



Global Research Trends on Prosocial Behaviour: A Bibliometric Analysis

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ABSTRACT

This article describes a quantitative investigation of prosocial behaviour (PSB) research in bibliometric analysis. This bibliometric study focuses on the global research trends followed using Scopus Database. The main variables used for analyses of this study were by year, source, affiliation, author, country, area of a subject, and document type. The analysis of CiteScore, total publications, total citations, and h-index was done to rank the top contributors. The first research article on PSB was published in 1967, followed by the most recent publications in 2020. A total of 3,644 publications have been found during these 53 years. The author keywords and co-occurrences have been represented by bibliometric maps using VOSviewer 1.6.16. This study found an increase in the research trend for PSB, which was mainly published in seven (7) different publishers' journals. Amongst these, American Psychological Association, Wiley, and Frontiers are the three top publishers with 4.61%, 4.23%, and 4.21% contribution to the total publications. Findings regarding the top 15 most prolific authors showed that most of the authors related to PSB were from the United States, followed by Italy, Canada, and only one from Netherlands, Germany, and Chile. Further, most of the PSB research work was done in psychology. Overall, this study provides an evidence base, highlighting global trends and directions of research work published on PSB, adding value to the existing body of knowledge, and paving the way for future researchers.

Keywords: VOSviewer, prosocial behaviour, bibliographic map, bibliometric analysis

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1 INTRODUCTION

Humans are known to be "social animals", owing to their ability to interact with individuals, move into society, and socialise with other people at work to live their lives in the usual way. While living their life, a person goes through different development stages, from infancy to late adulthood. During these developmental stages, individuals experience multiple emotions and enhance human relationships with positive outcomes to benefit others, known as prosocial behaviour (PSB) (Padilla-Walker & Carlo, 2014). For instance, a child comforting another sad child, a teenager helping his/her mother with house chores, or an adult guiding a child in need. PSB is integral in developing a healthy and empathetic society and is formed in response to cognitive and affective circumstances (Lewis, 2017). PSB includes the generally beneficial behaviour towards others, whereby a human's actions are extended from performing selfless acts to ignoring one's needs. PSB may depend on the closeness of one's feelings towards the other person, the circumstances in which a reaction occurs, and the internal traits that affect a person's behaviour (Padilla-Walker & Carlo, 2014). Therefore, PSB can be considered a helping behaviour integral to human socialisation. Social psychologists have been interested in understanding the factors like the effect of self-concept on PSB and drivers like empathy, cooperation, and sharing, which are involved in humans' helping nature or behaviour (Gupta & Thapliyal, 2015).

PSB is a general term that includes altruism (Ferraro, 2019), trustworthiness (Ehlebracht, Stavrova, Fetchenhauer, & Farrelly, 2018), cooperation (Bhogal, 2021), heroism (Margana, Bhogal, Bartlett, & Farrelly, 2019) and fairness (Bhogal, Galbraith, & Manktelow, 2016, 2017). Several studies have been conducted to find out how PSB plays a significant role in societal welfare, exploring the association between helping others and promoting PSB (Klein, 2017). Different studies have also been performed to determine the direct and indirect factors linking empathy and PSB with aggression, especially in young kids (Spataro, Calabrò, & Longobardi, 2020). Multiple factors affect the relationship between family characteristics and presenting PSB associated with behavioural and developmental psychology. Another critical aspect of PSB is to comprehend how individuals tend to perform acts of kindness with others, irrespective of any relation or association, at the cost of their interests (Kuhlmeier, Dunfield, & O'Neill, 2014). Given the context, several aspects have been assessed to understand how PSB is promoted among people; for instance, one is to examine the effect of meditation. Various researchers (Condon, 2019; Ferreira et al., 2016) investigated whether meditation can promote or inhibit PSB. It refers to whether PSB is promoted equally in males and females by empathetic behaviour, or any gender identity is more capable of developing a caring and kind behaviour than others. For this reason, a study on gender and empathy as predictors of PSB has been performed on African American adolescents, where the results showed a significant effect, informing that male is more likely to express PSB when given empathy (McMahon, Wernsman, & Parnes, 2006).

PSB is inherent in each human being and starts to appear during the second year of an individual's life (Brownell, 2013). The PSB is enhanced when a person is distressed because they tend to be more understanding and vulnerable towards the other person's feelings. The behaviour is generally developed early; however, what drives the PSB is not fully understood yet. Although Paulus (2014) conducted a study to understand how different motives can encourage PSB. For example, a study was performed on earthquake-hit areas in China to test the hypothesis mentioned above (Rao et

al., 2011). It proved that people who lived in distressed conditions showed more sympathetic and kind behaviour, which decreased over time (Rao et al., 2011). Individuals who are inherently compassionate and show short-term compassion toward strangers can promote more PSB (Leiberg, Klimecki, & Singer, 2011).

Promoting and understanding PSB is essential for human social welfare. There have been many studies performed on PSB. However, the direction and trends of these studies have varied over time. Therefore, an analysis of how many studies have been performed on this topic until now is required. In this context, bibliometric analysis is the best way to track the studies performed and how the trends have evolved. The period of this study ranges from 1967 to 2020 using the Scopus Database. Scopus is the most extensive database of peer-reviewed abstracts and citations. Therefore, it can be an efficient tool that helps to track, analyse, and visualise research trends. This bibliometric analysis is aimed to explore the growth of the publications and journal productivity, along with identifying the contribution of the most prolific authors in this area. The bibliometric analysis also highlights leading countries that researched PSB, the academic institutes with the most products on the topic, visualisation of common research terminologies and topics used and provides insight on future collaboration and directions of PSB.

2 METHODS

This study applied bibliometric analysis based on a mechanistic approach toward understanding global research trends of a particular study in an academic literature database's output. The bibliometric analysis helps to understand and note the research period in a specific study area. This approach is different from a review paper. It involves analysing existing innovations, problems, shortcomings, and future recommendations (Md Khudzari, Kurian, Tartakovsky, & Raghavan, 2018).

2.1 Data Sources and Research Strategy

Data mining was performed using the Scopus database from March 10th to 21st, 2021. The Scopus database searching was performed by keeping "*prosocial*behaviour*" in the search titles and abstracts. The search of the articles was done using this query string: TITLE-ABS ("prosocial behaviour*" OR "prosocial behaviour*" OR "prosociality" OR "pro-sociality") AND DOCTYPE (ar) AND PUBYEAR > 1966 AND PUBYEAR < 2021 AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (SUBJAREA, "PSYC")). Three thousand seven hundred fifty-nine documents were found using this query string. These 3,756 articles were further screened considering the research objective and narrowing the query string, thus excluding 115 records based on their titles, abstracts, and availability of full texts, which were deemed insignificant for this study. Resultantly, 3,466 articles were shortlisted and included in this bibliometric analysis by searching for terms like recent, progress, critical, or revisit from the abstracts and titles. After reading the abstracts and the articles' full texts, 3,466 articles out of 3,756 were reviewed. These review articles' EIDs (Scopus IDs) of these review articles were noted and added in another research string to prevent them from coming in the subsequent searches. EID, a Scopus digital identifier, helps identify review articles' IDs and effectively separates review articles from the research journal articles. Then, it will analyse

the search results by document type, country, affiliation, year, subject area, author, and source. In order to make the ranking table, bibliometric indicators such as the h-index and the total of citations are collected. The search strategy process is shown in Figure 1. The exact search string is listed in Table 1 below. Articles were noted and added in another research string to prevent them from coming in the subsequent searches. EID is a Scopus digital identifier that helps to identify review articles' IDs and effectively separate review articles from the research journal articles. Then, it will analyse the search results by document type, country, affiliation, year, subject area, author, and source. In order to make the ranking table, bibliometric indicators such as the h-index and the total of citations are collected. The search strategy process is shown in Figure 1. The exact search string is listed in Table 1 below.

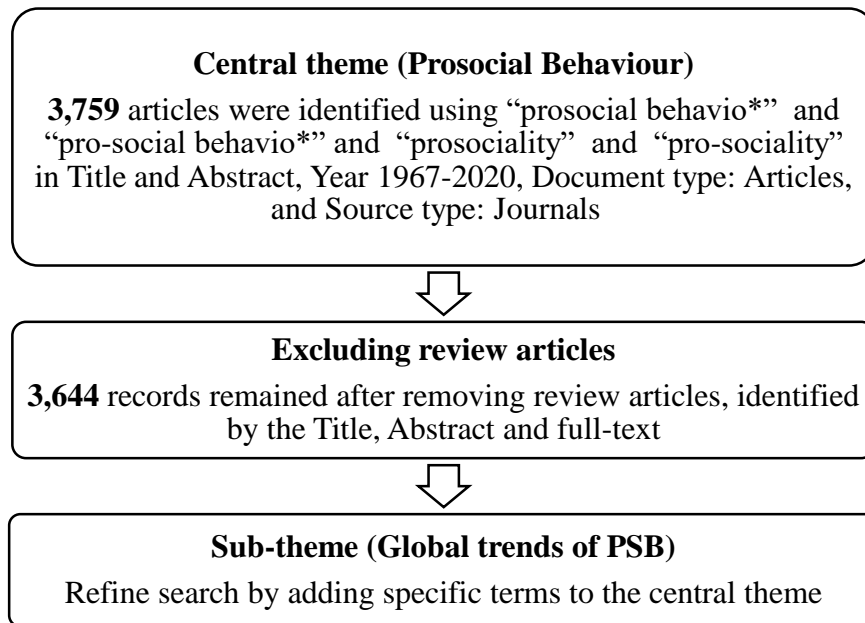


Figure 1. Flow diagram of data search.

Table 1. The search strategies and query strings used in Scopus.

Item	Theme	Search for?	Search string
i.	Central	Positive Behaviours research articles	TITLE-ABS (“prosocial behavio*” OR “pro-social behavio*” OR “prosociality” OR “pro-sociality”) AND DOCTYPE (ar) AND PUBYEAR > 1966 AND PUBYEAR < 2021 AND (LIMIT-TO (SRCTYPE , “j”)) AND (LIMIT-TO (SUBJAREA , “PSYC”))

ii.	Central	Review articles in (i)	TITLE-ABS ("prosocial behavio*" OR "prosocial behavio*" OR "prosociality" OR "pro-sociality") AND (TITLE ("recent" OR progress OR review OR critical OR revisit OR advance OR development OR highlight OR perspective OR prospect OR trends OR bibliometric OR scientometric) OR (ABS (progress OR review OR bibliometric OR scientometric))) AND DOCTYPE (ar) AND PUBYEAR > 1966 AND PUBYEAR < 2021 AND (LIMIT-TO (SRCTYPE , " j")) AND (LIMIT-TO (SUBJAREA , " PSYC"))
iii.	Central	Research without reviewing articles	TITLE-ABS (" prosocial behavio*" OR " prosocial behavio*" OR " prosociality" OR " pro-sociality") AND DOCTYPE (ar) AND PUBYEAR > 1966 AND PUBYEAR < 2021 AND (LIMIT-TO (SRCTYPE , " j")) AND NOT EID (<i>insert EID of review articles here</i> **) AND (LIMIT-TO (SUBJAREA , " PSYC"))

****EID of review articles**

Additionally, the author's ID from Scopus was used to get precise information about an author's output. The author's ID field in Scopus is mentioned as "AU-ID". For example, our exported data included two (2) articles that Scopus repeated with the same authors, author IDs, and titles. However, the issue number and EIDs differed for those two (2) articles. The title of that article is "Judgment and Decision Making".

Single-Country Publication (SCP) data was obtained by selecting one specific country and deselecting others. That gave the number of publications produced by the selected country. For example, in our study, the United States ranked at the top of the list of countries contributing the most to PSB studies. The SCP for the United States was calculated to be 73.39%. The "AFFILCOUNTRY" field code can also be used in Scopus for finding out the SCP for a country.

The main variables used for analyses of this study were by year, source, affiliation, author, country, area of a subject, and document type. The analysis of CiteScore, total publications, total citations, and h-index was done to rank the top contributors.

2.2 Bibliometric Maps

Bibliometric maps are made using VOSviewer 1.6.16. Author keywords, Citations, and Bibliographical data are exported from Scopus as an excel .csv file. This file is added in the VOSviewer 1.6.16, and items are selected based on the maps drawn. These bibliometric maps are the visual and graphical representation of the temporal distribution of our study period. Our study selected the co-authors affiliated with different countries and the common keywords opted by different authors from different areas while studying PSB. A link connects each country/author/keyword: the more robust the link, the more positive the numerical value. The links among co-authors from different countries represent the co-affiliation and associated publications that the authors have made (Md Khudzari et al., 2018).

2.3 Co-author Analysis

The analysis of co-authorship was done by using VOSviewer 1.6.16. The exported data was entered in the VOSviewer 1.6.16. The command for visualising authorship with countries was selected to represent the affiliation or co-authorship on the PSB studies. We included the 97 countries that were affiliated with 8,921 authors. The affiliated countries/territories were further divided into five continents, i.e. Africa, America, Asia, Europe, and Oceania.

2.4 Co-occurrence Analysis

While analysing co-occurrence in VOSviewer 1.6.16, the option for "author keywords" was selected. The limit for the minimum occurrence of a keyword was set to 5. Out of 5,704 author keywords, 437 met the threshold of VOSviewer 1.6.16. The total strength of the co-occurrence links with other keywords was calculated for every 210 keywords. The keywords with the most significant link strength were selected.

3 RESULTS AND DISCUSSION

3.1 Total Number of Publications and Research Done till Date

Our results from Scopus showed that the oldest research published on PSB was in 1967, and the latest in 2020; the total number of publications is 3,644. From 1967 to 1978, the maximum number of publications was 7 in 1975. The number of publications increased from 11 to 49 per year between 1979 and 2006. The research pattern continues to grow from 2007 until 2020. This trend shows that the research in psychology is gaining more attention as time passes and realise the importance of this topic and the need for it to be discussed. As mentioned earlier, PSB is integral to human socialisation. There is a need to understand the factors and circumstances that promote it or the causes that diminish this behaviour in certain people.

The increase in the research trend for PSB is a positive psychology approach, and it should be promoted further. The articles could be published in an open-access journal for easy access, provide their insight, and find new windows that can be studied in the existing studies. The total publications and cumulative publications are shown in Figure 2. The increasing trend can be seen in the 53 years.

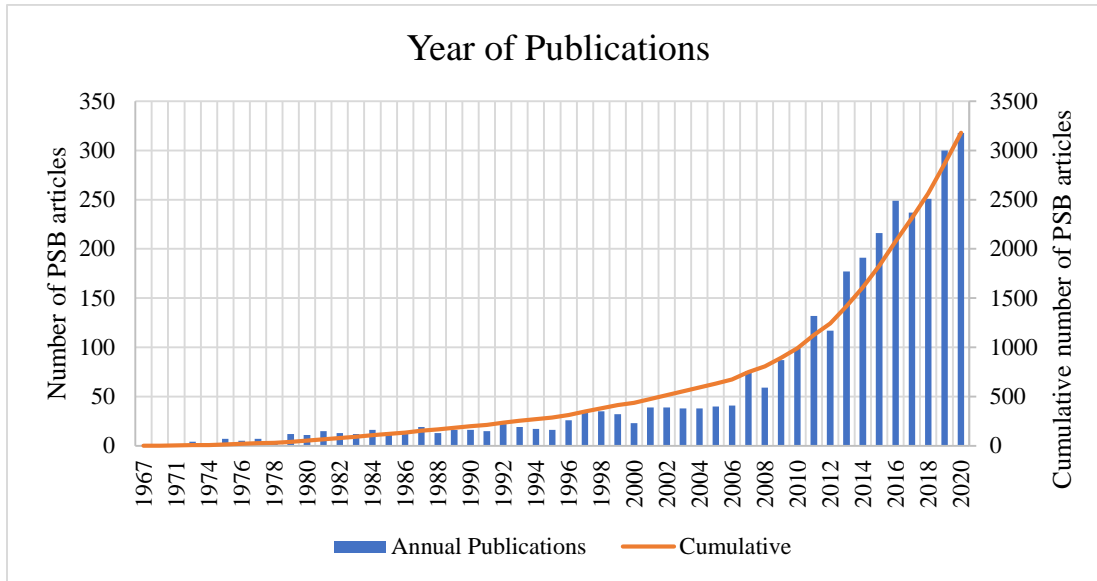


Figure 2. Total and cumulative publications from 1967 to 2020.

Research on PSB is a fast-growing topic under discussion. The number of studies on this topic has increased considerably over the past. The main concern of PSB as a subject area is related to psychology, behaviour, and medicine. The top five subject areas shown by the Scopus database are the fields of Psychology (3,644 articles), Social Sciences (1,419 articles), Medicine (676 articles), Neuroscience (316 articles), and Arts and Humanities (314 articles). PSB is a multi-disciplinary subject and touches various horizons; for example, PSB is also associated with Business, Management and Accounting (66 articles). It is also linked with Nursing (55 articles), showing that PSB is a behavioural aspect applicable and necessary in all fields. This topic has touched on the Computer Sciences fields (53 articles) and the technical side of Economics, Econometrics and Finance (52 articles). This subject area analysis shows that PSB is a multi-disciplinary topic not only associated with psychology and related fields but also covers broad areas of other academic fields.

3.2 Contributing Journals

Our data search from Scopus ranked the top 10 journals that contributed to publishing PSB research. Seven (7) different publishers published these journals. The top-ranked journal, *Frontiers in Psychology*, is based on its 1,566 Total Citations (TC). This journal is published by Frontiers Media SA and accounts for 4.12% of total publications on PSB. The journal *Developmental Psychology* has the highest CiteScore of 5.7 among the top 10 journals, with a 2.63% contribution to PSB publications. The most cited journal is *Child Development*, with 722 citations, and was published in 1966 (Bandura, Barbaranelli, Caprara, & Pastorelli, 1996). The following two journals, i.e., *Social Development* and *Journal of Personality and Social Psychology*, have contributed 2.09% and 1.98% towards the total publications on PSB, respectively. These two journals are published by Wiley and APA (American Psychological Association) separately. The *Social Development* journal published a study in 2010 with 285 citations (Lafontana & Cillessen,

2010), while the *Journal of Personality and Social Psychology* published a study in 1989, scoring 665 citations (Ryan & Connell, 1989). Next is the *Journal of Youth and Adolescence Development* with 1.84%, which Springer publishes. The most cited article in this journal was published in 2002, scoring 292 citations (Carlo & Randall, 2002). *Personality and Individual Differences* with 14.4% Total Publications (TP) come next in line with the top 10 contributing journals of PSB. Springer Link is the publisher of this journal, with its most cited study published in 2005, scoring 191 citations (Carlo, Okun, Knight, & de Guzman, 2005). The *International Journal of Behavioural Development* is among the top 10 contributors to publish PSB-related studies with a 1.56% contribution to TP and was published by SAGE Publications Ltd. Most cited article of this *International Journal of Behavioural Development* journal was published in 1992 with 158 citations (Tremblay, Vitaro, Gagnon, Piché, & Royer, 1992). The *Journal of Adolescence* keeps 1.34% TP and is published by Elsevier Online. The most cited article in this journal, published in 2004, has 263 citations (Laible, Carlo, & Roesch, 2004). The last of the top 10 journals contributing to TP on PSB is the *Journal of Genetic Psychology*, with 1.29% TP published by Elsevier Ltd. The most cited article in this journal has 139 citations, published in 2005 (Walker, 2005).

Our results show that the journals contained seven publishers with a maximum contribution towards the publications on PSB. American Psychological Association, Wiley, and Frontiers are the three top publishers with 4.61%, 4.23%, and 4.21% contribution to the TP%.—Based on the CiteScore (mentioned above), the highest CiteScore belonged to the *Journal of Personality and Social Psychology*, while the *Journal of Genetic Psychology* contributed the lowest CiteScore of 1.7. Three out of 10 journals are above the CiteScore of 5. CiteScore can be the basis upon which the authors are influenced to select a journal. However, the authors should also consider the journals working with a clear message and articles that help spread awareness about the issue. The authors must look at the journal's capability to target the audience and contribute to the field of work and study. Table 2 contains information regarding the top 10 journals. To help our fellow researchers to find the potential journals to submit their PSB-related work, we have listed the top 42 CiteScore journals in Table S1 (Supplementary Material).

Table 2 exhibits the top 10 journals and their most cited articles regarding PSB research, contributing to public awareness. Various aspects have been studied and published in these journals, for example, examining the giving and sharing of economic exchange games in a social gathering and finding if it affects PSB development (Güroglu, Bos, & Crone, 2014). PSB is initiated in a person's first and second years of life. As time passes, its variety and frequency change as per experiences (Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992).

3.3 Most Contributing Countries and Academic Institutions

United States (US) is the most significant contributor to the research on PSB, with 1,672 journals contributing to 45.88% of 3,644 articles. After the United States, the United Kingdom takes second place under her belt, published in 370 journals. Arizona State University from the US has contributed to the maximum number of publications, i.e., followed by Brigham Young University with 73 publications. After the United States, the UK's College has 27 publications, followed by

King's College London, having 24 publications on PSB. The University of Toronto, Canada, has 45 publications more than the University of Cambridge publications.

The USA and Japan surpass the 2/3rd Single-Country Publications (SCP) with 73.39% and 79.69%, respectively. This increment shows that both USA and Japan have intra-country solid affiliations that result in better research and new horizons to be studied under the PSB topic. Higher SCP explains how much a country has contributed to the research pool. Switzerland has the lowest SCP of 25.00%. The studies published by Switzerland are affiliated with other countries like the USA, UK (United Kingdom), Canada, Spain, Saudi Arabia, Germany, Italy, and England. Though Netherland is a small country, it has an SCP of 52.42% and is affiliated with 118 international institutions.

Arizona State University is the most efficient academic institute contributing to researching PSB with a record of 91 Total Publications of Institute (TPi), followed by King's College London of the United Kingdom, with a record of 32 TPi. Figure 3 contains the top 15 countries and academic institutes that have given rise to research in PSB.

Figure 4 represents the distribution of co-authors in different countries. Countries in close clusters represent a more critical link and affiliation among the authors and their research patterns. However, their link is deemed weaker if the countries are located at a distance from one another.

Table 2. Top 10 Journals with PSB research and their most cited articles.

	Journal	TP (%)	TC	Cite Score 2019	The most cited article (reference)	Times Cited	Publisher
1	Frontiers in Psychology	150 (4.12)	1566	3.2	A construct divided: Prosocial behaviour as helping, sharing, and comforting subtypes (Dunfield, 2014)	97	Frontiers
2	Developmental Psychology	96 (2.63)	8364	5.7	Development of concern for others (Zahn-Waxler et al., 1992)	707	APA
3	Child Development	78 (2.14)	9071	8.4	Multifaceted impact of self-efficacy beliefs on academic functioning (Bandura et al., 1996)	772	Wiley
4	Social Development	76 (2.09)	2148	3.1	Developmental changes in the priority of perceived status in childhood and adolescence (Lafontana & Cillessen, 2010)	285	Wiley
5	Journal of Personality and Social Psychology	72 (1.98)	1561	11.1	Perceived locus of causality and internalisation reasons for acting in two domains (Ryan & Connell, 1989)	665	APA

6	Journal of Youth and Adolescence Development	67 (1.84)	2082	5.4	The development of a measure of prosocial behaviours for late adolescents (Carlo & Randall, 2002)	292	Springer
7	Personality and Individual Differences	65 (1.78)	1556	4.4	The interplay of traits and motives on volunteering: Agreeableness, extraversion and prosocial value motivation (Carlo et al., 2005)	191	Elsevier
8	International Journal of Behavioral Development	57(1.5 6)	2231	4.0	A prosocial scale for the preschool behaviour questionnaire: Concurrent and predictive correlates (Tremblay et al., 1992)	158	SAGE
9	Journal of Adolescence	49 (1.34)	1651	4.4	Pathways to self-esteem in late adolescence: The role of parent and peer attachment, empathy, and social behaviours (Laible et al., 2004)	263	Elsevier
10	Journal of Genetic Psychology	47 (1.29)	1189	1.7	Gender differences in the relationship between young children's peer-related social competence and individual differences in theory of mind (Walker, 2005)	137	Taylor & Francis Online

TP: total publications; TC: total citations; APA: American Psychological Association



TPc: total publications of a given country; TPI: total publications of a given academic institution; SCP: single-country publications.

Figure 3. Top 15 most productive countries and academic institutions in PSB publications.

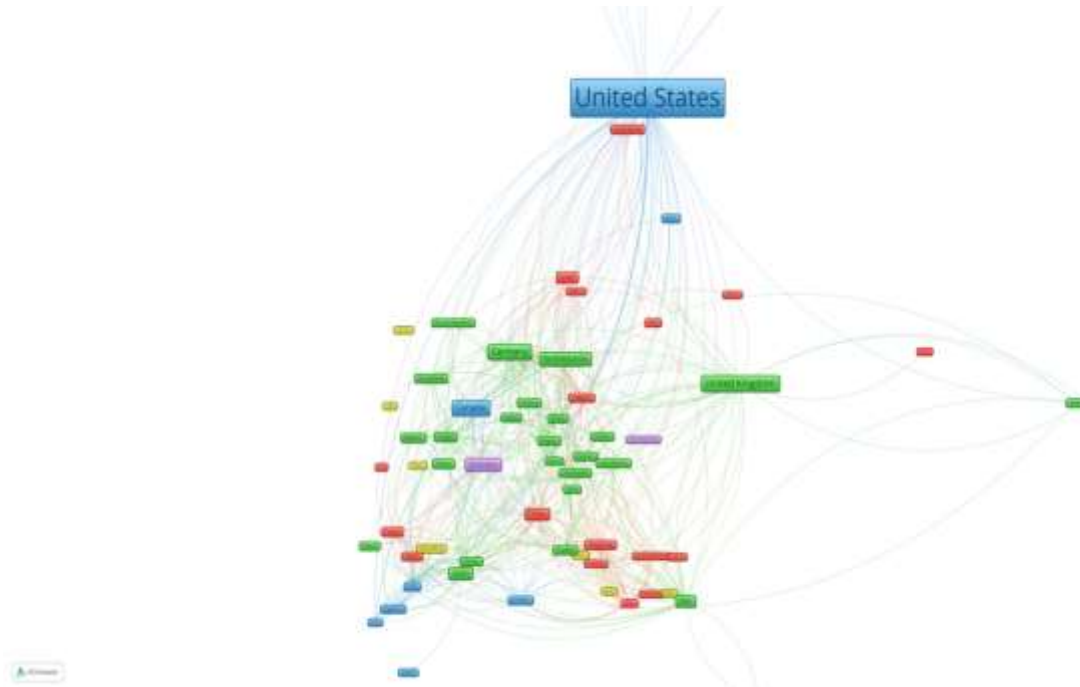


Figure 4. Screenshot of co-authorships with network visualisation bibliometric map (the following URL can be used to open Figure 4 in VOSviewer: <http://bit.ly/3cQ8YeG>).

3.4 Leading Authors

Table 3 shows the top 15 most prolific authors that have contributed to the studies related to PSB. 8 out of 15 authors are from the United States, whereas two are from Italy, two are from Canada, one is from the Netherlands, Germany, and Chile. The authors' affiliation represents the PSB studies under psychology and human behaviour. The first year of publication ranges from 1976 to 2012.

Gustavo Carlo, an American author, was at the top of the list with 74 publications since 1991, with an h-index of 37 and 4,171 total citations. Gian Vittorio Caprara, and Concetta Pastorelli are two authors that are from Università Degli Studi di Roma La Sapienza, Italy. The difference in time between these two authors is nine years. This shows that Università Degli Studi di Roma La Sapienza has been working on PSB since then. The work is carried forward by other people from that university. Similarly, Richard Ernest Tremblay and Frank Vitaro are two authors from the University of Montreal who worked between 1984 and 1986.

The most contributing university is Arizona State University, the United States of America, as shown in Table 3, in which the three authors are among the top 15 most contributing authors.

Table 3. List of most prolific authors in PSB research.

	Author	Scopus Author ID	Year of first publication*	TP	h-index	TC	Current affiliation	Country
1	Carlo, Gustavo	7006838405	1991 ^a	74	37	4171	University of California	United States
2	Eisenberg, Nancy	7102540176	1976 ^a	54	32	4969	Arizona State University	United States
3	Padilla-Walker, Laura Maria	6507526087	2002 ^a	44	20	1070	Brigham Young University	United States
4	Caprara, Gian Vittorio	7006408578	1977 ^a	27	21	2872	Università Degli Studi di Roma La Sapienza	Italy
5	Pastorelli, Concetta	6701500087	1986 ^b	27	19	2548	Università Degli Studi di Roma La Sapienza	Italy
6	Vitaro, Frank	56803476500	1986 ^a	24	15	931	University of Montreal	Canada
7	Tremblay, Richard Ernest	57188642378	1984 ^a	23	18	1196	University of Montreal	Canada
8	Cillessen, Antonius H.N.	6602876074	1992 ^a	22	15	1295	Radboud University Nijmegen	Netherlands
9	Coyne, Sarah Marie	808913460	2004 ^a	17	12	324	Brigham Young University	United States
10	Tomasello, Michael	7004816726	1983 ^a	16	10	1172	Duke University	United States
11	Fabes, Richard A.	7004986729	1982 ^a	14	13	2400	Arizona State University	United States
12	Petermann, Franz	7103035312	1976 ^b	14	6	136	Universität Bremen	Germany
13	Brownell, Celia A.	6701811741	1977 ^b	13	10	868	University of Pittsburgh	United States
14	Knight, George P.	35557450800	1971 ^c	13	12	640	Arizona State University	United States
15	Luengo Kanacri, Bernadette Paula	6701811741	2012 ^a	13	9	304	Pontificia Universidad Católica de Chile	Chile

* Role in co-authorship, superscripts.

^a First author.^b Co-author.^c Last author.

3.5 Author Keywords

The data exported from Scopus in a .csv excel file was inserted in VoSviewer 1.6.16 to generate a visual and graphical representation of the common keywords used by various authors in the PSB studies. Out of 5704, 437 author keywords were projected on a map. The range of minimum occurrence of a keyword was set at 5.

It is interesting to see how PSB has been linked to many factors and fields. PSB has been linked with music, helping, gratitude, morality, and mindfulness, which all induce positive emotions in humans. On the other hand, PSB is also linked with bullying, reputation, ostracism, guilt, and antisocial behaviour, which are all considered the causes that hinder PSB. The keyword projection in Figure 5 represents that PSB falls under the "Psychological" category. The colour difference in Figure 5 represents the average of keywords used in relevant years. Dark blue and purple colours represent the most current keywords used. In contrast, the light-yellow colour indicates the keywords used after 2018.



Figure 5. Screenshot of author keywords co-occurrence with overlay visualisation bibliometric map based on minimum occurrences of a keyword is set to five (the following URL can be used to open Figure 5 in VOSviewer: <http://bit.ly/3c4xzgB>).

3.6 Terminology and Concept

Analysing co-occurrence of author keywords presented PSB is the most used keyword in previous studies. There were 437 keyword occurrences and 5,235 links generated in Figure 5. Among the keyword occurrences are prosocial behaviour (682 occurrences, 344 links), helping (72 occurrences, 85 links), and sharing (18 occurrences, 34 links) were found in the author's keywords. Along with this, many of the author keywords were used in presenting the concept of PSB, for example, cooperation (89 occurrences, 103 links), social cognition (41 occurrences, 70 links), empathic (18 occurrences, 25 links), compassion (20 occurrences, 32 links), generosity (18 occurrences, 35 links), fairness (22 occurrences, 45 links), and mindfulness (27 occurrences, 53 links).

The PSB concept was associated with a few theories as well, like the 'theory of mind' (36 occurrences, 63 links), 'social identity' (10 occurrences, 26 links), and 'self-determination theory' (15 occurrences, 15 links). Theory of mind has more occurrences, suggesting humans' capacity for understanding and empathy (224 occurrences, 191 links) towards other people. One of the top-cited papers in Table 2, titled "Developmental changes in the priority of perceived status in childhood and adolescence", suggests that adolescents showed more PSB towards their friends with whom they felt understood compared to all other study groups (Lafontana & Cillessen, 2010).

3.7 Topics of Interest

Our keyword search presented various keywords that authors have used to find connections between PSB and other behavioural reactions and sentiments. For example, the relationship between prejudice and PSB can be seen in Figure 5. Studying discrimination and its effect on PSB is an under-researched topic. However, a study showed a negative impact on PSB toward Blacks due to an implicit anti-black bias (Stepanikova, Triplett, & Simpson, 2011). A link found between ostracism and PSB is also under debate. Workplace ostracism is an issue discussed whether it affects PSB or not. It is seen that people who tend to ignore the long-term benefits that they can get from their co-workers show less PSB towards colleagues who have ostracised them (Balliet & Ferris, 2013). Another interesting link that can be seen in Figure 5 is between music and PSB. The studies show that neutral or prosocial music increases helping behaviour among people (Kennedy, 2013). It is also suggested that ego depletion, linked with PSB in Figure 5, tends to decrease the PSB because it causes lesser guilt (Xu, Bègue, & Bushman, 2012). Another link between shyness and PSB has been studied, representing that shy boys can be more prosocial if their fathers show their elaborative emotional side. However, less shy children tend to be more prosocial if their mothers present their emotional side elaboratively (Grady & Hastings, 2018). Reciprocity and PSB is one link widely studied, and whether reciprocity enhances or decreases PSB has been debated. A study shows that indirect reciprocity increases PSB in the field (Mujcic & Leibbrandt, 2018).

Out of 437 author keywords, 'empathy' has the highest number of occurrences, i.e., 224 and 16 links, followed by 'adolescence' with 114 occurrences and 151 links. Our result is justified as two articles in the top-cited journals mentioned in Table 2 include 'adolescence' and 'empathy'. "A

study entitled "Pathways to self-esteem in late adolescence: The role of parent and peer attachment, empathy, and social behaviours" discusses the way how to help adolescents increase empathy (Laible et al., 2004) and "Perceived Locus of Causality and Internalization: Examining Reasons for Acting in Two Domains" discuss that if people take actions of their own free will, more empathy will be associated with it (Ryan & Connell, 1989).

The analysis suggests that the top 10 author keywords represent different but essential aspects: underlying causes and various terms used for PSB. For example, 'prosocial behaviour' (682 occurrences, 344 links), 'prosocial behaviour' (122 occurrences, 138 links), and 'prosocial behaviours' (80 occurrences, 101 links) are the few terms that occurred in the analysis for PSB. Similarly, 'empathy' (224 occurrences, 191 links), 'aggression' (133 occurrences, 148 links), 'altruism' (108 occurrences, 114 links), and 'helping' (72 occurrences, 85 links) are a few underlying causes for PSB. Additionally, a strong link is formed with 'adolescence' (144 occurrences, 151 links), 'children' (97 occurrences, 137 links), and 'adolescents' (81 occurrences, 117 links), which shows the developmental stages at which PSB is formed. The analysis of the top 10 keywords shows that PSB has mainly been studied for identifying the links between aggression, empathy, altruism, and helping in adolescence and children. The most cited article of the top journal in Table 2, titled "Developmental changes in the priority of perceived status in childhood and adolescence", also suggests the progression of PSB in adolescents (Lafontana & Cillessen, 2010).

In addition to the psychological field and behaviours around PSB, the analysis of author keywords shows that it is also related to other fields. For example, 'oxytocin' (29 occurrences, 41 links) and 'testosterone' (8 occurrences, 18 links) belong to the field of biology, and 'dictator game' (38 occurrences, 56 links) belongs to Economics.

Moreover, the analysis of author keywords shows the underlying factors contributing to PSB. For example, 'motivation' (28 occurrences, 50 links), 'aggressive behaviour' (29 occurrences, 41 links), 'reciprocity' (23 occurrences, 40 links), 'self-regulation' (28 occurrences, 56 links), 'volunteering' (18 occurrences, 32 links), 'fairness' (22 occurrences, 45 links), 'adjustment' (16 occurrences, 34 links). "The interplay of traits and motives on volunteering: agreeableness, extraversion, and prosocial value motivation" is an article mentioned in Table 2 that focuses on the relationship between PSB and traits and 'motivation' and 'volunteering' (Carlo et al., 2005).

The author keywords analysis found that China (6 occurrences, 11 links) was also emphasised in the studies. A study was performed in China that presented the importance of PSB in Chinese culture. The children are taught to opt for PSB because they are expected to love their families, respect the elders, show empathy towards others, build cordial relations with others, and keep the needs of the poor in consideration (Lai, Siu, & Shek, 2015).

Finally, the analysis shows that the link between PSB and mental health needs further study. Here, mental health refers to the broader multiple psychological states, including disruptive behaviours, anxiety, and mood disorders. The result puts forward some disorders like 'autism' (27 occurrences, 77 links), 'anxiety' (13 occurrences, 27 links), 'social anxiety' (10 occurrences, 24 links),

'respiratory sinus arrhythmia' (9 occurrences, 12 links), 'autism spectrum disorder' (15 occurrences, 31 links). These occurrences present that it is necessary to find the link between various disorders and diseases and their effect on exhibiting the PSB of a person.

The analysis of author keywords and the number of articles found in the Scopus database can identify PSB's applications in different areas. For example, 'parenting' (65 occurrences, 90 links) shows an application area of PSB. The strong link and occurrence show that good and efficient parenting can help promote PSB. Thirty-four occurrences of 'peer relationships' in the results indicate the importance of PSB and peer relationships.

PSB was not linked with a biological disorder and mental health issues in the early periods of 1967. It has been discussed more recently with the increased knowledge and awareness of mental health and issues.

The link strength of the two keywords, 'prosocial behaviour' and 'empathy', is 445 and 540, respectively, the strongest compared to the rest of the keywords. These two keywords are further linked with various branches.

It was seen from the result that only China was mentioned in the analysis. This present that China focuses on and enforces development and opts for PSB among its youth to make a welfare society.

4 LIMITATION OF STUDY

This study is limited because of only uses terms like 'prosociality' and 'prosocial behaviour' in the query string. Various authors have used different terms for prosocial behaviour, such as 'PSB' and 'prosocial behaviour' in their work, so this query string limits the search because those different terms are not added to the query string. Also, the author keywords were detected as 5,704, but only 437 could be projected on the map. Another limitation of this research is that the information presented in this study is based on a current database of Scopus that may change over time, subject to the thematic choices of psychologists.

5 CONCLUSION

The study presents a holistic representation of the bibliometric analysis of PSB-related literature in the field of psychology. Building upon the analysis results, the study provides an evidence base, highlighting global trends and directions of research work published on PSB, adding value to the existing body of knowledge. The findings of this study are particularly significant in the context of countries like Malaysia and China, where opting for PSB is always promoted to develop a civilised society. This study also paves the way for future researchers, emphasising focused research on behavioural and societal impacts of PSB in varied contexts.

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