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RESEARCH ARTICLE

The Psychology of Paralympic Athletes: A Bibliometric Analysis

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Abstract
Comprehending the paralympic athletes' psychology is paramount due to their distinctive challenges. Sports can be a facilitator, strengthening emotional well-being, coping mechanisms, and self-confidence and fostering resilience, yet internal stressors can undermine their mental health. It is crucial to elucidate the publications' fundamental components displaying a growing trend within this framework. Hence, this study aims to explore a comprehensive bibliometric analysis of paralympic athletes' psychology. The Web of Science database was analyzed for publications from 1992 to Sept. 1, 2023, across Social Sciences Citation, Science Citation Index Expanded, Emerging Sources Citation, and Arts & Humanities Citation indexes. Among these, 263 articles were integrated, encompassing 13 categories of sports, psychology, and sociology. This study utilized VOSviewer 1.6.19 to investigate citation and bibliometric coupling analysis and provided keywords, occurrence, and co-citation analysis. The findings indicate that 2022 witnessed the most cited publications, comprising 34 articles. Further findings revealed that David L. Mann is the top-cited author, the British Journal of Sports Medicine is the top-cited journal. Bibliometric coupling results underlined Psychology of Sport and Exercise, Loughborough University, and England, with the highest total link strength, respectively, as journal, institution, and country. Regarding study results, the most notable keyword clusters are sports, paralympic games, paralympic, paralympics, disability, and paralympic athletes. Finally, the top terms featured in abstracts were game, impairment, person, difference, program, and participation. Consequently, distinguished writers, organizations, and nations not only engage in vigorous interactions within their respective domains but also maintain robust and meaningful connections with one another.

Keywords
Para Athletes, Paralympians, Paralympic Sports, Disability, Athletes With Special Needs

INTRODUCTION

Extensive research has unequivocally established the transformative power of sports for individuals with disabilities, enabling them to surmount physical limitations and overcome social isolation and economic obstacles. Studies have specifically emphasized the pivotal role of disabled sports in not just promoting rehabilitation but also facilitating social participation (Tow et al. 2019; Yardımcı and Anaforoğlu Külünkoğlu, 2022). Furthermore, Swartz et al. (2019) posited that engaging in paralympic sports can serve as a protective buffer against the psychological and social challenges often accompanying disabilities.

The Stoke Mandeville Games, created by Sir Ludwig Guttmann in 1948, is credited as the foundation of modern disability sports (Brittain, 2016). Initially intended for rehabilitating injured military veterans, Sir Guttmann's vision evolved into the contemporary Paralympic Games.

As Legg (2018) reported, the word Paralympic, derived from the Greek words 'para' (beside) and Olympic, reflects that the Paralympic games were created as parallel games of the Olympics. The Paralympic games are exclusively for elite athletes with exceptional training and

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expertise, called Paralympians, as emphasized by Dieffenbach and Statler (2012). Paralympians require special training, dedication, and resources to pursue their Olympic dream like the Olympians.

The Paralympic Movement's vision is to inspire and excite the world by enabling Paralympic Athletes to achieve sporting excellence (IPC, 2010). To ensure this vision is realized, unique classification systems are used in Paralympic sports, serving two crucial functions. Firstly, these systems define who is eligible to compete in Paralympic sports and thus have the opportunity to achieve their goal of becoming a Paralympic Athlete. Secondly, they assist athletes in minimizing the impact of their disabilities and categorizing them into sports classes to ensure that sporting excellence is determined by which athlete or team achieves victory.

Like the Olympic Games, the Paralympic Games serve as a global platform for elite athletes to compete in various summer and winter team and individual sports (Dieffenbach and Statler, 2012). These games are characterized by intense competition, with paralympic athletes being classified into six distinct categories, namely amputees, cerebral palsy, individuals with intellectual disabilities, "Les Autres" (others), visually impaired, and wheelchair categories. Athletes are classified based on specific activity areas to ensure a level playing field. The classification system fosters an environment where athletes can compete against players of comparable standing (Özdemir and Ilkım, 2019).

A paralympic athlete also encounters challenging situations in many aspects, such as putting forth the best in the competitive culture, surpassing himself, preparing before the competition, and coping with many structures, such as excitement, fear, anxiety, and stress during the competition. Additionally, considering that the preparation for the competition is not a purely technical tactical training process, paralympic athletes have the exact basic needs as Olympic athletes in terms of psychological preparation for the competition and strengthening existing psychological skills.

Some researchers (Asken, 1991; Bawden, 2006) assert that coaching and sports psychology for Paralympic athletes is comparable to that of Olympic athletes. The commonality between the two groups lies in their shared identity as athletes, which facilitates fulfilling their fundamental psychological needs. Furthermore, this shared experience has the power to counteract any obstacles that may impede the satisfaction of these needs.

This research aims to explore the bibliometrics of Paralympic athletes' psychology thoroughly. The remarkable absence of any national or international publication that utilizes the visual mapping technique in the literature review to analyze these athletes' psychology brings to light this study's exceptional nature. By addressing this significant gap, the research will provide a reliable reference for scientists, psychological performance counselors, coaches, athletes, sports administrators, and new researchers keen on studying Paralympic athletes.

A rigorous examination of the following inquiries was undertaken to advance the research objectives.

- How do citation analyses of the examined research articles distribute across documents, journals, and authors?
- How do bibliometric coupling analyses of the examined research articles vary across journals, institutions, and countries?
- What is the keyword distribution in the research articles analyzed, based on frequency of use and total link strength?
- How are frequently used terms in the abstracts distributed based on frequency of use and relevance?
- What is the co-citation analysis distribution observed in reference, journal, and author criteria?

MATERIALS AND METHODS

This section covers the research model, universe and sample, data collection platform, data analysis, and ethical considerations.

Research model

This study employs a bibliometric analysis technique involving visual mapping. Bibliometrics applies mathematical and statistical methods to analyze books and other forms of communication. It is a commonly used method for evaluating scientific research based on research publications (Pritchard, 1969; Rehn and Kronman, 2008). Vosviewer, a cluster analysis-based tool, is used for this study. Bibliometric analysis is an indispensable tool for assessing research performance across different levels, from a broader

perspective to a more detailed one. While conducting country or discipline-level analysis provides a general outlook, meso-level analysis of institutions and micro-level analysis of individual authors can produce more refined insights. With the help of bibliometric techniques, researchers can access high-quality, dependable, and informative data to effectively assess publication performance, author and institution rankings and generate comprehensive maps of research activities (Laengle et al. 2017; Özsoy and Demir, 2018; Yalçın and Öztürk, 2017).

Universe and Sample

The universe of this bibliometric research on the psychology of Paralympic athletes consists of publications related to the subject in the Web of Science database. On September 1, 2023, a query was made to clarify the population and sample framework for research using Web of Science's advanced search engine. The selected keywords are formalized and written in the specified string, respectively: (ALL=("para athlete*" OR "paralymp*" OR "para race*" OR "para sport*")) AND (ALL=("psycho*" OR "sport psycho*")). With the selected keywords, 418 publications were reached in the Web of Science database. Upon examination, it was discovered that the earliest publication related to the subject was from 1992. Of the 418 publications accessed, a majority of 320 were research articles (76.6%), followed by 34 reviews (8.1%), 45 abstracts (10.8%), and 8 full-text papers (%1.9) presented at conferences, 2 book chapters (0.5%) and 9 editorial material (2.2%).

This study primarily chose the research articles covering 76.6% of the relevant literature as the unit of analysis. The publications classified in the categories of review, abstract, and full-text papers presented at conferences, book chapters, and editorial materials are omitted. Subsequently, the 323 articles selected as the analysis unit were scrutinized according to their indexation status in the SSCI, SCI-E, ESCI, and AHCI databases within the Web of Science Core Collection scope. Eventually, 321 articles were found to be matched. Afterward, all 321 articles were classified according to the Web of Science categories. Among these, a sum of 263 articles, respectively classified under 13 categories titled "hospitality leisure sport tourism", "psychiatry", "psychology", "psychology applied", "psychology clinical", "psychology developmental", "psychology experimental", "psychology multidisciplinary", "psychology social", "rehabilitation", "social sciences interdisciplinary", "sociology", and "sport sciences" were selected and incorporated into the study.

Based on the evaluations conducted, it has been conclusively determined that the first study in 1992 was a research article. Accordingly, the review interval of this study's publications is between 1992 and September 1, 2023.

Data collection platform

Web of Science (WoS) is a digital platform that serves as a repository for comprehensive citation data across various academic fields. It offered subscription-based access to multiple databases and was initially developed by the Institute for Scientific Information 'ISI' (Birkle et al. 2020). Today, WoS is managed by Clarivate Analytics.

The Web of Science Core Collection is comprised of six comprehensive online databases. These databases include (1) The Science Citation Index Expanded (SCIE), which meticulously scans over 8,500 peer-reviewed journals across 150 disciplines since 1900, (2) The Social Sciences Citation Index (SSCI), which focuses on over 3,000 journals that pertain to social sciences since 1900, (3) The Arts & Humanities Citation Index (AHCI), which has attentionally scanned over 1,700 journals that encompass science, social sciences, and arts since 1975, (4) The Emerging Sources Citation Index (ESCI), which focuses on over 5,000 journals that pertain to science and social sciences, (5) The Book Citation Index (BCI), which thoroughly scans over 60,000 printed books since 2005, and finally (6) The Conference Proceedings Citation Index (CPCI) which has carefully scanned over 160,000 scientific conference titles since 1990 (Birkle et al. 2020; Öner, 2022).

This comprehensive study examines research articles in SCIE, SSCI, AHCI, and ESCI databases.

Data analysis

The research employed the VOSviewer 1.6.19 software to generate a detailed network diagram of the psychology of paralympic athletes and to provide a clear visualization of the corresponding literature.

VOSviewer is a powerful software for visualizing literature units that excel in the advanced 'Visualization of Similarities (VOS)'

technology. This technology is particularly adept at displaying mapping information areas, focusing primarily on clustering (Van Eck and Waltman, 2010). According to Sinkovics (2016), VOSviewer is the most popular method used in bibliometric mapping. The related literature claims that VOSviewer is suitable for analyzing large-scale data and creating complex networks (Zou et al. 2018) and is specially designed for mapping and visualization (Cobo et al. 2011). It provides bibliometric tools facilitating citations, authors, geographic distribution, and word frequency analyses (Niñerola et al. 2019).

VOSviewer boasts a unique clustering technique, which is a standout feature. The circles within the set highlight the position of each item under review, with their size reflecting the number of co-occurrences. The larger the circle, the more significant the element and its impact. Colors are assigned to items based on their respective sets to distinguish clusters. Additionally, the distance between the items within the examination unit offers valuable insights into their relationships (Khalil and Crawford, 2015; Van Eck and Waltman, 2010). The proximity of the examined elements indicates a strong relationship, while a significant distance implies insufficient similarity and a weak correlation in mapping. Finally, the absence of a connection reveals the lack of a relationship.

Through an extensive review of relevant literature, this study has identified the optimal keywords to select appropriate data for the planned content analysis. The chosen keywords, based on the literature review, include "para athlete", "paralympian", "paralympic", "para race", "para sport", "psychology", and "sport psychology". Then, it was evaluated from which database the publications that overlapped with the purpose of the review should be accessed. The Web of Science (WoS) database served by Clarivate Analytics was chosen because it is a platform that attracts excellent attention regarding publication quality. The selected keywords were placed in the "query" line in the "Documents" subsection in the advanced search feature offered by Web of Science (WoS), considering the different extension possibilities of the selected keywords written with the string (ALL=("para athlete*" OR "paralymp*" OR "para race*" OR "para sport*") AND (ALL=("psycho*" OR "sport psycho*")). With the selected keywords, 418 publications were accessed in the Web of Science database between 1992 and September 1, 2023. The study meticulously assessed research articles published in SSCI, SCI-E, ESCI, and AHCI databases that were classified in WoS categories closely related to the subject matter. Ultimately, only 263 articles that met the strict criteria were included as the analysis unit, whereas 155 publications that failed to fulfill the relevant requirements were excluded.

The selected articles, which serve as the foundation for the analysis, have been transferred to the VOSviewer 1.6.19 program for visual mapping and data analysis.

The study analyzed the distribution of documents based on their publication years. The citation analyses regarding documents, journals, and authors were detailed and strengthened through bibliometric publication images and density maps. The program's bibliographic coupling analysis highlighted the connections among the journals, institutions, and countries referenced in the relevant publications for the research topic. Furthermore, keywords were analyzed to identify the frequently used words. Besides these, the study also revealed the most used terms in the abstracts. In these analyses, bibliometric images and density maps explained the results. Additionally, detailed information is provided on reference, journal, and author characteristics that emerged in the co-citation network analysis.

Ethical considerations

This study was carried out following the unanimous decision of the Istanbul Rumeli University Ethics Committee dated 21/12/2022 and numbered 2022/11-08.

RESULTS

This section highlights research findings that align with the general purpose and sub-objectives.

Analysis of Publications by Years

The accompanying visual, Figure 1, illustrates the timeline of research articles about Paralympic athletes' psychological aspects.

Figure 1 indicates a fluctuating trend in the research publication on paralympic athletes' psychology between 1992 and 2014. Interestingly, the number of publications remained constant at 12 articles in 2015 and 2016 and did not decrease in subsequent years. Notably, the number of

publications from 1992-2014 amounted to 57, while between 2015 and September 1, 2023, saw a substantial increase to 206 publications. The year 2022 saw the highest number of publications, comprising 34 releases.

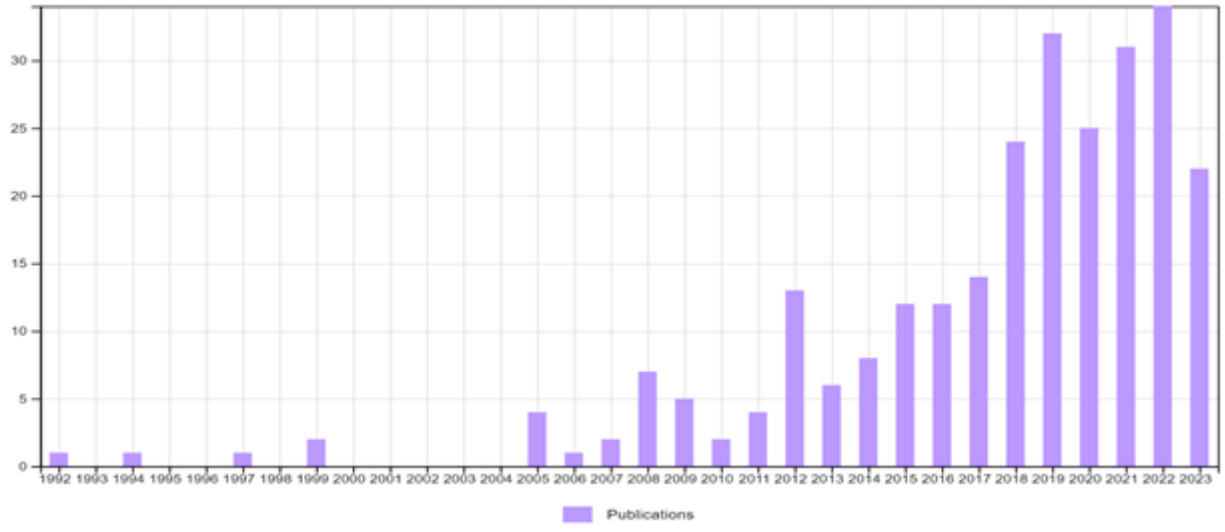

Figure 1. Chronological distribution of articles

Citation analyses

Citations analyses regarding documents

The research delved into which publications are cited the most, yielding valuable insights. A minimum citation count of 2 was set for each publication analyzed, and 178 out of 263 publications surpassed this threshold. Table 1 provides a detailed breakdown of the top 16 studies with the highest citation counts.

Table 1. Most cited publications

Article Title	Authors	Citations Count
Consensus statement on concussion in sport-the 5th international conference on concussion in sport held in Berlin, October 2016	McCrory, P. et al. 2017	2126
How much is too much? (Part 2) International Olympic Committee consensus statement on load in sport and risk of illness	Schwellnus, M. et al. 2016	253
The Sport Concussion Assessment Tool 5th Edition (SCAT5): Background and rationale	Echemendia, R.J. et al. 2017	239
Spontaneous facial expressions of emotion of congenitally and noncongenitally blind individuals	Matsumoto, D. and Willinghan B., 2009	147
Changing negative attitudes towards persons with physical disabilities: An experimental intervention	Krahé, B. and Altwasser, C., 2006	116
Research on physical activity and health among people with disabilities: A consensus statement	Cooper, R.A. et al. 2001	109
Paralympic classification: Conceptual basis, current methods, and research update	Tweedy, S.M. et al. 2014	102
Disability sport and activist identities: A qualitative study of narratives of activism among elite athletes' with impairment	Smith, B. et al. 2016	91
Coach autonomy support, basic need satisfaction, and intrinsic motivation of paralympic athletes	Banack, H.R. et al. 2011	73
Giving and receiving autonomy support in a high-stakes sport context: A field-based experiment during the 2012 London Paralympic Games	Cheon, S.H. et al. 2015	71
International Olympic Committee (IOC) Sport Mental Health Assessment Tool 1 (SMHAT-1) and Sport Mental Health Recognition Tool 1 (SMHRT-1): towards better support of athletes' mental health	Gouttebarg, E.V. et al. 2021	70

Table 1. Continue

Article Title	Authors	Citations Count
Modulators of the personal and professional threat perception of olympic athletes in the actual COVID-19 Crisis	Clemente-Suarez, V.J. et al. 2020	69
The dynamics of expertise acquisition in sport: The role of affective learning design	Headrick, J. et al. 2015	68
Sleep quality evaluation, chronotype, sleepiness and anxiety of paralympic Brazilian athletes: Beijing 2008 Paralympic Games	Silva, A. et al. 2015	64
Motivational factors and coping strategies of Norwegian paralympic and olympic winter sport athletes	Pensgaard, A.M. et al. 1999	48
Athlete mental health in the olympic/paralympic quadrennium: A multi-societal consensus statement	Henriksen, K. et al. 2020	47

Regarding Table 1, the research article with the highest number of citations, with 2126, belongs to McCrory et al. (2017). While Schwellnus et al.'s (2016) studies ranked second with 253 citations, and Echemendia et al.'s (2017) studies were the third most cited publication with 239 citations. Figure 2 shows the connections between the documents, while Figure 3 illustrates their density.

After analyzing the citations, 12 distinct clusters within the publications were identified. The two most significant red and green clusters ranked the first two rows with 11 and 10 documents, respectively. The blue cluster follows them with nine documents, while the light blue has only two publications, making it the smallest cluster. Figure 3 highlights Schwellnuss et al. (2016), Krahé and Altwasser (2006), Tweedy et al. (2014), Banack et al. (2011), Smith et al. (2016), Pensgaard et al. (1999) and Silva et al. (2012) as the forerunners regarding documents' citation density.

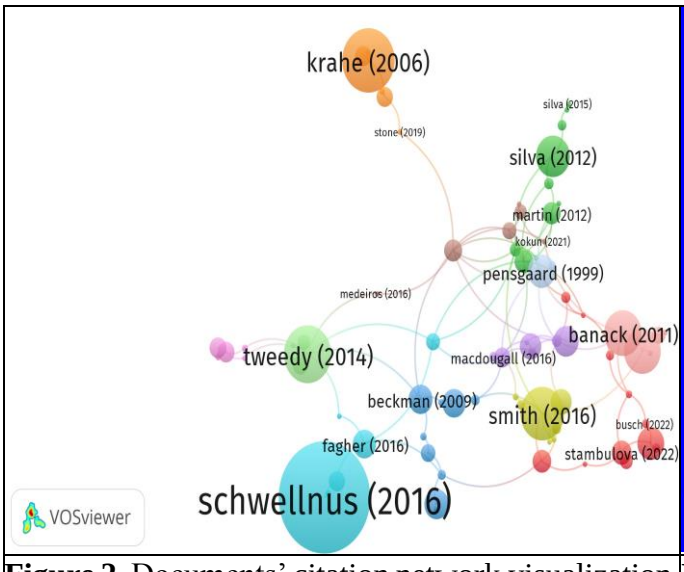

Figure 2. Documents' citation network visualization

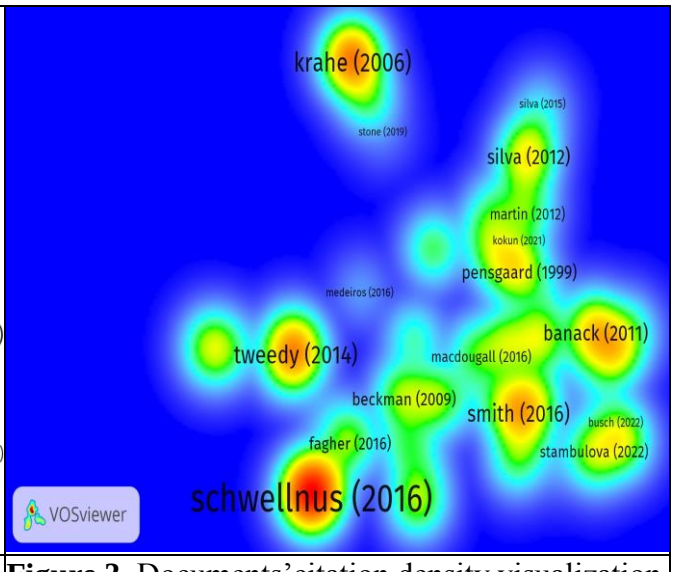

Figure 3. Documents'citation density visualization

Citation Analyses Regarding Journals

As part of the research, the distribution of the journals where the documents were published was analyzed. A minimum of four documents published in a journal was selected as the default threshold value, and it was discovered that 15 out of the 103 journals exceeded this threshold. Table 2 provides further details on the identified journals.

Table 2. Most cited journals

Journal	Citations Count	Publications	
		Count	Percentage
British Journal of Sports Medicine	2861	14	5.32%
Psychology of Sport and Exercise	390	18	6.84%
Frontiers in Psychology	247	22	8.37%
Adapted Physical Activity Quarterly	128	11	4.18%
International Journal of Sport and Exercise Psychology	90	6	2.28%
Journal of Sport Psychology in Action	67	7	2.66%
Journal of Applied Sport Psychology	61	4	1.52%
Journal of Sports Sciences	46	9	3.42%
Frontiers in Sports and Active Living	32	7	2.66%
Psychology Society & Education	20	4	1.52%
Revista Brasileira De Medicina Do Esporte	19	4	1.52%
International Journal of Sports Science & Coaching	16	4	1.52%
Journal Of Human Kinetics	14	5	1.90%
Retos Nuevas Tendencias En Educacion Fisica Deporte Y Recreacion	7	4	1.52%
Pedagogics Psychology Medical-Biological Problems of Physical Training	3	22	8.37%

The British Journal of Sports Medicine, with 14 publications and 2861 citations, and the Psychology of Sport and Exercise, with 18 publications and 390 citations, shared the first two stages among the most cited journals. Frontiers in Psychology ranked third row with 22 publications and 247 citations. In comparison, Adapted Physical Activity Quarterly, with 11 publications and 128 citations, the International Journal of Sport and Exercise Psychology 6 publications and 90 citations ranked fourth and fifth. Figure 4 displays the relationships between journals with four or more publications from Table 2, while Figure 5 shows the density map.

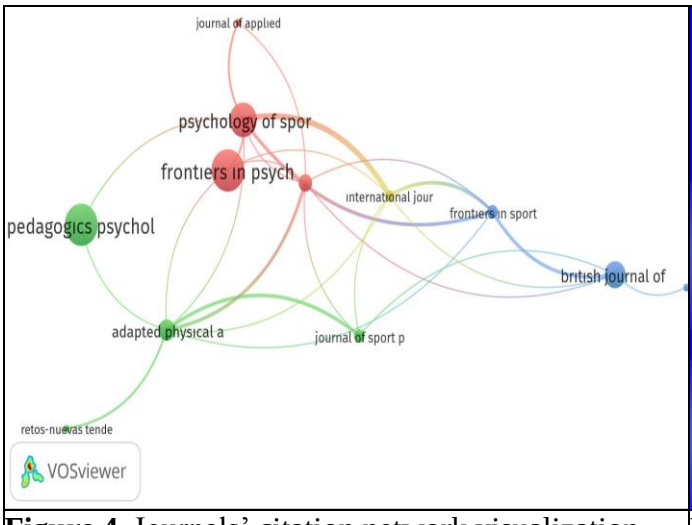

Figure 4. Journals' citation network visualization

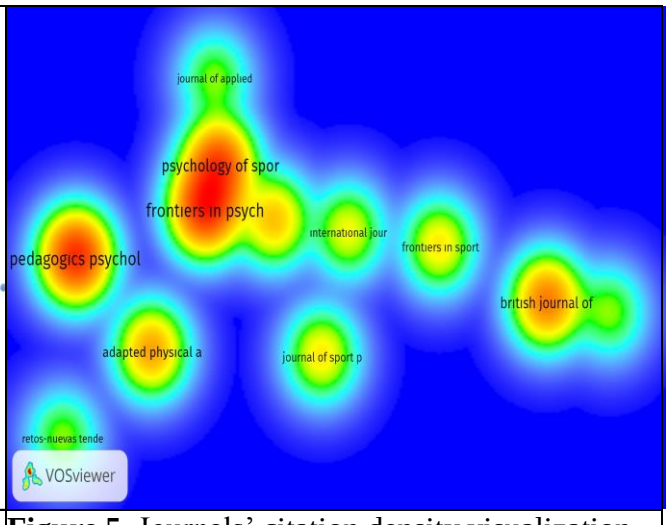

Figure 5. Journals' citation density visualization

Figure 4 and Figure 5 reveal that the most cited journals with four or more articles are grouped into four primary clusters.

The initial cluster, identified in red, includes

Frontiers in Psychology, Journal of Applied Psychology, Journal of Sport Sciences, and Psychology of Sport and Exercise.

In the second cluster, colored green, Adapted Physical Activity Quarterly, Journal of Sport Psychology in Action, Pedagogics Psychology Medical-Biologicals Problems of Physical Training, and Retos Nuevas Tendencias En Educacion Fisica Deporte Y Recreacion stand out.

The third and blue cluster covers the British Journal of Sports Medicine, Frontiers in Sports And Active Living, and Revista Brasileira De Medicina Do Esporte.

Finally, the International Journal of Sport and Exercise Psychology became evident in the yellow cluster.

Citation Analyses Regarding Authors

As a means of assessing citations, the distribution of highly cited authors was analyzed. Authors with at least four documents were listed as the default threshold value, resulting in 20 individuals surpassing this threshold out of 955 authors. Table 3 illustrates the 16 most frequently cited authors from this group.

Within this particular context, David L. Mann has been cited the most frequently with ten documents (146 citations), followed by Sergio Tufik with nine documents (126 citations) and Marco Túlio de Mello with eight documents (122 citations). Additionally, these authors had the highest number of publications compared to those in Table 3.

Table 3. Most cited authors

Author	Citations Count	Publications Count	Total Link Strenght
David L. Mann	146	10	4
Sergio Tufik	126	9	25
Marco Túlio de Mello	122	8	25
Brett Smith	118	5	0
Rosemary Purcell	113	4	2
Andressa Silva	95	5	21
Ciro Winkler	91	6	20
Roberto Vital	89	6	17
Rianne H. J. C. Ravensbergen	76	5	2
Cheri Blauwet	71	4	0
Jan Lexell	64	4	0
Peter M. Allen	54	7	2
Leslie Schwartz	48	5	2
Jan Burns	46	5	1
Keziah Latham	46	4	0
Joy Myint	46	4	0

Figure 6 depicts a bibliometric visualization showcasing the connections between the most cited authors, while Figure 7 displays a density map.

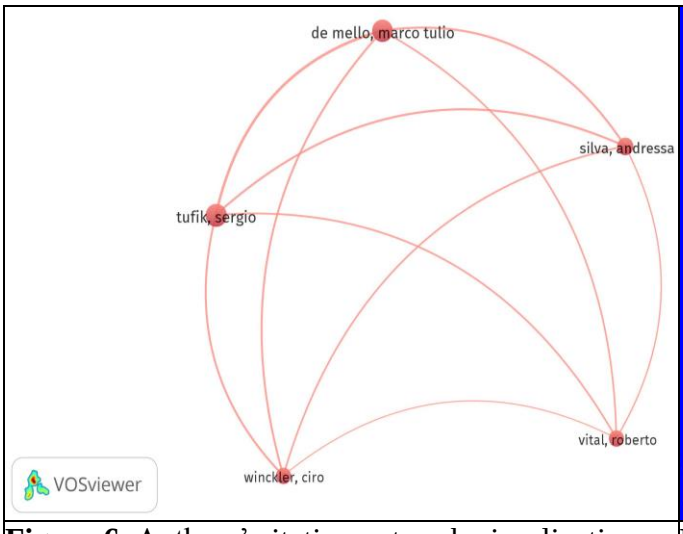

Figure 6. Authors' citation network visualization

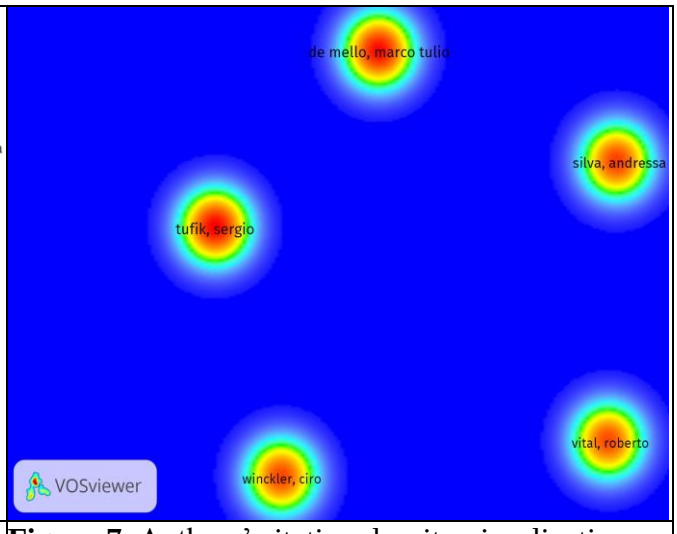

Figure 7. Authors' citation density visualization

A single cluster surfaced in the highly cited authors' network following the mapping process. This cluster comprises individuals with solid connections, namely Marco Tulio De Mello, Andressa Silva, Sergio Tufik, Roberto Vital, and Ciro Winckler.

Bibliographic Coupling Analyses

Bibliographic Coupling Analyses of Journals

Throughout the bibliometric coupling analysis, meticulous attention was given to pinpointing the journals in which the examined documents were featured. A standard threshold of at least four publications was applied, which resulted in 15 out of the 103 journals surpassing this benchmark. Table 4 enumerates the journals with the most published documents to offer a more transparent representation.

Table 4. Bibliographic coupling between journals

Journal	Total Link Strenght	Publications		Citations Count
		Count	Percentage	
Psychology of Sport and Exercise	541	18	6.84%	390
Frontiers in Psychology	514	22	8.37%	247
Frontiers in Sports and Active Living	338	7	2.66%	32
Journal of Sports Sciences	273	9	3.42%	46
International Journal of Sport and Exercise Psychology	234	6	2.28%	90
Adapted Physical Activity Quarterly	199	11	4.18%	128
British Journal of Sports Medicine	115	14	5.32%	2861
Journal of Sport Psychology in Action	113	7	2.66%	67
Journal of Applied Sport Psychology	111	4	1.52%	60
International Journal of Sports Science Coaching	101	4	1.52%	16
Retos Nuevas Tendencias En Educacion Fisica Deporte Y Recreacion	87	4	1.52%	6
Psychology Society & Education	60	4	1.52%	19
Journal of Human Kinetics	54	5	1.90%	14
Revista Brasileira De Medicina Do Esporte	32	4	1.52%	19
Pedagogics Psychology Medical Biological Problems of Physical Training and Sports	30	22	8.37%	3

Based on the data presented in Table 4, Psychology of Sport and Exercise, Frontiers in Psychology, and Frontiers in Sports and Active Living are the top three journals with the highest total link strength. Interestingly, the British Journal of Sports Medicine, which has the highest degree in citation analysis, ranked 7th among all journals regarding total link strength. Following the British Journal of Sports Medicine, Psychology of Sport and Exercise reached the second degree with 390 citations, and Frontiers in Psychology the third degree with 247 citations.

Figure 8 displays the bibliometric coupling network visualization presenting the connections between journals, while Figure 9 reveals its density visualization.

Figure 8 and Figure 9 remark that the journals with the most total link strength are distinct into four prominent clusters.

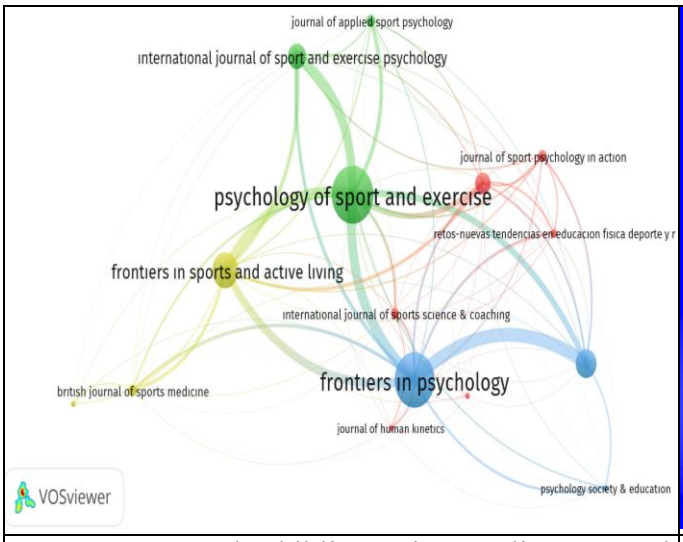

Figure 8. Journals' bibliometric coupling network visualization

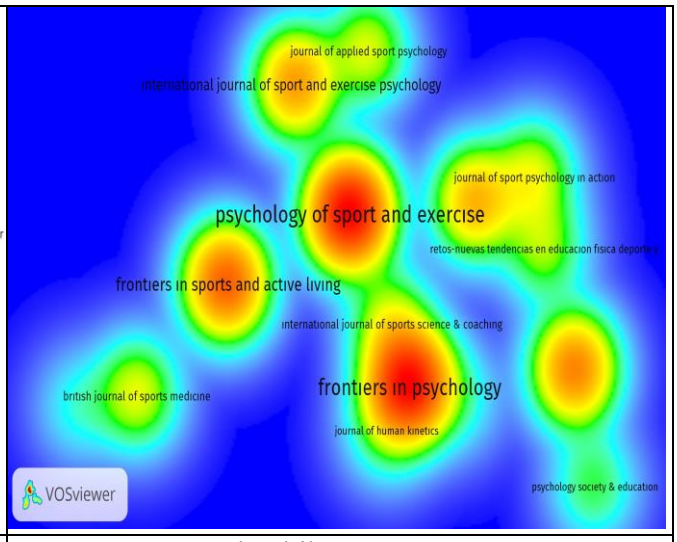

Figure 9. Journals' bibliometric coupling density visualization

The cluster colored red, with 6 journals, is led by Adapted Physical Activity Quarterly. Among the other three clusters, each formed by three different journals, Psychology of Sport and Exercise stands out in the green cluster, Frontiers in Psychology in the blue cluster, and Frontiers in Sports and Active Living in the yellow cluster.

Bibliographic Coupling Analyses of Institutions

The bibliometric coupling analysis scrutinized the distribution of the institutions that published the examined documents. The default threshold value was set at five documents, and 19 out of the 497 institutions surpassed this.

Table 5 presents a comprehensive list of these institutions. Within this particular context, it is noteworthy to highlight the institutions that possess the highest total link strength, respectively: Loughborough University (11 documents and 99 citations), Lund University (6 documents and 111 citations), Vrije Universiteit Amsterdam (11 documents and 164 citations), Anglia Ruskin University (7 documents and 55 citations), and Norwegian School of Sport Sciences (9 documents and 317 citations).

Table 5. Bibliographic coupling between institutions

Institution	Total Link Strength	Publication		Citations Count
		Count	Percentage	
Loughborough University	837	11	4,18%	99
Lund University	732	6	2,28%	111
Vrije Universiteit Amsterdam	665	11	4,18%	164
Anglia Ruskin University	653	7	2,66%	55
Norwegian School of Sport Sciences	617	9	3,42%	317
University of Ottowa	495	5	1,90%	55
Universidade Federal De Minas Gerais	484	8	3,04%	58

University of British Columbia	475	7	2,66%	59
University of Birmingham	457	5	1,90%	134
Universidade Federal De Sao Paulo Unifesp	454	9	3,42%	126
Linkoping University	448	5	1,90%	329
Stellenbosch University	387	6	2,28%	29
University of Queensland	381	7	2,66%	425
Brazilian Paralympic Committee	359	5	1,90%	22
McGill University	200	5	1,90%	103
Katholieke University Leuven	104	5	1,90%	39
Canterbury Christ Church University	70	5	1,90%	47
Universidad Miguel Hernandez De Elche	30	5	1,90%	16
National University Of Ukraine On Physical Education Sport	2	7	1,90%	0

A graphical representation of the connections between these institutions is given in Figure 10, whereas Figure 11 showcases their bibliometric coupling density. Based on the bibliometric coupling analysis of institutions illustrated in Figures 10 and 11, it becomes apparent that four distinct clusters emerge. The research reveals that seven institutions belong to the red cluster, five to the green cluster, four to the blue cluster, and three to the yellow cluster, all exhibiting solid relationships. According to total link strength, the leading institutions behind these clusters are Lund University, Vrije Universiteit Amsterdam, Loughborough University, and Universidade Federal De Minas Gerais, respectively, corresponding to the red, green, blue, and yellow clusters.

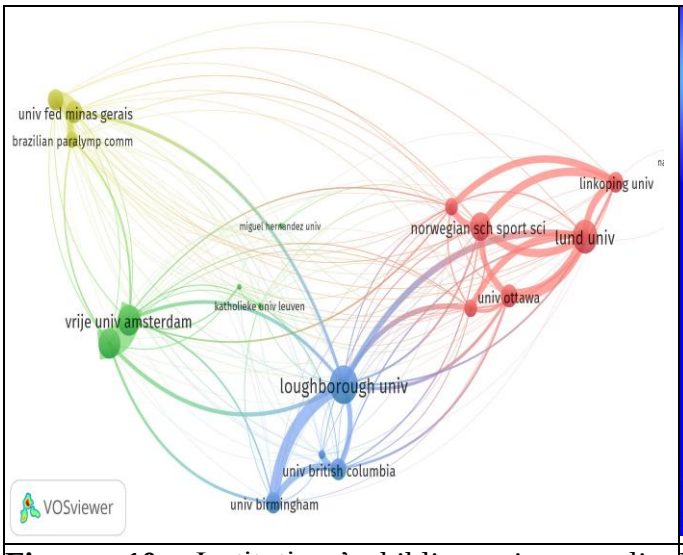

Figure 10. Institutions' bibliometric coupling network visualization

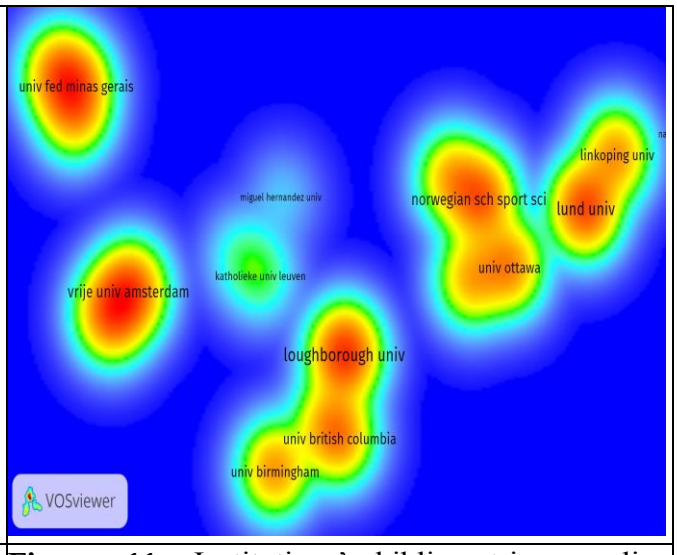

Figure 11. Institutions' bibliometric coupling density visualization

Figure 11 reveals the distinct density zones around Universidade Federal De Minas Gerais and Brazilian Paralympic Committee, around Vrije Universiteit Amsterdam, around Loughborough University, University of British Columbia and University of Birmingham, around the Norwegian School of Sport Sciences and University of Ottowa, and finally around Lund University and Linkoping University.

Bibliographic Coupling Analyses of Countries

The bibliometric coupling analysis involved an examination of the countries in which the documents had been published. Only countries with at least five documents were considered to establish a default threshold value. It was found that 23 out of 43 countries exceeded this threshold value. These countries were then ranked based on their connection strength, and the top 15 countries

with the most robust connections are listed in Table 6.

According to Table 6, the countries with the highest link strength ranked England (52 documents and 3255 citations), Canada (38 documents and 2865 citations), the United States (48 documents and 3318 citations), and Australia (31 documents and 3160 citations) took the first four places. Among the countries listed in Table 6, the country with the highest publication percentage in the total quantity of analyzed with the count of 263 is England (19,77%), followed by the USA (18,25%) and Canada (14,45%).

Table 6. Bibliographic coupling between countries

Countries	Total Link Strength	Publication		Citations Count
		Count	Percentage	
England	7345	52	19,77%	3255
Canada	6745	38	14,45%	2865
USA	6549	48	18,25%	3318
Australia	5160	31	11,79%	3160
Norway	3897	20	7,60%	2857
Netherlands	3603	21	7,98%	2666
South Africa	3565	11	4,18%	2677
Sweden	3428	13	4,94%	420
Switzerland	3357	7	2,66%	2709
Brazil	2714	29	11,03%	241
Belgium	2678	10	3,80%	342
Japan	2398	11	4,18%	2246
Ireland	2397	8	3,04%	516
Spain	1905	26	9,89%	177
Finland	1888	5	1,90%	82

The bibliometric coupling of the networks between the countries listed in Table 6 is presented in Figure 12, and their density map is displayed in Figure 13.

Through bibliometric coupling analyses, it has been uncovered that nations can be classified into three unique clusters. The first cluster, marked in red, includes 10 countries, while the remaining clusters, highlighted in green and blue, consist of 7 and 6 countries, respectively. Canada, England, and Norway emerged as the leading countries in their corresponding clusters in that precise order.

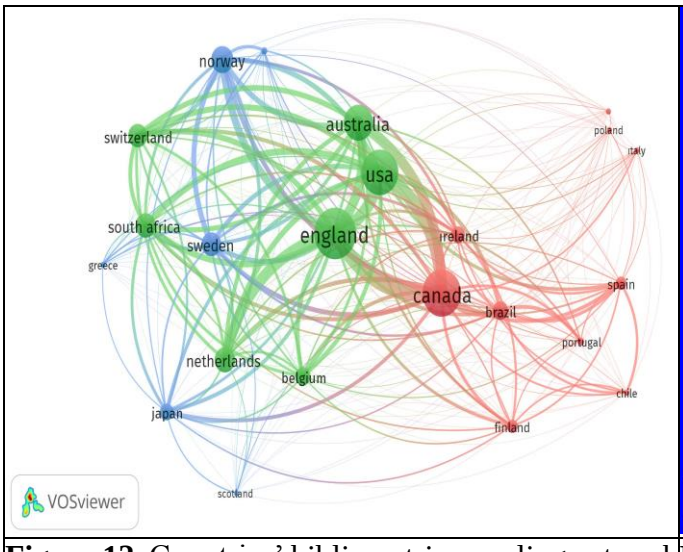

Figure 12. Countries' bibliometric coupling network visualization

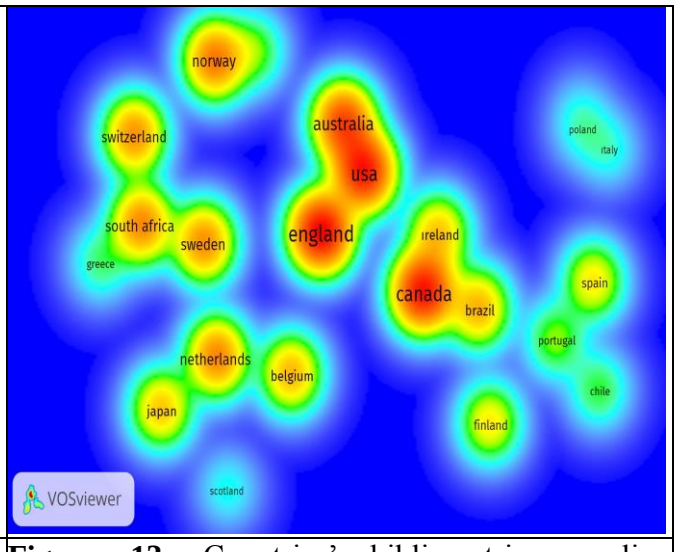

Figure 13. Countries' bibliometric coupling density visualization

Keyword Analysis

In order to identify the main research themes related to the psychology of Paralympic athletes, a data visualization was conducted using keyword analysis. A default threshold value of at least four keyword repetitions was used, and it was observed that 43 out of 717 keywords exceeded this threshold. The results of the analysis are displayed in Figure 14. The density visualization of the keywords is shown in Figure 15.

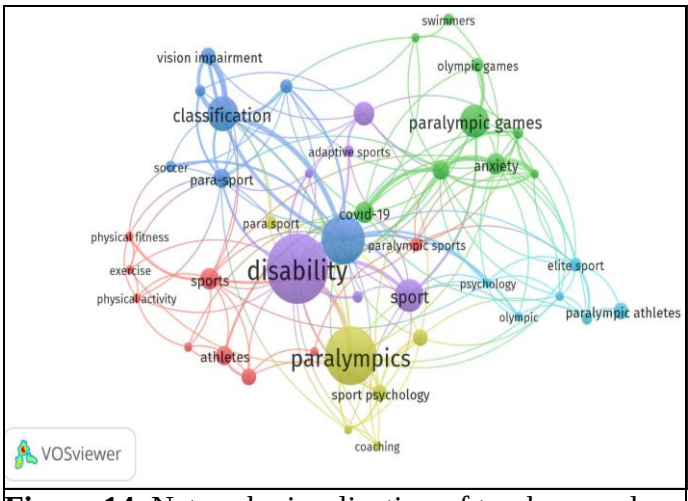

Figure 14. Network visualization of top keywords

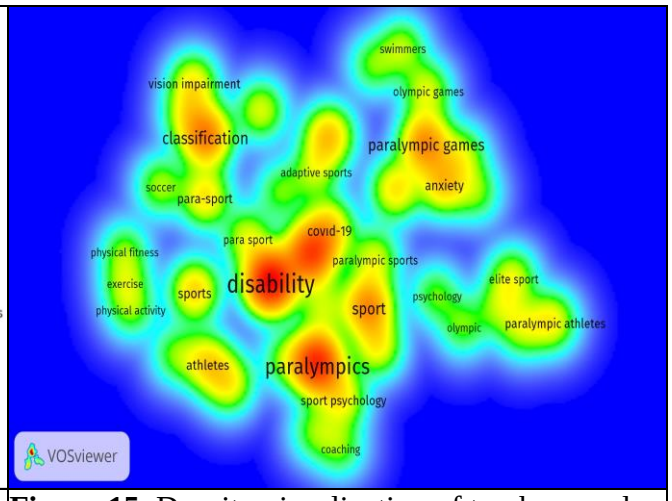

Figure 15. Density visualization of top keywords

Figure 14 displays a grouping of keywords into six main clusters. Within the red cluster, sports (9 occurrences) and athletes (8 occurrences) are the most common ones, while in the green cluster, paralympic games (14 occurrences) is the most robust keyword. The blue cluster fosters paralympic (21 occurrences), and the yellow cluster underlines paralympics (25 occurrences) as the most mentioned keywords. Finally, the purple cluster displays disability (30 occurrences), whereas the turquoise cluster reveals paralympic athletes (7 occurrences) and elite sport (6 occurrences) as the most common keywords.

Regarding total link strength (tls), the following keywords are prominent: disability (33 tls), paralympic (27 tls), classification (23 tls), paralympics (22 tls), anxiety (20 tls) and mental health (20 tls).

Analysis of Top Terms in Abstract

The visualization technique was used to analyze the abstract sections' top terms. A threshold value of at least ten repetitions for each keyword was set to ensure relevance, revealing that 131 out of 6336 words surpassed the threshold. The findings are shown in Figure 16. The density of the most frequently used terms in abstracts is shown in Figure 17.

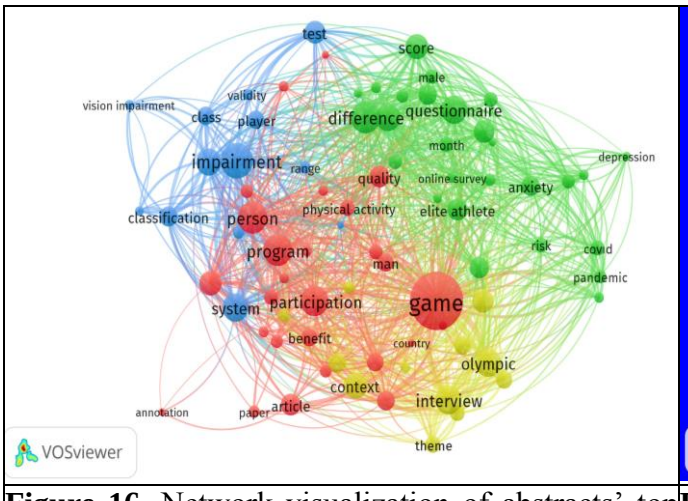

Figure 16. Network visualization of abstracts' top terms

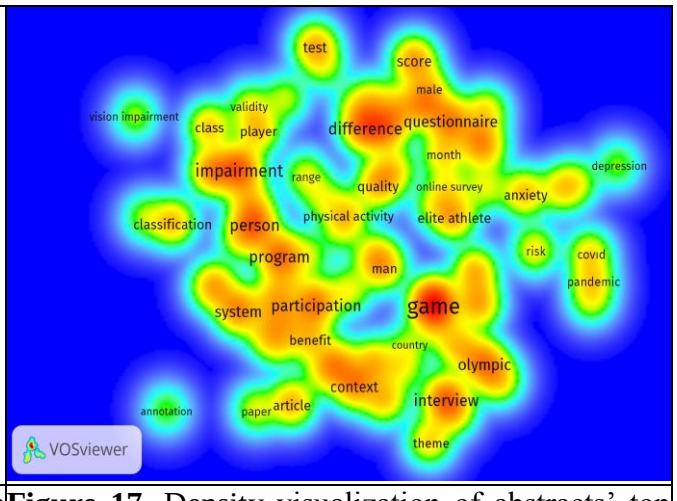

Figure 17. Density visualization of abstracts' top terms

Figure 16 gathered four main clusters. There are 27 terms in the red cluster, 27 in the green, 13 in the blue, and 12 in the yellow cluster. The most mentioned term in the red cluster is game (72 occurrences), followed by the green cluster that fosters difference (40 occurrences). In comparison, the blue cluster's top-used term was impairment (44 occurrences). Finally, the forerunner terms in the yellow cluster were interview (36 occurrences) and olympic (35 occurrences).

The density map in Figure 17 also highlights the terms that are most frequently mentioned. According their occurrences these can be lined up as follows; game (72 occurrences), impairment (44 occurrences), person (40 occurrences), difference (40 occurrences), program (39 occurrences), participation (38 occurrences), interview (36 occurrences) and olympic (35 occurrences). On the other hand, the ranking based on relevance rate highlights that vision impairment (5.99), classification system (3.42), depression (2.98), and annotation (2.84) are the main focus of the abstracts.

Co-Citation Analyses

Co-Citation Analyses of Cited-References

The analysis showed that out of 8611 cited references, 10 exceeded the threshold value of 12 citations. The results are displayed in Table 7.

Table 7. Cited-references' co-citation analyses

Author	Article	Co-citation Count	Total Link Strength
Tweedy, S.M. and Vanlandewijck, Y.C., 2011	International Paralympic Committee position stand—background and scientific principles of classification in Paralympic sport	22	12
Smith, B. and McGannon, K.R., 2018	Developing rigor in qualitative research: problems and opportunities within sport and exercise psychology	20	36
Rice, S.M. et al. 2016	The Mental Health of Elite Athletes: A Narrative Systematic Review	17	24
Braun, V. and Clarke, V., 2006	Using thematic analysis in psychology	16	32
Reardon, C.L. et al. 2019	Mental health in elite athletes: International Olympic Committee consensus statement (2019)	15	20
Braun, V. and Clarke, V., 2019	Reflecting on reflexive thematic analysis	14	35
Sparkes, A.C. and Smith, B., 2014	Qualitative Research Methods in Sport, Exercise and Health	13	26
Cohen, J., 1998	Statistical power analysis	13	2
Ravensbergen, R.H.J.C. et al. 2016	Expert consensus statement to guide the evidence-based classification of Paralympic athletes with vision impairment: a Delphi study	12	15
DePauw, K.P. and Gavron, S.J., 2005	Disability Sport	12	2

The findings of cited-references' co-citation analyses are demonstrated through two different mapping techniques. The first of these is the co-citation network visualization shown in Figure 18, and the second is the density visualization displayed in Figure 19.

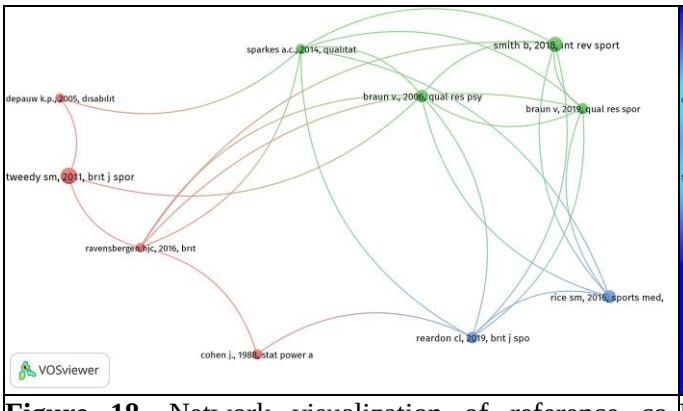

Figure 18. Network visualization of reference co-citation

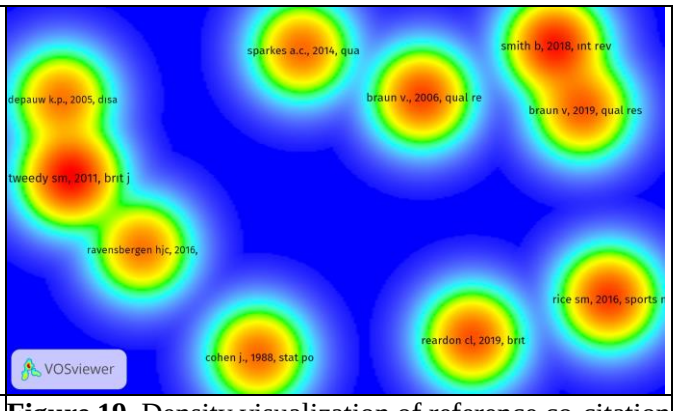

Figure 19. Density visualization of reference co-citation

Based on Figure 18, three reference clusters have emerged as the most prevalent. Notably, four authors belong to the red cluster, four to the green cluster, and two to the blue cluster.

Tweedy and Vanlandewijck's (2011) article is recognized as the trailblazer in the red cluster. While Smith and McGannon (2018) is acknowledged as the pioneer in the green cluster, Rice et al. (2016) is credited as the pioneer in the blue cluster.

Co-Citation Analyses of Cited-Journals

Upon analyzing sources with a minimum of 40 citations, a co-citation network was revealed within the journal. Out of the 3,809 references, 30 surpassed the threshold value. Table 8 displays the top 10 journals.

Tablo 8. Cited-journals' co-citation analyses

Journal	Co-citation Count	Total Link Strength
British Journal of Sports Medicine	397	4353
Psychology of Sport and Exercise	265	4485
Adapted Physical Activity Quarterly	264	2867
Journal of Sports Sciences	205	3423
Sports Medicine	142	2435
Sport Psychologist	133	2170
Med Science Sport and Exercise	117	1868
Journal of Applied Sport Psychology	114	2035
Frontiers Psychology	102	1529
Scandinavian Journal of Medicine Science in Sports	88	1658

The utilized co-citation analyses of the cited journals are demonstrated in Figure 20. Figure 20 displays two prominent clusters. Notably, eighteen journals emerge in the red cluster, and twelve are grouped in the green cluster.

Psychology of Sport and Exercise and Adapted Physical Activity Quarterly are the leading journals of the red cluster, while the British Journal of Sports Medicine is at the top of the green cluster. According to Figure 21, it is seen that the density of the co-citation network of cited journals becomes evident around the British Journal of Sports Medicine, Journal of Sport and Exercise Psychology, Adapted Physical Activity Quarterly, and Journal of Sports Sciences.

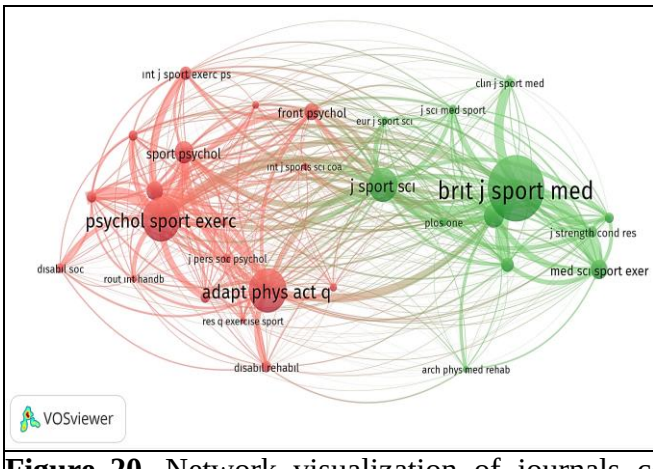

Figure 20. Network visualization of journals co-citation

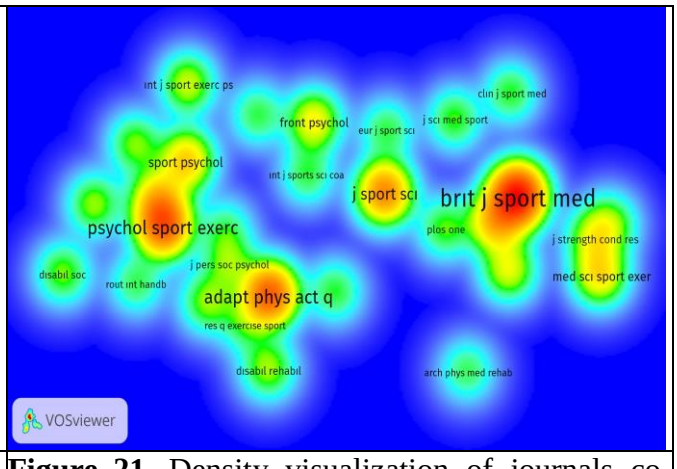

Figure 21. Density visualization of journals co-citation

In other relatively small co-citation networks, the intensity around Frontiers Psychology and Medicine and Science in Sports and Exercise attracts attention. On the other hand, the Archives of Physical Medicine and Rehabilitation is monitored relatively distant from the co-citation networks in the density analysis of journals.

Co-Citation Analyses of Cited- Authors

Upon selecting a minimum threshold of 25 citations for authors, it was noted that only 14 out of the 5987 authors exceeded this criterion. Further details regarding these findings are shown in Table 9.

Tablo 9. Cited-authors' co-citation analyses

Author	Co-citation Count	Total Link Strength
Brett Smith	72	385
Jeffrey J. Martin	71	233
Virginia Braun	51	283
International Paralympic Committee	50	176
Sean M. Tweedy	40	87
Wayne Derman	35	16
Andrew C. Sparkes	33	230
Simon M. Rice	32	64
Raul Reina	29	22
Stephanie J. Hanrahan	27	74
Rachel Arnold	25	124
Robert J. Schinke	25	110
Elizabeth Campbell	25	102
R M. Ryan	25	40

In Table 9, the authors Brett Smith, Jeffrey J. Martin, and Virginia Braun emerged as the frontrunners with the highest number of co-citations and their total link strength.

Revealing the cited-authors' co-citation network, Figure 22 visualized their connections.

As shown in Figure 22, the red and green clusters each group four authors, while the blue and yellow clusters each cover three authors.

The density visualization of the cited-authors' co-citation is depicted in Figure 23.

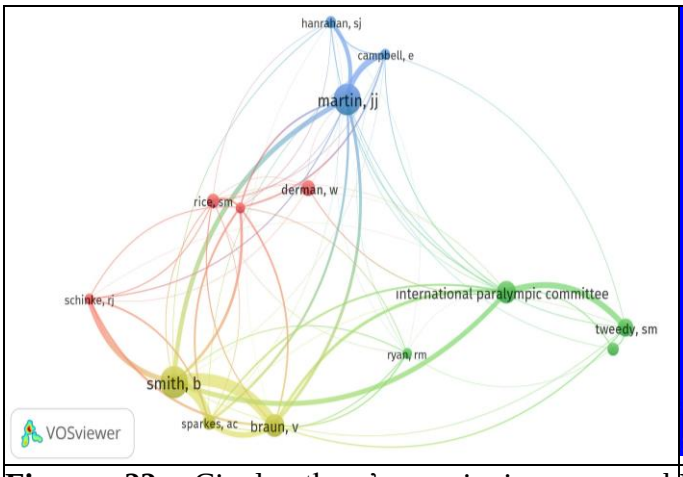

Figure 22. Cited-authors' co-citation network visualization

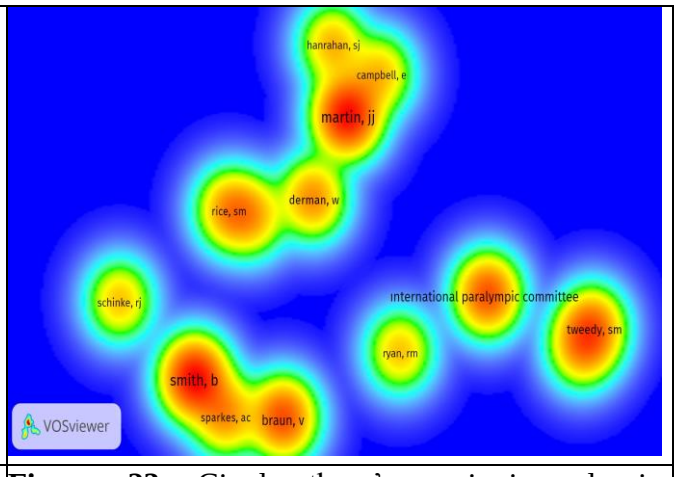

Figure 23. Cited-authors' co-citation density visualization

Brett Smith is the leading authority of the yellow cluster. In contrast, the International Paralympic Committee pioneered the green cluster, and Jeffrey J. Martin is the top in the blue cluster. Arnold and Schinke stood out with their total link strength in the red cluster, while Derman and Rice had higher co-citation numbers than those.

According to Figure 23, in the authors' co-citation distribution, Tweedy, International Paralympic Committee, Smith, Martin, Rice, and Braun are the names that show the highest co-citation network density.

DISCUSSION

The study's objective is to explore the psychological aspects of Paralympic athletes through the implementation of bibliometric analysis of research articles published in the WoS database from 1992 to September 1, 2023. A meticulous assessment of a significant part of scientific publications has been conducted, providing a comprehensive and insightful overview of research trends and studies within the relevant literature.

This research revealed that studies on the paralympic athletes' psychology followed a fluctuating course in the beginning years. As of 2016, it fluctuated and increased without returning to this level and reached the highest number of publications, with 34 articles in 2022.

The most cited document in the citation analysis is McCroy et al.'s publication titled Consensus Statement on Concussions in sport-the 5th International Conference on Concussions in Sport held in Berlin, October 2016. This document was developed for physicians and healthcare providers involved in the care of athletes at the recreational, elite, or professional level. While this publication focuses on the causes and consequences of concussion in athletes, it also draws attention to the effects of trauma that develop due to injury, neuropsychological evaluation protocols, and returning to sports. Based on the general content of this work, the relative scarcity of publications addressing psychological traumas that possible injury experiences of paralympic athletes may trigger has been evaluated as a sign of a gap in the field.

The article entitled "How much is too much? (Part 2) International Olympic Committee consensus statement on load in sport and risk of illness," ranked second in the documents' citation analyses, presents a comprehensive overview of the findings that establish a correlation between load and athletes' susceptibility to overtraining and illness. It aims to equip athletes, coaches, and support staff with actionable recommendations for managing load effectively and minimizing the risk of sports-related health issues. These recommendations encompass guidelines for determining the optimal training and competition load and strategies for monitoring various aspects of load, such as training intensity, psychological stress, athlete wellness, and illness.

The third most cited document recommended a systematic approach to translate and culturally adapt the SCAT5 into a broad range of languages. It encouraged establishing a comprehensive set of norms across language groups, sports, gender, age and disabilities.

These three articles share a commonality: they may provide valuable tips and inspiration to professionals seeking to work with paralympic athletes despite not being centered on them directly. Additionally, these articles were published in the esteemed British Journal of Sports Medicine.

England emerged as the most productive country in the analysis, with a total connection strength of 7345 and 52 publications. Ludwig Guttmann established a center in 1944 for rehabilitating people with spinal cord injuries at Stoke Mandeville Hospital in England upon the request of the British Government, which eventually grew into a recreational and competitive sport. Moreover, Guttmann organized a pioneering competition for wheelchair athletes on the opening day of the 1948 London Olympic Games (TMPK, n. d.). Considering these, the outcome revealing England's productivity is one of the foreseeable results of this research.

On the other hand, Loughborough University was the most productive institution, with a total connection strength of 837 and 11 publications. The fact that Loughborough University is a British institution fosters the idea that studies on the psychology of paralympic athletes are given significant support in the UK.

The prominence of Brett Smith, who ranks highest in co-citation and total link strength, is particularly noteworthy given his past affiliation with Loughborough University. This case speaks

to England's prominent position in the field as well. The colaboration between the countries, institutions, and authors is a positive sign for advancing science through academic partnerships. Öner's (2022) bibliometric analysis study on the psychology of sports injuries confirms the significant impact of the collaborative orientation of countries, institutions, and researchers in driving scientific progress, which aligns with the results of this research.

According to another study result, the Lund University, Vrije Universiteit Amsterdam, Loughborough University, and Universidade Federal De Minas Gerais have emerged as the frontrunners in the clusters of studies related to the psychology of Paralympic athletes. This point confidently establishes that European nations are at the forefront of conducting research in this field on a global scale.

Based on another research result, the most significant keywords in the studies include sports, athletes, paralympic games, paralympic, paralympics, disability, paralympic athletes, and elite sport. This result indicates that the keywords selected by the authors are tailored to the unique conceptualization of paralympism. However, the researcher also encountered several other terms, including anxiety, mental health, depression, motivation, quality of life, mental skill, and emotion, which were underrepresented in the keyword query. This fact highlights the vital role of keyword selection in comprehending scientific content.

The findings of this study indicate that prominent authors, organizations, and nations not only engage in robust interactions within their respective domains, but also maintain substantial and significant connections with one another. These results highlight the importance of fostering strong relationships between entities in order to promote collaboration and advancement in various fields. It is evident that these distinguished actors recognize the value of maintaining meaningful connections and actively work towards cultivating them, thereby contributing to the overall growth and development of their respective disciplines.

This study has some significant limitations. One is that the research data is obtained only from the Web of Science database, and the other is the review of only research articles. Future studies should explore various databases and publication types to gather more insights. This study also showed that national publications on the psychological experiences of paralympic athletes are limited. This context points to an essential gap in Turkish Exercise and Sports Psychology regarding the psychology of paralympic athletes. Therefore, focusing on studies in this area is envisaged to fortify the national literature.

Additionally, this study provides an overview of the psychology of paralympic athletes. In analyzing the most emphasized terms in the keyword analyses and abstracts, the stand-out words emphasize more basic meanings, such as paralympic games, paralympic athlete, paralympics, disability, impairment, program, and participation. This issue sheds light on the need for original thematic studies focusing on the psychology of paralympic athletes. Finally, innovative studies that include social support units such as coaches, instructors, peers, and families that appear as facilitators in the Paralympic performance processes will further strengthen the field.

Conflict of interest:

The author declared no conflict of interest.

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There is no financial support from any institution or organization in this study.

Author Contribution:

In this study, the contribution rate of the sole author was 100%.

Ethics Statements

This article followed the journal writing rules, publication principles, research and publication ethics, and journal's ethical rules. The author is responsible for any violations that may arise regarding the article. The Istanbul Rumeli University Ethics Committee approved the article with the decision dated 21/12 /2022 and numbered 2022/11-08."

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