

# A Bibliometric Study of Scientific Productivity on Adaptive Behavior in Children and Adolescents with Autism

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## Abstract

The objectives of this study were to characterize the bibliometric indicators of scientific productivity on adaptive behavior (AB) in children and adolescents with autism spectrum disorders (ASD) during the year 2021. The PubMed database was used to summarize information from quantitative scientific articles (cross-sectional, longitudinal and experimental) and reviews (bibliographic, systematic review and meta-analysis). The data collected for each of the articles were: year of publication, journal name, country, language of publication and type of published document (cross-sectional study, longitudinal, experimental, biographical review, systematic review and meta-analysis). The United States (USA) published more articles than any other country in the world ( $n = 28$ ), followed by Italy with 13 studies, China and Spain with six studies. A total of 44 scientific journals were identified that have published a total of 89 scientific articles related to AB in children and adolescents with ASD. Regarding the type of published paper, 63 quantitative studies were identified (cross-sectional studies, 9 longitudinal studies, 15 experimental studies). In addition, 14 literature reviews, 9 systematic reviews, and 3 systematic reviews/meta-analyses were identified. These results suggest practitioners and researchers to address and decide where to read and publish scientific articles related to AB in youth with ASD

## Keywords:

Adaptive Behavior, Bibliometrics, ASD; Children, adolescents.

## Introduction

Autism is a pervasive neurodevelopmental disorder characterized by lifelong impairments in communication, social reciprocity and the presence of repetitive or restrictive behaviors and/or interests (Kanne et al. 2011).

Children and adolescents with autism spectrum disorder (ASD) have language difficulties and may show antisocial behaviors such as aggression, withdrawal or even, seek self-stimulation, sometimes, in response to stress or changes in routine (Alshaiqi et al. 2020). Indeed, adaptive behavior, or the ability to function independently in one's environment, is a key phenotypic construct in ASD disorder (Pugliese et al. 2016; Farmer, Swineford, & Swedo, 2018).



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In that sense, ASD is universal and affects all racial, ethnic and socioeconomic groups (Baio, 2014). Moreover, it produces economic, emotional, social and health consequences with a real burden for families and governments (Lavelle et al. 2014), so using a bibliometric study to analyze scientific productivity on adaptive behavior (AB) in children and adolescents with ASD is very relevant. This is because bibliometrics is considered a valuable tool to map the vast amounts of research available in disciplines and to describe its developmental trends and state of form, in a comprehensive, systematic and reproducible way (Linnenluecke, Marrone, & Singh, 2020). In addition, it allows not only to analyze scientific productivity, but also publication trends by authors, topics, institutions, countries, regions, among other indicators (Limaymanta et al. 2021).

In essence, several bibliometric studies on children and youth with ASD are currently available in the literature (Sweileh, Al-Jabi, & Sawalha, 2016; Carmona-Serrano et al. 2020; Gomes-Cordeiro et al. 2020). However, as far as is known, there are no bibliometric studies related to AB in populations with ASD. So, understanding this issue in this population is fundamental, especially if it is to help achieve their outcomes (Pugliese et al. 2016), since independent living depends more on AB than cognitive ability or autism spectrum disorder (ASD) symptomatology (Kanne et al. 2011; Farley et al. 2009).

Therefore, the aim of this study was to characterize bibliometric indicators of scientific productivity on AB in children and adolescents with ASD in the PubMed database of the US National Library of Medicine. To achieve the objective of the study, we proposed the following questions: What will be the scientific journals that have published topics on AB in children and adolescents with ASD and what types of scientific articles have been published during the years 2020 and 2021?

## Methodology

### Design and Sample

A documentary (bibliometric) study of scientific productivity on AB in children and adolescents with ASD was conducted. Bibliometric mapping is used to visualize trends in various research and create a descriptive visual environment of terms commonly included in studies on a specific topic or population (van Eck, & Waltman, 2010).

Bibliometric data were extracted from the U.S. National Library of Medicine's PubMed database (<https://pubmed.ncbi.nlm.nih.gov/>, accessed January 15-20, 2022).

The Pubmed database has a high coverage of English-language journals. It also includes citations

and abstracts of biomedical and psychological literature, which facilitates the search of various NLM bibliographic resources.

### Search Strategy

The search strategy covered one calendar year (January 1 to December 31, 2021). To achieve relevance with this bibliometric review, articles included the following keywords; (1) adaptive behavior, conceptual skills, social skills, social skills, practical skills, functional academic skills; (2) children, adolescents, school children; (3) autism spectrum disorder, dysfunction, autism.

Initially, all keywords and the booleans "and" and "or" were used to order them. Subsequently, these words were grouped into combinations of two or three, and a new search was performed, such as, for example, adaptive behavior and children and autism.

The following were considered as indicators of scientific productivity: country and continent of publication, language of publication, the name of the journal and the type of document published. In addition, the observation technique was used to extract bibliometric indicators.

The terms indicated were searched for in the title, abstract and keywords of the manuscripts. Inclusion criteria were: (i) peer-reviewed articles related to health science areas; (ii) articles on AB; (iii) articles on ASD population; (iv) articles that provided all the required bibliometric indicators listed; and (v) published in English, Spanish and French. In the case of studies that included systematic reviews and meta-analyses, these were excluded from the analysis.

### Data Collection

The procedure for extracting the bibliometric indicators was carried out by two of the researchers in this study (MACB and CUA). Each of the observers recorded the information separately on an index card. A third observer (RGC) collated the records of the first two observers. This ensures the process of abstraction of the information. In cases where there was no match, this third observer verified each of the indicators and made the pertinent corrections. We then obtained a general matrix of the studies, which made it possible to analyze the bibliometric indicators described here.

We used the PRISMA guidelines, proposed by the researchers Moher, Liberati, Tetzla and Altman (2009) to identify and extract the data for the bibliometric review. Figure 1 illustrates the steps performed.

Initially, a total of 151 scientific articles related to AB in children and adolescents with ASD were identified.

Then 22 studies were eliminated for not being related to the study topic and the type of sample (children and adolescents). Next, the titles and abstracts were read and thoroughly evaluated to be sure if they corresponded to the purpose of the research (eliminating 40 articles). Finally, 89 studies were considered for bibliometric analysis.

**Data Analysis**

The data collected from the bibliometric matrix for were quantified through descriptive statistical analyses, such as frequency, range and percentage (%). These calculations were performed in Microsoft Excel spreadsheets.

**Results**

Table 1 shows the bibliometric indicators of the scientific articles analyzed during 2021. A total of 89 scientific articles (e.g., original articles, literature reviews, systematic reviews and meta-analyses) were identified. In general, 88 were published in English and one in French. In relation to the analysis by country, it stands out that, by country, the USA is the country that published the most articles in relation to the other countries of the world ( $n = 28$ ), followed by Italy

with 13 studies, China and Spain with six studies. In addition, it was found that, by continent, Europe had 38 studies, North America 32, Asia 15, Oceania and South America, each with 2 studies.

A total of 44 scientific journals were identified that have published a total of 89 scientific articles related to AB in children and adolescents with ASD during 2021. The journal *Frontiers in psychiatry* published 12 articles, followed by *Frontiers in psychology*, *Journal of autism and developmental disorders* and *Molecular autism* with seven studies each. Subsequently, the other journals ranged from 4 to 1 study during 2021.

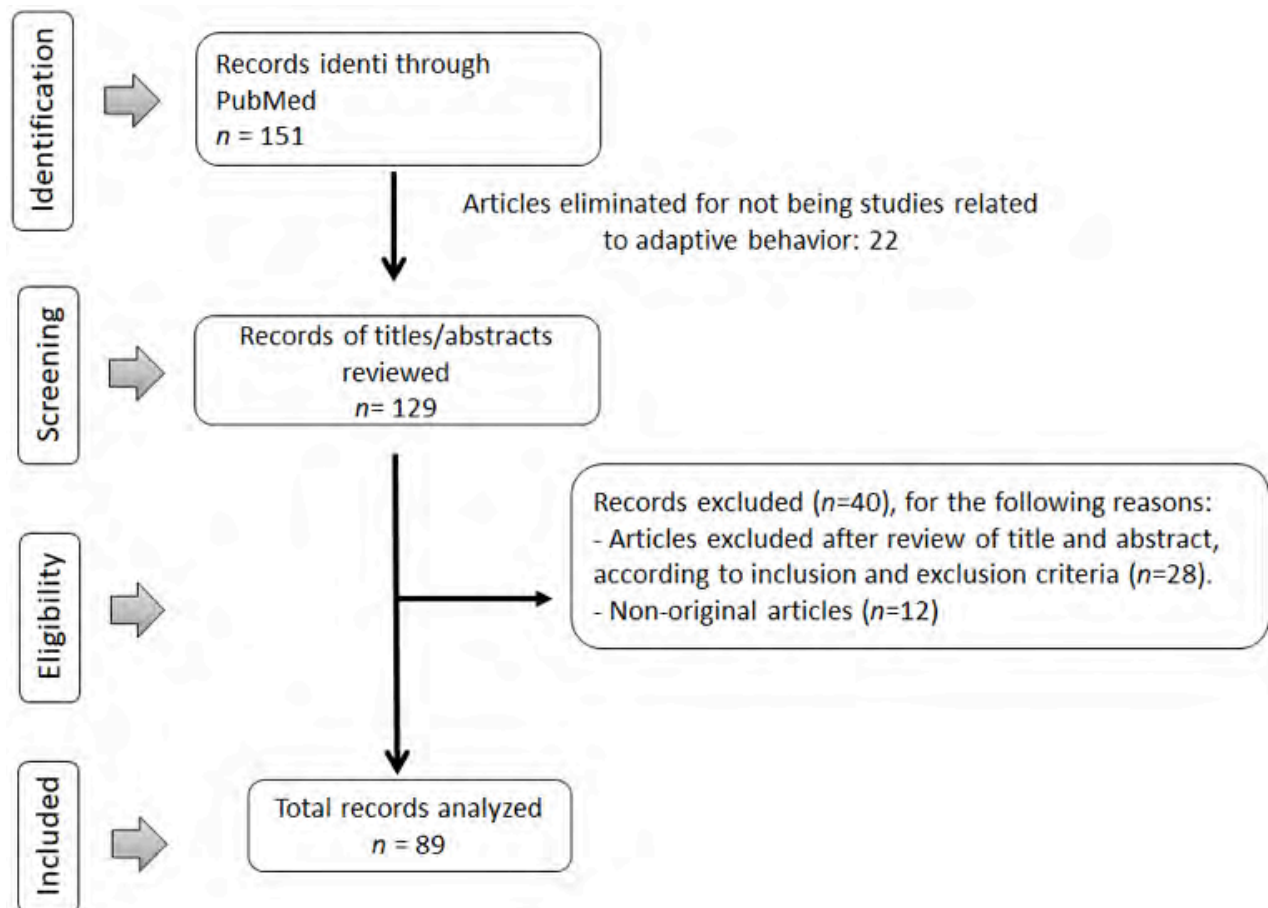
Regarding the type of document published in the 44 scientific journals during 2021, 63 quantitative studies were identified (e.g., 39 cross-sectional studies, 9 longitudinal studies, 15 experimental studies). In addition, 14 literature reviews, 9 systematic reviews, and 3 systematic reviews/meta-analyses were identified.

**Discussion**

The aim of this study was to characterize the bibliometric indicators of scientific productivity on adaptive behavior in children and adolescents

**Figure 1.**

*Screening and selection process for the records according to the PRISMA (Preferred Reporting Items for Reviews and Meta-Analyses) flowchart.*



**Table 1.**
*Characteristics of the bibliometric indicators used*

Indicators	f	%
Language of publication		
English	88	98.9
French	1	1.1
Total	89	100
Country		
U.S.A.	28	31.5
Italy	13	14.6
China	6	6.7
Spain	6	6.7
Canada	4	4.5
Austria	3	3.4
Japan	3	3.4
Germany	2	2.2
France	2	2.2
England	2	2.2
Israel	2	2.2
South Korea	2	2.2
Multi-country	2	2.2
Australia	1	1.1
Chile	1	1.1
Colombia	1	1.1
Denmark	1	1.1
Slovakia	1	1.1
India	1	1.1
Norway	1	1.1
Netherlands	1	1.1
Poland	1	1.1
Portugal	1	1.1
Qatar	1	1.1
Sweden	1	1.1
Sweden	1	1.1
Switzerland	1	1.1
Total	89	100
Continent		
Europe	38	42.7
North America	32	36
Asia	15	16.9
Oceania	2	2.2
South America	2	2.2
Total	89	100

Legend: f: frequency, %: percentage.

**Table 2.**

*Journals indexed in PubMed that published scientific articles on adaptive behavior in autistic children and adolescents.*

N°	Journals	f	%
1	Frontiers in psychiatry	12	13.48
2	Frontiers in psychology	7	7.87
3	Journal of autism and developmental disorders	7	7.87
4	Molecular autism	7	7.87
5	Brain sciences	4	4.49
6	Frontiers in neuroscience	3	3.37
7	International journal of molecular sciences	3	3.37
8	Neuropsychiatric disease and treatment	3	3.37
9	BMC psychiatry	2	2.25
10	Cerebral cortex	2	2.25
11	Clinical child and family psychology review	2	2.25
12	Journal of clinical medicine	2	2.25
13	Journal of neuro developmental disorders	2	2.25
14	PloS one	2	2.25
15	Scientific reports	2	2.25
16	Archives of rehabilitation research and clinical translation	1	1.12
17	Behavioral sciences	1	1.12
18	BMJ paediatrics open	1	1.12
19	Cancers	1	1.12
20	Communications biology	1	1.12
21	Cureus	1	1.12
22	Current psychiatry reports	1	1.12
23	Ethique & sante	1	1.12
24	Frontiers innu	1	1.12
25	Frontiers in pediatri	1	1.12
26	Genes	1	1.12
27	Health and quality of life outcomes	1	1.12
28	International journal of developmental disabilities	1	1.12
29	International journal of environmental research and publichealth	1	1.12
30	JMIR mental health	1	1.12
31	Journal of applied behavior analysis	1	1.12
32	Journalof Behavioral Education	1	1.12
33	Journal of developmental and behavioral pediatrics	1	1.12
34	Journal of pediatric psychology	1	1.12
35	Journal of speech language and hearing research	1	1.12
36	Languagespeech and hearing services in schools	1	1.12
37	Network neuroscience	1	1.12
38	Neuroscience and biobehavioral reviews	1	1.12
39	Psychiatry investigation	1	1.12
40	Psychiatry journal	1	1.12
41	Research in developmental disabilities	1	1.12
42	Science advances	1	1.12
43	Themental health clinician	1	1.12
44	Trials	1	1.12
	Total	89	100

Legend: f: frequency, %: percentage.

**Table 3.***Types of papers published in PubMed on adaptive behavior in autistic children and adolescents*

Type of document	f	%
Original articles		
Transversal	39	43.8
Longitudinal	9	10.1
Experimental	15	16.9
Total	63	70.8
Review Articles		
Review	14	15.7
systematic review	9	10.1
Systematic review/Meta-analysis	3	3.4
Total	26	29.2
Total articles	89	100

Legend: f: frequency, %: percentage.

with ASD in the PubMed database. The results have evidenced that 89 studies on AB in children and adolescents with ASD have been published in 2021. In addition, 44 scientific journals were identified worldwide and the types of papers published were mostly quantitative studies (39 cross-sectional, 9 longitudinal and 15 experimental) and 26 review articles (14 literature review, 9 systematic review and 3 meta-analyses).

These findings indicate that the majority of articles published in 2021 were quantitative research, reflecting 70.8% (63 articles) relative to review articles, which accounted for 29.2% (26 articles). In fact, regardless of the type of scientific publications, the use of bibliometrics allows researchers to gain more knowledge about research trends in a given subject (Sweileh, Al-Jabi, & Sawalha, 2016), as well as to identify the journals with the highest productivity in particular scientific articles.

In essence, this bibliometrics identified 44 journals that have published scientific articles related to AB in youth with ASD. Of these, *Frontiers in psychiatry* is the journal that has published in 2021 twelve articles (13.48%), followed by *Frontiers in psychology*, *Journal of autism and developmental disorders* and *Molecular autism* that have published seven articles each journal.

In fact, through the publication of the 89 scientific articles, regardless of the type of paper, we highlight that during 2021 significant advances have been achieved. Not only from cross-sectional (Liu, et al. 2021; Cola et al. 2022; Mason et al. 2021), longitudinal (Allison et al. 2021; Rosello et al. 2021; Helverschou et al. 2021) and experimental (Moxon-Emre et al. 2021; Fastman et al. 2021) point of view. But in addition, literature review studies (Dyar et al. 2021; Hus & Segal, 2021), systematic reviews (Mann, McMillan, Silver, & Stein, 2021; Janšáková et al. 2021) and systematic review and meta-analysis

(D'Alò et al. 2021; Wickstrom et al. 2021) have also described and provided better understanding and increased surveillance in the young ASD population.

Generally speaking, this research is relevant for people currently suffering from ASD, in whom symptoms could be prevented and treated (Thurm, & Swedo, 2012). Even the results of this research can be of use to caregivers, family members and researchers, respectively (Anagnostou et al. 2015).

In general, the studies analyzed in the present investigation, can offer the opportunity to better understand the types of work published on children with ASD. In addition, to know the scientific journals that publish AB topics. This, information can serve not only to enable undergraduate and graduate students to approach quantitative (cross-sectional, longitudinal and experimental) or documentary (literature review, systematic review and meta-analysis) research in youth with ASD. But also to delve areas of progress and ongoing challenges in studies addressing the etiology, pathophysiology and treatment of ASD (Thurm, & Swedo, 2012).

In that context, more than 24 years ago, a Forum on Neuroscience and Nervous System Disorders was organized in April 2007 to bring together scientists sponsoring ASD-related research (Altevogt, Hanson, & Leshner, 2008). That event had already warned about the scientific opportunities that research at such an event can provide, so the use of bibliometrics, likewise can provide an important, feasible and systematic means to make judgments about the importance of published works, to examine the productivity and influence of individuals and institutions, and to compare different disciplines and scientific journals (Haddad, 2017).

This study presents some limitations, given that only

one Pubmed database was used. In addition, it was limited to analyzing the scientific productivity of AB in children and adolescents with ASD in the year 2021 (number of articles, scientific journals and types of documents). However, future studies can measure and compare other bibliometric indicators, such as the impact and importance of the authors or researchers of specific articles, journals, departments and institutions, and from different fields or disciplines (Haddad, 2017).

It also presents some strengths, for example, it is one of the first bibliometric studies that can serve as a baseline to compare future studies in AB in young people with ASD. In addition, the fact of identifying journals, the number of published articles and types of documents are relevant indicators for libraries and researchers, so this evidence can serve to develop future studies and direct their scientific articles to certain specialized journals.

### Conclusions

This study characterized the bibliometric indicators of scientific productivity on AB in children and adolescents with ASD, identifying 44 specialized scientific journals. The journal *Frontiers in psychiatry* stands out, publishing 12 articles in the area. In addition, 89 scientific articles (39 cross-sectional studies, 15 experimental, 14 literature review, 9 longitudinal and systematic reviews and 3 systematic review and meta-analysis) were recorded during 2021. These results suggest to professionals and researchers to address and decide where to read and publish scientific articles related to AB in young people with ASD, and may even contribute to identify the type of study published and share among their academic and scientific networks.

### Disclosure statement

The authors reported no potential conflict of interest.

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