the addition of newly published work, which has not had the time to attract citations (Moradi et al., 2023; Norton, 2024).

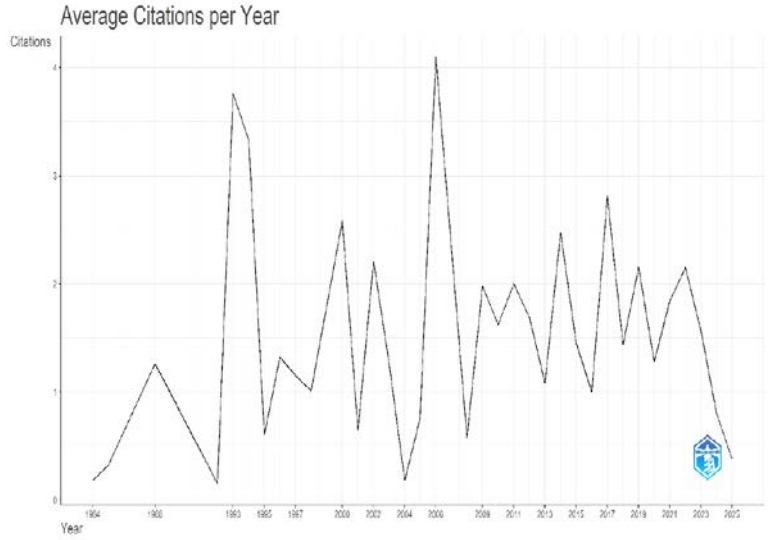

Figure 2. Citation Trends Over Time in Sport Science History

Note: Figure 2 illustrates the total citations, average annual citation count, and citations of the most frequently cited publications in sport science history research.

The most frequently referenced publication is Funk and James (2006), which is shown in Table 1. This paper is from the first era of publication (in the latter case this is only partially true since the paper has had time to be reviewed and influence subsequent publication). The perception of consumer loyalty and the role of attachment in the construction of sport team allegiances was considered in this article. Its constitutive function and practical significance have ensured its status as a primary point of reference in the historiography of sport science. This should not be a surprise in a context in which English is becoming the lingua franca for writing and publishing and for achieving international visibility (Waddington 1996; Young 1993; McPherson 1994).

Table 1. Top-Cited Papers in Sport Science History

Publication Title	Authors	Publication Year	Citations
Consumer loyalty: The meaning of attachment in the development of sport team allegiance	Funk, D. C., & James, J. D.	2006	327
The development of sport expertise: Mapping the tactical domain	McPherson, S. L.	1994	144
Bourdieu, feminism and female physical culture: Gender reflexivity and the habitus-field complex	Thorpe, H.	2009	140
Development of a boxing dynamometer and its punch force discrimination efficacy	Smith, M. S., Dyson, R. J., Hale, T., & Janaway, L.	2000	134
Violence, risk, and liability in male sports culture	Young, K.	1993	124
Differences in self-regulatory skills among talented athletes: The significance of competitive level and type of sport	Jonker, L., Elferink-Gemser, M. T., & Visscher, C.	2010	101
Self-efficacy and balance correlates of fear of falling in the elderly	McAuley, E., Mihalko, S. L., & Rosengren, K.	1997	91
Investigating the effects of ego depletion on physical exercise routines of athletes	Dorris, D. C., Power, D. A., & Kenefick, E.	2012	89
Energy expenditure and enjoyment during video game play: Differences by game type	Lyons, E. J., Tate, D. F., Ward, D. S., Bowling, J. M., Ribisl, K. M., & Kalyararaman, S.	2011	85

3.2. Mapping Evaluation

Three bibliometric indicators have been employed to identify structures, uncover hidden scholarly networks, and evaluate research trends: (i) Co-citation, (ii) Bibliographic coupling, and (iii) Co-occurrence of author

3.2.1. Co-citation Study

Bibliographic coupling is used to examine the intellectual base of History of Sport Science by showing which publications are cited together in the same works. This technique presumes that the more frequently two documents are found together in the references of other publications, the more closely related they are in subject matter or content (Small, 1973; Chen, 2017). Therefore, co-citation patterns may, for example, expose the iridescent literature that underlines a domain of study and support the discovery of new intellectual groups and thematic communities (Thorpe, 2009; Smith, Yu and Krajcik, 2000). In the current work, bibliographic data crawled from the Web of Science Core Collection (1980–2023) was also employed for

building the co-citation network among articles and reviews in English. Cited references appeared in at least five co-citation pairs and were selected to ensure that they were analytically significant.

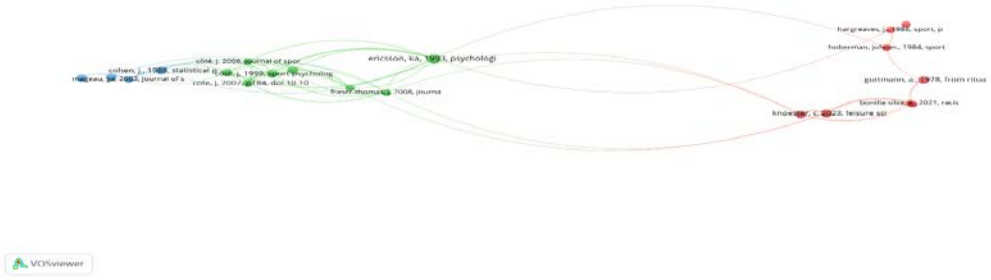

Figure 3. Co-Citation Network of References in Sport Science History
Note: Figure 3 highlights the top ten references identified through reference co-citation analysis in sport science history research.

The network was constructed by VOSviewer software (version 1.6.20) with the minimum times cited references of five times, the association strength for normalization option, and the modularity optimization clustering method (resolution = 1.0) as parameters. Visualization of the structure was based on the Fruchter man-Reingold algorithm, which places nodes (publications) close to each other if they are frequently co-cited.

Referring to Table 2, it provides the top cited references among the papers referred to. Of note is that the Ericsson and Côté papers have also received much attention (eight and six citations, respectively), which highlights the relevant and seminal work they have done in this area of research in sport psychology and expertise. Knoester's contributions also represent the changing conversation taking place within leisure studies/sport sociology. Guttmann's classic is still relevant today, informing our historical understanding of modern sport's evolution. Furthermore, Fraser-Thomas work on youth sport/athlete development contributes to the psychological perspective in sport.

Table 2. Reference Co-Citation Analysis for Sport Science History

Publication	Author(s)	Year	Citations	Link Strength
"Deliberate practice and expert performance"	Ericsson, K.A.	1993	8	17
"Athlete development and coaching"	Côté, J.	1999	6	21
"Leisure sciences contributions"	Knoester, C.	2023	6	11
"From ritual to record: The nature of modern sports"	Guttmann, A.	1978	5	3
"Gender reflexivity and the habitus-field complex"	Thorpe, H.	2009	4	4
"Statistical power analysis for behavioral sciences"	Cohen, J.	1988	5	3
"Structural equation modeling"	Hu, L.T.	1999	5	2
"Psychology of athlete development"	Fraser-Thomas, J.	2008	4	14
"Sport and political ideology"	Hoberman, J.	1984	4	4
"Sociology of sport and culture"	Hargreaves, J.	1986	4	4

In terms of link strength, which reflects the degree to which publications are interconnected within the existing body of knowledge (Larsson & Quennerstedt, 2012)—there is considerable variation among references. For instance, Knoester demonstrates a moderate link strength of 11, whereas Côté shows a substantially higher link strength of 21, indicating a greater influence within the field. Both Ericsson and Fraser-Thomas exhibit high link strengths, suggesting that their work is frequently co-cited across multiple thematic areas.

The co-citation results for cited authors are presented in Table 3 and present a list of the most cited authors in sport science literature. Of these, McHugh is the most prominent citation, attaining 115 citations and a betweenness strength of 309, which reflects several strong connections between citations. Also, the social influence of Knoester is prominent in Figure 10 with 74 citations and a strong link strength of 440 that implies his central position in the collaboration networks. It is also worth noting that despite having fewer publications and citations, Buckley has the highest total link strength of 840, pointing towards his centrality in the given author network.

Table 3. Author Co-Citation Analysis in Sport Science History

Author	Documents	Citations	Total Link Strength
McHugh, Tara-Leigh F.	4	115	309
Knoester, Chris	8	74	440
Buckley, Thomas A.	3	18	840
Davenport, Margie H.	3	66	303
Khurana, Rshmi	2	60	270
Nesdoly, Autumn	2	60	270
Ray, Lauren	2	60	270
Allison, Rachel	3	59	239
Collins, Kieran	2	29	124
Malone, Shane	2	29	124

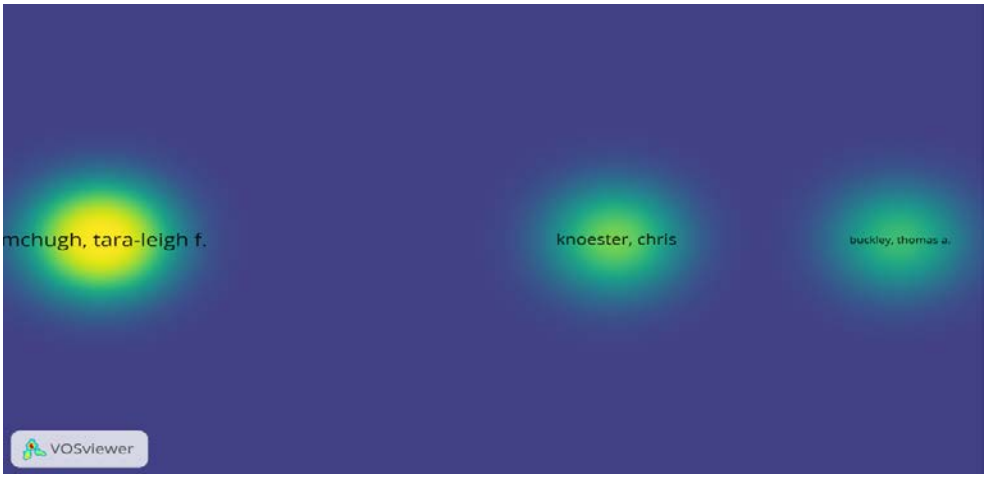

Figure 4. Density Map of Author Co-Citation in Sport Science History

Note: Figure 4 offers a detailed view of author co-citation likelihood in sport science history, with closer proximity indicating higher co-occurrence probability.

The visualization of potential author co-citation can be seen in figure Here, color is proportional to citation density (from red (most cited authors) to green (authors cited less often). Also, the distance of authors indicates a likelihood of being cited together. This visualization exposes major collaborative groupings around McHugh, Knoester, and Buckley, emphasizing their centrality to the history of outstanding sport science history research. On the other hand, if nodes that are authors with lesser or

solitary co-citation connections are located on the periphery, though focused on gender and race in sport.

Overall, the co-citation network identifies three core thematic clusters in the history of sport science research: sport psychology and athlete development, socio-cultural and historical perspectives, and research methods. Taken together, these linked clusters provide an overview of the interdisciplinary origins of sport science history and their changing configurations of collaborative relationships between top authors.

3.2.2. Bibliographic Linkage

Bibliographic coupling Bibliographic coupling is a technique that is utilized to study the intellectual structure of a given research field, wherein such technique seeks to link the reference list of one article to the reference list from a second article in the same research domain (Zupic & Čater, 2015). Bibliographic coupling, in contrast to co-citation analysis, relates citing documents to each other based on the references they have in common, rather than on the frequency with which they are cited together in subsequent publications. It is especially helpful to map new research fronts, thus drawing academic conversations or methodological relationships among recently published works of knowledge (Chen, 2017). Whereas co-citation analysis shows historical influence, bibliographic coupling also provides information regarding current trends and convergence of research interest within a field of study such the history of sport science.

Bibliographic coupling Bibliographic coupling was conducted using data from the Web of Science Core Collection (1980–2023), restricted to peer-reviewed English language articles in the current study. Documents with at least five references in common were considered for meaningful linkage. The network was generated by VOSviewer (version 1.6.20), with association strength normalization to eliminate document length and citation density differences. Clustering was performed using modularity optimization algorithm (resolution = 1.0), and the Fruchter man-Reingold force layout algorithm was employed for visualization. It also unveils the locations of thematic densities and of intersections across different disciplines.

The network that emerged presented several interconnected clusters, each corresponding to a particular but interrelated domain of scholarly interest. These clusters were interpreted based on keyword analysis, title scanning, and review of high-centrality documents by cluster.

A significant cluster focal point was sociocultural and critical sport history, with representation from Sociology of Sport Journal and Sport, Education and Society. This body of research tends to focus on gender, identity, power and inclusion, often using such concepts, from sociology, cultural studies and feminist theory, to provide theoretical tools (Hargreaves, 1986; Thorpe, 2009; Young, 1993).

A distinct cluster comprises mainly physiology and performance research closely related to journal such as the European Journal of Sport Science and the Journal of Sports Sciences. These papers frequently reference methodological and empirical research within exercise physiology, biomechanics and training science (e.g., Bangsbo et al., 1994; Girard et al., 2020), suggesting a common dependence on quantitative and laboratory-bound methods. Historical analyses that track the development of performance science, moreover, are increasingly incorporating these works despite their relatively weaker emphasis on explicit "history."

The coupling network also exposes cross-fertilizations between sociology and psychology subspecialties. For instance, in the domain of youth sport development, critical sociology and developmental psychology are often cited in the same paper and overlap is relatively strong.

This analysis does not purport to be the first or coverall mapping of the history of sport science. It is an incremental, rather than a revelatory, contribution to an existing effort among scholars to understand how research communities are organized, how knowledge travels, and how interdisciplinary borrowing reshapes a field. In line with previous bibliometric analyses in related fields (Boucher, 2023; Dorsch et al., 2023) the results reported here present a concise profile of contemporary interconnections in historical sport science research activity.

Table 4. Document and Citation Distribution by Source in Sport Science History

Source	Documents	Citations	Total Link Strength
frontiers in sports and active living	20	101	83
Sociology of sport journal	20	547	943
sport education and society	15	264	1203
quest	11	402	745
Journal of human sport and exercise	10	24	30
international journal of sport psychology	9	66	111
revista internacional de medicina y ciencias de la actividad fisica y del deporte	9	23	147
acta gymnica	6	5	592
European journal of sport science	6	41	36
Journal of sport management	6	418	26
Journal of strength and conditioning research	6	158	74
revista brasileira de medicina do esporte	6	2	3
Journal of the philosophy of sport	5	24	21

In terms of citation impact, the Sociology of Sport Journal is leading (547 citations), followed by the Journal of Sport Management (418) and Quest (402). The combined share for these three journals is more than 56% in the most prolific sources, indicating the crucial role they played in shaping the discourse.

The fact that the Sociology of Sport Journal tops the list of rated journals is certainly in line with the dynamic interdisciplinary nature of sport science history. This journal aims to take both with hands the output of many seminal works that have addressed sociocultural concerns and gender relations in sport (Sage et al., 2013; Thorpe, 2009; Young, 1993). The Journal of Sport Management has similarly covered important topics such as sport governance and fan engagement, adding to the field's diversity (Funk & James, 2006). In the meantime, Quest has played a useful part in fostering basic research on sport expertise and pedagogy (McPherson, 1994; Larsson & Quennerstedt, 2012).

Other important journals that have also contributed are the "European Journal of Applied Physiology and the "Journal of Sports Sciences," which have been cited 67 and 265 times, respectively. The emphasis of these outlets is on the physiological and performance aspects of sport science, following the interdisciplinary nature of sport science (Jonker et al. 2010, Young et al. 2015). In addition, the new journal Frontiers in

Sports and Active Living has several recent publications, which have been widely cited (n = 101), demonstrating an appetite for cross-disciplinary and creative research tools and techniques (Girard et al., 2020).

This variety of journals demonstrates indeed the multidimensional character of research in the history of sport science. It ranges from sociological, psychological, and physiological to management aspects, and all the viewpoints deepen and extend such a range.

3.2.3. Author Keyword Co-occurrence

Author keyword co-occurrence analysis was used to identify a central theme in research, and the development of academic discussions over time, in the historical studies of sport science. This is the frequency with which the author has applied these keywords to publications and the frequency that these have appeared together in other publications (Zupic & Čater, 2015). Unlike citation-based methods that represent intellectual ancestry and influence across time, keyword co-occurrence indexes contemporary conceptual affinities and provides a window on in vogue topics of interest, emerging fields of research, and cross-disciplinary integration (Chen, 2017). Since authors commonly choose keywords to represent the central emphasis of their work, their combined usage offers a useful approximation of what is currently on trend, and how attention to scholarly interests may have shifted (Larsson & Quennerstedt, 2012; Allan et al., 2020). Its purpose is therefore primarily a diagnostic tool to chart the thematic landscape of a field in evolution.

The sample of the present analysis was obtained from the Web of Science Core Collection with research articles that were peer reviewed from (1980 to 2023) and published only in English. Author given keywords (not possibly selected by the authors during the analytical assignments) were imported from the bibliographic records and the data undergo a qualified cleaning to ensure consistency and analytical soundness. This took the form of standardization of spelling variants (e.g., “sport”/” sports”), plural forms, and hyphenation (e.g., “physical activity”/” physical activities”), in conjunction with the deletion of excessively broad terms (e.g., “review”/“case study”). We only retained keywords that appeared in at least five documents, thus ensuring that the network of keywords would reflect substantively engaged themes, rather than singular or idiosyncratic uses. The co-occurrence network was generated by VOSviewer (version 1.6.20), a popular bibliometric imaging software for scientific maps. A normalization

technique for association strength (Strength-CSn) was used to normalize differences in publication volume and keyword variety between journals. To preserve network clarity, a minimal co-occurrence threshold of five was used, and clustering was done by modularity-optimized hierarchical clustering method with a resolution of 1.0, which is an “optimal” setting of the trade-off between fine grained cluster and cluster cohesion. Visualization was done using the Fruchter man-Reingold layout that places closely related keywords (words that frequently co-occur) close together and natural clusters based on themes appear.

The third cluster was designated to be \("Health, Injury, and Talent Development"\) listed with such keywords as concussion, health, talent development, basketball. This product is indicative of an emerging academic attention and public interest in the well-being of athletes, medicalization, and long-term development pathways. The rise of “concussion” as a key term calls forth broader medical, legal, and ethical discussions of brain injury in contact sport, as well as historical analyses which plot the movement and shifting logics of medical intervention, health protocol, and institutional culpability (Waldén et al., 2023; McCrory et al., 2017). The merging of “talent development” and “health” marks a growing counter-narrative to success-driven high-performance models and youth sport alike.

A temporal analysis of keyword usage—via publication shows a noticeable transformation of thematic focus over the last two decades. In contrast, terms such as gender, women, talent development, and concussion have all seen marked increases in frequency since the early part of the past decade, which is indicative of the surge in scholarly and societal interest in equity, athlete safety, and developmental ethics. Similarly, core-issue terms, but not key-terms, such as physical education and sport history continuously appear, signifying their enduring presence as anchor concepts. The prefixed health- and equity-related keywords that have become more popular seems to indicate a wider shifting by the profession towards socially responsible and a more humanist outlook.

This is by no means a claim that we have made the first or the most inclusive mapping of keyword trends in the history of sport science. It is not meant to be a definitive document, but rather to form part of a continuing scholarly debate over how and in what directions research themes have developed, how interdisciplinary conversation is influencing the field, and

how the presence of history can enrich current praxis. The results are consistent with other bibliometric studies in sport sociology, kinesiology, and science and technology studies (Boucher, 2023; Dorsch et al., 2023) but highlight key aspects of the historical dimension of keyword usage and thematic evolution.

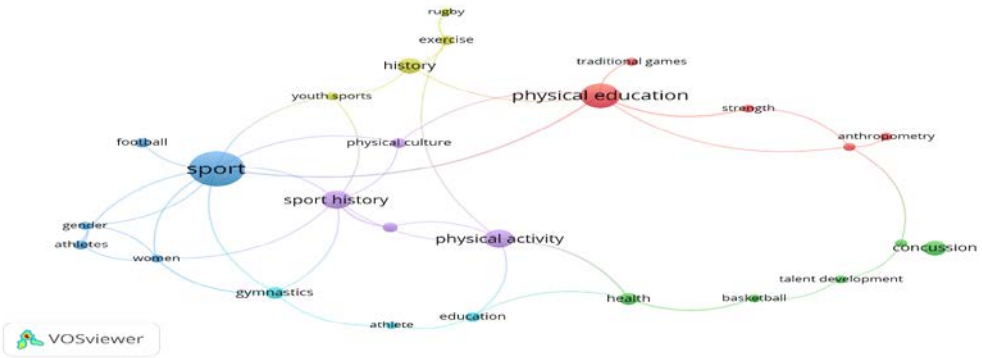

Figure 5. Co-Occurrence Map of Author Keywords in Sport Science History.

Note: Figure 5 presents the outcomes of the author keyword co-occurrence analysis in sport science history research.

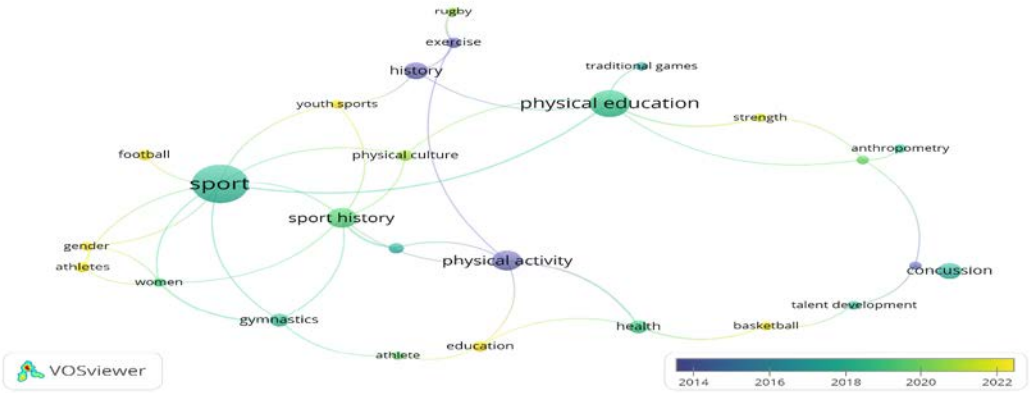

Figure 6. Temporal Evolution of Author Keyword Co-Occurrence in Sport Science History.

Note: Figure 6 depicts the temporal progression of author keyword co-occurrence analysis in sport science history research.

The evolution of author keyword co-occurrence over time in Figure 6 provides insights into the changing topic focus throughout the years. Core concepts, such as “history,” “sport history,” and “physical education,” appear in cooler colors that denote their earlier or continued importance in

the literature. On the other hand, ‘gender,’ ‘women,’ ‘athletes,’ ‘youth sports,’ and ‘talent development’ appear in warmer colors, indicating a more up to date, increasing research interest toward the end of the 2010s and early 2020s (Allison & Knoester, 2021; Davenport et al., 2022). Furthermore, health topics like “concussion” have consistently gained traction since they first appeared, highlighting that sport science remains a concern (Waldén et al., 2023).

Table 5. Author Keyword Co-Occurrence Summary in Sport Science History

Keyword	Occurrences	Link Strength
sport	20	10
physical education	13	8
physical activity	9	6
sport history	9	9
concussion	7	1
history	7	3
gymnastics	5	5
health	5	5
athletes	4	3
exercise	4	4
football	4	1
education	4	3
gender	3	3
women	3	6
basketball	3	3
anthropometry	3	1
talent development	3	2
Traditional games	3	1
youth sports	3	3
strength	3	3

Supporting this observation, the frequency of appearance and the strength of each important term are revealed in Table 5. In this line of sight, "sport" (20 occurrences) and "physical education" (13 occurrences) appear clearly as keywords highlighting their central positions.

4. Practical Applications and Final Remarks

4.1. Practical Applications

Although a complete historical picture of sport science is a difficult and ongoing job given the interdisciplinary nature of the field and the

changing methods employed, the results of this study are relevant for researchers, practitioners and policy makers (Funk & James, 2006). Not seeking to be the "first" study of this sort in this area of interest, a claim already refuted by previous work in sport history and kinesiology (Boucher, 2023; Dorsch et al., 2023), the present research offers a targeted analysis of the intellectual structure and thematic evolution of research focused on the history of sport science from 1980 to 2023. By using bibliometric techniques including co-citation, bibliographic coupling, and keyword co-occurrence analysis, it uncovers hidden structure in the literature, identifies pivotal scholarly clusters, changing thematic decision and interdisciplinary connection (Zupic & Čater, 2015).

These results have specific practice and policy implications. For sport organizations and national governing bodies (NGBs) that have recognized early specialization and other exclusionary practices in shaping youth development programs- a focus on the retrospective lens may enhance program re-design in a way that does not replicate previous injustices. For instance, the observed increase in research on ‘gender’ and ‘women’ in the history of sport science draws attention to an emerging scholarly critique of androcentric training models that may inform more inclusive coaching practices and athlete support programs.

Policy makers may also benefit from historical context when assessing longer-range interventions. The growing attention to “concussion” and “athlete health” in current writing is an indication of increased attention by primary care and sports medicine practitioners, but also of earlier inattention to what should be a primary concern: the well-being of athletes. By understanding this path, organizations such as the IOC, the WHO and national sports ministries can introduce informed guidelines that will respect past failings and be more closely matched to the rights of the athlete.

In schools the introduction of sport science history in curricula is read to be conductive to critical thinking in aspiring coaches, sport scientists and physical education teachers. “Physical Education and Biomechanical Assessment”), provides a point of departure for designing interdisciplinary courses integrating technical training and ethical and sociocultural reflection (Larsson & Quennerstedt, 2012; Allan et al., 2020).

In addition, the thematic maps developed in this investigation can be used by scholars to pinpoint gaps and areas of under-representation (e.g. history of sport science in the Global South, disability sport or Indigenous

physical cultures) as opportunities for future inquiry. These are not only scholarly opportunities, but also ethical obligations to diversify the past and confront dominant Western histories.

This study does not provide the answers, but is a coherent, evidence-based platform for discussion across academic, professional and policy boundaries.

5. Conclusions, Constraints, and Future Research Directions

This study provides a bibliometric overview of the research on the history of sport science in the period 1980 to 2023, and it concludes with the intellectual structure, thematic evolution, and main scholarly contributions. The study identifies leading research clusters, pivotal works, and evolving research themes through combining co-citation, bibliographic coupling, and author keyword co-occurrence, contributing to a more coherent picture of the evolution of the field (Zupic & Čater, 2015; Waltman, van Eck, & Noyons, 2010).

Our findings reveal that the history of sport science research has evolved throughout three key stages: a phase of foundation (1980–2007), a period of disciplinary crystallization (2008–2015), and a recent phase of thematic dissemination (2016–2023). Alternate: Co-citation also showed that classic literature in sport sociology and sport psychology, as well as social identity and fans (Funk & James, 2006) and expertise and deliberate practice (Ericsson et al., 1993). Bibliographic coupling (cf. Waltman, van Eck 2012) revealed that the key works and the traditional theoretical discourse had their centers of mass in high-impact journals such as Sociology of Sport Journal, Quest, and European Journal of Sport Science. By analyzing keyword co-occurrence, additional emergent themes identified included gender equity, talent development, injury epidemiology, and digital integration—in particular wearable sensors and performance monitoring systems (Thorpe, 2009; Waldén et al., 2023; Szot, 2024).

Notwithstanding these contributions, limitations of the present study should be recognized. The first limitation is that the dataset configuration relied only on the Web of Science Core Collection, which is the most reputable but can neglect studies published in non-English languages or indexed in other databases such as Scopus or the DOAJ. Such practice may become a linguistic bias and may neglect contributions from scholars in LA, Africa, and Asia (Aksnes et al., 2020). Second, the co-citation and

bibliographic coupling analyses are based on algorithms, so they may not fully account for collaborative authorship, particularly in large, co-authored papers where effort may be distributed. While manual testing was conducted to try to compensate for this, it is still possible that the network places an undue emphasis on first authors. Third, and related, citation-based techniques have the shortcoming that recent works—in this case, those published within the last five years of our time range—will be underrepresented, as they will have yet to receive enough citations to be incorporated in the co-citation networks (van Raan 2005).

Furthermore, the final number of 269 documents is methodologically strong but highlights how sport science history remains somewhat on the periphery as a separate research field. This small corpus is statistically underpowered for this type of analysis, but it provides additional indication that rather than as a coherent academic discipline, the field is fragmented into subdisciplines.

Lastly, for the historiography of sport science, it would be necessary to expand the horizons to non-Western, Indigenous, and Global South perspectives. Consideration of perceptions of indigenous games in post-colonial countries or the value of community-based physical education places would widen the Eurocentric focus of the field while potentially adding both depth and width to the field’s theory bases (Boucher, 2023; Isaacson & Theofilou, 2024).

The aim of this study was to present an organized data-based review of the history of sport science research. It is not meant to be comprehensive or final, but it represents a 'methodologically clear' attempt to map out an emerging and multidisciplinary field.

References

Allison, R., & Knoester, C. (2021). Gender, sexual, and sports fan identities. *Sociology of Sport Journal*, *38*(3), 310-321.

Arora, N. K., Roehrken, G., Crumbach, S., Phatak, A., Labott, B. K., Nicklas, A., ... & Donath, L. (2023). Good scientific practice and ethics in sports and exercise science: a brief and comprehensive hands-on appraisal for sports research. *Sports*, *11*(2), 47.

Boucher, A. (2023). The Contributions of Asia-Located Sport Sociologists and Historians to the Global Economy of Knowledge: A Scoping Review. *Asian Journal of Sport History & Culture*, *2*(3), 237-259.

Callon, M., Courtial, J. P., Turner, W. A., & Bauin, S. (1983). From translations to problematic networks: An introduction to co-word analysis. *Social science information*, *22*(2), 191-235.

Ciomaga, B. (2013). Sport management: a bibliometric study on central themes and trends. *European sport management quarterly*, *13*(5), 557-578.

Davenport, M. H., Nesdoly, A., Ray, L., Thornton, J. S., Khurana, R., & McHugh, T. L. F. (2022). Pushing for change: a qualitative study of the experiences of elite athletes during pregnancy. *British Journal of Sports Medicine*, *56*(8), 452-457.

Dorris, D. C., Power, D. A., & Kenefick, E. (2012). Investigating the effects of ego depletion on physical exercise routines of athletes. *Psychology of Sport and Exercise*, *13*(2), 118-125.

Dorsch, T. E., Blazo, J. A., Paoli, A. G. D., & Hardiman, A. L. (2023). We know what we know, but from whom did we learn it? A sociodemographic history of participant characteristics and reporting practices in sport and exercise psychology. *Psychology of Sport and Exercise*, *69*, 102504.

Ferreira, J. J., Fernandes, C., Ratten, V., & Miragaia, D. (2019). Sports innovation: A bibliometric study. In *Sport Entrepreneurship and Public Policy: Building a New Approach to Policy-making for Sport* (pp. 153-170). Cham: Springer International Publishing.

Funk, D. C., & James, J. D. (2006). Consumer loyalty: The meaning of attachment in the development of sport team allegiance. *Journal of Sport Management*, *20*(2), 189-217.

Girard, O., Brocherie, F., Goods, P. S., & Millet, G. P. (2020). An updated panorama of "living low-training high" altitude/hypoxic methods. *Frontiers in Sports and Active Living*, *2*, 26.

Isaacson, T., & Theofilou, A. (2024). Football (soccer?) on campus. Examining the historical development and promotion of the world's most popular sport through transatlantic university comparisons. *Corporate Communications: An International Journal*, *29*(1), 52-67.

Jarneving, B. (2007). Bibliographic coupling and its application to research-front and other core documents. *Journal of informetrics*, *1*(4), 287-307.

Jiménez-García, M., Ruiz-Chico, J., Peña-Sánchez, A. R., & López-Sánchez, J. A. (2020). A bibliometric analysis of sports tourism and sustainability (2002–2019). *Sustainability*, *12*(7), 2840.

Jonker, L., Elferink-Gemser, M. T., & Visscher, C. (2010). Differences in self-regulatory skills among talented athletes: The significance of competitive level and type of sport. *Journal of sports sciences*, *28*(8), 901-908.

Khatra, O., Shadgan, A., Taunton, J., Pakravan, A., & Shadgan, B. (2021). A bibliometric analysis of the top cited articles in sports and exercise medicine. *Orthopaedic Journal of Sports Medicine*, *9*(1), 2325967120969902.

Larsson, H., & Quennerstedt, M. (2012). Understanding movement: A sociocultural approach to exploring moving humans. *Quest*, *64*(4), 283-298.

Lavega, P., Alonso, J. I., Etxebeste, J., Lagardera, F., & March, J. (2014). Relationship between traditional games and the intensity of emotions experienced by participants. *Research quarterly for exercise and sport*, *85*(4), 457-467.

Lindahl, J., Stenling, A., Lindwall, M., & Colliander, C. (2015). Trends and knowledge base in sport and exercise psychology research: a bibliometric review study. *International Review of Sport and Exercise Psychology*, *8*(1), 71-94.

Liu, B., Zhou, C. J., Ma, H. W., & Gong, B. (2023). Mapping the youth soccer: A bibliometrix analysis using R-tool. *Digital Health*, *9*, 20552076231183550.

Lohmann, J., Tittlbach, S., & Steinbauer, M. J. (2024). Sustainable development in sport and physical activity—perspectives and challenges. *German Journal of Exercise and Sport Research*, *54*(1), 1-5.

Lyons, E. J., Tate, D. F., Ward, D. S., Bowling, J. M., Ribisl, K. M., & Kalyararaman, S. (2011). Energy expenditure and enjoyment during video game play: differences by game type. *Medicine and science in sports and exercise*, *43*(10), 1987.

Mann, D. L., & Ravensbergen, H. J. C. (2018). International Paralympic Committee (IPC) and International Blind Sports Federation (IBSA) joint position stand on the sport-specific classification of athletes with vision impairment. *Sports Medicine*, *48*(9), 2011-2023.

McAuley, E., Mihalko, S. L., & Rosengren, K. (1997). Self-efficacy and balance correlates of fear of falling in the elderly. *Journal of aging and physical activity*, *5*(4), 329-340.

McPherson, S. L. (1994). The development of sport expertise: Mapping the tactical domain. *Quest*, *46*(2), 223-240.

Monsonís, O. B., Verhagen, E., Kaux, J. F., & Bolling, C. (2021). 'I always considered I needed injury prevention to become an elite athlete': the road to the Olympics from the athlete and staff perspective. *BMJ open sport & exercise medicine*, *7*(4).

Moradi, E., Gholampour, S., & Gholampour, B. (2023). Past, present and future of sport policy: a bibliometric analysis of International Journal of Sport Policy and Politics (2010–2022). *International Journal of Sport Policy and Politics*, *15*(4), 577-602.

Morrison, J. (2023). An evolutionary perspective on sport and performance enhancement. *Performance Enhancement & Health*, *11*(4), 100263.

Norton, K. (2024). Update on the evolution of World Cup soccer: men and women. *International Journal of Performance Analysis in Sport*, 1-14.

Phillips, M. G. (2020). Sizing up sport history journals: Metrics, sport humanities, and history. *The International Journal of the History of Sport*, *37*(8), 692-704.

Pinheiro, M. C., Pimenta, N., Resende, R., & Malcolm, D. (2014). Gymnastics and child abuse: An analysis of former international Portuguese female artistic gymnasts. *Sport, Education and Society*, *19*(4), 435-450.

Sage, G. H., Eitzen, D. S., & Beal, B. (2013). *Sociology of north American sport* (p. 464). Paradigm Publishers.

Sheng, Y., Huiting, Z., Qiang, Z., & Chenhui, L. (2024). A corpus-based bibliometric study of highly cited papers in sport sciences. *Sage Open*, *14*(1), 21582440231225856.

Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for information Science*, *24*(4), 265-269.

Smith, M. S., Dyson, R. J., Hale, T., & Janaway, L. (2000). Development of a boxing dynamometer and its punch force discrimination efficacy. *Journal of sports sciences*, *18*(6), 445-450.

Su, H. N., & Lee, P. C. (2010). Mapping knowledge structure by keyword co-occurrence: A first look at journal papers in Technology Foresight. *scientometrics*, *85*(1), 65-79.

Szot, T. (2024). Evolution of sport wearable global navigation satellite systems' receivers: A look at the Garmin Forerunner series. *Proceedings of the Institution of Mechanical Engineers, Part P: Journal of Sports Engineering and Technology*, 17543371241237319.

Tang, J., Xu, Z., Sun, R., Wan, J., & Zhang, Q. (2022). Research trends and prospects of sport-related concussion: A bibliometric study between 2000 and 2021. *World neurosurgery*, *166*, e263-e277.

Thomas, K. T. (1994). The development of sport expertise: From Leeds to MVP legend. *Quest*, *46*(2), 199-210.

Thorpe, H. (2009). Bourdieu, feminism and female physical culture: Gender reflexivity and the habitus-field complex. *Sociology of Sport Journal*, *26*(4), 491-516.

Van Eck, N. J., & Waltman, L. (2022). Crossref as a source of open bibliographic metadata. MetaArXiv, 1-15.

Waddington, I. (1996). The development of sports medicine. *Sociology of sport journal*, *13*(2), 176-196.

Waldén, M., Mountjoy, M., McCall, A., Serner, A., Massey, A., Tol, J. L., ... & Andersen, T. E. (2023). Football-specific extension of the IOC consensus statement: methods for recording and reporting of epidemiological data on injury and illness in sport 2020. *British Journal of Sports Medicine*, *57*(21), 1341-1350.

Waltman, L., & van Eck, N. J. (2013). A systematic empirical comparison of different approaches for normalizing citation impact indicators. *Journal of Informetrics*, *7*(4), 833-849.

Waltman, L., Van Eck, N. J., & Noyons, E. C. (2010). A unified approach to mapping and clustering of bibliometric networks. *Journal of informetrics*, *4*(4), 629-635.

Young, K. (1993). Violence, risk, and liability in male sports culture. *Sociology of sport journal*, *10*(4), 373-396.

Young, W. B., Miller, I. R., & Talpey, S. W. (2015). Physical qualities predict change-of-direction speed but not defensive agility in Australian rules football. *The Journal of Strength & Conditioning Research*, *29*(1), 206-212.

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational research methods*, *18*(3), 429-472.