

Trends and Patterns of Sports Research in Islam: Bibliometric Analysis Using the Scopus Database

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Abstract

Sports are highly recommended in Islam, especially archery, horse riding, and swimming. All three contain aspects of health, skill, accuracy, sportsmanship, and competition. The main objective of this study is to conduct a systematic analysis of trending research literature, especially on the topic of sports in Islam, using bibliometric analysis. This study uses a bibliometric analysis approach with the help of the VOSViewer application. The search results show 393 sports studies in Islam published from 1928-2021 using the Scopus database. Based on VOSViewer mapping, the findings reveal that: the number of publications from 1928 to 2021 fluctuated; Of the 393 documents published, the United Kingdom published the most articles (146 documents); Tansin Benn (University of Birmingham, Birmingham, United Kingdom) were the most influential authors contributing articles (17 documents) and was the most cited author (508 citations); the sources that published the most documents were the Journal of Sports Sciences (20 documents); the most influential documents (134 citations) was entitled "Young Muslim Women and Sport: The Impact of Identity Work" written by Kristin Walseth; keywords that often appear are "Islam, sport, gender, religion, Ramadan, Muslim, football, Muslim women, physical education, fasting". For further researchers, they can see exciting topics to be researched.

Keywords: Question Research Mapping, Sport, Islam, Bibliometrics.

Introduction

Bibliometric analysis has evolved into an efficient tool for reviewing and analyzing vast scientific data from diverse databases such as Scopus and Web of Science. This is because the number of articles published in a field of study, whether pure scientific or social science, enables researchers to gather the most pertinent data to perform additional analysis and trace the subject's evolution (Abdullah, 2022; Perdima, Suwarni & Gazali, 2022). Consequently, it is anticipated that this method will comprehend the publication growth and summarize the current condition of an established or rising research issue better to perceive trends and patterns of sports research in Islam.

Sport and religion are science disciplines that cannot be separated since all religions recommend that believers do sport, although the rule and the practice may be distinguished. The connected relationship between sport and religion happens in various associations (Lee, 2005). Sports and religion are important for development, unity, stability, togetherness, and peaceful coexistence (Jona & Okou, 2013). Religion is a domain that has not been widely studied for its influence on the social self and body culture, especially in education and sports (Benn, Dagkas & Jawad, 2011). For Muslims, biological maturity coincides with religious transition (Abo-Zena, 2019). The starting point for Muslims is to try to understand their world with their faith (Akhavi, 2003).

Islam is an ideology that encourages its followers to engage in recreational, physical, and/or competitive activities (Farooq & Parker, 2009). Islamic culture and Olympic sports have different values, beliefs, and behaviors regarding body discipline (Benn & Dagkas, 2013). Physical activity is recommended for all Muslims (Agergaard, 2015; Nakamura, 2002), to get an excellent physical condition Islamically (Walseth, 2006b), under the guidance of the Qur'an and Hadith, as well as in the context of spreading the teachings of Islam (Abd Rahim, Diah, Jani & Ahmad, 2019). Islam has made many efforts to maintain health, develop a healthy lifestyle, and encourage involvement in physical culture and sports to improve health and protect oneself and one's family, and the homeland (Galimov, 2016). Sports and Islam can explain the theological influence on sports activities (Walseth, 2016).

Islamic teachings have allowed or even encouraged Muslims to play games and sports to reduce the sadness and grief from the exhaustion they experience in life. (Kizar, 2018). Islam says that all Muslims should do something for their bodies, to take care of them. One way to do this is through exercise (Walseth & Fasting, 2003). Islam comes with an intermediary curriculum that teaches its people a balance between body and soul, a balance between mind and heart, a balance between religion and the world, and ideals. (Al-Dafrawi, 2020). The code of life is revealed through Islamic law regulated in Sharia (Dagkas & Benn, 2006). Prophet Muhammad emphasized physical activity and sports and regularly participated in horseback riding, swimming, archery, wrestling, running, and mountain climbing. It is interesting to note that all the sports recommended are endurance-based, apart from archery which is a fine motorsport (Zaman, 1997). It is highly recommended to train children in various types of sports (Noaparast, 2013).

Sports Research in Islam: A Brief Note

Given that modern sport requires individual dedication to the life of the 'athlete', especially at a professional level, it is challenging for Muslims not to deviate from the right path (Testa & Amara, 2016). Modern professional and amateur sports are popular in Muslim society (Shavit & Winter, 2011). Abdul-Jabbar's entry into Islam shaped his presentation as a politically

conscious basketball superstar and shaped the more widespread understanding of Islam in the United States (Goudsouzian, 2016). Muhammad Ali said, "Allah is the foundation of his success" (Kretschmann & Benz, 2012). Athletes' participation in sports is more substantial than winning matches (Abd Rahim, Mohamad Diah & Aman, 2018). Sports don't make them feel less religious or violate Islamic principles (Turkmen, 2018).

The general view of the Olympics is participatory and positive, with Muslim countries having a long history of involvement and, more recently, entering contests bidding to host future games (Randeree, 2011). To a certain extent, the treatment of sports by the Islamic Movement is similar to its treatment of nationalist ideology (Sorek, 2002). On the one hand, the Muslim world has accepted modern sport as a symbol of modernization in Muslim societies and as a privileged tool for nation-state building. But on the other hand, many Muslims, especially representatives of the Islamic movement, are wary of modern sports as a symbol of secularism and a deviation from the concerns of the authentic community of the Ummah (Muslim nation) (Amara, 2008). Countries with large Muslim populations rarely experience international sporting success (Malcolm, Bairner & Curry, 2010). However, the success of a country where the majority of the population is the achievements of a country in international sporting events does not always measure Muslims. One example is the Islamic Solidarity Sports Federation (ISSF), a non-governmental and non-profit organization that has successfully organized a major sporting event that shows the world that Muslims have a strong unity. This shows that Islam has the potential to become a new force in the international sports system, although it requires more concrete evidence. But at least, Islam has shown the ability to organize sports internationally (Sofyan, Saputra, Nurihsan & Kusmaedi, 2021).

The selection of sporting activities to promote values tends to be determined by the sports facilities available and not necessarily by a literal interpretation of the Sunnah (the tradition of the Prophet) (Amara & Henry, 2010). For European Muslims, sport is another area to explore (or to "conquer") to unify their dual identity (Amara, 2013). Therefore, framing Islamic narratives and sports in the media is related to the actual outward practice of Islam (Bahfen, 2013). In its original form, Islam does not prohibit Muslims (male or female) from doing sports (De Knop, Theeboom, Wittock & De Martelaer, 1996). Islam does not prohibit women from doing sports (Al-Imam, 2020). Participation in sports does not conflict with the spirit of Islam and "shari'a" (Islamic code of life) (Marwat, Zia-Ul-Islam, Waseem & Khattak, 2014). Muslims can only do sports if they meet the requirements (Galimov, 2016).

Islam has affirmed some sporting activities not as an end but as a means to establish, strengthen, and spread Allah's guidance and develop life on earth according to that guidance (Maishnu, 2009). Active sports and recreation are widely encouraged in most Islamic countries as part of policies to develop a healthy mind and body (Martin & Mason, 2004). In Muslim communities, religion controls how much women can participate in sports (Jona & Okou, 2013). One of the latest innovations for Muslim women is the manufacture of swimwear and sportswear that is resistant to the rigors of strenuous physical activity and following Islamic law (Kahan, 2011). The importance of exercise is stated by the perfect verses, hadiths, and imams of the words and deeds of the Prophet (Sanchooli, 2016).

This study uses bibliometric analysis conducted on the Scopus database to trace, track, and review the development of research and scientific publications related to sports and Islam in all countries. We reviewed scientific publications from 1993-2021. The research process is focused on the following: 1) How is the development of sports and Islamic scientific publications in the

Scopus database? 2) Name of the most influential journal, author, and article in sports and Islam? 3) What search keywords often appear in sports and Islam? 4) Which countries and institutions are most focused on sports and Islam?

The development of research related to sports and Islam has not received much attention from Muslim researchers. Several studies have been conducted using bibliometric analysis on the topic of sports and physical education (Gümüs, Gençoglu & Sahin, 2020), fasting Ramadan and health (Husain et al., 2020), sports and muscle education (Završnik, Kokol, Pišot & Blažun, 2015), sports and sports medicine (Fares, Fares, Baydoun & Fares, 2017), outdoor air quality used for sports training (Andrade, Dominski & Coimbra, 2021), technology and sports for health promotion (Belfiore, Ascione & Di Plama, 2020), social media in sports (López-Carril, Escamilla-Fajardo, González-Serrano, Ratten & González-García, 2020), physical activity, sedentary behavior, and health (Müller et al., 2018). In conducting metadata searches, we have never found a bibliometric study that discusses sports and religion, especially Islam, in the Scopus database or others. We use only one database, namely Scopus because the distribution of reputable scientific publications in this database is the largest of all existing databases. Through this research, we seek to fill in the gaps and open new perspectives for future research. Based on bibliometric analysis and visualization, we provide an objective and up-to-date overview of sports and Islam. Thus, we can meet the information and document needs of researchers, academics, and practitioners to be used as reference materials for further research. This bibliometric study is an objective and reliable resource that maps research areas, enabling a wider range of selected studies (Hernández-Torrano et al., 2020).

Materials and Methods

This study uses a bibliometric analysis approach with the help of the VOSViewer application. Per the purpose of this study, a systematic search was conducted using the Scopus database (Figure 1). In obtaining the metadata, the researcher conducted a phrase search on December 10, 2021, including the search for the title “sport” OR “sports” OR “physical education” AND “Islam” OR “Muslim”. There are 392 documents published and found using the Scopus database. This has fulfilled the requirements for analyzing bibliometrics because Rogers, Szomszor and Adams (2020) said that a minimum of 200 documents is needed to analyze bibliometrics. Meanwhile, Donthu, Kumar, Mukherjee Pandey & Lim (2021) said 300 documents were needed.

Researchers mapped the main contributors (author, university, and source name), and applied keyword occurrence analysis to discover publication trends. They tracked the main themes or topics that emerged in the publication. To present the data, the researcher uses data visualization with the help of the VOSViewer application (Van Eck & Waltman, 2019). Researchers use several parameters in VOSViewer to obtain document metadata, including: 1) Type of analysis (Co-occurrence analysis), 2) Unit of analysis (All keywords), 3) Method of calculation (Full counting), and 4) the Minimum number of author documents (2 documents) (Jeong & Koo, 2016). Counting data pairs within a collection unit is all involved in a co-occurrence analysis. The unit analysis refers to the publication factor aimed to analyze in this study, which is the authors' keywords. The method of calculation that has been applied in this study is complete counting. The occurrences attribute in the whole counting specifies a phrase's total number of occurrences in all documents (Van Eck & Waltman, 2019). And the minimum number of author's documents for score characteristics is that comparing two items based on

whether one item has a higher score than the other item makes sense.

This study analyzed the scrutinized parameters using Microsoft Excel and VOSviewer. Microsoft Excel is used to analyze publication trends and patterns, whereas VOSviewer is applied to identify the mapping of bibliographic data pertinent to sports in Islamic research publications. Publication trends and patterns were crucial in determining the growth of research in any research field (Abdullah, 2021). In addition, researchers can benefit from mapping techniques when analyzing article data containing information about authors, locations, institutions, citations, co-citations, and other nuanced factors such as keywords (Abdullah, 2022). The mapping technique in the current study is vital to express the most extensive keywords that have been concentrated on in previous research on sports and Islamic research publications. One possible explanation is that the article's keyword often represents the article's core substance and that the keyword's frequency of occurrence and co-occurrence may reflect the topics focused on in a particular field (Chen, Chen, Wu, Xie & Li, 2016).

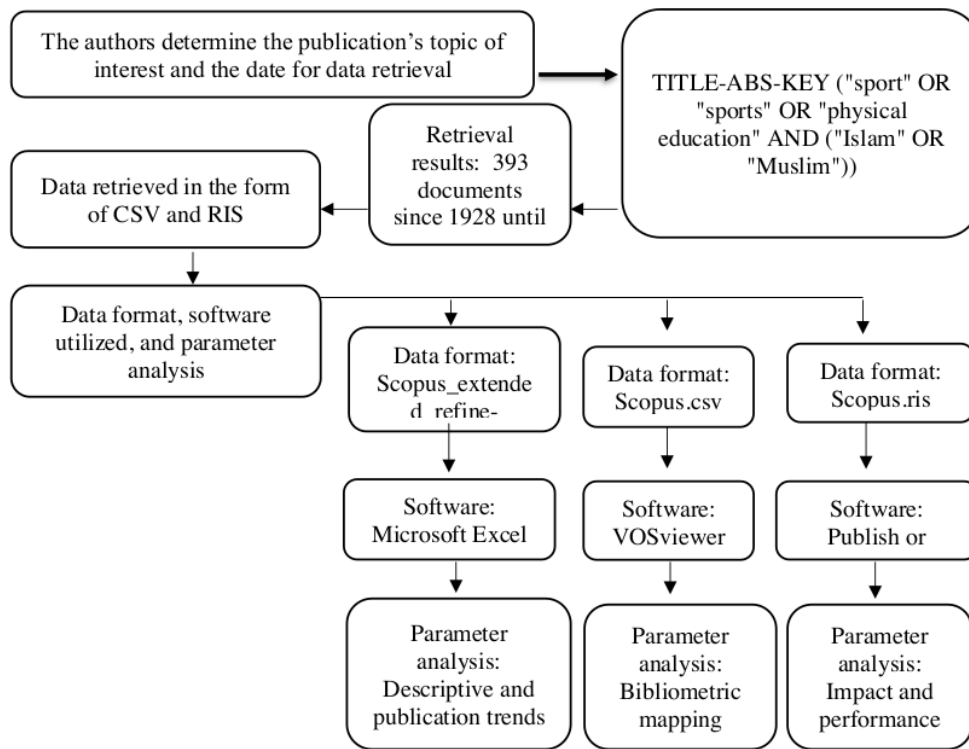


Figure 1: The Flowchart of Data Collection and Data Retrieval

Results

This section contains the results of the bibliometric analysis according to the research questions. First, we present a survey of the literature focusing on its evolution over time and contributions in the field by country, organization, and document type. Second, we examined the most influential journals, leading authors, and papers cited in scholarly works. Third, we look at the analysis of collaboration patterns between authors and countries using co-authorship

analysis, on existing connections between authors or journals using co-citation analysis, and between terms or keywords using co-word analysis.

Productivity of Sports and Islamic Research Publications

The first article discussing sport in Islam was published in 1928, and only 1 document title was discussed. After that, from 1929-1973, no documents were published. In 1974 the documents were re-published with a total of 1 document. From 2003 to 2021, the development of documents experienced an up-and-down trend. The increase occurred only in 2012 (31 documents) and 2015 (30 documents). The development of documents in the last 5 years is 2016 (28 documents), 2017 (29 documents), 2018 (17 documents), 2019 (23 documents), 2020 (29 documents), and 2021 (27 documents). The dynamics of changes in publication productivity can be seen in Figure 2.

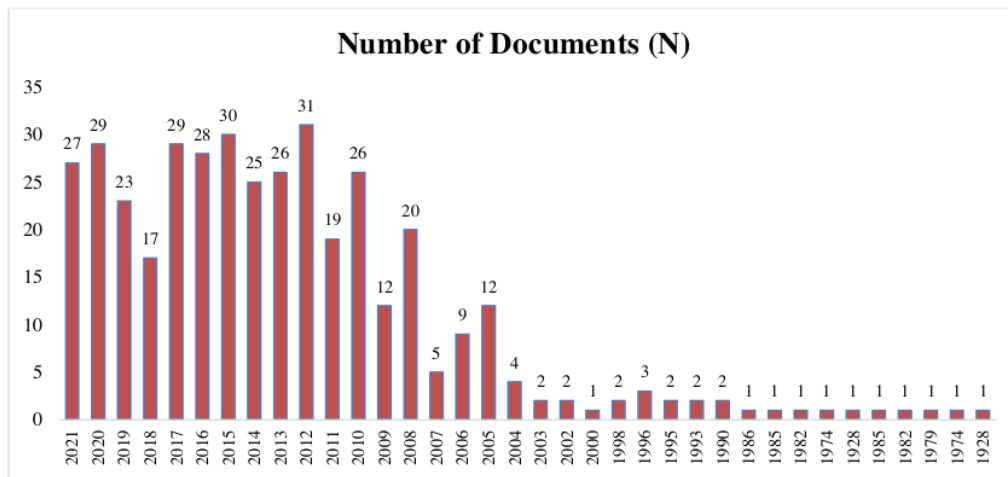


Figure 2: Productivity of Scientific Publications

The Most Influential Sources, Authors, and Publications on Sports Topics in Islam

Based on documents published in 393 titles. The published documents have different influences. The influence can be seen from the large number and citations of sources, authors, and document titles. The following describes the influence of each source, author, and document title on sports in Islam (Table 1).

Table 1
10 Published Resources on the Topic of Sports in Islam

Sources	Document	%
Journal of Sports Sciences (Journal)	20	3,26
Sport Education and Society (Journal)	13	2,12
International Review for The Sociology of Sport (Journal)	11	1,79
Sport in Islam and Muslim Communities (Journal)	8	1,31
Muslim Women and Sport (Journal)	7	1,14
International Journal of The History of Sport (Journal)	6	0,98
British Journal of Sports Medicine (Journal)	5	0,82

Sources	Document	%
Leisure Studies (Journal)	5	0,82
Sport In Society (Journal)	5	0,82
With God on Their Side Sport in The Service of Religion (Book)	5	0,82

Table 1 presents the 10 sources regarding the number of documents published on sports in Islam. Of the 10 identified, the Journal of Sports Sciences contributed 20 documents (3.29%), Sports Education and Society contributed 13 documents (2.12%), International Review for The Sociology of Sport contributed 11 documents (1.79%), Sport in Islam and Muslim Communities contributed 8 documents (1.31%), Muslim Women and Sport contributed 7 documents (1.14%), International Journal of The History of Sport contributed 6 documents (0.98%), followed by British Journal of Sports Medicine, Leisure Studies, Sport In Society, and With God on Their Side Sport in The Service of Religion jointly contributed 5 documents (0.82%).

Figure 3 presents the 10 leading sources regarding the number of sources cited on the topic of sport in Islam. Of the 10 identified, 3 sources (journals) have a considerable influence, between 460 - 604 citations. The Sport, Education, and Society ranked first with 604 citations, the Journal of Sports Sciences ranked second with 518 citations, and the International Review for The Sociology of Sport ranked third with 460 citations.

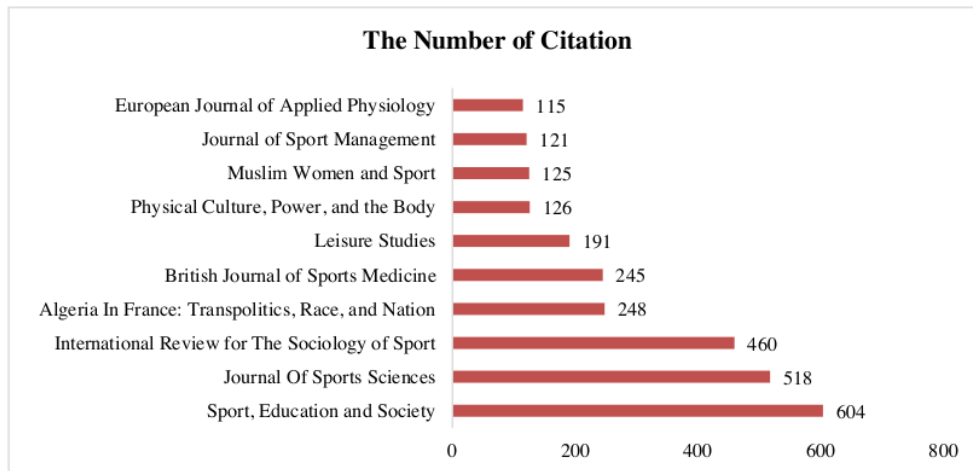


Figure 3: 10 Sources Cited on Sports Topics in Islam

Next, we use the number of publications and the number of document citations to identify the most active and influential researchers on the topic of sport in Islam. Quotations are used to measure influence (Zupic & Čater r, 2015). Of the 393 published titles of documents, 724 authors contributed to this field. Of the 724 authors, Tansin Benn (University of Birmingham, Birmingham, United Kingdom) was the most influential author in publishing documents, with a total of 17 documents (Table 2).

Table 2

Most Authors Publish Documents on Sports Topics in Islam

Authors	Country	Documents
Tansin Benn	United Kingdom	17
Jiri Dvorak	Switzerland	12
Gertrud Ursula Pfister	Denmark	12
Mahfoud Amara	Qatar	11
Hamdi Chtourou	Tunisia	11
Symeon Dagkas	United Kingdom	11
Yacine A. Zerguini	United Kingdom	11
Karim Chamari.	Qatar	10
Ronald J Maughan	United Kingdom	10
Anis Chaouachi	Tunisia	9

Furthermore, the most influential writer based on the number of document citations is Tansin Benn (University of Birmingham, Birmingham, United Kingdom), with 508 citations. More clearly can be seen in Table 3.

Table 3

Authors of the Most Cited Documents on the Topic of Sports in Islam

Authors	Country	Citations
Tansin Benn	United Kingdom	508
Karim Chamari	Qatar	420
Jiri Dvorak	Switzerland	399
Yacine A. Zerguini	United Kingdom	375
Ronald J Maughan	United Kingdom	370
Symeon Dagkas	United Kingdom	367
John B Leiper	United Kingdom	340
Kristin Walseth	Norway	328
Anis Chaouachi	Tunisia	311
Rachida Roky	Morocco	308

Seeing the large number of documents published, we are interested to know which documents have the most influence on the topic of sport in Islam. Of the 393 documents published in the Scopus database, the document with the title "Young Muslim Women and Sport: The Impact of Identity Work" written by Kristin Walseth in 2006, was the most frequently published document quoted with a total of 134 citations. More clearly can be seen in Table 4.

Table 4

Most-Cited Publications

Titles	Authors	Source	Citation	Year
Young Muslim Women and Sport: The Impact of Identity Work (Walseth, 2006b)	Kristin Walseth	Leisure Studies (Journal)	134	2006
Muslims in Britain: An Introduction (Gilliat-Ray, 2010)	Sophie Gilliat-Ray	Cambridge University Press (Book)	115	2010

Titles	Authors	Source	Citation	Year
The effect of the Ramadan fast on physical performance and dietary habits in adolescent soccer players (Meckel, Ismaeel & Eliakim, 2008)	Yoav Meckel, Aobeida Ismaeel, & Alon Eliakim	European Journal of Applied Physiology (Journal)	109	2008
Daughters of Islam: Family Influences on Muslim Young Women's Participation in Sport (Kay, 2006)	Tess Kay	International Review for the Sociology of Sport (Journal)	108	2006
Sport and Belonging (Walseth, 2006a)	Kristin Walseth	International Review for the Sociology of Sport (Journal)	101	2006
Impact of Ramadan on physical performance in professional soccer players (Zerguini, Kirkendall, Junge & Dvorak, 2007)	Yacine Zerguini, Donald Kirkendall, Astrid Junge, & Jiri Dvorak	British Journal of Sports Medicine (Journal)	100	2007
Young Muslim women's experiences of Islam and physical education in Greece and Britain: a comparative study (Dagkas & Benn, 2006)	Symeon Dagkas & Tansin Benn	Sport, Education and Society (Journal)	95	2006
Multiple voices: improving participation of Muslim girls in physical education and school sport (Dagkas, Benn & Jawad, 2011)	Symeon Dagkas, Tansin Benn, & Haifaa Jawad	Sport, Education and Society (Journal)	91	2011
The effect of time-of-day and ramadan fasting on anaerobic performances (Chtourou, Hammouda, Chaouachi, Chamari & Souissi, 2012)	H. Chtourou, O. Hammouda, A. Chaouachi, K. Chamari, N. Souissi	International Journal of Sports Medicine (Journal)	89	2012
Maximizing positive social impacts: Strategies for sustaining and leveraging the benefits of intercommunity sport events in divided societies (Schulenkorf & Edwards, 2012)	Nico Schulenkorf & Deborah Edwards	Journal of Sport Management (Journal)	88	2012

Keywords that often appear on the topic of sports in Islam

The results of data visualization analysis using VOSViewer show that the keywords with the highest number of occurrences in the research sample were Islam (44), sport (43), gender (20), religion (20), Ramadan (19), Muslim (18), football (17), Muslim women (16), physical education (15), fasting (14). The top 10 high-frequency keywords and their bibliometric characteristics (including the number of occurrences and total link strength) visualizations of the item density of high-frequency keywords are presented in Table 4 and Figure 4.

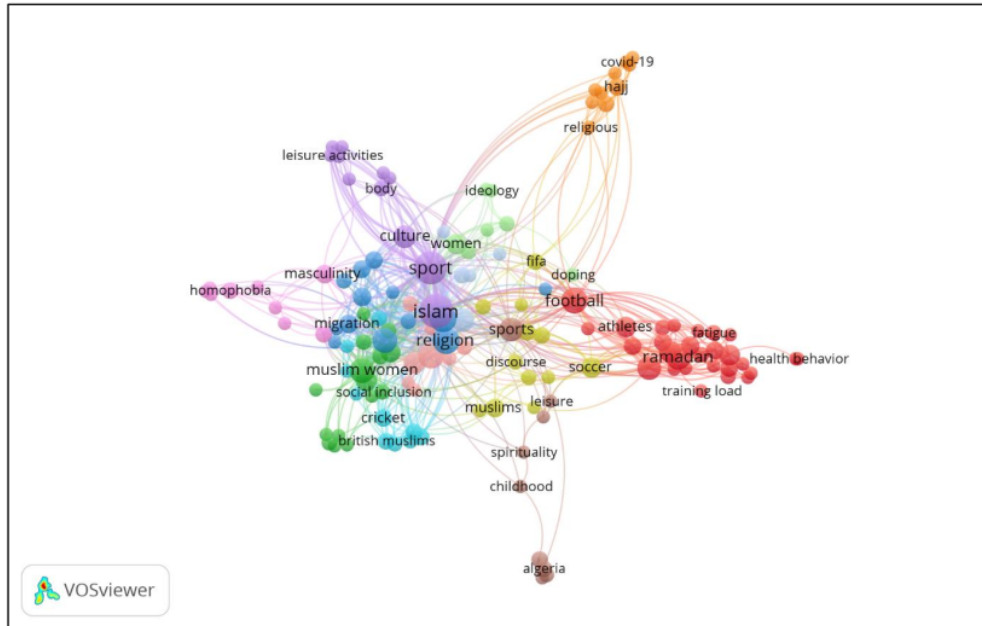


Figure 4: Keywords that Often Appear on the Topic of Sports in Islam

In Figure 4, keywords are grouped according to their relevance/relatedness. The keyword network shows the relationship between research themes (Giannakos, Papamitsiou, Markopoulos, Read & Hourcade, 2020). The presence of lines between keywords indicates close relationships, while the size of the colorful circles indicates the number of occurrences of that keyword. Therefore, the larger the circle on the keyword, the more frequently that keyword appears.

Based on the visualization in Figure 4, it can be identified into 12 thematic clusters, namely: (1) Ramadan, (2) Muslim Women, (3) Gender, (4) Soccer, (5) Islam, (6) Cricket, (7) Hajj, (8) Sports, (9) Masculinity, (10) Muslim; (11) Women; (12) Physical Activity. The keywords in bold are the keywords with the highest number of occurrences. To better understand and see the interactions between sports topics in Islam, see Table 5.

Table 5
High-Frequency Keyword Groups Related to Publications about Sports in Islam

Cluster	Number of Keywords	Keyword (Occurrences)
Cluster 1	28	Athletes (8), Athletic Performance (3), Body Composition (2), Circadian Rhythm (2), Circadian Rhythms (3), Coping Strategies (2), Dehydration (5), Diurnal Variation (2), Exercise (5), Fasting (14), Fatigue (3), Football (17), Health Behavior (2), Hydration (3), Intermittent Fasting (2), Nutrition (5), Performance (10), Physical Performance (2), Qualitative Research (2), Questionnaire (2), Ramadan (19) , Ramadan Fasting (9), Sleep (5), Sleep Characteristics (2), Subjective Assessment (2), Subjective Perception (2), Training (6), Training Load (2)

Cluster	Number of Keywords	Keyword (Occurences)
Cluster 2	15	Belonging (3), Community (3), Cultural Diversity (2), Identity (8), Indian Subcontinent (2), Integration (7), Intergroup Relations (2), Minorities (3), Muslim Women (16) , Social Capital (2), Social Change (2), Social Identity (3), Social Inclusion (3), Soft Power (2), Youth (2)
Cluster 3	13	Embodied Faith (2), Europe (2), Exclusion (3), Gender (20) , Intersectionality (6), Leisure Participation (2), Migration (6), Muslim Girl (5), Physical Education (15), Protest (2), Religion (20) , Religiosity (5), Sport Participation (3)
Cluster 4	12	Bibliometrics (2), Discourse (3), Fifa (4), Fitness (4), Hijab (4), Hijabophobia (2), Islamophobia (3), Media (3), Muslims (6), Olympic Games (2), Soccer (9) , Terrorism (2)
Cluster 5	11	Body (3), Culture (11), Islam (44) , Leisure Activities (2), Leisure Time (2), Middle East (2), Sport (43), Traditional Values (2), Tunisia (2), Veil (2), Western Values (2)
Cluster 6	10	British Asians (3), British Muslims (4), Cricket (5) , Fandom (3), Media Representation (2), Multiculturalism (3), Orientalism (2), Race (4), Racism (4), Transnational Feminism (2)
Cluster 7	10	Covid-19 (2), Festival (2), Hajj (5) , Infectious Diseases (2), Mass Gathering (2), Mass Gatherings (4), Outbreaks (2), Pilgrimage (2), Religious (2), Umrah (2)
Cluster 8	9	Algeria (4), Childhood (2), Islah (2), Leisure (2), Madrasa (3), School (4), Spirituality (2), Sports (13) , Swimming (2)
Cluster 9	9	Community Development (2), Gay (2), Heteronormativity (2), Homophobia (4), Homosexuality (2), Inclusion (4), Lesbian (2), Masculinity (6) , Stereotypes (2)
Cluster 10	8	China (2), Ethnicity (10), Family (3), Girls (2), Health (3), History (2), Muslim (18) , Participation (2)
Cluster 11	7	Doping (2), Globalization (3), Ideology (2), National Identity (2), Qatar (2), Space (3), Women (8)
Cluster 12	5	Adolescents (2), Health Promotion (2), Iran (4), Physical Activity (14) , Politics (2)

The VOSViewer app visualizes a growing range of topics from year to year. Figure 5 shows the colors blue, green, and yellow, each color indicating the year a document was published. The blue color indicates the beginning of the year of publication, and green to yellow indicates the most recent year of publication of a document.

Discussion

This study analyses the development of publications on sports in Islam and their impact on research productivity. This study tracked publications from 1923 to 2021, focusing on the number of documents published yearly. Researchers and academics must continue encouraging in-depth research in this field to encourage research productivity regarding sports in Islam. Support from educational institutions, for example, United States research universities that implement reforms that increase the incentives and resources the system directs to research (MacLeod & Urquiola, 2021), religious organisations, and the government is also vital to provide the necessary incentives and resources for researchers to carry out a broader study of sports in Islam.

Furthermore, regarding scientific sources, it shows that there is significant attention paid to sports research in Islam. This publication provides theoretical foundations, historical reviews, social analysis, and specific research on the role of sport in Muslim communities and the lives of Muslim women. The importance of these published sources shows a great need to continue to develop research on sports in the Islamic context. In line with this, the number and quality of research works published in leading scientific journals are the main indicators of a country's scientific progress (Matcharashvili Tsveraidze, Sborshchikovi and Matcharashvil (2014) and professional journals in disseminating theoretical and practical knowledge and their value in learning about the development of a field (Silvia, Valerio & Lorenza, 2012). By referring to these sources, researchers can further expand their knowledge about the importance of sports in Islam, its impact on Muslim communities, and the role of Muslim women in sports.

The diversity of writers dedicated to producing research on sports in Islam varies greatly based on their expertise. The presence of authors from various countries, including the UK, Switzerland, Denmark, Qatar, and Tunisia, demonstrates the global interest in this topic. These authors have contributed to our understanding of the importance of sport in Islam, its relation to Muslim culture, its impact on Muslim society, and other related aspects. Furthermore, the publications most widely cited in research on sports in Islam need special attention. Each publication is indicated by its title, author, publication source, number of citations received, and year of publication. This shows the importance of these publications in developing knowledge about sports in Islam. These publications describe the impact of identity, family influences, and changes in physical and sporting performance during Ramadan on Muslim individuals, as well as other impacts on economic, social, and cultural factors.

From this comprehensive description of the keyword groups that frequently appear in publications about sports in Islam, it appears that research in this field covers a wide range of topics involving athletics, identity, participation, cultural issues, religion, and other social factors. These findings strengthen our understanding of the importance of sport in the context of Muslim life and its impact on individuals, communities, and society. This is reinforced by the statement that sport and physical exercise have a historical relationship with Islam, and Islam advocates a strong relationship between the spiritual well-being of Muslims and sports. The study emphasises the importance of spiritual education and sports in maintaining the faith and religion of Muslims (Tomar, 2018). Another study by Pramuda, Adi and Andiana (2022) states that the benefits of sports can accelerate body development, trigger group brotherhood, foster self-confidence, and give people hope to win. Then empowerment education is important for Muslim girls to participate in sports activities (Senarath & Liyanage, 2020), and religion's importance in integrating human life into a coherent whole (Schuurman, 2011).

By understanding the topics that have been researched, sports researchers and practitioners can identify areas that still need to be explored further and produce new knowledge useful for sports development in Islam. Bibliometric characteristics of the latest keywords that appear in publications about sport in Islam Cluster 1 highlight research related to the Indian subcontinent. At the same time, Cluster 2 reveals a focus on the impact of the COVID-19 pandemic and infectious diseases. Cluster 3 discusses the relationship between Umrah and Hajj worship and sports in Islam. In addition, Clusters 4 to 9 also reflect topics that have been researched in this field, such as bibliometrics, health promotion, sleep characteristics, and globalisation. This information is important for viewing current research trends and highlighting topics that need attention in future research in the context of sports in Islam.

Conclusion

This study provides a comprehensive overview of the development of publications about sports in Islam and their impact on research productivity in this field. The results show increased publications from 1928 to 2021, illustrating the significant interest in this topic. However, this study has several limitations, such as limitations on the database used and a lack of in-depth analysis of the contents of publications. Therefore, it is suggested that further research be carried out by digging deeper into the publication's content and involving a wider variety of data sources. Another recommendation is to involve inter-agency collaboration, including educational institutions, religious organisations, and the government, to encourage more comprehensive research and facilitate access to needed resources. This research implies the importance of a better understanding of the role of sport in the Islamic context, including its impact on individual Muslims, communities, and society. By deepening our knowledge of sports in Islam, we can strengthen Muslim sports participation, address associated social issues, and encourage the development of policies that support inclusive and sustainable sports participation within Muslim communities.

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References

- Abdullah, K. H. (2022). Publication trends in biology education: A bibliometric review of 63 years. *Journal of Turkish Science Education*, 19(2), 465-480. <https://doi.org/10.36681/tused.2022.131>
- Abdullah, K. H. (2021). Publication trends and thematic evolution of safety motivation research: a bibliometric review. *Proceedings on Engineering Sciences*, 3(2), 181-192. <https://doi.org/10.24874/PES03.02.006>
- Abo-Zena, M. M. (2019). Being Young, Muslim, and Female: Youth Perspectives on the Intersection of Religious and Gender Identities. *Journal of Research on Adolescence*, 29(2), 308-320. <https://doi.org/10.1111/jora.12497>

- Abd Rahim, B. H., Mohamad Diah, N., & Aman, M. S. (2018). From immigrants to sports figures: the case study of the ioc refugee team in rio olympics 2016. *Al-Shajarah: Journal of the International Institute of Islamic Thought and Civilization (ISTAC)*, 137-154. Retrieved from <https://journals.iium.edu.my/shajarah/index.php/shaj/article/view/740>
- Abd Rahim, B. H., Diah, N. M., Jani, H. M. & Ahmad, A. S. (2019). Islam and Sport: From human experiences to revelation. *Intellectual Discourse*, 27(2), 413-430. Retrieved from <https://journals.iium.edu.my/intdiscourse/index.php/id/article/view/1427>
- Agergaard, S. (2015). Religious culture as a barrier? A counter-narrative of Danish Muslim girls' participation in sports. *Qualitative Research in Sport, Exercise and Health*, 8(2), 213-224. <https://doi.org/10.1080/2159676X.2015.1121914>
- Akhavi, S. (2003). Islam and the West in world history. *Third World Quarterly*, 24(3), 545-562. <https://doi.org/10.1080/0143659032000084465>
- Al-Dafrawi, A. S. A. (2020). An Islamic viewpoint on doping in sports: An analytical study. *Journal of Islamic Thought and Civilization*, 10(2), 106-126. <https://doi.org/10.32350/jitc.102.07>
- Al-Imam, A. A. M. (2020). The legal provisions of practicing sports for women. *Journal of Critical Reviews*, 7(14), 3286-3292.
- Amara, M. (2008). The Muslim world in the global sporting area. *Brown Journal of World Affairs*, 14(2), 67-75.
- Amara, M. (2013). Sport, Islam, and Muslims in Europe: In between or on the margin? *Religions*, 4(4), 644–656. <https://doi.org/10.3390/rel4040644>
- Amara, M. & Henry, I. P. (2010). Sport, Muslim identities and cultures in the UK, an emerging policy issue: Case studies of Leicester and Birmingham. *European Sport Management Quarterly*, 10(4), 419-443. <https://doi.org/10.1080/16184742.2010.502743>
- Andrade, A., Dominski, F. H. & Coimbra, D. R. (2021). Scientific production on indoor air quality of environments used for physical exercise and sports practice: Bibliometric analysis. *Applied Science*, 196, 188-200. <https://doi.org/10.1016/j.jenvman.2017.03.001>
- Bahfen, N. (2013). Embracing footy: The sporting dimensions of australian muslim identity in greater Western Sydney. *Islam and Christian-Muslim Relations*, 24(4), 445-457. <https://doi.org/10.1080/09596410.2013.816468>
- Belfiore, P., Ascione, A. & Di Plama, D. (2020). Technology and sport for health promotion: A bibliometric analysis. *Journal of Human Sport and Exercise*, 15(4), 932-942. <https://doi.org/10.14198/jhse.2020.154.19>
- Benn, T. & Dagkas, S. (2013). The Olympic Movement and Islamic culture: Conflict or compromise for Muslim women? *International Journal of Sport Policy and Politics*, 5(2), 281-294. <https://doi.org/10.1080/19406940.2012.656677>
- Benn, T., Dagkas, S. & Jawad, H. (2011). Embodied faith: Islam, religious freedom and educational practices in physical education. *Sport, Education and Society*, 16(1), 17–34. <https://doi.org/10.1080/13573322.2011.531959>
- Chen, X., Chen, J., Wu, D., Xie, Y. & Li, J. (2016). Mapping the research trends by co-word analysis based on keywords from funded project. *Procedia Computer Science*, 91, 547-555. <https://doi.org/10.1016/j.procs.2016.07.140>
- Chtourou, H., Hammouda, O., Chaouachi, A., Chamari, K. & Souissi, N. (2012). The effect of time-of-day and ramadan fasting on anaerobic performances. *International Journal of Sports Medicine*, 33(2), 142-147. <https://doi.org/10.1055/s-0031-1286251>

- Dagkas, S. & Benn, T. (2006). Young Muslim women's experiences of Islam and physical education in Greece and Britain: A comparative study. *Sport, Education and Society*, 11(1), 21-38. <https://doi.org/10.1080/13573320500255056>
- Dagkas, S., Benn, T. & Jawad, H. (2011). Multiple voices: Improving participation of Muslim girls in physical education and school sport. *Sport, Education and Society*, 16(2), 223-239. <https://doi.org/10.1080/13573322.2011.540427>
- De Knop, P., Theeboom, M., Wittock, H. & De Martelaer, K. (1996). Implications of Islam on Muslim girls' sport participation in Western Europe. Literature review and policy recommendations for sport promotion. *Sport, Education and Society*, 1(2), 147-164. <https://doi.org/10.1080/1357332960010202>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N. & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285-296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Fares, M. Y., Fares, J., Baydoun, H. & Fares, Y. (2017). Sport and exercise medicine research activity in the Arab world: A 15-year bibliometric analysis. *BMJ Open Sport and Exercise Medicine*, 3(1), 1-5. <https://doi.org/10.1136/bmjsem-2017-000292>
- Farooq, S. & Parker, A. (2009). Sport, physical education, and Islam: Muslim independent schooling and the social construction of masculinities. *Sociology of Sport Journal*, 26(2), 277-295. <https://doi.org/10.1123/ssj.26.2.277>
- Galimov, I. A. (2016). The attitude of the religion islam to the physical culture , sport and healthy lifestyle. *International Journal of Humanities and Cultural Studies, Special August*, 148-155.
- Giannakos, M., Papamitsiou, Z., Markopoulos, P., Read, J. & Hourcade, J. P. (2020). Mapping child-computer interaction research through co-word analysis. *International Journal of Child-Computer Interaction*, 23-24, 100165. <https://doi.org/10.1016/j.ijcci.2020.100165>
- Gilliat-Ray, S. (2010). *Muslims in Britain: An introduction*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511780233.001>
- Goudsouzian, A. (2016). From Lew Alcindor to Kareem Abdul-Jabbar: Race, Religion, and Representation in Basketball, 1968-1975. *Journal of American Studies*, 51(2), 437-470. <https://doi.org/10.1017/S0021875816000621>
- Gümüş, H., Gençoğlu, C. & Sahin, T. (2020). Physical education and sports: Bibliometric analysis of the ERIC database. In *International Online Journal of Education and Teaching (IOJET)*, 7(4), 1823-1837. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1271118.pdf>
- Hernández-Torrano, D., Ibrayeva, L., Sparks, J., Lim, N., Clementi, A., Almukhambetova, A., Nurtayev, Y. & Muratkyzy, A. (2020). Mental health and well-being of university students: Bibliometric mapping of the literature. *Frontiers in Psychology*, 11, 1226. <https://doi.org/10.3389/fpsyg.2020.01226>
- Husain, S., Zafar, M. & Ullah, R. (2020). Ramadan and public health: A bibliometric analysis of top cited articles from 2004 to 2019. *Journal of Infection and Public Health*, 13(2), 275-280. <https://doi.org/10.1016/j.jiph.2019.11.006>
- Jeong, D. & Koo, Y. (2016). Analysis of trend and convergence for science and technology using the VOSviewer. *International Journal of Contents*, 12(3), 54-58. <https://doi.org/10.5392/IJoC.2016.12.3.054>

- Jona, I. N. & Okou, F. T. (2013). Sports and religion. *Asian Journal of Management Sciences and Education*, 2(1), 46-54. Retrieved from [http://www.ajmse.leena-luna.co.jp/AJMSEPDFs/Vol.2\(1\)/AJMSE2013\(2.1-04\).pdf](http://www.ajmse.leena-luna.co.jp/AJMSEPDFs/Vol.2(1)/AJMSE2013(2.1-04).pdf)
- Kahan, D. (2011). AAA roadmap for navigating religion in physical education. *Strategies*, 24(4), 20-24. <https://doi.org/10.1080/08924562.2011.10590939>
- Kay, T. (2006). Daughters of Islam: Family influences on muslim young women's participation in sport. *International Review for the Sociology of Sport*, 4(3), 357-373. <https://doi.org/10.1177/1012690207077705>
- Kizar, O. (2018). The place of sports in the light of quran, hadiths and the opinions of the Muslim scholar in Islam. *Universal Journal of Educational Research*, 6(11), 2663-2668. <https://doi.org/10.13189/ujer.2018.061132>
- Kretschmann, R. & Benz, C. (2012). God has a plan: Moral values and beliefs of Christian athletes in competitive sports. *Journal of Human Sport and Exercise*, 7(2), 495-519. <https://doi.org/10.4100/jhse.2012.72.14>
- Lee, J. W. (2005). Sport and the church: Exploring sport in the christian life center. *The SMART Journal*, 2(1), 25-32. Retrieved from <http://www.thesmartjournal.com/church.pdf>
- López-Carril, S., Escamilla-Fajardo, P., González-Serrano, M. H., Ratten, V. & González-García, R. J. (2020). The rise of social media in sport: A bibliometric analysis. *International Journal of Innovation and Technology Management*, 17(6). <https://doi.org/10.1142/S0219877020500418>
- MacLeod, W. B. & Urquiola, M. (2021). Why does the United States have the best research universities? incentives, resources, and virtuous circles. *Journal of Economic Perspectives*, 35(1), 185-206. <https://doi.org/10.1257/JEP.35.1.185>
- Maishnu, I. M. (2009). An analytical study of sports development as viewed from Islamic perspective. *The Shield-Research Journal of Physical Education & Sports Science*, 4, 80-100. Retrieved from <file:///C:/Users/drghane/Downloads/2713-Article%20Text-4968-1-10-20201201-1.pdf>
- Malcolm, D., Bairner, A. & Curry, G. (2010). "Woolmergate": Cricket and the representation of Islam and Muslims in the British press. *Journal of Sport and Social Issues*, 34(2), 215-235. <https://doi.org/10.1177/0193723510367768>
- Martin, W. H. & Mason, S. (2004). Leisure in an Islamic context. *World Leisure Journal*, 46(1), 4-13. <https://doi.org/10.1080/04419057.2004.9674343>
- Marwat, M. K., Zia-Ul-Islam, S., Waseem, M. & Khattak, H. (2014). Islamic perspectives with reference to health and participation in sports. *Asian Journal of Social Sciences & Humanities*, 3(3), 23-29. Retrieved from [http://www.ajssh.leena-luna.co.jp/AJSSHPDFs/Vol.3\(3\)/AJSSH2014\(3.3-04\).pdf](http://www.ajssh.leena-luna.co.jp/AJSSHPDFs/Vol.3(3)/AJSSH2014(3.3-04).pdf)
- Matcharashvili, T., Tsveraidze, Z., Sborshchikovi, A. & Matcharashvili, T. (2014). The importance of bibliometric indicators for the analysis of research performance in Georgia. *Trames*, 18(4), 345-356. <https://doi.org/10.3176/tr.2014.4.03>
- Meckel, Y., Ismael, A. & Eliakim, A. (2008). The effect of the Ramadan fast on physical performance and dietary habits in adolescent soccer players. *European Journal of Applied Physiology*, 102(6), 651-657. <https://doi.org/10.1007/s00421-007-0633-2>

- Müller, A. M., Maher, C. A., Vandelanotte, C., Hingle, M., Middelweerd, A., Lopez, M. L., DeSmet, A., Short, C. E., Nathan, N., Hutchesson, M. J., Poppe, L., Woods, C. B., Williams, S. L. & Wark, P. A. (2018). Physical activity, sedentary behavior, and diet-related ehealth and mhealth research: Bibliometric analysis. *Journal of Medical Internet Research*, 20(4), e122. <https://doi.org/10.2196/jmir.8954>
- Nakamura, Y. (2002). Beyond the Hijab: Female Muslims and physical activity. *Women in Sport and Physical Activity Journal*, 11(2), 21-48. <https://doi.org/10.1123/wspaj.11.2.21>
- Noaparast, K. B. (2013). Physical and spiritual education within the framework of pure life. *International Journal of Children's Spirituality*, 18(1), 46-61. <https://doi.org/10.1080/1364436X.2012.741062>
- Perdima, F. E., Suwarni & Gazali, N. (2022). Educational technology in physical education learning: A bibliometric analysis using Scopus database. *SPORT TK-Revista EuroAmericana de Ciencias Del Deporte*, 11(2), 34-42. <https://doi.org/10.6018/spork.517091>
- Pramuda, D. D. D., Adi, S. & Andiana, O. (2022). Survei motivasi berolahraga bagi santri putra. *Jurnal Sport Science*, 1(2), 38-44. Retrieved from <file:///C:/Users/drghane/Downloads/2192-3885-1-SM.pdf> [in Indonesian]
- Randeree, K. (2011). Islam and the Olympics: Seeking a host city in the Muslim World. *International Journal of Islamic and Middle Eastern Finance and Management*, 4(3), 211-226. <https://doi.org/10.1108/mf.2008.00934jaa.001>
- Rogers, G., Szomszor, M. & Adams, J. (2020). Sample size in bibliometric analysis. *Scientometrics*, 125(1), 777-794. <https://doi.org/10.1007/s11192-020-03647-7>
- Sanchooli, Z. (2016). Physical education and sport in the from perspective Islam. *International Academic Journal of Social Sciences*, 3(1), 22-32.
- Schulenkorf, N. & Edwards, D. (2012). Maximizing positive social impacts: Strategies for sustaining and leveraging the benefits of intercommunity sport events in divided societies. *Journal of Sport Management*, 26(5), 379-390. <https://doi.org/10.1123/jsm.26.5.379>
- Schuurman, E. (2011). Technology and religion: Islam, Christianity and materialism. *Koers - Bulletin for Christian Scholarship*, 76(2), 373-386. <https://doi.org/10.4102/koers.v76i2.21>
- Senarath, S. K. I. U. & Liyanage, T. P. (2020). Religious involvement in young islamic women participation in physical education, sports, and physical activities. *Journal of Psychology Research*, 10(8), 319-323. <https://doi.org/10.17265/2159-5542/2020.08.005>
- Shavit, U. & Winter, O. (2011). Sports in contemporary Islamic law. *Islamic Law and Society*, 18(2), 250-280. <https://doi.org/10.1163/156851910X537784>
- Silvia, B., Valerio, D. & Lorenza, G. (2012). The reflective journal: A tool for enhancing experience- based learning in nursing students in clinical practice. *Journal of Nursing Education and Practice*, 3(3), 102-111. <https://doi.org/10.5430/jnep.v3n3p102>
- Sofyan, D., Abdullah, K. H. & Gazali, N. (2022). A bibliometric review of basketball game: Publication trends over the past five decades. *ASM Science Journal*, 17, 1-12. <https://doi.org/10.32802/asmscj.2022.1277>
- Sofyan, D., Saputra, Y. M., Nurihsan, J. & Kusmaedi, N. (2021). Islamic Solidarity Games (ISG): Historical perspective. *Journal Sport Area*, 6(2), 201-208. [https://doi.org/10.25299/sportarea.2021.vol6\(2\).6476](https://doi.org/10.25299/sportarea.2021.vol6(2).6476)
- Sorek, T. (2002). The Islamic soccer league in Israel: Setting moral boundaries by taming the wild. *Identities*, 9(4), 445-470. <https://doi.org/10.1080/10702890214867>

- Testa, A. & Amara, M. (2016). *Sport in Islam and in Muslim communities*. London: Routledge. <https://doi.org/10.4324/9781315745480>
- Tomar, R. (2018, December). Linkages of Sports Activities with Spirituality and Religiosity of Community: The Case in Muslim Majority Country. In *2nd Yogyakarta International Seminar on Health, Physical Education, and Sport Science (YISHPESS 2018) and 1st Conference on Interdisciplinary Approach in Sports (CoIS 2018)* (pp. 369-373). Atlantis Press. <https://doi.org/10.2991/yishpess-cois-18.2018.93>
- Turkmen, M. (2018). Religiosity and female participation in sport: Exploring the perceptions of the Turkish university students. *Physical Education of Students*, 22(4), 196-206. <https://doi.org/10.15561/20755279.2018.0405>
- Van Eck, N. J. & Waltman, L. (2019). Manual for VOSviewer version 1.6.10. In *CWTS Meaningful metrics*. Universteit Leiden. Retrieved from https://www.vosviewer.com/documentation/Manual_VOSviewer_1.6.10.pdf
- Walseth, K. (2006a). Sport and belonging. *International Review for the Sociology of Sport*, 4, 447-464. <https://doi.org/10.1177/1012690207079510>
- Walseth, K. (2006b). Young Muslim women and sport: The impact of identity work. *Leisure Studies*, 25(1), 75-94. <https://doi.org/10.1080/02614360500200722>
- Walseth, K. (2016). Sport within Muslim organizations in Norway: ethnic segregated activities as arena for integration. *Leisure Studies*, 35(1), 78-99. <https://doi.org/10.1080/02614367.2015.1055293>
- Walseth, K. & Fasting, K. (2003). Islam's view on physical activity and sport: Egyptian women interpreting Islam. *International Review for the Sociology of Sport*, 38(1), 45-60. <https://doi.org/10.1177/10126902030381003>
- Zaman, H. (1997). Islam, well-being and physical activity: perceptions of muslim young women. In Clarke, G., Humberstone, B. (eds) *Researching Women and Sport*. Palgrave Macmillan, London. https://doi.org/10.1007/978-1-349-25317-3_4
- Završnik, E., Kokol, P., Pišot, R. & Blažun, H. (2015). Education and sport: Identifying most productive research topics related to muscle with bibliometric analysis. *Journal of Physical Education and Sport*, 15(1), 77-81. <https://doi.org/10.7752/jpes.2015.01013>
- Zerguini, Y., Kirkendall, D., Junge, A. & Dvorak, J. (2007). Impact of Ramadan on physical performance in professional soccer players. *British Journal of Sports Medicine*, 41(6), 398-400. <https://doi.org/10.1136/bjism.2006.032037>
- Zupic, I. & Čater, T. (2015). Bibliometric Methods in Management and Organization. *Organizational Research Methods*, 18(3), 429-472. <https://doi.org/10.1177/1094428114562629>

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