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A Bibliometric Analysis and Trends of Scientific Research on the Role of Sleep in Athletic Performance

Osman AKILLIOĞLU[1*]

Author Informations

Affiliation:
[1*] Dr. Research Assistant, Harran University, School of Physical Education and Sport, Şanlıurfa, Türkiye

ORCID:
0000-0001-8238-5140

Email:
osmanakillioglu@harran.edu.tr

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Abstract

In this study, the scientific literature addressing the role of sleep in athletic performance was examined using a bibliometric approach. A total of 2,121 publications indexed in the Web of Science Core Collection between 1981 and 2025 were analyzed, and the evaluations were conducted using the bibliometrix package in the RStudio environment. The analysis focused on publication production trends, core journals, scientific contributions at the author and country levels, and citation patterns. The findings indicate that research on sleep and athletic performance has exhibited a marked growth trend over the past four decades, with a particularly notable increase in publication volume and citation impact in recent years. The literature was found to be concentrated around a limited number of specialized journals, displaying a core–periphery structure consistent with Bradford's Law. Scientific output was predominantly led by the United States, Australia, and the United Kingdom, while author productivity was concentrated within a relatively small group of researchers. Citation patterns further demonstrate that the development of the field has been shaped by influential and guiding studies, evolving over time toward a more diversified research structure.

Sportif Başarıda Uykunun Konumunu Ele Alan Bilimsel Çalışmaların Bibliyometrik Analizi ve Eğilimleri

Yazar Bilgileri

Kurum Bilgileri:
[1*] Dr. Araştırma Görevlisi; Harran Üniversitesi Beden Eğitimi ve Spor Yüksekokulu, Antrenörlük Eğitimi Bölümü, Şanlıurfa, Türkiye

ORCID:
0000-0001-8238-5140

Email:
osmanakillioglu@harran.edu.tr

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Özet

Bu çalışmada, sportif başarıda uykunun rolünü ele alan bilimsel literatür, bibliyometrik bir yaklaşımla incelenmiştir. Web of Science Core Collection veritabanında 1981–2025 yılları arasında yayımlanan 2.121 çalışma analiz edilmiş; değerlendirmeler RStudio ortamında bibliometrix paketi kullanılarak gerçekleştirilmiştir. Analiz kapsamında yayın üretim eğilimleri, çekirdek dergiler, yazar ve ülke düzeyindeki bilimsel katkılar ile atıf örüntüleri ele alınmıştır. Elde edilen bulgular, uyku ve sportif başarı araştırmalarının son kırk yılda belirgin bir büyüme eğilimi gösterdiğini ve özellikle son yıllarda yayın hacmi ile atıf etkisinin arttığını ortaya koymaktadır. Literatürün sınırlı sayıda uzmanlaşmış dergi etrafında yoğunlaştığı ve yayın dağılımının Bradford Yasası ile uyumlu bir çekirdek–çevre yapısı sergilediği belirlenmiştir. Bilimsel üretimin ağırlıklı olarak Amerika Birleşik Devletleri, Avustralya ve Birleşik Krallık merkezli olduğu; yazar üretkenliğinin ise sınırlı bir araştırmacı grubunda yoğunlaştığı saptanmıştır. Atıf örüntüleri, alanın gelişiminin etkili ve yönlendirici çalışmalar etrafında şekillendiğini ve zaman içinde daha çeşitlenen bir araştırma yapısına evrildiğini göstermektedir.

1. INTRODUCTION

Athletic performance is shaped by a complex interaction of physiological, psychological, and behavioral factors (Neumann et al. 2024; Anastasiou et al. 2024). While training load, recovery strategies, and competitive demands have long been central themes in sport science research, sleep has increasingly been recognized as a fundamental component influencing performance outcomes. Sleep plays a critical role in cognitive functioning, neuromuscular coordination, metabolic regulation, and recovery processes, all of which are essential for sustained athletic performance (Fullagar et al. 2015; Charest et al. 2022). Despite its importance, sleep was historically treated as a secondary or supportive variable rather than a core performance determinant within sport and exercise science.

Over the past several decades, growing empirical evidence has highlighted the relevance of sleep duration, quality, and timing in relation to athletic performance, injury risk, and recovery efficiency (Walsh et al. 2021). This shift has been driven by advances in sleep science, wearable monitoring technologies, and an increased emphasis on holistic performance models that integrate physiological and behavioral dimensions (de Zambotti et al. 2024; Fullagar et al. 2015). As a result, research on sleep and athletic performance has expanded across multiple subdisciplines, including sport physiology, psychology, chronobiology, and applied performance science.

The rapid growth of this literature has led to a fragmented and multidimensional research landscape, making it increasingly challenging to obtain a comprehensive overview of the field's development, dominant publication outlets, and influential contributors. While narrative and systematic reviews have addressed specific aspects of sleep in athletic contexts, such approaches are limited in their ability to capture large-scale structural patterns, long-term publication trends, and the intellectual organization of the research domain as a whole (Lastella et al. 2020).

Bibliometric analysis offers a systematic and quantitative framework for examining the evolution of a research field through the analysis of publication and citation data (Aria & Cuccurullo 2017). By mapping scientific output, journal structures, authorship patterns, and citation dynamics, bibliometric approaches provide valuable insights into how knowledge is produced, disseminated, and consolidated over time. In the context of sleep and athletic performance research, such an approach enables the identification of growth trajectories, core journals, and influential studies that have shaped the field's scientific foundation.

Accordingly, the present study aims to provide a comprehensive bibliometric analysis of scientific research examining the role of sleep in athletic performance. By analyzing publications indexed in the Web of Science Core Collection, this study seeks to map the development of the literature, identify leading journals and authors, and examine broader trends characterizing the evolution of sleep-related research within performance-oriented sport science. Through this macro-level perspective, the study contributes to a clearer understanding of the field's current structure and offers a contextual framework for future empirical investigations.

2. METHOD

2.1. Study Design

This study employs a descriptive research design grounded in bibliometric analysis to examine the scientific literature on sleep and athletic performance within the field of sport and exercise science. Bibliometric analysis is a systematic and quantitative approach that enables the evaluation of the structural and intellectual organization of a research field through the analysis of publication and citation data (Aria & Cuccurullo, 2017). Within this framework, the present study aims to identify publication trends, core journals, and authorship patterns characterizing

the development of sleep-related research in performance-oriented sport science. By mapping patterns of knowledge production, the study provides a comprehensive overview of how research on sleep and athletic performance has evolved over time.

2.2. Data Sources and Search Strategy

The bibliometric analysis was conducted using RStudio with the bibliometrix package. Bibliographic data retrieved from the Web of Science Core Collection were imported in plain text format and converted into a data frame for analysis. Descriptive analyses were performed to examine publication trends and to identify the most productive journals and authors in the field of sleep and athletic performance. In addition, keyword co-occurrence analysis was applied to explore the conceptual structure of the literature. All analyses were performed without additional manual filtering to ensure the transparency and reproducibility of the study.

3. FINDINGS

The bibliometric dataset comprised 2,121 documents published between 1981 and 2025 and indexed in the Web of Science Core Collection. These publications were distributed across 620 sources, predominantly journal articles. The dataset included 8,555 authors, with an average of 5.81 co-authors per document. The annual growth rate of publications was 5.68%, and the average number of citations per document was 19.98.

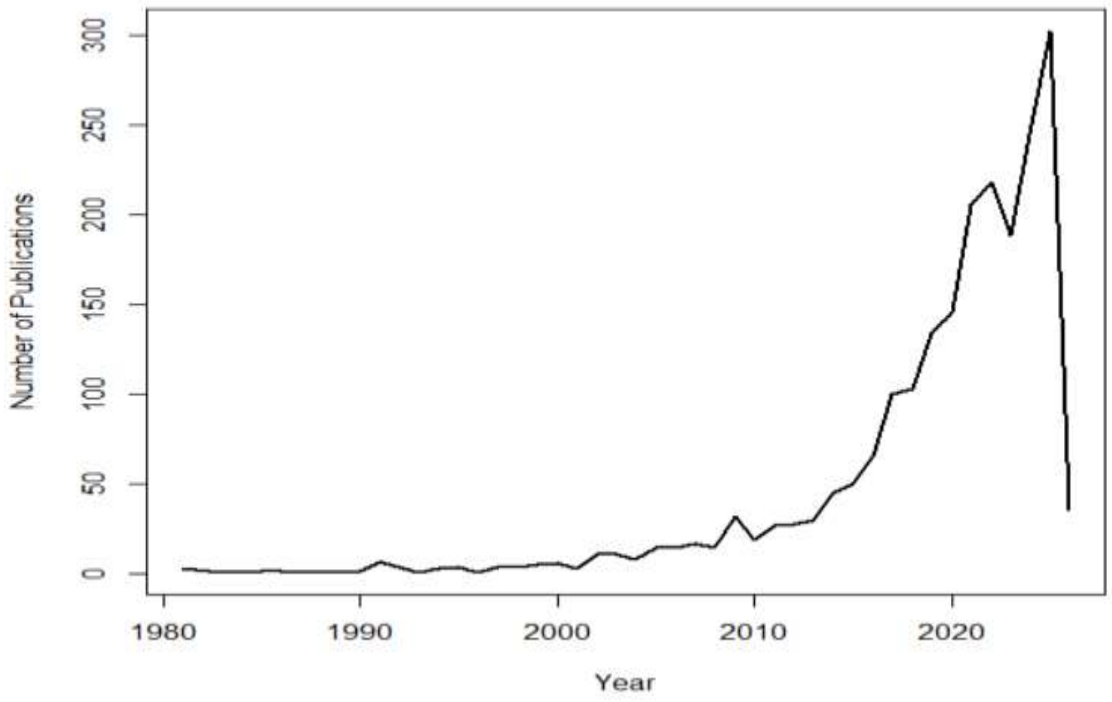

Figure 1. Annual scientific production on sleep and athletic performance research indexed in the Web of Science Core Collection (1981–2025).

Note. The figure illustrates the annual number of publications related to sleep and athletic performance. Scientific output remained limited during the early period, followed by a

gradual increase, with a marked acceleration in publication volume observed in the most recent years.

Table 1. Leading journals publishing research on sleep and athletic performance.

Journal	Publications
British Journal of Sports Medicine	44
Frontiers in Psychology	40
International Journal of Environmental Research and Public Health	40
Sports Medicine	40
Chronobiology International	38
Medicine & Science in Sports & Exercise	36
Journal of Sports Sciences	35
Journal of Strength and Conditioning Research	34
Frontiers in Physiology	32
Frontiers in Sports and Active Living	31

Table 1 presents the leading journals contributing to the literature on sleep and athletic performance. Consistent with Bradford's Law, the findings indicate that a relatively small number of specialized journals account for a substantial proportion of the total scientific output in the field.

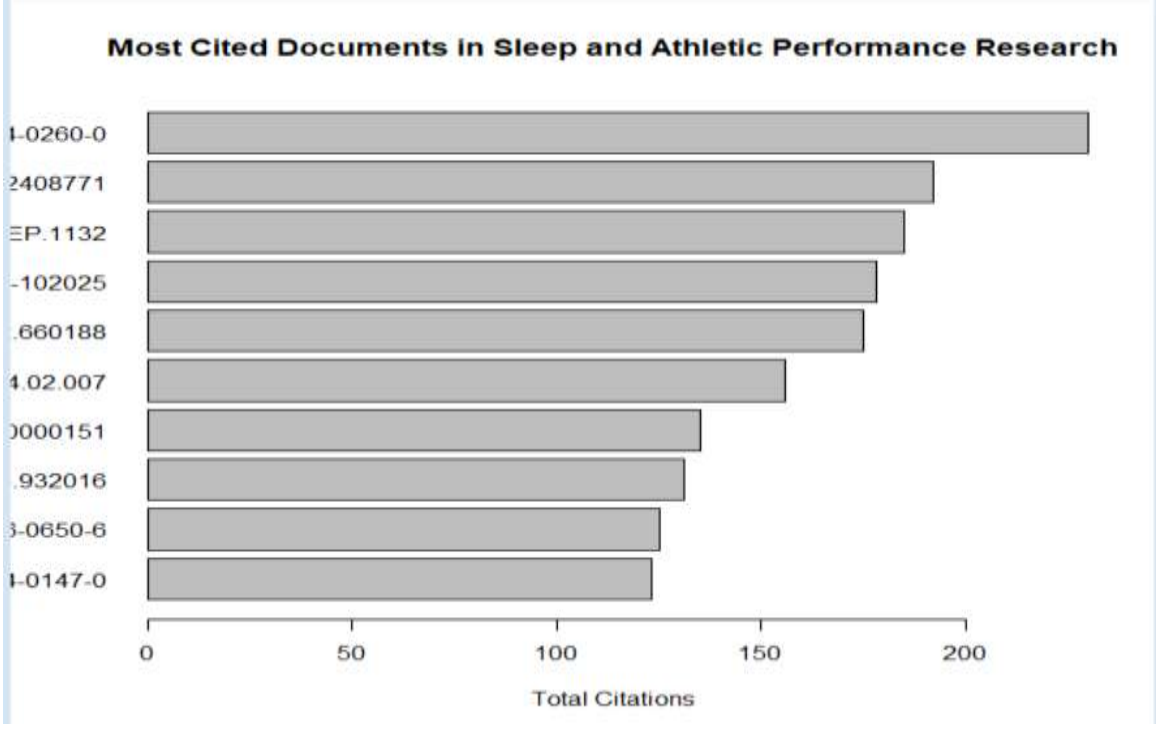

Figure 2. Most cited documents in sleep and athletic performance research (Web of Science Core Collection).

Most cited documents in sleep and athletic performance research indexed in the Web of Science Core Collection. The figure presents the ten publications with the highest total citation counts, providing an overview of the studies that have attracted the greatest scholarly attention within the field. These highly cited documents represent key reference points in the literature and reflect the foundational research themes that have shaped the scientific development of sleep-related investigations in athletic performance contexts.

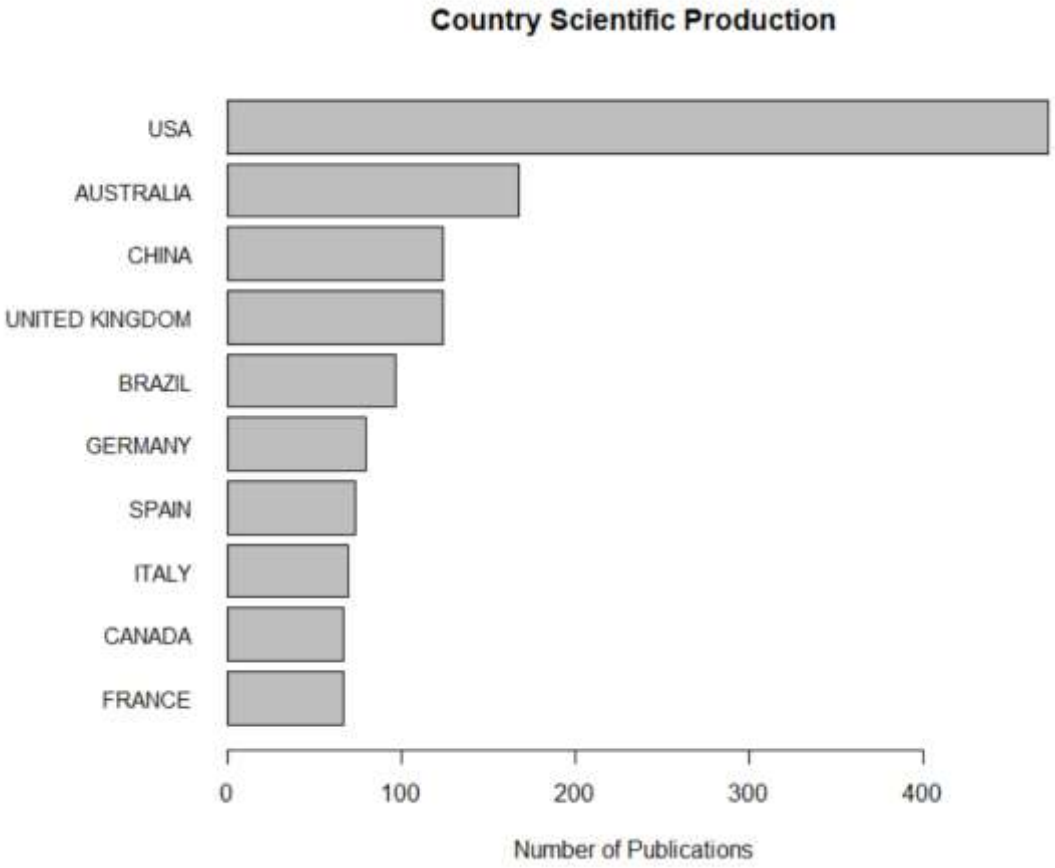

Figure 3. Country scientific production in sleep and athletic performance research (Web of Science Core Collection)

Figure 3 illustrates the distribution of scientific production by country in the field of sleep and athletic performance research. The United States emerges as the most productive country by a substantial margin, indicating its central role in shaping the literature. It is followed by Australia, China, and the United Kingdom, which together form a secondary cluster of high-output countries. European countries such as Germany, Spain, Italy, and France also contribute consistently to the field, reflecting a geographically diverse research landscape. Overall, the figure highlights pronounced cross-national differences in publication output and underscores the dominance of a limited number of countries in driving scientific production within this research area.

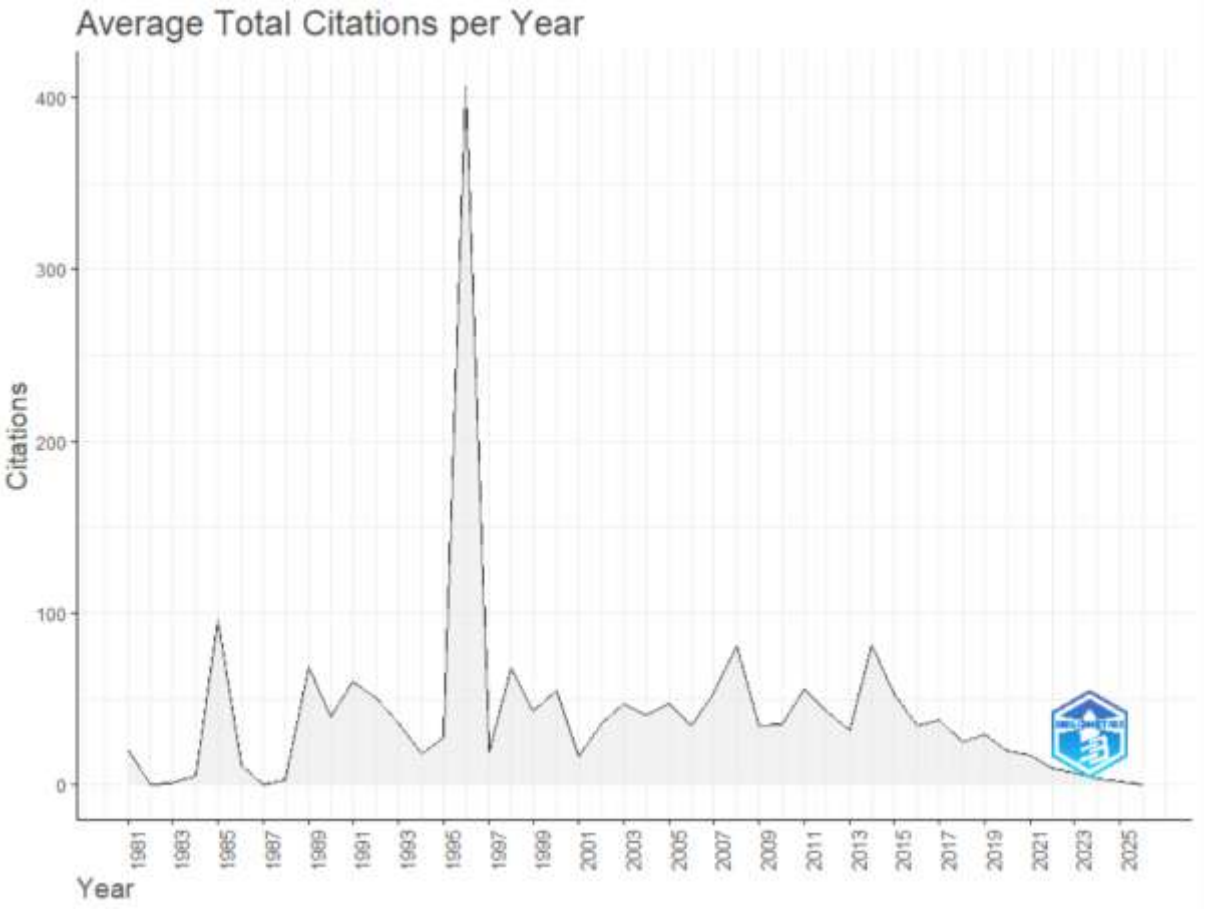

Figure 4. Average total citations per year in sleep and athletic performance research indexed in the Web of Science Core Collection.

Figure 4 illustrates the temporal evolution of the average total number of citations received per year by publications focusing on sleep and athletic performance. The figure reveals notable fluctuations in citation activity over time, with relatively low citation levels during the early developmental phase of the field, followed by a pronounced increase from the mid-1990s onward. A sharp peak observed in the mid-1990s reflects the publication of highly influential foundational studies that substantially shaped subsequent research directions. In more recent years, citation levels exhibit a stabilization trend, indicating both the maturation of the field and the diversification of research outputs. Overall, the citation trajectory highlights periods of intensified scholarly impact and underscores the long-term influence of seminal contributions within the literature.

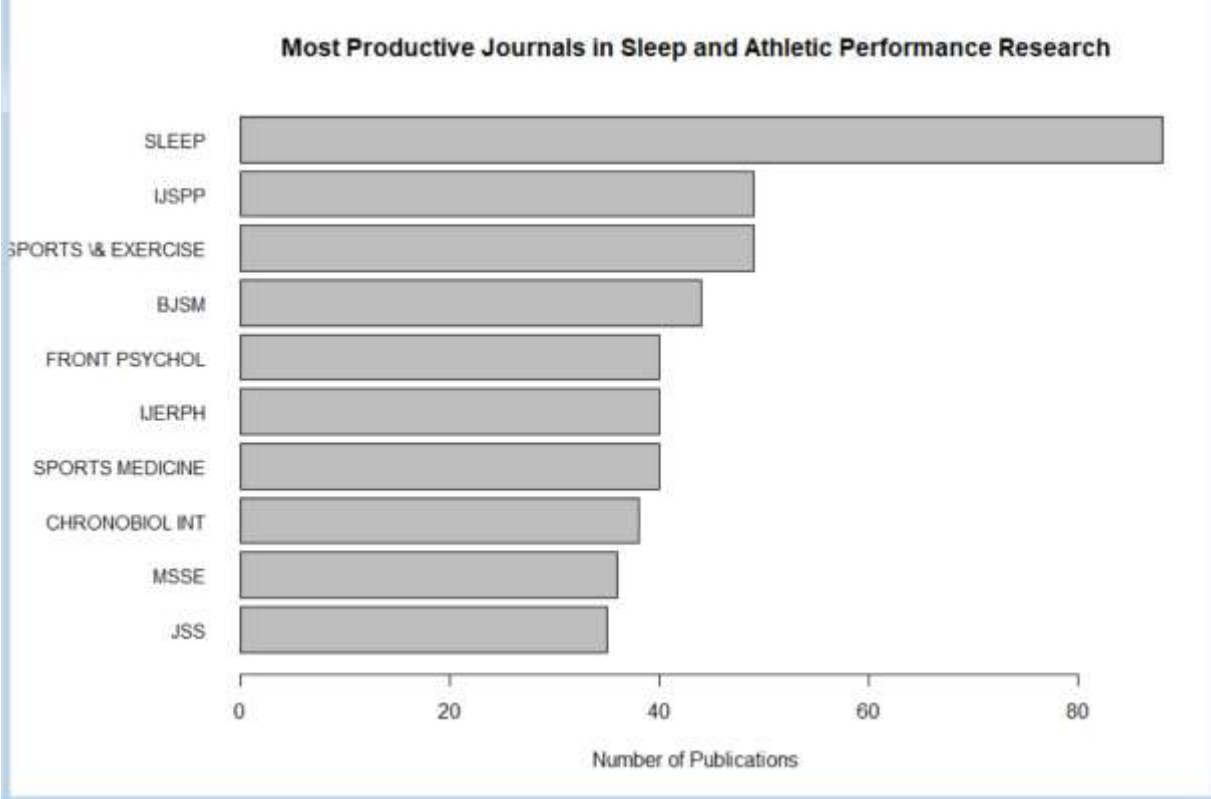

Figure 5. Most productive journals in sleep and athletic performance research indexed in the Web of Science Core Collection.

Figure 5 depicts the distribution of the most productive journals publishing research on sleep and athletic performance. The results demonstrate a pronounced concentration of scientific output within a limited number of specialized journals, with Sleep emerging as the leading publication outlet in terms of total number of articles. This is followed by International Journal of Sports Physiology and Performance, Medicine & Science in Sports & Exercise, and British Journal of Sports Medicine, highlighting the central role of sport science and sleep-focused journals in shaping the intellectual structure of the field. The observed publication pattern reflects a core–periphery structure consistent with Bradford's Law, indicating that a relatively small set of journals accounts for a substantial share of the overall scientific production in this research area.

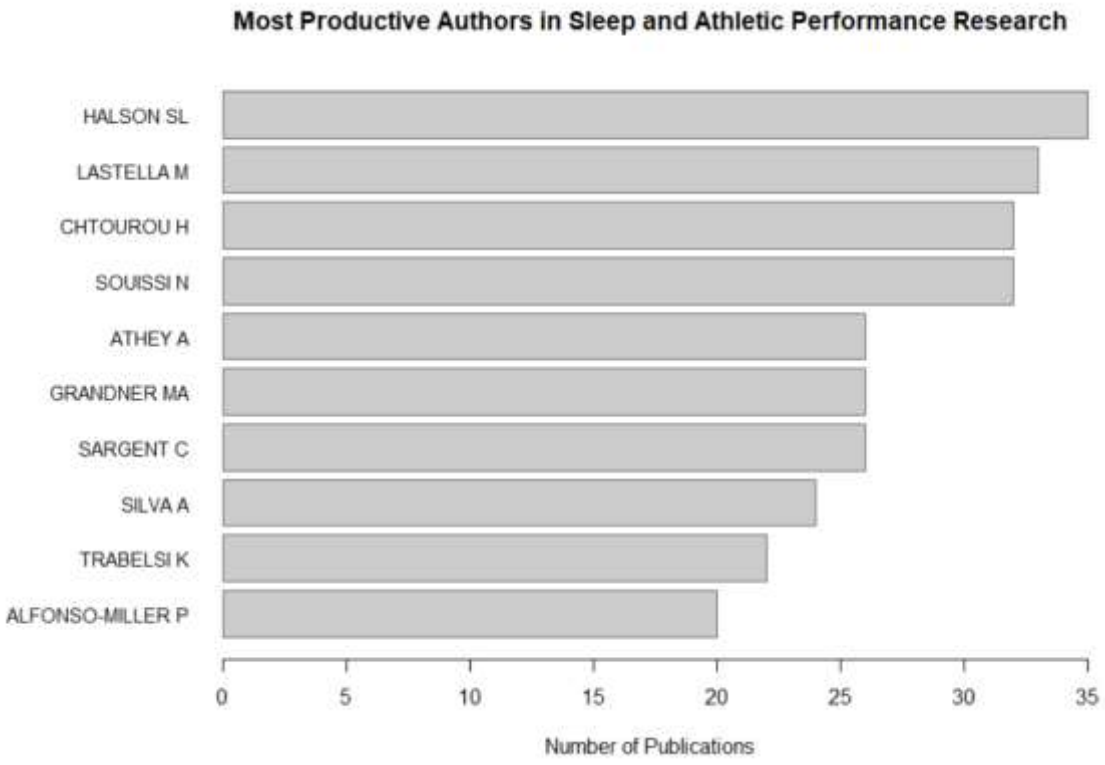

Figure 6. Most productive authors in sleep and athletic performance research indexed in the Web of Science Core Collection.

Figure 6 illustrates the most productive authors in the field of sleep and athletic performance research based on the number of publications indexed in the Web of Science Core Collection. The distribution reveals a concentration of scientific output among a limited group of researchers, indicating the presence of a core authorship structure within the literature. Authors such as Halson, Lastella, and Chtourou emerge as leading contributors, reflecting sustained research engagement and thematic specialization in sleep-related performance outcomes. This pattern suggests that the development of the field has been strongly shaped by recurring contributions from a small number of highly productive authors, consistent with established bibliometric regularities in scientific productivity.

4. DISCUSSION

The findings indicate that research on sleep and athletic performance has demonstrated a steady and accelerating growth pattern over the past four decades (Lastella et al. 2020). The limited number of publications observed during the early period suggests that sleep was initially treated as a peripheral factor within performance-oriented sport science. However, the marked increase in scientific output in recent years reflects a growing recognition of sleep as a core component influencing athletic performance, recovery, and training adaptation. The annual publication growth rate of 5.68% and the relatively high average citation count per document (19.98) point to both the expanding volume and the sustained scholarly impact of research in this area. The high level of multi-authorship further indicates an increasing tendency toward collaborative and interdisciplinary research, aligning sleep research with broader physiological,

psychological, and performance-based frameworks. Collectively, these trends suggest that sleep and athletic performance research has transitioned from an emerging topic to a more established and integrative research domain within sport sciences.

The distribution of publications across journals reveals a clear concentration of scientific output within a limited number of specialized outlets. Consistent with Bradford's Law, a small core of journals accounts for a substantial share of research on sleep and athletic performance, indicating a well-defined publication nucleus within the field (Bradford, 1985). Journals such as British Journal of Sports Medicine, Sports Medicine, and Medicine & Science in Sports & Exercise occupy a central position, reflecting the strong integration of sleep research into performance-oriented sport science discourse. The presence of multidisciplinary and physiology-oriented journals, including Frontiers in Psychology, Frontiers in Physiology, and Chronobiology International, further suggests that sleep research in athletic contexts spans both psychological and biological dimensions. This pattern highlights the field's interdisciplinary character and indicates that sleep and athletic performance research is embedded within a mature and specialized journal ecosystem rather than being dispersed across unrelated outlets.

The most highly cited documents in the field highlight the foundational studies that have shaped the scientific understanding of sleep in relation to athletic performance (Facer Childs et al 2018). The concentration of citations within a limited number of key publications suggests that the development of the field has been strongly influenced by a core set of influential studies that continue to guide subsequent research. These highly cited works function as intellectual anchors, providing conceptual frameworks, methodological standards, and empirical evidence that have defined research priorities over time. The prominence of these seminal publications also indicates a cumulative knowledge structure, in which later studies build upon established theoretical and empirical foundations rather than developing in isolation. This citation pattern reflects the maturation of the field and underscores the enduring impact of early, high-quality research in shaping contemporary investigations into sleep-related performance outcomes.

The country-level analysis reveals a pronounced concentration of scientific production in a limited number of countries, with the United States occupying a dominant position in sleep and athletic performance research (Lastella et al. 2020). This leadership likely reflects the presence of well-established research infrastructures, sustained funding mechanisms, and strong integration between sport science and sleep research disciplines. The emergence of Australia, China, and the United Kingdom as a secondary high-output cluster further indicates that the field is shaped by a small group of countries with advanced sport science ecosystems. The consistent contributions from several European countries suggest a geographically diversified but asymmetrical research landscape, in which scientific production is not evenly distributed across regions. Overall, this pattern highlights the central role of a few research-intensive countries in driving knowledge production, while also pointing to potential opportunities for broader international collaboration and expansion of sleep-focused sport science research across underrepresented regions.

The temporal pattern of average citations per year reflects the developmental trajectory of sleep and athletic performance research. The low citation levels observed during the early phase indicate a formative period in which the field had not yet established a consolidated research agenda. The pronounced increase and sharp citation peak from the mid-1990s onward suggest the emergence of highly influential studies that defined key research questions and methodological approaches, serving as reference points for subsequent investigations (Donthu et al., 2021). The stabilization of citation levels in more recent years points to the maturation of the field, characterized by a broader diversification of research topics rather than reliance on a small

number of seminal works. This trend indicates that sleep and athletic performance research has transitioned into a more stable and structured domain, where cumulative knowledge development coexists with expanding thematic breadth.

The distribution of the most productive journals further confirms the existence of a clearly defined core publication structure within sleep and athletic performance research. The prominence of Sleep as the leading outlet underscores the central role of sleep-specific scholarship in advancing performance-related investigations, while the strong representation of sport science journals such as International Journal of Sports Physiology and Performance, Medicine & Science in Sports & Exercise, and British Journal of Sports Medicine highlights the integration of sleep research into applied performance science. This core–periphery publication pattern is consistent with Bradford's Law and indicates that scientific knowledge in the field is largely consolidated within a small number of specialized journals (Bornmann & Leydesdorff 2014). Such concentration reflects both the maturation of the research area and the establishment of stable dissemination channels that shape the intellectual structure and research standards of sleep-focused sport science.

The analysis of author productivity reveals a pronounced core authorship structure within sleep and athletic performance research. The concentration of publications among a limited number of highly productive authors indicates sustained scholarly engagement and thematic specialization, with researchers such as Halson, Lastella, and Chtourou playing a central role in shaping the field. This pattern suggests that knowledge production has been driven by recurring contributions from established experts rather than sporadic or isolated efforts. Such a core authorship structure is consistent with well-documented bibliometric regularities in scientific productivity and reflects the progressive consolidation of expertise within the field. The presence of leading authors with long-term research trajectories further indicates that sleep and athletic performance research has developed a stable intellectual leadership, contributing to the coherence and continuity of the literature.

Conclusion

This bibliometric review provides a comprehensive overview of the scientific landscape of sleep and athletic performance research, revealing a field that has evolved from a marginal research interest into a well-established and increasingly integrated domain within sport sciences. The steady growth in publication output, the concentration of research within a defined set of specialized journals, and the presence of influential foundational studies collectively indicate the maturation and consolidation of the literature. The findings further demonstrate that scientific production is driven by a limited number of research-intensive countries, core journals, and highly productive authors, reflecting a structured and centralized knowledge base. At the same time, the stabilization of citation patterns and the diversification of publication outlets suggest that the field has entered a phase characterized by thematic expansion rather than reliance on a narrow set of seminal works. Overall, this study highlights the central role of sleep in performance-oriented sport science research and underscores its increasing recognition as a critical component of athletic performance, recovery, and training optimization. By mapping publication trends, intellectual structures, and geographic patterns, the present review offers a valuable reference framework for researchers seeking to contextualize future empirical studies and identify emerging directions in sleep-related performance research

Strengths and Limitations

A major strength of this study is its use of a systematic and reproducible bibliometric approach to map the development of sleep and athletic performance research over a long time span. The

analysis provides an objective overview of publication trends, core journals, and influential studies based on data from the Web of Science Core Collection.

However, the findings are limited by the exclusive use of a single database, which may omit relevant studies indexed elsewhere. In addition, bibliometric indicators reflect scientific visibility rather than the methodological quality or practical impact of individual studies. Therefore, the results should be interpreted as a macro-level representation of the research landscape.

Conflict of Interest
There is no conflict of interest between the author(s) and any individual, institution, or organization that could have influenced this research.

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Author Biographies
Corresponding Author: *Osman AKILLIOĞLU*[1*] – Dr. Araştırma Görevlisi; Harran Üniversitesi Beden Eğitimi Ve Spor Yüksekokulu, Antrenörlük Eğitimi Bölümü, Şanlıurfa, Türkiye, ORCİD No: *0000-0001-8238-5140*, *osmanakillioglu@harran.edu.tr*

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