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A bibliometric analysis of publications on special education between 2011 and 2020

RUMIYE ARSLAN, KEZIBAN ORBAY and METIN ORBAY*

Faculty of Education, University of Amasya, Turkey

RESEARCH ARTICLE

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ABSTRACT

The present study aims to identify the most productive countries, journals, authors, institutions and the most used keywords in the field of special education during 2011–2020, based on the WoS database. The widespread effects of the papers and how they are related were analyzed with the bibliometric analysis method. The findings of the study showed that the USA is inarguably the most productive country, followed by England and Australia. On the other hand, there was a very strong positive correlation($r = 0.929$) between the number of papers published by countries and their h-index, a similar finding was also found to be present between the countries' h-index and GDP per capita ($r = 0.790$). Moreover, it was found that the journals with the highest quartile (Q1 and Q2) in the field of special education published significantly more papers than the journals with the lowest quartile (Q3 and Q4). Matson, JL (USA), Sigafoos, J (New Zealand) and Lancioni, GE (Italy) were determined as the most prolific authors, respectively. Autism, intellectual disability, and Down syndrome were the phrases most frequently used as keywords. Our findings provide key information regarding the developments that the research direction of special education field has recently taken. This study also serves a potential roadmap for future studies.

KEYWORDS

special education, bibliometric, citation analysis, Web of Science

* Corresponding author. E-mail: metin.orbay@amasya.edu.tr

INTRODUCTION

Special education is a type of education offered to children who are different from the majority and have special needs and it enables children with superior characteristics to maximize their capacities in line with their abilities, prevents incapacities transforming into disabilities, equips the disabled person with skills to support them in being integrated into the society and helping them to be independent and productive individuals by enabling them to achieve self-sufficiency (Ataman, 2005; Heward, Alber-Morgan, & Konrad, 2018). Although the field of special education is a thematic field, it should be emphasized that in this context, it is also an important branch of the field of education (Rumrill, Cook, & Stevenson, 2020). For example, a recent report by the National Center for Education Statistics in the United States shows that in the 2019-20 academic year, the number of students aged 3 to 21 receiving special education services under the Individuals with Disabilities Education Act was 7.3 million (14% of all government students), and the report highlights the fact that 33% of these students had specific learning difficulties (NCES, 2021).

Academic journals are among the official communication languages of science and have come into prominence more than ever in the process of spreading and using the knowledge produced in the field, as a result of the increasing interaction of the special education field with other disciplines, its wide content and internationalization in the field (Örnek, Miranda, & Orbay, 2021). However, the competitive environment created by the increasing number of academic journals caused "*publish or perish!*" mentality among researchers, while it also raised the question of "*quality or quantity?*" in terms of the conducted research (Civera, Lehmann, Paleari, & Stockinger, 2020; Fire & Guestrin, 2019; McGrail, Rickard, & Jones, 2006; Orbay et al., 2020, 2021; Van Dalen, 2021). Therefore, in order to understand the present and to make inferences between the past and the future, it becomes gradually important to follow the publications produced in academic journals, to determine the characteristics of the publications and to analyze them based on various criteria (Engels, Ossenblok, & Spruyt, 2012; Henriksen, 2016; Larivière, Archambault, Gingras, & Vignola-Gagné, 2006; Rowlinson, Harvey, Kelly, Morris, & Todeva, 2015).

Today, the studies that are commonly considered to have high quality are those that are published in journals in the Web of Science (WoS) database, specifically indexed in the Science Citation Index (SCI), Social Sciences Citation Index (SSCI) and Arts & Humanities Citation Index (A&HCI). This notion leads researchers to prefer this particular database for bibliometric analysis (Birkle, Pendlebury, Schnell, & Adams, 2020). Here, journals regarding special education are categorized under "Education, Special" (hereinafter referred to as the SE) category. The SE category is composed of "*resources that are concerned with the education and development of persons with special needs, including the gifted as well as those with learning disabilities*" (Clarivate Analytics, 2022).

Bibliometrics is known as an effective method to analyze the trend in a particular research area. For this reason, it is used as an important tool to investigate the impact of the scientific field, researchers and articles (Pritchard, 1969). It is emphasized that bibliometric studies on special education are insufficient (Liu, 2020). The systematic reviews in the aforementioned SE category journals are few and not contemporary (Swanson, Wanzek, Haring, Ciullo, & McCulley, 2013; Zurita, Merigó, & Lobos-Ossandón, 2016). Moreover, most special education studies focus on a particular subject or subfield. For example, Anh, Nga, Thuong, Giang, and Luong (2021)

focused on speech disorders and the bibliometric analysis was used in that research to examine how the publications of speech disorders had been published during 1955–2019. Carmona-Serrano, López-Belmonte, López-Núñez, and Moreno-Guerrero (2020) concentrated on autism spectrum disorder, with the goal of analyzing scientific production on the term autism in the WoS database, with an emphasis on the educational area, in order to detect research trends in that field of study. Comarú, Lopes, Braga, Batista Mota, and Galvão (2021) focused on the scientific production concerning the inclusion of people with disabilities in Science Education by using bibliometric analysis based on the WoS database during 2009–2019. Cretu and Morandau (2020) focused on the research literature published in indexed by the WoS database on initial teacher education for inclusive education by using bibliometric analysis. Fernández Batanero, Montenegro Rueda, Fernández Cerero, and García Martínez (2019) analyzed the impact of the Information and communication technologies on students with Down syndrome through the consult of scientific articles published during 2008–2018. Ferreira, de Souza, da Silva, and Fernandes (2017) analyzed scientific production about politics in special education modality, during 1997–2014, in the Brazilian Journal of Special Education and in the Special Education Journal. Hernández-Torrano and Kuzhabekova (2020) focused on the state and development of international research on gifted education using publication and citation data from four specialized journals in the field during 1957–2017. Hernández-Torrano, Somerton, and Helmer (2022) concentrated on the research literature on inclusive education using Scopus indexed publications in terms of the growth trajectory, productivity, collaborative networks, and intellectual structure of the field. La, Nguyen, Truong, Tran, and Nguyen (2021) aimed to shed light on the cohesive speech of pre-schoolers knowledge base by using bibliometric analysis based on Scopus indexed publications from 1970 to 2020. Mengual-Andrés, Chiner, and Gómez-Puerta (2020) aimed to examine the academic output in the field of internet and people with intellectual disability from a bibliometric perspective based on the WoS database. Pérez-Gutiérrez, Castanedo-Alonso, Salceda-Mesa, and Cobo-Corrales (2021) focused on the analysis of the scientific production on inclusive education and physical education, focusing on productivity, topics and collaboration by using bibliometric analysis based on different databases such as ERIC, Scopus and the WoS databases. Sezgin, Orbay, and Orbay (2022b) tried to reveal the bibliometric characteristics of publications on educational research (such as special education, psychology education,…) from diverse perspectives, including the level of national-international collaborations, the percentage change in open-access papers, and interactions with other disciplines based on the WoS database during 2011–2020. Finally, Tosun (2021) tried to reveal trends of articles related to science education for special education students published in the SSCI journals.

A full bibliometric analysis is lacking in the field of special education, either holistically examining publications for the most productive countries, institutions, authors, journals, keywords, or discussing the widespread impact of publications. Therefore, the present study presents a comprehensive discussion of holistic bibliometric analysis and research progress in special education research.

Aim of the study

The present study investigates the most productive countries, authors, institutions, journals, and the most-used keywords in the field of special education. With this aim, the study examines the WoS database in years 2011–2020. Bibliometric analysis was used. The research questions (RQ) regarding the SE category are as follows:

RQ1: What are the top 10 countries in terms of productivity?

RQ2: What is the relationship between the number of publications in these countries and their *i)* h-index *ii)* Gross Domestic Product (GDP) per capita?

RQ3: What are the first 10 authors, institutions, journals in terms of productivity?

RQ4: What are the most used keywords, and the most cited papers?

METHODOLOGY

WoS database was used in the present study for the purpose of conducting a bibliometric analysis of SE category, on December 15, 2021. Irrelevant and anonymous documents were excluded from the search results, leaving 71.87% of all the documents in the SE category. Remaining results consisted of 14,397 articles (67.45%) and 944 reviews (4.42%), meeting abstracts (18.37%), editorial materials (4.04%), and book reviews (2.37%). "Articles" and "reviews" that are published in English are included in the present study, which we refer to as "papers". Descriptive data analysis was performed with IBM SPSS Statistics Software version 20. Pearson product moment correlation analysis were used to examine the relationship between the number of publications in these countries and their i) h-index ii) GDP per capita. The level of significance was accepted as $p < 0.05$ for statistical analyses (George & Mallery, 2022). For analysis of collected data and illustration of the bibliometric maps of scientific relations, VOSviewer 1.6.13 was used (Van Eck & Waltman, 2010).

FINDINGS AND DISCUSSION

In this section, the findings of the research problems are presented, and the results are discussed in the light of the relevant literature.

Findings and discussion for RQ1 and RQ2

The annual distribution of papers. Figure 1 shows the annual change of papers published in the SE category between 2011 and 2020. As it can be seen in Fig. 1, the number of papers in the field of special education did not change much over time, while the trend of change remained almost constant.

Compared to other fields of education in the WoS database (general education, psychology education, etc.), the change in the number of studies in the field of special education over time is limited (Sezgin et al., 2022b). On the other hand, the number of papers indexed in the WoS database tends to increase almost exponentially over time (Hu, Leydesdorff, & Rousseau, 2020).

The most productive countries. Table 1 shows the papers published in the 2011–2020 period. 102 countries/regions were found in total (referred to as 'countries' in the present paper). 10 countries that produced most papers in SE can be seen listed, along with the variables of h-index and GDP per capita of the country.

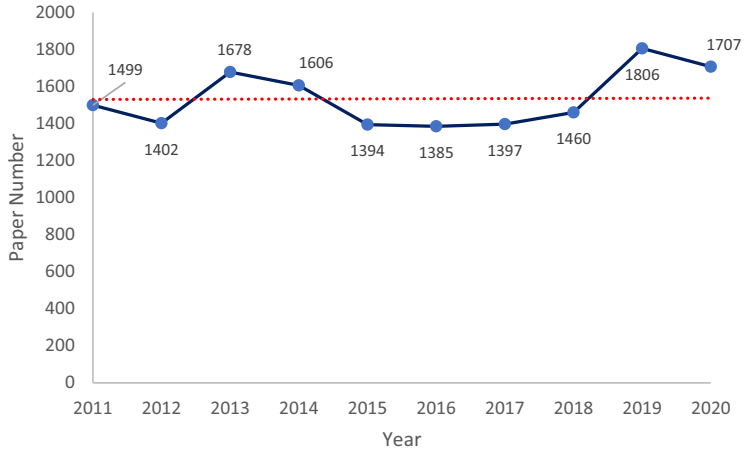

Fig. 1. The annual distribution of papers for the SE category

Table 1. The 10 most productive countries based on papers between 2011 and 2020

Country/Region	TP	% of TP	h-index	GDP per capita (in US $)
USA	8,349	54.42	92	63,051
England	1,381	9.00	55	39,229
Australia	1,125	7.33	47	51,885
Netherland	798	5.20	51	51,290
Canada	762	4.97	45	42,080
Italy	462	3.01	41	30,657
Taiwan	418	2.72	35	28,358
Spain	383	2.50	30	26,832
China	376	2.45	29	10,839
Israel	362	2.36	33	41,560

TP: Total Paper

In terms of both number (54.42% of TP) and impact (*h-index = 92*) of papers published, USA seems to be the pioneer country in Table 1. Following the USA are England (9.00%, $h = 55$), Australia (7.33%, $h = 47$), and Netherlands (5.20%, $h = 51$). Moreover, papers published in Netherlands ($h = 51$) and Israel ($h = 33$) seem to have greater impact in comparison.

The correlation matrix between the number of papers in the ten most productive countries in the field of special education and the h-index values, which is accepted as a measure of the widespread effect of the papers, and the gross national product per capita of the countries are given in Table 2.

Table 2 shows that there is a very strong positive correlation between the number of papers and the h-index ($r = 0.929$), and between the h-index and GDP per capita values of the countries ($r = 0.790$), while there is a moderate positive correlation ($r = 0.637$) between the number of papers and the GDP per capita values of the countries. On the other hand, it is

Table 2. Pearson correlation matrix among some bibliometric indicators in the SE category

Bibliometric indicators	A	B	C
A *Paper count*	*1*	*0.929**	*0.637**
B *h index*		*1*	*0.790**
C *Country/Region GDP per capita (in US$)*			*1*

*Significantly correlated when the significance level is set at 0.01 (two-tailed).

known that many parameters such as the quartiles (Q) of the journals selected for publication, the level of national and international cooperation in the studies, the level of support of the studies by research funds, whether the papers are published as open access have an impact on the widespread effect of special education research (Sezgin, Orbay, & Orbay, 2022a). Taking all this into account, it can be said that low-population, well-governed countries with a long history of democracy are more successful in transforming economic success into high-quality research, as highlighted by Allik, Lauk, and Realo (2020).

Findings and discussion for RQ3 and RQ4

The most productive authors. 29,748 authors contributed to special education research in the said period. The density map of the relationship between authors with 10 and more than 10 published research is given in Fig. 2 (red = high-density; blue = low-density).

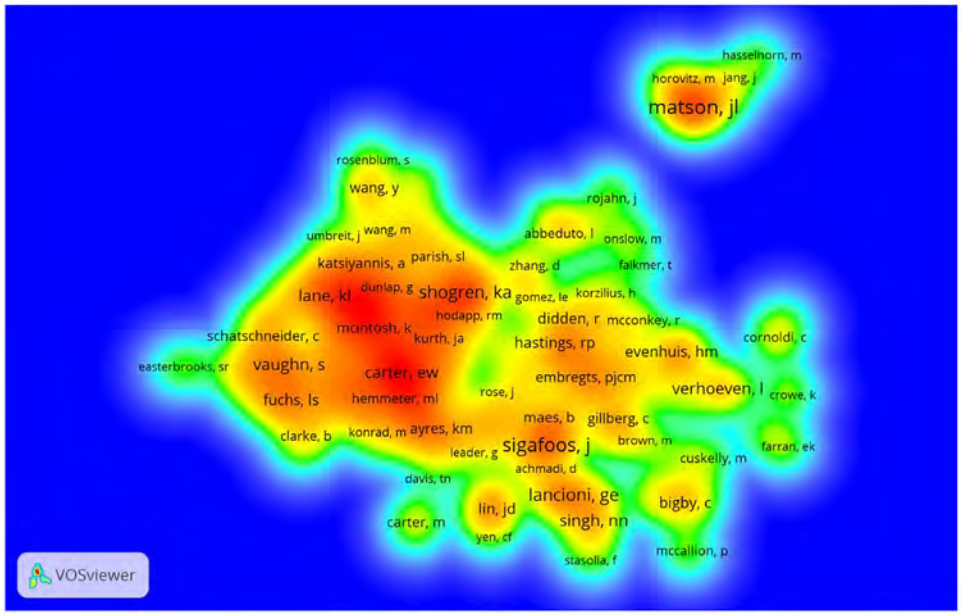

Fig. 2. Author co-occurrence network density distribution map

Table 3 shows some bibliometric data from the ten most productive authors in the field of special education. The data show that US researchers, who are in the most productive position in special education research, come to the fore here as well.

The most productive institutions. Between 2011 and 2020, 6,680 institutions from 103 different countries contributed to special education research. The overlay visualization map among institutions with 10 and over 10 published studies is given in Fig. 3.

Table 3. The first 10 authors by total paper in the SE category during 2011–2020

Authors	Affiliation-Country	TP	h-index	TC
Matson, JL	Louisiana State University-USA	161	29	2,952
Sigafoos, J	Victoria University-New Zealand	117	24	2,513
Lancioni, GE	Universita degli Studi di Bari Aldo Moro-Italy	90	22	1,955
O'Reilly, MF	University of Texas-USA	83	19	1,458
Shogren, KA	University of Illinois-USA	79	21	1,569
Carter, EW	Vanderbilt University-USA	67	25	1,637
Lane, KL	University of Kansas-USA	65	20	1,068
Barton, EE	Vanderbilt University-USA	64	17	904
Singh, NN	Amer Health & Wellness Institute-USA	63	16	804
Vaughn, S	University of Texas-USA	62	21	1,563

TP: Total Paper; TC: Total Citation

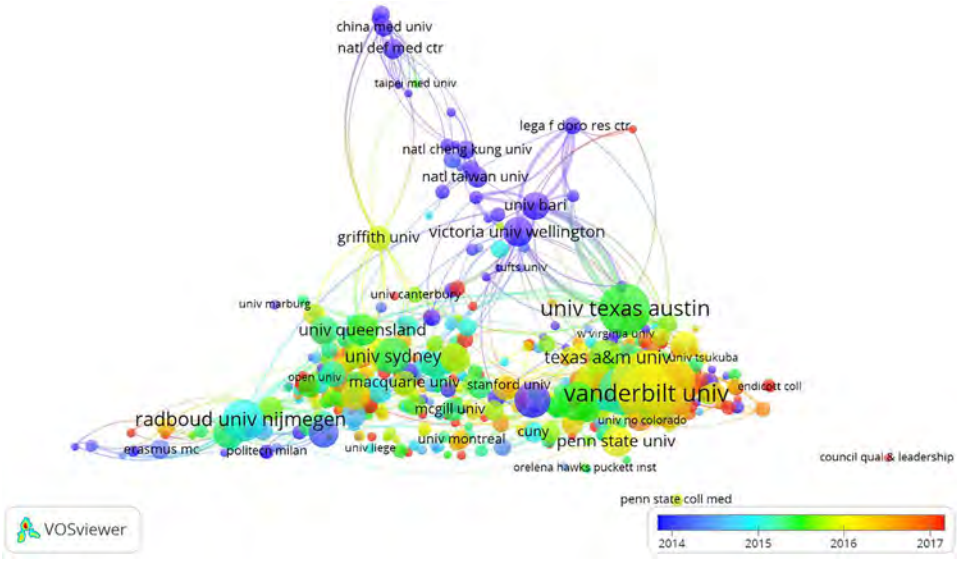

Fig. 3. The overlay visualization map of organizations in the SE category

In Fig. 3, the great quantity of papers is represented by the size of circle, whereas the intensity of papers by years is shown with colors. For instance, color blue represents organization that have been making publications since 2015 or before, while organizations that are recently more active are shown with yellow-to-red color range.

Some bibliometric data of the ten most productive institutions in the field of special education are given in Table 4. As it can be seen in the data, US institutions are once again the most productive in special education research.

Journals with most published papers. Figure 4 shows the network of relations established upon the paper quantity that journals published under the SE category. A bigger circle size indicates more published papers. *Research in Developmental Disabilities (Q1)* published 2,625 papers (17.12%), *Research in Autism Spectrum Disorders (Q1)* 1,286 papers (8.39%) and *Journal of Intellectual Disability Research (Q2)* published 971 papers (6.33%), making them the lead publishers.

As shown in Fig. 4, the journals with high impact factors publish much more than the 25% theoretically expected. Moreover, it should be note that Fig. 4 reveals an interesting correlation between the journal quartile and the number of papers in the journals. In order to check the robustness of this fact, the share of papers published by journal quartiles were examined year by year, from 2011 to 2020. As can be seen Fig. 5, the share of papers published in Q1 varying from 28.87% (2019) to 59.51% (2013) in the period 2011–2020 while the share of papers published in Q4 varied from 13.51% (2014) to 27.96% (2019). Based on this data, the correlation between the journal quartile and the number of papers seen in Fig. 4 indicates that the journals with the highest quartiles (Q1 and Q2) publish a greater number of papers than others (Q3 and Q4 quartiles) in the SE category. This finding is also consistent with previous studies (Liu et al., 2016, 2018; Miranda & Garcia-Carpintero, 2019; Örnek et al., 2021).

The most used keywords. As known, keywords are a high summary of a paper's content, reflecting the research hotspots and topics in a certain field. In the present study, autism was found to be the keyword that is most frequently searched. Other most commonly used keywords are found to be: intellectual disability, Down('s) syndrome, assessment, dyslexia, inclusion, reading and disability. In Fig. 6, a network and a connections map created by the frequency

Table 4. The first 10 institutions by total paper number in the SE category between 2011–2020

Institutions-Country	TP	TC
Vanderbilt University-USA	505	8,501
Kansas University -USA	474	7,597
Texas University -USA	387	6,346
North Carolina University-USA	367	7,877
Illinois University -USA	296	5,199
Radboud University-Netherlands	266	4,512
Oregon University-USA	244	4,307
Ohio State University-USA	230	3,715
Minnesota University-USA	213	3,354
Sydney University- Australia	194	3,741

TP: Total Paper; TC: Total Citation

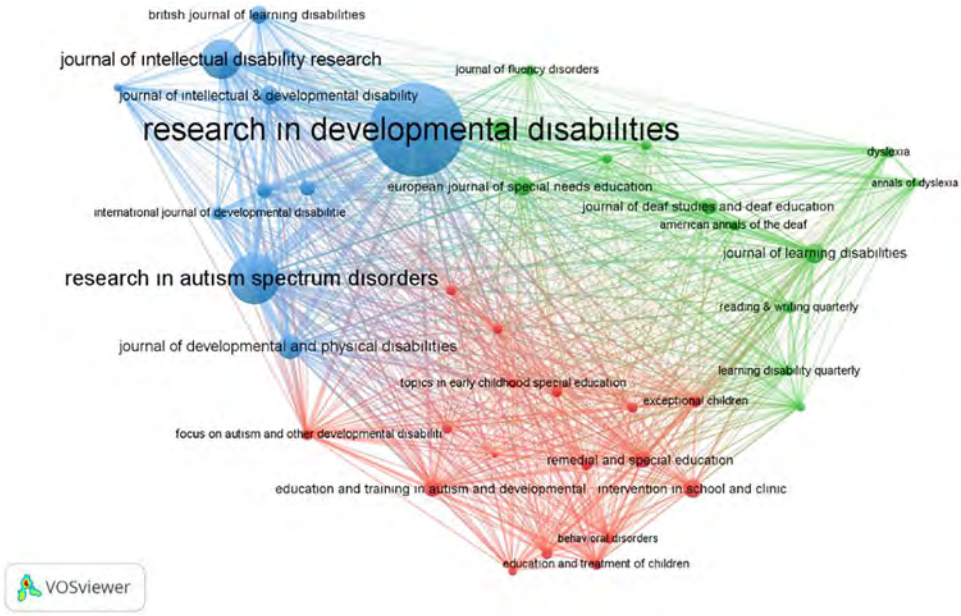

Fig. 4. The network visualization map of journals in the SE category

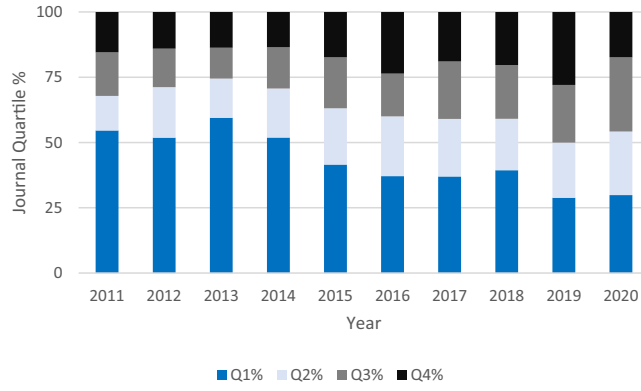

Fig. 5. The share of papers published by journal quartiles between 2011 and 2020

of usage are presented. Keywords that are tightly interrelated are shown with the same color and in close proximity. An example of an associated keywords would be “mental health”, “learning disability”, “parents”, “challenging behavior”, and “quality of life”; whereas “intellectual disability” is not associated with this group.

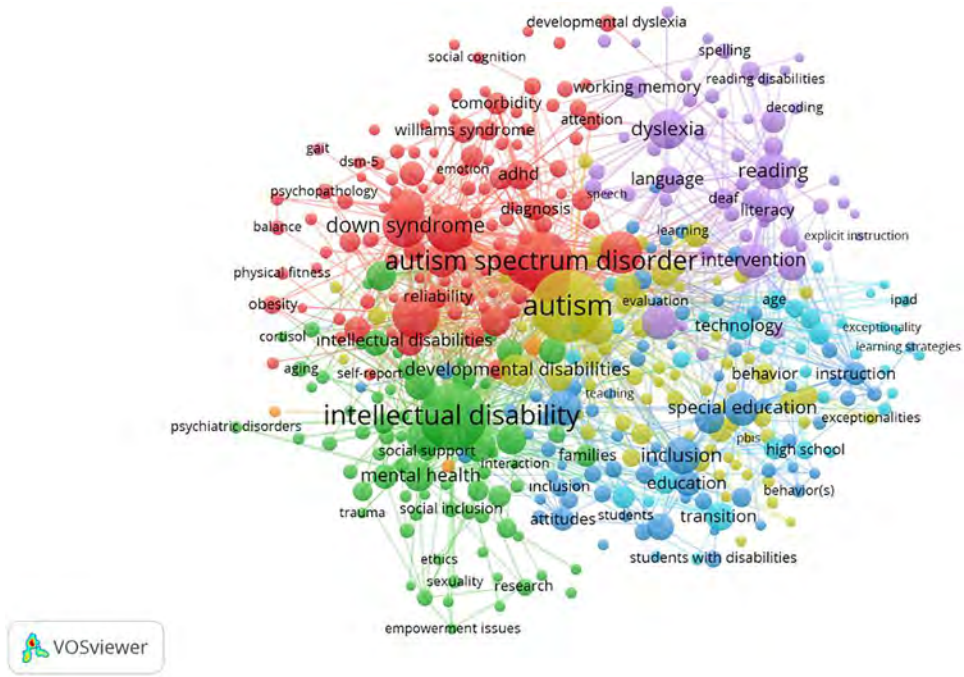

Fig. 6. Co-occurrence of author keywords of papers published in the SE category

The most cited papers. Citation numbers of a published paper is an indicator of its relevance and scientific significance. For this reason, the more a particular paper is cited, the more it should have affected other researchers in the field. This increases the likelihood of the said paper to have a significant effect on the future research, or even real-life applications of the findings. The open identifiers of the 10 most cited papers in the SE category in the specified period, the number of citations they received from the WoS database, the average number of citations per year and the quartiles of the year in which the papers were made are given in Table 5.

As it can be clearly seen in Table 5, the most cited papers are published in journals with high impact value (Q1, Q2). In terms of document type, it is seen that 4 out of 10 studies are review papers. The fact that there are 4 studies among the most cited papers in this study is an expected result, while the review papers among the papers we analyzed were at the level of 6%. Because it is known that reviews generally receive more citations than research articles (Lei & Sun, 2020; Miranda & Garcia-Carpintero, 2018; Orbay et al., 2021; Valderrama, 2019). In addition, when the publication dates of the papers in Table 5 are carefully analyzed, it is seen that they are concentrated between 2011–2013. This is actually an expected situation. That is, articles in medicine, engineering, and basic sciences begin to be cited immediately after they are published with citation peaking at the end of the third year. In the social sciences, on the other hand, articles do not receive many citations in the first years, and the citation peaks almost toward the tenth year. Therefore, a period of at least five years is needed for the citation analysis of articles in social sciences (Archambault & Larivière, 2010).

Table 5. The 10 most cited papers in the SE category between 2011 and 2020

Paper [Active Journal Quartile-Document Type]	TC	ACY
Maulik, P. K., Mascarenhas, M. N., Mathers, C. D., Dua, T., & Saxena, S. (2011). Prevalence of intellectual disability: a meta-analysis of population-based studies. *Research in Developmental Disabilities*, *32*(2), 419–436. [Q1-Review]	703	63.91
Kratochwill, T. R., Hitchcock, J. H., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2013). Single-case intervention research design standards. *Remedial and Special Education*, *34*(1), 26–38. [Q1-Article]	611	67.89
Chang, Y. J., Chen, S. F., & Huang, J. D. (2011). A Kinect-based system for physical rehabilitation: A pilot study for young adults with motor disabilities. *Research in Developmental Disabilities*, *32*(6), 2566–2570. [Q1-Article]	451	41.00
Neece, C. L., Green, S. A., & Baker, B. L. (2012). Parenting stress and child behavior problems: A transactional relationship across time. *American Journal on Intellectual and Developmental Disabilities*, *117*(1), 48–66. [Q2- Article]	392	39.20
Cook, B. G., & Odom, S. L. (2013). Evidence-based practices and implementation science in special education. *Exceptional Children*, *79*(2), 135–144. [Q1- Article]	325	36.11
Kagohara, D. M., van der Meer, L., Ramdoss, S., O'Reilly, M. F., Lancioni, G. E., Davis, T. N., … & Sigafoos, J. (2013). Using iPods® and iPads® in teaching programs for individuals with developmental disabilities: A systematic review. *Research in Developmental Disabilities*, *34*(1), 147–156. [Q1-Review]	301	33.44
Lugnegård, T., Hallerbäck, M. U., & Gillberg, C. (2011). Psychiatric comorbidity in young adults with a clinical diagnosis of Asperger syndrome. *Research in Developmental Disabilities*, *32*(5), 1910–1917. [Q1- Article]	281	25.55
Fixsen, D., Blase, K., Metz, A., & Van Dyke, M. (2013). Statewide implementation of evidence-based programs. *Exceptional Children*, *79*(2), 213–230. [Q1- Article]	275	30.56
Diehl, J. J., Schmitt, L. M., Villano, M., & Crowell, C. R. (2012). The clinical use of robots for individuals with autism spectrum disorders: A critical review. *Research in autism spectrum disorders*, *6*(1), 249–262. [Q1-Review]	263	26.30
Matson, J. L., & Kozlowski, A. M. (2011). The increasing prevalence of autism spectrum disorders. *Research in Autism Spectrum Disorders*, *5*(1), 418–425. [Q1-Review]	238	21.64

TC: Total Citation; ACY: Average Citation per Year

CONCLUSIONS

The bibliometric analysis results show that the USA has an undisputed leadership in the field of special education. On the other hand, Anglo-Saxon and Continental European countries stand out in terms of h-index, which is accepted as a measure of both paper productivity and the widespread impact of papers. There is a very strong positive correlation both between the number of papers and the h-index of the countries, and between the country's h-index and the country's GDP per capita. As highlighted by Allik et al. (2020), it can be said that countries with long democracies, low populations, and well-governed countries such as the Netherlands and Israel are more successful in transforming their economic success into high-quality research in the field of special education.

An examination of the top-publishing journals in the field of special education shows that journals with high impact ratings publish more papers than journals with low impact. Thus, it can be said that there is a positive correlation between the quality and quantity of the papers. However, this does not mean that publishing in high-impact journals is an easy task. One of the main reasons for this is that publishing in high-impact journals is considered very prestigious within the academic ecosystem, which is a natural consequence of the supply and demand for these journals (Huang, 2016).

The field of special education is the common denominator of the fields of education and health (Rehabilitation, Psychiatry, Psychological Development, etc.) and is a relatively small discipline compared to other fields of education. However, it is a clear fact that every successful academic step taken in the field of special education will increase the quality of life of individuals in need of special education. Scientific data obtained in the light of studies in this field play an important role in the construction, dissemination and use of knowledge. As seen in the present study, scientific productivity in the field of special education and the widespread effects of publications are directly related to the geographies and economic conditions of the countries. In other words, this has almost turned into a destiny in the field of special education. As a result, underdeveloped and developing countries should try to cooperate with leading countries in this field and allocate more funds for research. On the other hand, a more willing attitude to cooperation with these countries by developed countries will ensure that the special education field takes root on a more solid ground.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

As described above, the present study makes significant contributions to the literature in several aspects. However, it is not exempt from limitations. First limitation of the present study is the possibility of not including some relevant research in the field due to use of only bibliometric data that is provided by the WoS. Second limitation is that the present study only investigated English publications, leading to a possibility of overlooking significant scientific special education studies conducted in other languages. Third, for the reason that the dataset represents a standard in the industry, the present study only focused documents in the 'article' and 'reviews' format and other found file formats were excluded, which may have caused a loss of important data regarding the field. Similarly, the number of citations that we reported as a bibliometric indicator is a variable that constantly changes over time, therefore the values we reported are not

final. In order to eliminate these limitations, we recommend future studies to include other databases (ERIC, Scopus etc.). On the other hand, it is important to acknowledge that having information about the allocation of budgets to the field of special education and the level of support provided for related work would greatly enhance the richness of the study. However, it is evident that obtaining such data can be challenging due to certain limitations. Exploring this topic as a separate research subject, taking into account its broader dimensions, would be highly valuable. This approach might enable us to provide a more meaningful explanation for the leadership of Anglo-Saxon and European countries in the context of this discussion. By delving deeper into this area, we can gain a better understanding of the global development and practices in the field of special education. Meanwhile, it should be explicitly stated that when listing the most productive authors, important parameters such as authors' national or international collaboration levels, research funding levels, etc., are worth investigating under a separate heading. However, in this study, commonly used bibliometric indicators such as the number of papers, number of citations, and h-index were employed in the bibliometric analysis approach.

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