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Twenty years of scientific production in sport and exercise psychology journals: A Bibliometric Analysis in Web of Science

Danilo Reis Coimbra[1], Fábio Hech Dominski[2], Ricardo Brandt[3], Guilherme Guimarães Bevilacqua[4], Leonardo Vidal Andreato[5], Alexandro Andrade[6]

Abstract
The present study analyzed the last twenty years (2001 to 2020) of scientific production in sport and exercise psychology (SEP) journals indexed in Web of Science. Ten journals were selected. Psychology of sport and exercise was the journal with the highest number of articles per year (n = 82). USA was the most productive country (n = 1553). University of Birmingham (n = 195) was the institution most prolific, and Social Sciences and Humanities Research Council of Canada (n = 239)was the funding agency most present. Nikos Ntoumanis (n = 67) was the most prolific author. Physical activity (n = 326) was the keyword with most occurrences. Open access represents 27.24% of articles. We concluded that the majority of journals published in the English language and with no open access. Self-determination theory is a well consolidated theoretical framework in the last twenty years in SEP journals.
Keywords: sport psychology; scientometrics; performance; physical activity; web of science

Introduction

The American Psychological Association (APA) define sport psychology as "a discipline focused on the development and application of psychological theory for the understanding and modification or enhancement of human behavior in the sport and exercise environment". Although Triplett's experiment with cyclists is recognized as the first published study (dates in the late 19th century), the sport and exercise psychology (SEP) emerged 70's and 80's as a field of research science (Weinberg & Gould, 2015). Ever since, the increase in scientific production is notable (Poucher et al., 2020; Fiorese et al., 2019; Lindahl et al., 2015). Since 1975 researchers have been examining trends and identify knowledge gaps in studies published within the field of SEP (Lindahl et al., 2015). Over the past few years, analysis of scientific production in the SEP have been conducted. With the purpose of analyze the scientific production in SEP in Brazil, Spain, and English-speak journals, Gomez et al. (2007) analyzed more than 1000 articles. They verified that cross-sectional observational studies are predominant in SEP in the three languages. Dominski et al. (2018) analysis of scientific production related to sports psychology in sports science journals of Portuguese language. In 15 different journals, they found 145 articles about SEP. They analyzed prolific institutions, modalities, and themes most investigated. The authors concluded that SEP area in Brazil is in development ye, and international collaboration in limited. Culver et al. (2012), examined the qualitative research published in three major sport psychology journals (Journal of Applied Sport Psychology (JASP), Journal of Sport and Exercise Psychology (JSEP), and The Sport Psychologist (TSP)) for the years 2000 through 2009, and compared what trends seem to be apparent in the last decade to those of the 1990s. They concluded that positivist/postpositivist approaches appear to maintain a predominant position in SEP. With a different approach, Fiorese et al. (2019) investigated institutional research and their themes in SEP from the graduate programs. Studies were selected and retrieved from a national database (Sucupira Platform), that contains all registered researchers from Exercise and Sport Science and Psychology programs in the country. Concluded that the predominant scientific production in SEP programs in Brazil have interface in the exercise and quality of life, health, and education, with gaps existing in the studies on sports and performance.

Bibliometric analysis is a useful tool to evaluate scientific production and identify developing in the research (Bramness et al., 2014; Prieto et al., 2015). Recently, bibliometrics analysis has been used in the fields of sport, physical activity, and medicine to investigate the increases in the number of publications, identification of the main authors, research institutions, countries, and funding agencies of a research area (Hu et al., 2020; Coimbra et al. 2019; Müller et al., 2016). Additionally, with a view of co-citation authors and keywords assigned by authors may help to identify the networks between research groups and themes more and less widely investigated in the field (Jeong et al., 2014; Hou et al., 2018). The citation analysis measures the impact and relevance of authors, journals, or themes in a field, that could establish research trends, future directions, and

[1] Federal University of Juiz de Fora – UFJF. Email: danilo.coimbra@ufjf.br ; vidal.leo@hotmail.com
[2] Santa Catarina State University / UDESC. Center of Health and Sport Science / CEFID. Email: fabio.dominski@udesc.br
[3] Western Paraná State University. Email: ricabrandt@gmail.com
[4] Santa Catarina State University / UDESC. Center of Health and Sport Science / CEFID. Email: guibevi_1@hotmail.com
[5] School of Health Sciences, University of Amazonas State (Brazil). Email: vidal.leo@hotmail.com
[6] Santa Catarina State University / UDESC. Center of Health and Sport Science / CEFID. Email: alexandro.andrade.phd@gmail.com

science-policy decisions (Leydesdorff et al., 2016). The option for citation analysis has been popular bibliometric indicator, despite the limitations indication of other key dimensions of research quality (Aksnes et al., 2019). Additionally, with a visualization mapping of the scientific production, constitute an attractive reference to consult journals, and identify productive countries, relevant institutions, influential authors and their networks, impactful articles, predominant themes, and paradigms in the field (Agarwal et al., 2016). For example, some countries tend to dominate the best-known academic journals. It should be recognized that many of the SEP journals are English-speaking journals (Schinke et al., 2016).

In this sense, mapping the productions related to SEP allows to identify the way the research is organized and how trends and paradigms are structured (Fiorese et al., 2019). In line with this aim, Lindahl et al. (2015), investigated trends and knowledge base in sport and exercise psychology research through a bibliometric review, provided a "snapshot" of the topical structure, interconnectedness, and organization of the sport and exercise literature published and cited between 2008 and 2011. Included 1140 articles and verified that SEP have isolated research areas identified indicating potential for research integration. Clancy et al. (2017) conduced a critical review and bibliometric analysis to evaluate the six most highly cited motivation measures in sport. The bibliometric data analyzed were impact factor and citations per year to evaluate the impact of the use of each questionnaire.

However, these past reviews have often sought to address quite targeted issues such as the design, the application of qualitative methods, the stratification area, and the emergence of integrate the domains of study in SEP, sometimes in short period time. Furthermore, considering the evolution of electronic databases in recent years (Hu et al., 2020), as well as the recent emerge of the journals in SEP, it is important to update information on the evolution of the research, trends, and how themes advanced (Fiorese et al., 2019). To the best of our knowledge, there has been no previous bibliometric analysis of the scientific production in sport and exercise psychology journals indexed in Web of Science, considering the contributions of journals, countries, institutions, funding agencies, authors, as well as the citations, networks, and thematic analysis of keywords assigned by authors used in the articles published. A work that shows the scenario of knowledge production on sport psychology in one of the largest databases is relevant and can be a landmark in the research.

Therefore, the current study aimed to investigate the scientific production in the last twenty years (2001 to 2020) SEP journals indexed in Web of Science through a bibliometric analysis. To accomplish this, we performed an analysis of bibliometric indicators (journals, countries, institutions, funding agencies, and authors), citation reports, and visualization mapping (countries, authors, and keywords assigned by authors).

Methods

This is a bibliometric analysis of SEP of the journals indexed in Web of Science. To delimit the bibliometric analysis, only studies published in the last twenty years were selected – 2001 to 2020.

Bibliographic Database

The Web of Science (Core Collection) database was chosen because it is a multidisciplinary platform of bibliographic data, incorporating different categories of scientific knowledge. In Web of Science is possible see the journal impact factor (JIF), measured through the Journal Citation Reports (JCR), published by the Institute for Scientific Information (ISI) and edited by Thomson Reuters (Clarivate Analytics, USA). The JCR is a recognized metric and analysis of the world's most impactful journals included in the Science Citation Index Expanded (SCIE) and Social Sciences Citation Index (SSCI), part of the Web of Science (Agarwal et al., 2016; Anker et al., 2019). JIF normalizes for the size effects of journals by using a (lagged) 2-year moving average (Leydesdorff et al., 2016).

Eligibility Criteria

Only SEP journals indexed in Web of Science Core Collection and published in English were selected. SEP journals was defined how a journal with "sport" or "exercise" and "psychology" or "psychologist" in the title. Related the articles, only Original articles or Review were included.

Search Strategy and Validity

The search strategy employed in the current study was similar from previously conducted bibliometric analyses (Memon et al., 2020, Coimbra et al., 2019, Vošner et al., 2016). First, the search was conduct in Journal Citation Report for a manual retrieved eligibility. After a verification of the eligibility criteria, in Web of Science, search was conducted in field "Publication Types" the title of the SEP journals. After this, ten journals were selected: *International Journal of* ***Sport*** *and* ***Exercise Psychology*** *(IJSEP), International Journal of* ***Sport Psychology*** *(IJSP), International Review of* ***Sport*** *and* ***Exercise Psychology*** *(IRSEP), Journal of Applied* ***Sport Psychology*** *(JASP), Journal of Clinical* ***Sport Psychology*** *(JCSP), Journal of* ***Sport*** *&* ***Exercise Psychology*** *(JSEP), Journal of* ***Sport Psychology*** *in Action (JSPA),* ***Psychology*** *of* ***Sport*** *and* ***Exercise*** *(PSE),* ***Sport Exercise*** *and Performance* ***Psychology*** *(SEPP), and* ***Sport Psychologist*** *(TSP). Revista de Psicología del Deporte* was excluded because the most articles are in Spanish language. *The Zeitschrift für Sportpsychologie* was excluded because the articles are in German language. *Ibero-American Journal of Exercise and Sports Psychology* was excluded because is indexed in Emerging Sources. According

past review, these ten SEP journals can considerate the operationalization of SEP journals in general. To validity and reliability of this approach, a manually search in each journal was conducted and the registers selected were extract to a spreadsheet individually.

Related the document type, Meeting Abstract, Book review, Editorial Material, Early access, Proceedings Paper, Correction, Note, Biographical Item, Letter, Correction Addition, Bibliographies, Item about an Individual Reprint, and Retraction was excluded. Finally, only publication registered between 2001 to 2020 was selected (20 years). After application of the criteria to select the articles, the data was added to Marked List and export to Excel spreadsheet full recorded coding registered of each article.

Analysis of Results and Bibliometric Indicators

The categories analyzed were number of articles published by year; number of articles published by journal; rate of articles published per year by journal; The Top 10 countries; institutions; funding agencies; authors; and authors keywords in the last twenty years in SEP journals indexed in Web of Science. Finally, the number of articles Open Access Designations was also analyzed. To countries, institutions, funding agencies, and authors, name disambiguation to identify synonym and homonym names at the individual level was conducted. The first author (DRC) extracted these data and a manual double check was performed to identify inconsistencies.

Citation Report

Data about the citations were analyzed through the retrieved data in spreadsheet. The total number of citations was extracted for the Top 10 authors. Additionally, the Top 10 most cited articles were analyzed (Authors, Year of publication, Title, Author Keywords, Journal, Total citations, and Total citations per year).

Bibliometric Visualization Mapping

The VOS viewer program (version 1.6.15) was used for visualization of bibliometric networks. The VOSviewer is freely available software by Leiden University Netherlands, for bibliometric mapping and visualization to understand citation relationships (van Eck & Waltman, 2010). Bibliometric mapping and visualization were used to understand relationships of occurrence and co-occurrence among countries, authors, and keywords assigned by authors used in articles published in SEP journals indexed in Web of Science. The bibliometric map was created based on bibliographic data read from file exported of Web of Science(.txt). The type of analysis for countries and author was co-authorship. For keywords, the type of analysis conducted was co-occurrence and unit of analysis only author keywords. The counting method used was full counting. VOSviewer work with cluster algorithm based in density and position in mapping. The color of a point in a map depends on the number of items in the neighborhood of the point and on the importance of the neighboring items (Van Eck & Waltman, 2010). Points in the mapping with similar colors, represent same clusters. The method for cluster normalization was through the association strength. The layout used was with default values. The cluster resolution was 1.00, with option to no merge small cluster. The size of the circles represents higher frequencies of occurrence. The thickness of the lines represents the strength of the link between the units (countries, authors, and keywords assigned by authors). The number of clusters created may vary according to the number of points and the position (x and y) represented in map. The visualization scale was equal 1.0 and based on number of documents.

Results

Journal characteristics

Table 1 presents the main characteristics of SEP journals indexed in Web of Science, the frequency of publication, year of the first edition available online, year of indexation, impact factor, and category in Web of Science. The SEP journal with more issues per year is IJSP, JSEP, and PSE (6 issues per year). The first SEP journal available online (1979) and indexed in Web of Science (1988) was JSEP. The impact factor ranges from 0.600 (IJSP) to 20.652 (IRSEP). Five SEP journals are in four different categories in Web of Science. The most usual was Psychology Applied (nine SEP journals).

Table 1

Characteristics of SEP journals indexed in Web of Science.

Journal	Frequency	Year of the first edition available online	Indexation in Web of Science	Impact Factor*	Categories in Web of Science
International Journal of Sport and Exercise Psychology (IJSEP)	4 issues per year	2003	2015	3.304	02 (Hospitality Leisure Sport Tourism; Psychology Applied)
International Journal of Sport Psychology (IJSP)	6 issues per year	2008	1974	0.600	04 (Hospitality Leisure Sport Tourism; Psychology Multidisciplinary; Sport Sciences; Psychology)
International Review of Sport and Exercise Psychology (IRSEP)	1 issue per year	2008	2011	20.652	02 (Hospitality Leisure Sport Tourism; Psychology Applied)
Journal of Applied Sport Psychology (JASP)	4 issues per year	1989	1995	3.585	04 (Hospitality Leisure Sport Tourism; Psychology Applied; Sport Sciences; Psychology)
Journal of Clinical Sport Psychology (JCSP)	4 issues per year	2007	2015	1.531	01 (Psychology Applied)
Journal of Sport & Exercise Psychology (JSEP)	6 issues per year	1979	1988	3.016	04 (Hospitality Leisure Sport Tourism; Psychology Applied; Sport Sciences; Psychology)
Journal of Sport Psychology in Action (JSPA)	4 issues per year	2010	2015	0.610	01 (Psychology Applied)
Psychology of Sport and Exercise (PSE)	6 issues per year	2000	2002	4.785	04 (Hospitality Leisure Sport Tourism; Psychology Applied; Sport Sciences; Psychology)
Sport Exercise and Performance Psychology (SEPP)	4 issues per year	2011	2012	4.250	02 (Hospitality Leisure Sport Tourism; Psychology Applied)
Sport Psychologist (TSP)	4 issues per year	1987	1993	1.453	04 (Hospitality Leisure Sport Tourism; Psychology; Psychology Applied; Sport Sciences)

* 2020 JCR

The online search for the current study was performed on September 23, 2021, to avoid day-to-day changes in the Web of Science database. In the search field, the names of the journals were used, and the category "Publication Name" or "Source" was selected. After the search, 16535 records were identified in Web of Science. After eligibility criteria, 4949 articles were included in this bibliometric analysis, which were published in the last twenty years in SEP journals indexed Web of Science (Figure 1).

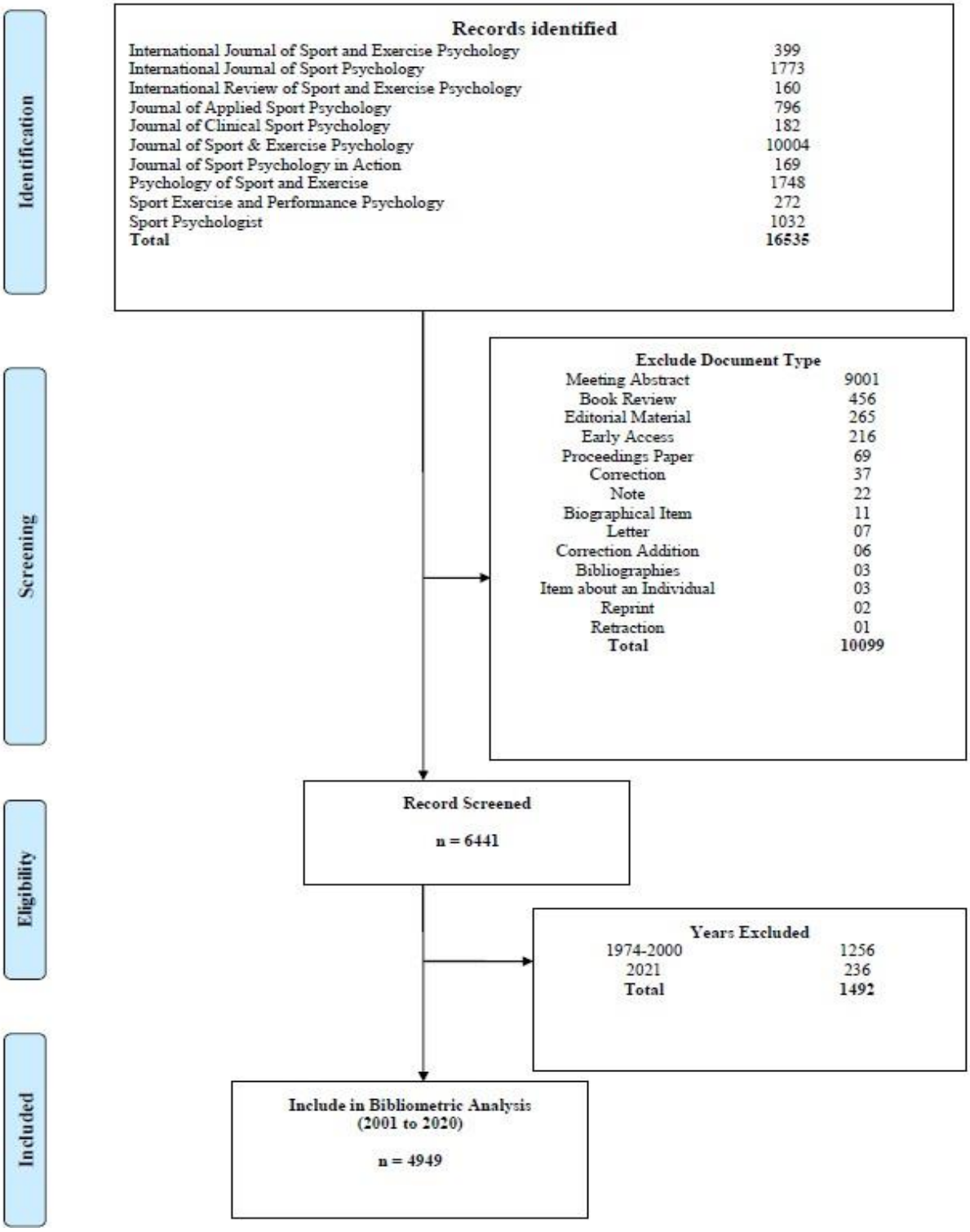

Figure 1. Flow of articles included in bibliometric analysis.
Source: Author's production

Figure 2 presented the description per year of the twenty years of scientific production in SEP journals indexed in Web of Science. In the first year (2001), four SEP journals were already indexed (IJSP, JASP, JSEP , and TSP) and 84 articles were published. In 2015, after the ten journals were already indexed in Web of Science, the number of publications per year in SEP journals range from 350 (2015) to 495 (2020). In relation the number of articles per journal and per year, the number varied to 21 in 2001 (four journals) to 50 in 2020 (10 journals).

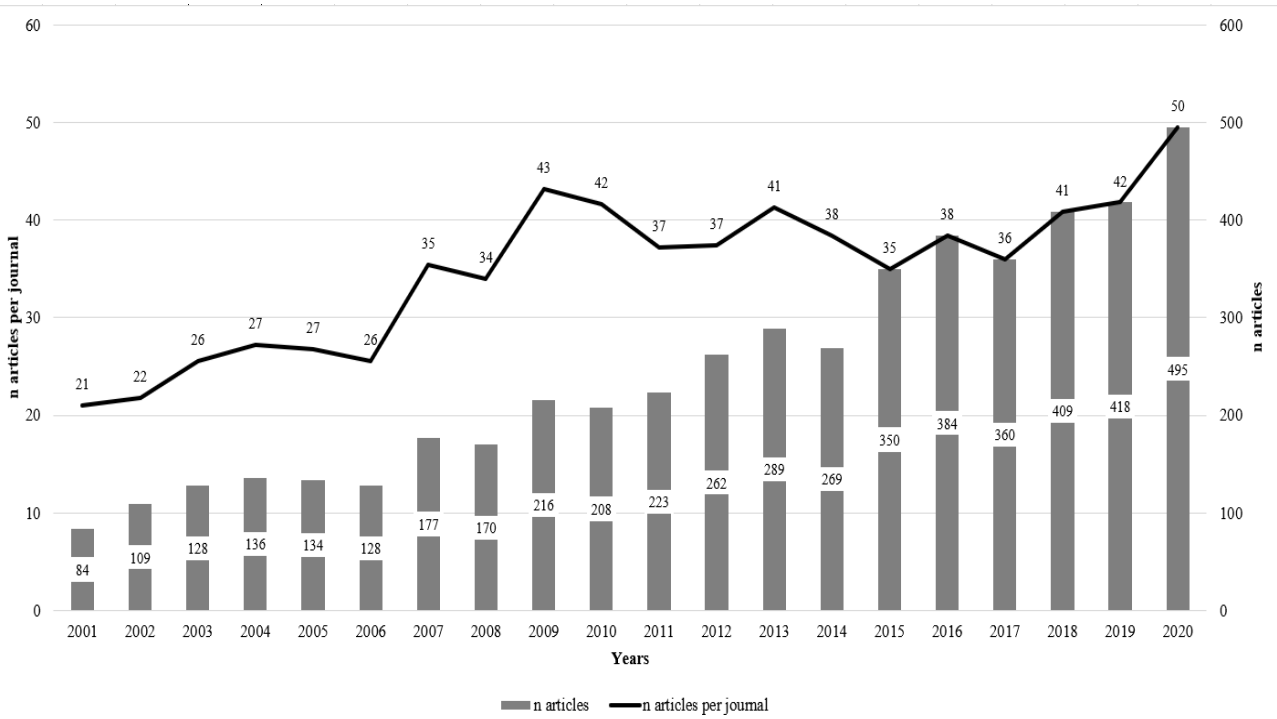

Figure 2. Number of articles published per year in sport psychology journals indexed in Web of Science in the last twenty years.
Source: Author's production

Among the ten journals of SEP indexed in Web of Science (Table 2), PSE contained the highest number of articles published in these twenty years (n = 1566) as well as the highest number of articles per year (n = 82).

Table 2

SEP journals indexed in Web of Science: total number of articles and number per year in last two decades.

Journal	n articles	n per year*
Psychology of Sport and Exercise	1566	82
Journal of Sport & Exercise Psychology	756	38
Journal of Applied Sport Psychology	610	31
Sport Psychologist	578	29
International Journal of Sport Psychology	546	27
International Journal of Sport and Exercise Psychology	268	45
Sport Exercise and Performance Psychology	224	25
Journal of Clinical Sport Psychology	165	28
Journal of Sport Psychology in Action	126	21
International Review of Sport and Exercise Psychology	110	11

* Considered year of indexation in Web of Science.

A total of 73 different countries published in SEP journals indexed in Web of Science in the last twenty years. The top 10 countries are presented in Table 3. The *USA* was ranked first (n = 1553; 31.4%), followed by *England* (n = 1285; 25.9%). *Canada* was the third country that most published (n = 943; 19.0%).

Table 3

Top 10 countries that published in SEP journals indexed in Web of Science in last two decades.

Rank	Country	n articles	%
01	USA	1553	31.4%
02	England	1279	25.8%
03	Canada	943	19.0%
04	Australia	560	11.3%
05	Germany	319	6.4%
06	France	262	5.3%
07	Wales	253	5.1%
08	China	148	2.9%
09	Scotland	136	2.7%
10	Sweden	129	2.6%

Note: The sum of n articles per country is more than total number (n = 4949) due to the international collaboration

Network visualization mapping for countries with a minimum 5 papers (to a better visualization) showed 38 countries in seven clusters (Figure 3). Minimum cluster size was 02 countries. Same color represents countries in the same cluster. The strongest collaboration (thickness of the line) was among the following pairs of countries: *USA* and *Canada* (link strength = 160), *England* and *USA* (link strength = 119), and *England* and *Wales* (link strength = 112).

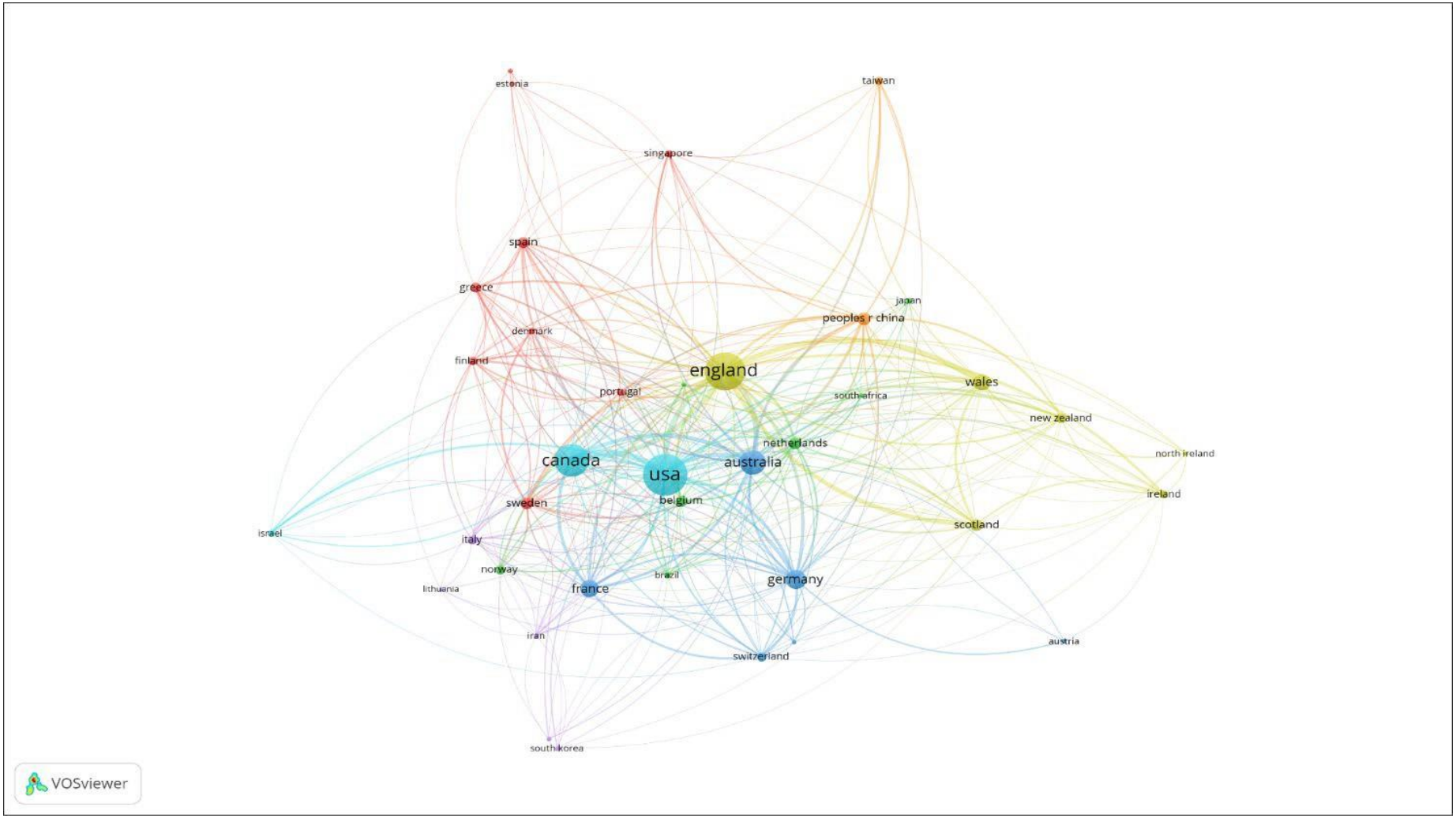

Figure 3. Visualization map of the international collaboration among countries that most frequently published in sport psychology journals indexed in Web of Science in the last twenty years.
Source: VOSviewer
Note: each circle represent one country and size is frequency of documents. Same colors are same cluster of network collaborations.

Regarding institutions, 2040 different organizations were identified that published in SEP journals indexed in Web of Science in the last twenty years. The top 10 institutions that showed a high number of publications are presented in Table 4. The *University of Birmingham* (England) was the most active institution (n = 195, 3.9%), followed by the *University of Ottawa* (n = 145, 2.9%), and *University of Alberta* (n = 132, 2.6 %), both of Canada.

Table 4

Top 10 Institutions that published in SEP journals indexed in Web of Science in the last two decades.

Rank	Institution	Country	n articles	%
01	University of Birmingham	England	195	3.9
02	University of Ottawa	Canada	145	2.9
03	University of Alberta	Canada	132	2.6
04	Loughborough University	England	121	2.4
05	University of British Columbia	Canada	120	2.4
06	Florida State University	USA	113	2.3
07	Michigan State University	USA	91	1.8
08	Bangor University	Wales	84	1.7
09	Queens University	Canada	83	1.7
10	University of Western Australia	Australia	82	1.6

In total, 1028 different funding agencies emerged from the 4949 articles selected. However, 3769 articles (76.16%) do not contain data about funding agencies. Table 5 present the Top 10 funding agencies. The most cited how funding agency was *Social Sciences and Humanities Research Council of Canada (SSHRC, Canada)*, with 239 (4.8%) articles, followed to *United States Department of Health Human Services (NIH, USA*), with 193 (3.9%) funded articles, and Australian Research Council (ARC, Australia) in third, with 76 (1.5%).

Table 5

Top 10 funding agencies that published in SEP journals indexed in Web of Science in the last two decades.

Rank	Funding Agencies	Country	n of articles	%
01	Social Sciences and Humanities Research Council of Canada (SSHRC)	Canada	239	4.8
02	United States Department of Health Human Services (NIH)	USA	193	3.9
03	Australian Research Council (ARC)	Australia	76	1.5
04	Medical Research Council (MRC)	UK	71	1.4
05	National Science Council (NSC)	China	69	1.4
06	German Academic Exchange (DAAD)	Germany	56	1.1
07	European Commission	European Union	50	1.0
08	Canadian Institutes of Health Research (CIHR)	Canada	42	0.85
09	Economic & Social Research Council (ESRC)	England	35	0.71
10	French Ministry	France	33	0.66

A total of 7633 different authors have published in SEP journals indexed in Web of Science in the last twenty years, 5248 (68.75%) of which have published one article. Total authors per paper varied to single-authored (n = 288, 5.8%) to 14 authors (n = 04; 0.08%), and most of the papers was three authored (n = 1459; 29.5%). The top 10 most prolific authors are present in Table 6. *Nikos Ntoumanis* with 67 articles, *Gershon Tenenbaum* with 65 articles, *Dave Collins* and *Nicholas Holt* with 53 were the most prolific authors in the last twenty years in SEP journals. *Nikos Ntoumanis* (n = 57.93) *Jean-Roch Cote* (n = 56.63) and *Joan Duda* (n = 51.74) were more cited per item. The h-index of the top 10 authors varied between 16 (*James Dimmock* and *Ben Jackson*) to 33 (*Nikos Ntoumanis*).

Table 6

Top 10 authors most prolific in SEP journals indexed in Web of Science in the last two decades.

Rank	Author	Institution (Country)	Number of papers	Times Cited	Citations per item	h-index
01	Nikos Ntoumanis	University of Southern Denmark (Denmark) Curtin University (Australia)	67	3881	57.93	33
02	Gershon Tenenbaum	Florida State University (USA)	65	1277	19.65	20
03	Dave Collins	University of Edinburgh (Scotland)	53	1359	25.64	22
04	Nicholas Holt	University of Alberta (Canada)	53	2276	42.94	29
05	Maria Kavussanu	University of Birmingham (England)	49	1619	33.04	25
06	James Dimmock	James Cook University (Australia)	46	896	19.47	16
07	Ben Jackson	The University of Western Australia (Australia)	44	729	16.57	16
08	Jean-Roch Cote	Queens University (Canada)	43	2435	56.63	24
09	Joan Duda	University of Birmingham (England)	42	2173	51.74	26
10	Catherine Sabiston	University of Toronto (Canada)	41	1321	32.22	21

A coauthorship network visualization analysis produced a map for 263 authors who published at least 10 (to a better visualization) papers in SEP journals indexed in Web of Science as shown in Figure 4. Minimum cluster size was 04 authors. Eighteen cluster were formed. Same color represents clusters of co-occurrences. *Ntoumanis, N* (number of links = 40), *Cote, J* (number of links = 22), and *Sabiston, CM* (number of links = 21) were the authors with most links.

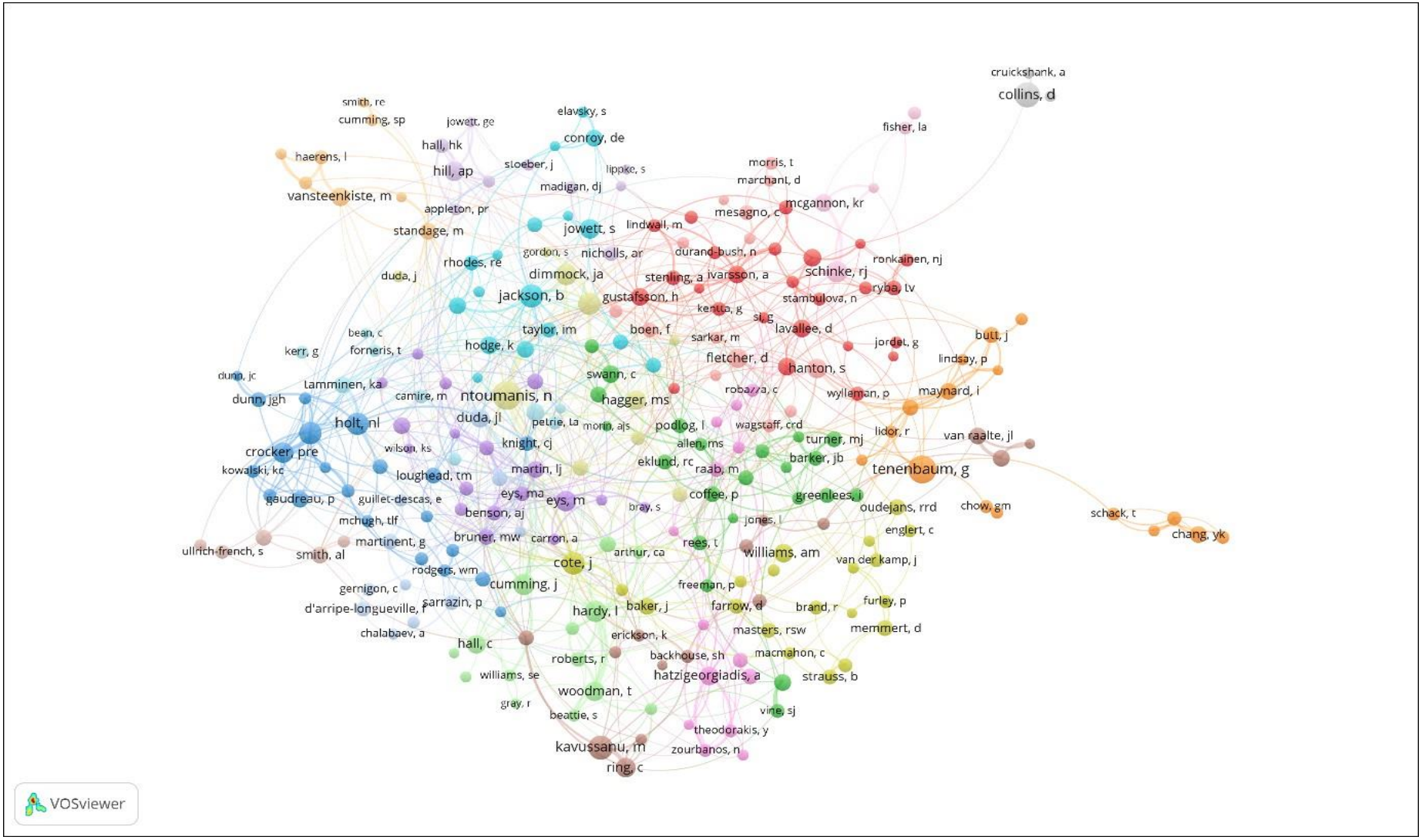

Figure 4. Visualization map of the authors that most frequently published in sport psychology journals indexed in Web of Science in the last twenty years. Source: VOSviewer

Of the top 10 cited articles (Table 7), the most cited in Web of Science was the *A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables* (n = 904), a review published in 2002 in JSEP for the authors *MS Hagger*; *NLD Chatzisarantis*; and *SJH Biddle,* related to past behavior and exercise. However, when considered by year, *Developing rigor in qualitative research: problems and opportunities within sport and exercise psychology,* published in 2018 in IRSEP for *Smith B* and *McGannon KR* stand out from the others with 301.5 citation per year.

Table 7

Top 10 articles most cited of the SEP journals indexed in Web of Science in the last two decades.

Rank	Authors	Year	Title	Author Keywords	Journal	Total Citation *	Total Citation per year
01	Hagger MS; Chatzisarantis NLD; Biddle SJH	2002	A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables	past behavior; self-efficacy; exercise; cumulative analysis	JSEP	904	50.2
02	Markland D; Tobin V	2004	A modification to the behavioral regulation in exercise questionnaire to include an assessment of amotivation	exercise motivation; measurement; self-determination theory	JSEP	654	40.9
03	Mann DTY; Williams AM; Ward P; Janelle CM	2007	Perceptual-cognitive expertise in sport: A meta-analysis	expert; skill acquisition; anticipation; advance-cue usage; visual search	JSEP	635	48.8
04	Smith B; McGannon KR	2018	Developing rigor in qualitative research: problems and opportunities within sport and exercise psychology	Member checking; inter-rater reliability; universal criteria; research quality	IRSEP	603	301.5
05	Gould D; Dieffenbach K; Moffett A	2002	Psychological characteristics and their development in Olympic champions	NR	JASP	512	28.4
06	Gagne M; Ryan RM; Bargmann K	2003	Autonomy support and need satisfaction in the motivation and well-being of gymnasts	NR	JASP	479	28.1
07	Castelli DM; Hillman CH; Buck SM; Erwin HE	2007	Physical fitness and academic achievement in third- and fifth-grade students	cognition; preadolescent; exercise; standardized testing	JSEP	439	33.8
08	Wulf G.	2013	Attentional focus and motor learning: a review of 15 years	external focus; instructions; feedback; motor performance; movement effectiveness; movement efficiency	TSP	419	59.8
09	Araujo D; Davids K; Hristovski R	2006	The ecological dynamics of decision making in sport	decision making; ecological psychology; dynamical systems; cognition; action; representative tasks	PSE	410	29.2
10	Spence JC; Lee RE	2003	Toward a comprehensive model of physical activity	exercise; ecological model; behavior; theory	PSE	396	23.2

* Times Cited, WoS Core; NR: Not reported. Note: Total Citation disregarded year of the publication; JSEP: Journal of Sport & Exercise Psychology; IRSEP: International Review of Sport and Exercise Psychology; JASP: Journal of Applied Sport Psychology; TSP: Sport Psychologist; PSE: Psychology of Sport and Exercise.

The Top 10 high frequency authors keywords in SEP journals indexed in Web of Science in last twenty years were *physical activity* (Occurrence = 326), *sport* (Occurrence = 263), *exercise* (Occurrence = 254), *motivation* (Occurrence = 249), *self-determination theory* (Occurrence = 165), *sport psychology* (Occurrence =

134), *performance* (Occurrence = 123), *youth sport* (Occurrence = 111), *anxiety (*Occurrence = 96), *and coaching* (Occurrence = 95). The keywords assigned by authors (with a minimum number of occurrences of 10 keyword to a better visualization) is showed in Figure 5 through a visualization map. There were 294 different keywords distributed in eight clusters with minimum cluster size with 04 keywords. In Cluster one (red color) was formed with the link between 60 keywords. In this Cluster, the keywords *performance* (link strength = 244), *sport psychology* (link strength = 227), *and anxiety* (link strength = 187) were the most link strength. Cluster 2, (green color), with 47 keywords, the most link strength was *physical activity* (link strength = 556), *exercise* (link strength = 452), *and self-efficacy* (link strength = 155). *Sport* (link strength = 537), *coping* (link strength = 142), *and gender* (link strength = 110) were the keywords between 43 with the most link strength in Cluster 3 (blue color).

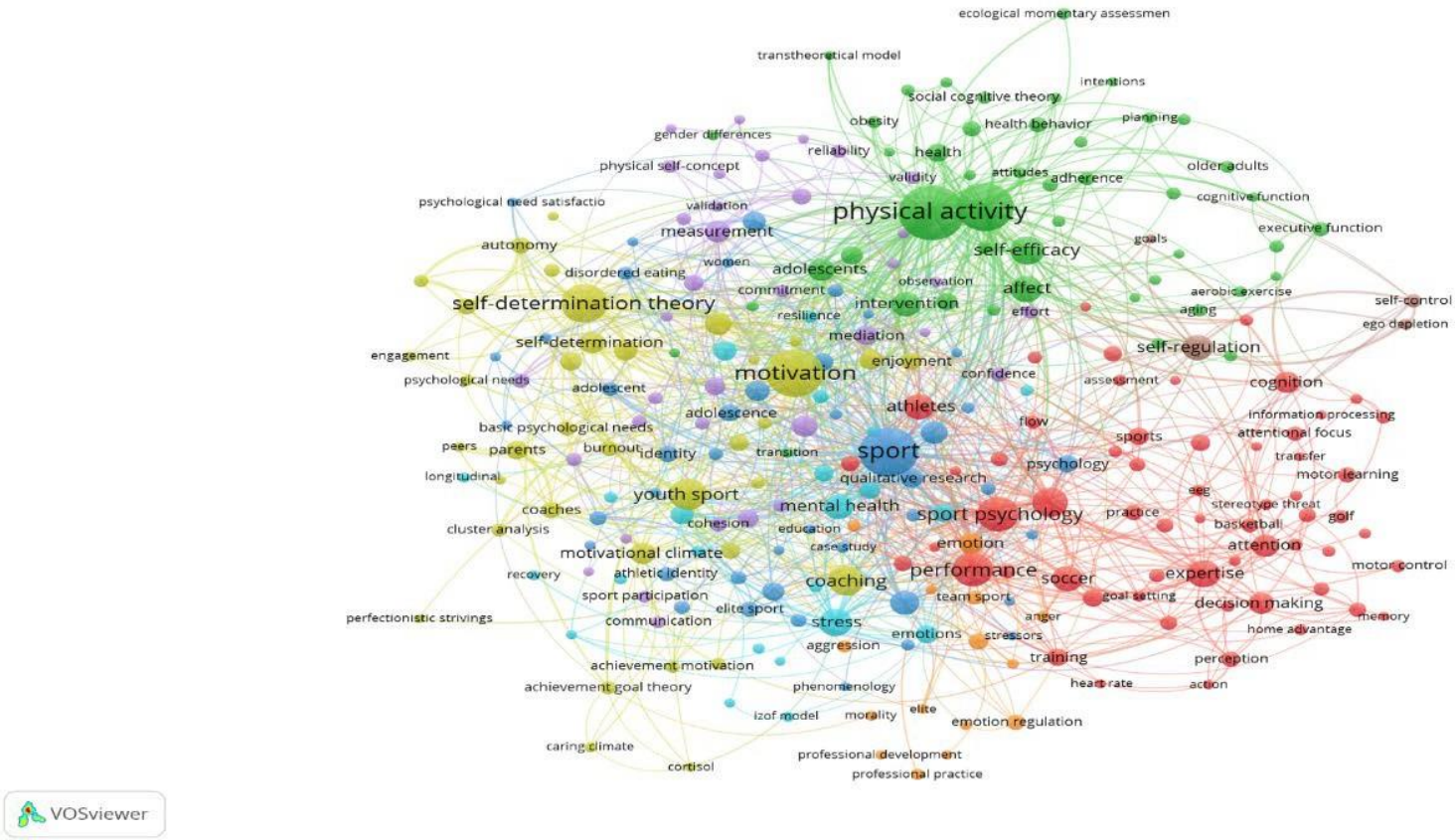

Figure 5. Visualization map of the keywords assigned by authors most cited in articles published in sport psychology journals indexed in Web of Science twenty years.
Source: VOSviewer

Was performed an overlay visualization by year (Figure 6) to show the variation in author keywords. In the first period (2001-2008), keywords *goal orientations* (Occurrence = 16), *self-confidence* (Occurrence = 11), and *transtheoretical model* (Occurrence = 11). Whereas in the last period (2017-2020) the keywords with

most occurrence was *mindfulness* (Occurrence = 36), *dual career* (Occurrence = 19), and *student-athletes* (Occurrence = 15).

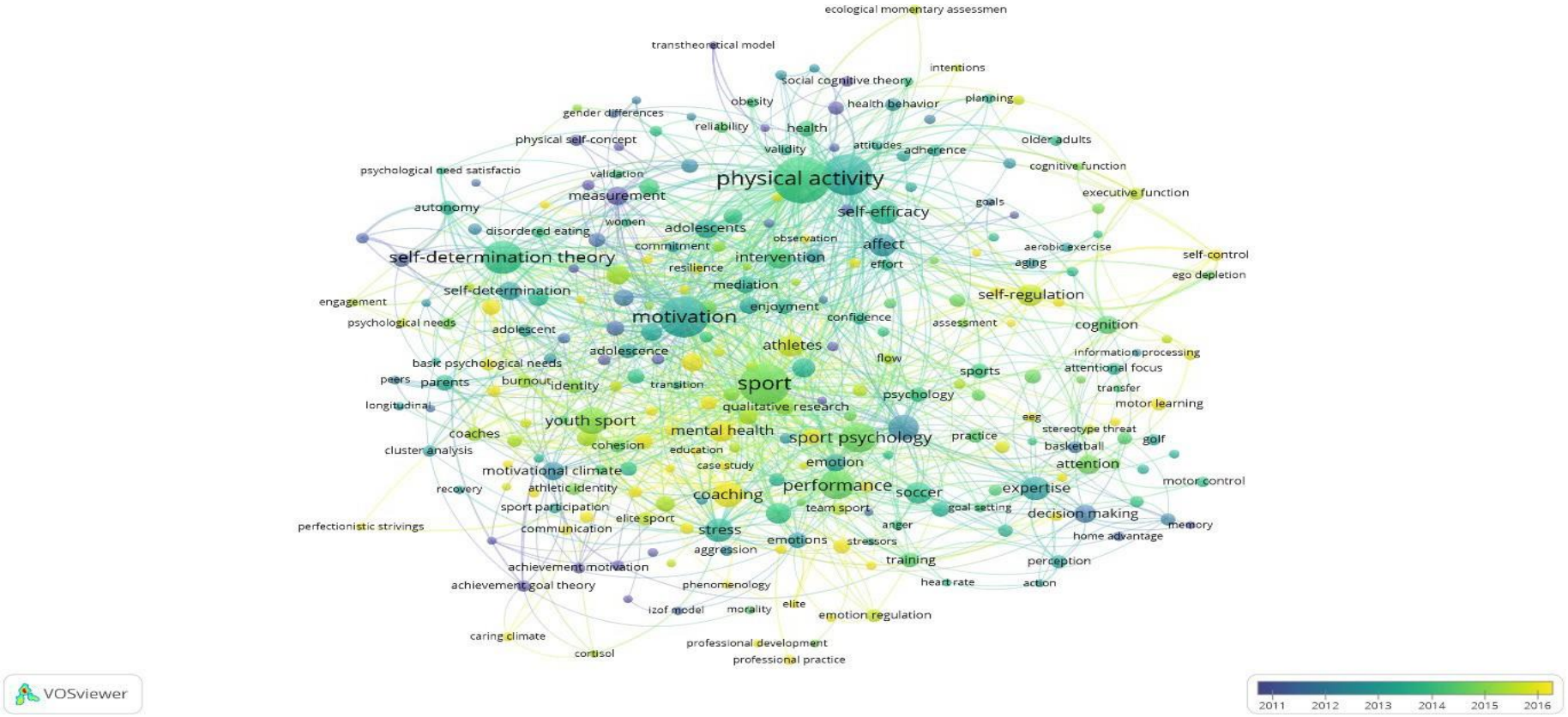

Figure 6. Visualization map of the keywords per years assigned by authors most cited in articles published in sport psychology journals indexed in Web of Science in the last twenty years.
Source: VOSviewer

Finally, the Open Access designations articles were analyzed. In total, 1348 articles were designed how open access (27.24%). The journal with the greatest percent of articles published in open access was IRSEP (n = 50; 45.5%), followed the SEPP (n = 84; 37.5%), and JSEP (n = 253; 33.5%). In relation the year of publication, 2018 (n = 170; 41.6%), 2016 (n = 143; 37.2%), and 2017 (n = 134, 37.2%) was the years with the most percent articles published designed how open access.

Discussion

In this study we analyzed the scientific production of the SEP journals indexed in Web of Science of the last twenty years through a bibliometric analysis. We observed 4949 articles in ten journals eligible.

The results showed that total number of papers published in SEP journals per year increased in the last five years. In 2015, only three SEP journals were indexed in the Web of Science (IJSEP, JCSP, and JSPA) and the inclusion of other journals could explain this increase. In this sense, we analyzed the rate of number of articles published per number of journals indexed. In the first six years (2001 to 2006) the number of papers per journal was below 30. After 2009 (n=43) the number of papers was relatively stable until 2019, between 35 (2015) and 43 (2009). However, three out of the 10 SEP journals eligible (JSEP, PSE, and IJSP) have increased the number of issues (4 issues to 6 issues per year) publications during the examined period. The increased of work and interest in the area may has generated increased in number of issues and consequently the number of publications (Németh, de La Vega, and Szabo, 2016). This increase may be related due to the general expansion in electronic database (Danell and Danell, 2009).

Regarding the results related to the journals, the *Psychology of Sport and Exercise* was the journal with the greatest number of articles (N = 1566) and articles per year (N = 82). Obviously, it was expected that journals that were already indexed in the Web of Science at the beginning of the evaluated period (IJSP, JASP, JSEP, and TSP) would have more articles published. However, other variable that could also influence the total number of publications is higher frequency of issues per year of three SEP journals (IJSP, JSEP, and PSE), with six issues per year. The popularity between SEP researchers and change of paper to electronic publication could explain the high number of publications of some journals (Khoo, Ansari, and Morris, 2021).

The United States was the most productive country in SEP journals indexed in Web of Science in last twenty years, with 1553 articles. Network visualization mapping for countries showed that *USA*, *England*, *Canada,* and *Australia* appear central in SEP journals. These results are similar to others recent bibliometrics in SEP (Khoo, Ansari, and Morris, 2021; Németh, de La Vega, and Szabo, 2016). Németh, de La Vega, and Szabo (2016) showed that while the USA remains stable between 2003 and 2012, countries like Germany (+ 262.5%) and Australia (+ 72.7 %) increased and appeared emergently contributions in SEP journals. The authors argues that the explain to this predominant of Anglophone countries is because the better background knowledge in SEP, more easily access of this journals that are in English language, and endogenous publication bias in the area. Additionally, in an applied perspective, Szabo (2014) showed a strong correlation between the national research in SEP published in high-impact journals and Olympic success in terms of winning medals from three nations (USA, UK, and Canada).

Khoo, Ansari, and Morris (2021) analyzed sport and exercise psychology publications from Asian and South Pacific researchers and showed that most of the collaborations outside the region were with the USA and England. The authors reinforce the importance of mobility researchers between regions. The collaboration between Asian and South Pacific researchers and England or EUA was possible because have been fostered by Asian South-Pacific Association of Sport Psychology (through contacts made at the quadrennial International Congresses, Managing Council meetings and, official visits to various Asian countries), and training of Asian academics in SEP in the USA.

In contrast, the visualization map shows an absence of South American countries in collaboration with central countries (Brazil is the only present in figure). We argue the importance of research and collaboration between SEP researchers in these countries. SEP in Brazil is currently in a development stage but has strengths that could represent opportunities in partnerships for improvement (Serra de Queiroz et al., 2016). In this sense, Vieira et al. (2013), presented the state of the art of research in SEP in Brazil, evidencing the existence of scientific production and well-established research groups (Vilarino et al., 2017), both in Exercise and Sport Science post-graduate programs and in Psychology programs (Fiorese et al., 2019).

A similar pattern of hegemony was observed regarding the institutions. The University of Birmingham (England), Ottawa University and Alberta University (Canada) institutions contributed to the majority of the literature on SEP journals indexed in Web of Science in the last twenty years. This finding agrees with other studies performed in SEP journals (Németh, de La Vega, and Szabo, 2016). In the same way, Khoo, Ansari, and Morris (2021) showed that the most active universities from the Asian and South Pacific region was University of Western Australia, with 104 publications. In the present study, this institution was the tenth, with 82 articles. This difference (n = 22) was due to the coverage in years (Khoo, Ansari, and Morris (2021) searched publications from 1989 onwards). The bibliometric analysis of institutions was not conducted "because is good to know". The knowledge of better institutions in SEP put call to action to a global demand to opportunity of institutional partnerships, multicentric, and cross cultural studies, essential for the development of the area, through training research, postdoctoral supervision, and technical visit, like anterior experiences (Khoo, Ansari, and Morris, 2021).

Research funding bibliometric analysis is less usual, but not least important for development of the field (Andrade, Dominski, Coimbra, 2017). Therefore, we

performed an analysis of funding agencies. However, the percentage of articles that reported funding is still low (23.84%). Memon et al. (2020) identifies a similar result in the top 10 funding agencies that supported 14.8% of total papers about sleep and exercise. Productivity seems related to funding. Top funding agency was the Social Sciences and Humanities Research Council of Canada (SSHRC), with 239 papers stands for 25% of total publications of Canada. We argue that this bibliometric finding is an important information source and could provide insight for countries agencies in terms of allocation of funding, and impact in one area (Khoo, Ansari, and Morris, 2021). Funding is not to "publish or perish", in an area of research reflects the social interest in the field (Andrade et al., 2015).

Regarding the authors, our analyses showed the most prolific authors in SEP journals indexed in Web of Science in last twenty years and network between then. This enables one to understand how SEP publication has been distributed. Khoo, Ansari, and Morris, (2021) analyzed the authors with the most publications and citations SEP research from the Asian and South Pacific region. Four authors between the top 10 are the same. Two authors with South Pacific affiliations (*James Dimmock* and *Ben Jackson*) and two without affiliations (*Nikos Ntoumanis* and *Gershon Tenenbaum*), showing a mobility of researchers between regions. As well as demonstrating in the study of Khoo, Ansari, and Morris, (2021), these prolific researchers could work and teach in other countries and institutions, contributing strongly to publications and development of SEP (Khoo, Ansari, and Morris, 2021).

In the same way, Lindahl et al. (2015) showed the overall intellectual structure of SEP. The visualization showed that authors are connected with each other on the basis of co-citation relationships in principal components themes of SEP and how these themes are associated. In this sense, Lindahl et al. (2015) indicated that the co-occurrence between the authors is related around the themes is SEP. The visualization map in present study showed eight clusters of co-occurrences between authors. In both, the absence of researchers from South America and Asia demonstrates the necessity of more visibility in SEP journals to studies with athletes from these countries to investigate whether sport systems, structures, and societal cultures impact SEP themes. To fill this gap, partnerships and multicenter studies are recommended between the main authors of the theme and researchers of countries, for example (Andrade, Dominski, Coimbra, 2017; Fiorese et al., 2019).

Analysis of the top articles cited has been used in different scientific fields (Ahmad et al., 2020; Coimbra et al., 2019; Andrade, Dominski, Coimbra, 2017). To our knowledge, this has not yet been performed in sport and exercise psychology. The results of the present study showed that the most cited paper of the sport and exercise psychology journals indexed in Web of Science in last twenty years was "A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables" published in JSEP in 2002, by Hagger, Chatzisarantis, and Biddle, with 867 citations (Hagger et al., 2002). Four of the ten most cited articles are related to physical activity or exercise. This is probably because this is a thematic of interest in medicine science (Rhodes & Nasuti, 2011), increasing the chances of an article receiving citations. On other hand, the article "Developing rigor in qualitative research: problems and opportunities within sport and exercise psychology" (Smith & McGannon, 2018), in the IRSEP contrasts with the others as this work was published 2 years ago and has received 621 citations (207 per year). However, this citation analysis should be interpreted with caution, like recommended to Waltman (2016), due to impact that these indicators are used to determine funding research and in academic practice.

Through the visualization map of the most commonly keywords assigned by authors, we observed a distinct cluster that makes sense. For example, the keyword *physical activity* was linked with keywords related to behavior models, such as *theory of planned behavior*, *transtheoretical model*, *health behavior.* On the other hand, *performance* was linked with *decision-making, expertise, mental skills*.

The network related to motivation (keywords *motivation, self-determination theory, motivational climate)* stands out. Lindahl et al. (2015) found that motivational theories (self-determination and planned behavior) are central in SEP. However, faraway from others central themes, like sport talent. In the same way, Clancy et al. (2016) suggest in a review of competitive sport motivation research, that although there has been a plethora of studies over the last 20 years of sport motivation research, news insights maybe valuable. In this sense, based to keywords visualization map, motivation could be investigated in the other areas in SEP.

Technology is a new emerging research field in SEP. Esports is a growing industry, and SEP researchers could focus on executive functions, psychophysiology and game performance, and behavior of engaged gamers (Pedraza-Ramirez et al., 2020). In addition, virtual reality is another promissory technology for decision making training in team sports (Craig & Watson, 2011). Injury was little used, considering that this is a major concern of athletes and coaches. Kinesiophobia is a psychology condition associated with "fear of pain", however there are few studies with professional athletes. In this sense, sport psychologists could help practitioners to deal with injury treatment and decrease the fear of returning to a regular training routine.

However, plausive elucidations are need. There are topics within the SEP that are not exclusive for SEP and are of interest to other scientific fields. For example, articles about psychology of sports injuries might

published in Sport Science journals or in SEP journals. Similar in the case of articles about internal training load and stress, recovery, and wellbeing in athletes (SEP and Sport Science) or sports technologies (SEP and Computer Science). Thus, the authors could publish on multidisciplinary topics, and some topics might be underestimated in the SEP journals but not in science in general.

Analysis regarding open access articles was performed in this bibliometric analysis. Previous studies suggest that open access articles have the potential to receive more citations than those without open access (Tamminen & Poucher, 2018). However, due to the number of open access articles varies according to each journal and year, we didn't explore this issue with statistical analysis. IRSEP is a recent journal with a higher impact factor and 30% of the articles are open access, which contributes to more visualization and could collaborate in more citations.

Our sample size of 16,607, which would make a manual review of all data very time-consuming. The temporal scope of this study, including twenty years of the analysis of scientific production, is the main strength of this study. Thus, a comprehensive and deeper bibliometric analysis was performed. Similar studies have been conducted considering the five core journals of SEP, while our study advances the results by including ten journals in Web of Science with well-defined criteria to select the journals in this database.

We performed a bibliometric analysis of the scientific production in the last twenty years in sport and exercise psychology journals indexed in Web of Science. We presented the Top 10 countries, institutions, funding agencies, and authors that most frequently published in the field as well as the citation report for each category. In addition, visualization mapping of the co-occurrence of countries, authors, and keywords assigned by authors showed the network and relations between keywords used in sport and exercise psychology journals. Lastly, the in-depth classification of keywords assigned by authors was presented related to the main themes of the sport and exercise psychology research.

Lindahl et al. (2015) classified scientific production according to the areas - sport psychology and exercise psychology and verified that the focus of scientific production in five core journals between 2008 and 2011 was in sport psychology, with a lesser extent on exercise psychology. Although we did not classify scientific production in the same way, we verified that some indicators, such as most commonly keywords assigned by authors in articles and most cited articles, were related to exercise psychology.

As suggestions for further research, new trends are emerging, such as esports, virtual reality, and technology. Despite a recent discussion on whether e-sports are sports or not (Hallmann & Giel, 2018) this could be a future research field.

Limitations

As limitation, SEP is an interdisciplinary field and allot of research in SEP is published in non-SEP journals. For example, *Journal Motor Behavior* and *Perceptual and Motor Skills* usually publish research related SEP, but are not journals of SEP. Other limitation related the results about keywords assigned by authors, possibly do not reflect the number of studies published. The authors' chose these keywords to be retrieved from the electronic database. We point the importance of the keywords choice, as a means of identifying specific works related to the theme. Our sample was limited to the scope of the ten journals. Obviously, there is more scientific knowledge on SEP published in other journals in several areas and other databases (like Scopus and SportDiscus). Thus, relevant papers for SEP area were left out of the citation analysis (for example, *Re-imagining motor imagery: Building bridges between cognitive neuroscience and sport psychology*, published by Moran and cols in British Journal of Psychology in 2012), because it was not published in one of the 10 eligible journals. Finally, this bibliometric analysis was apparently descriptive, with no inference analyze. However, this is in-depth guideline about the scientific production in sport and exercise psychology.

Conclusion

This bibliometric analysis work contributes to the research field through well-defined criteria to select the journals in Web of Science, as well as the eligibility to include the papers to analyze. Second, the updated analysis of contributions for each journal and citation report. Third, the keywords assigned by authors for visual mapping and thematic analysis were extracted from works registered in the database and defined by the authors themselves.

The main findings of this bibliometric analysis were: (a) the evident prevalence of Anglo-Saxon countries, institutions, and authors in sport and exercise psychology journals. The majority of journals published in the English language and with no open access, increasing access barriers to developing countries (such as Latin-American, African, and Asian). (b) The most productive authors in the SEP journals contributing to its growth and development in the SEP area; (c) Self-determination theory is a well consolidated theoretical framework in the last twenty years in SEP journals. In SEP journals, one the most cited paper was related to the perceptual-cognitive expertise. On the other hand, other themes may be promissory to the future of the field and should gain attention, such as the application of technology in sport and exercise psychology, as well as studies with special populations in the sport and exercise context.

We hope that this study on scientific production in sport and exercise psychology journals, through a bibliometric analysis of the last twenty years, will be a source of consultation on the state of the art in the field

for researchers and professionals in sport and exercise psychology. We believe that in an area of strong academic, scientific, and professional development, related to the sports phenomenon, sport spectacle, performance and health, analyses such as this allow greater knowledge and deeper analyses of the past, present, and future decisions of sport psychology journal in the last twenty years.

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