Vol. 2 No. 4 April 2015 ISSN: 2321 – 788X

BIBLIOMETRIC ANALYSIS OF LITERATURE ON LEARNING DISABILITIES (1974 – 2013)

G. Jeyanthi[1], Dr.P.Vinayagamoorthy[2], Dr.J.Ramakrishnan[3] & Dr. J. Shanthi[4]

[1]Research Scholar, R&D Centre, Bharathiar University, Coimbatore – 641 046
[2]University Librarian, Thiruvalluvar University, Vellore – 632 115
[3] Deputy Librarian, Regional Medical Library,
The Tamil Nadu Dr. M.G.R. Medical University, Guindy, Chennai – 600 032
[4]Librarian, DKM College for Women (Autonomous), Vellore-632 001

Abstract

This paper presents a bibliometric analysis of the literature in the field of Learning Disabilities covered in MEDLINE data which are covered in the Pubmed during the study period i.e. 1974 to 2013. Maximum number of records (3606) was published during the year 2013, followed by 2755 in 2012 and 2586 in 2011. It was found that 87.4% are journal articles, 1.25% are Comment, 0.59% are Letter, 0.45% are Editorial and 0.24% are News. 93.28% of the records were in English language followed by German, French, Spanish, Japanese, Russian, Chinese, Polish, Portuguese, Italian, Dutch, Swedish, Hebrew, Hungarian, Czech, Finnish, Norwegian, Danish, Rumanian and Other languages. United States has contributed the highest number of records in the study. Next major contribution belongs to England, Netherland, Germany, Switzerland, Ireland, France and Italy. India has the 18th position among the countries. Relative Growth Rate (RGR) has been decreasing from 1974 (0.67) to 2013 (0.09) but in fluctuation trend. Doubling Time (Dt) has also shown an fluctuation trend. Indian efforts in Learning Disabilities research are greater in 14 years out of 40 years of study, since the Activity Index is higher than 100, in those 14 years, which reflects higher activity of Learning Disabilities research than the World's average.

Keywords*: Bibliometrics, Relative Growth Rate (RGR), Doubling Time (Dt) and Activity Index (AI).*

Introduction

Bibliometrics is an academic discipline and much research is being carried out for a quantitative study of the various aspects of literature of a given subject. It is a branch of Information Science which analyses quantitatively the published information based on bibliographic data elements. Bibliometric also analysis throws light on the pattern of growth of literature, inter-relationship among different branches of knowledge, productivity, authorship pattern, degree of collaboration, pattern of collection building, and their use. Gradually bibliometric studies are attaining the status of inter-disciplinary in nature.

In this paper an attempt has been made to identify the contributions in the field of Learning Disabilities (1974-2013) in MEDLINE data which are covered in the Pubmed.

Review of Literature

One of the most obvious features of science in recent years has been its rate of growth. Scientific growth has involved not only increase in manpower but also finance. .

Growth studies in scientific areas studied by Conard[1] in biology, Sengupta in microbiology[2], Ramesh Babu and Ramakrishnan in Hepatitis[3],

Various studies on compare the world's output *vs* Indian literature in their fields and they used Activity Index for India has been calculated for different years to see how India's research activity changed during different years, Garg and Padhi[4]. Karki and Garg[5], The review of literature on collaborative articles showed that so far no quantitative study on "Learning Disabilities" was conducted. Hence the present study.

Learning Disability

Learning disability is a classification that includes several areas of functioning in which a person has difficulty learning in a typical manner, usually caused by an unknown factor or factors. While learning disability, learning disorder and learning difficulty are often used interchangeably, they differ in many ways. Disorder refers to significant learning problems in an academic area. These problems, however, are not enough to warrant an official diagnosis. Learning disability on the other hand, is an official clinical diagnosis, whereby the individual meets certain criteria, as determined by professional (psychologist, pediatrician, etc.). Individuals with learning disabilities can face unique challenges that are often pervasive throughout the lifespan. Depending on the type and severity of the disability, interventions and current technologies may be used to help the individual learn strategies that will foster future success.[6]

Objectives of the Study

The Objectives of this study are:

1. To study the growth of literature in the field of Learning Disabilities covered in the MEDLINE data which is covered in Pubmed for the period 1974-2013.
2. To study the difference between Indian contributions and other countries.
3. To compare the world's output *vs* Indian literature in the field of Learning Disabilities research productivity for the period 1974-2013.

Methodology

The records published during the year 1974 to 2013 in the field of Learning Disabilities in the MEDLINE data which are covered in the Pubmed (www.pubmed.com) which is a free resource that is developed and maintained by the National Center for Biotechnology Information (NCBI), at the U.S. National Library of Medicine (NLM), located at the National Institutes of Health (NIH) was searched and bibliographic details like author, title, publication type, language, year; address of the contributors, country of publications, source etc. were collected. The retrieved records were converted into FoxPro and loaded in SPSS for the purpose of analysis. The keyword 'Learning Disabilities' has been used for extracting the number of records available in the above said database. The data thus

collected from the source database on the literary production of 'Learning Disabilities' for the period 1974-2013 has been analysed by using following bibliometric techniques.

- Relative Growth Rate (RGR)
- Doubling time (Dt)
- Activity Index (AI)

Relative Growth Rate (RGR)

The Relative Growth Rate (RGR) is the increase in number of articles/pages per unit of time. This definition is derived from the definition of relative growth rates in the study of growth analysis of individual plants and effectively applied in the field of Botany[7]. The mean Relative Growth Rate (R) over the specific period of interval can be calculated from the following equation:

$$1\text{-}2\ R = \frac{Log_{e\,2}W - log_{e\,1}W}{{}_2T - {}_1T}$$

whereas

$1\text{-}2\ \bar{R}$ = mean relative growth rate over the specific period of interval

$log_{e\ 1}W$ = log of initial number of articles/pages

$log_{e\ 2}W$ = log of final number of articles/pages after a specific period of interval

${}_2T - {}_1T$ = the unit difference between the initial time and the final time

The year can be taken here as the unit of time. The RGR for both articles and pages can be calculated separately.

Therefore

$1 - 2\ \bar{R}$ (aa –1 year –1) can represent the mean relative growth rate per unit of articles per unit of year over a specific period of interval.

and

$1 - 2\ \bar{R}$ (pp –1 year –1) can represent the mean relative growth rate per unit of pages per unit of year over a specific period of interval.

Doubling Time (Dt)

There exists a direct equivalence between the relative growth rate and the doubling time. If the number of articles/pages of a subject doubles during a given period then the difference between the logarithms of numbers at the beginning and end of this period must be logarithms of number 2. If natural logarithm is used this difference has a value of 0.693. Thus the corresponding doubling time for each specific period of interval and for both articles and pages can be calculated by the formula:

$$\textbf{Doubling time (Dt)} = \frac{0.693}{\bar{R}}$$

Therefore,

$$\text{Doubling time for articles Dt (a)} = \frac{0.693}{1 - 2\ \bar{R}\ (\text{aa-1 year-1})}$$

and

$$\text{Doubling time for pages Dt (p)} = \frac{0.693}{1 - 2\ \bar{R}\ (\text{pp-1 year-1})}$$

Activity Index (AI)

Activity Index characterizes the relative research effort of a country to a given field. It is defined as

AI = { (given field's share in the country's publication output) / (given field's share in the world's publication output) } x 100

AI = 100 indicates that the country's research effort in the given field corresponds precisely to the world's average. AI>100 reflects higher activity than the world's average, and AI<100 indicates lower than average effort dedicated to the field under study.

In this study, Activity Index for India has been calculated for different years to see how India's research activity changed during different years using the above formula. First suggested by Price[8]. Activity Index characterizes the relative research effort of a country to a given field.

$$AI = \{(Ii / Io) / (wi / wo)\} x100$$

Mathematically

where Ii = India's output in the year i
Io = Total Indian output
wi = world output in the year i
wo = Total world out put

The method used for calculating Activity Index has been explained below for Research output by different nations in different blocks.

$$AI = \left\{(N_{ij} / N_{io}) / (N_{oj} / N_{oo})\right\} x\ 100$$

N_{ij} : Number of papers in theme i and block j;
N_{io} : Number of papers in theme i for all blocks ;
N_{oj} : Number of papers in all theme for block j;
N_{oo} : Number of papers for all theme and all blocks;

Limitations

This study is confined to a period from 1974 to 2013 using MEDLINE data which covered in Pubmed only.

Analysis and Discussion

Quantum of Literature Published in Learning Disabilities

The research productivity on 'Learning Disabilities' covered in the database is shown in Table 1. It is observed that total of 42933 records on 'Learning Disabilities' are covered in the MEDLINE data which covered in Pubmed for a period of forty years from 1974 to 2013.

The year-wise distribution of literature on 'Learning Disabilities' according to source database MEDLINE is shown in Table 1. It is found that the maximum number of records (3606) was published during 2013, followed by 2755 in 2012 and 2586 in 2011. On the whole, it is noticed that from 1974 onwards there is a gradual increase of Learning Disabilities research productivity every year except few years.

Table 1: Quantum of Literature published in Learning Disabilities by year wise

S.No.	Year	Frequency	%	Cumulative %
1	1974	314	0.7	0.7
2	1975	299	0.7	1.4
3	1976	330	0.8	2.2
4	1977	307	0.7	2.9
5	1978	391	0.9	3.8
6	1979	459	1.1	4.9
7	1980	456	1.1	6
8	1981	465	1.1	7
9	1982	541	1.3	8.3
10	1983	561	1.3	9.6
11	1984	634	1.5	11.1
12	1985	513	1.2	12.3
13	1986	560	1.3	13.6
14	1987	531	1.2	14.8
15	1988	554	1.3	16.1
16	1989	596	1.4	17.5
17	1990	699	1.6	19.1
18	1991	594	1.4	20.5
19	1992	641	1.5	22
20	1993	733	1.7	23.7
21	1994	746	1.7	25.4
22	1995	790	1.8	27.3
23	1996	750	1.7	29
24	1997	869	2	31.1
25	1998	858	2	33.1
26	1999	936	2.2	35.2
27	2000	1083	2.5	37.8

28	2001	1175	2.7	40.5
29	2002	1253	2.9	43.4
30	2003	1369	3.2	46.6
31	2004	1658	3.9	50.5
32	2005	1671	3.9	54.4
33	2006	1815	4.2	58.6
34	2007	1978	4.6	63.2
35	2008	2220	5.2	68.4
36	2009	2261	5.3	73.6
37	2010	2376	5.5	79.2
38	2011	2586	6	85.2
39	2012	2755	6.4	91.6
40	2013	3606	8.4	100
Total		**42933**	**100**	

Publication Types Distribution of Learning Disabilities Research

Table-2 reveals the distribution of the 'Learning Disabilities' research output according to various publication types of MEDLINE. It was found that 87.4% are journal articles, 1.25% are Comment, 0.59% are Letter, 0.45% are Editorial and 0.24% are News. The literatures published in other bibliographic forms are 10.11%.

Table 2: Publication Type

S.No.	Publication Type	Total	%	Cumulative %
1	Journal Article	37505	87.36	87.36
2	Comment	538	1.25	88.61
3	Letter	254	0.59	89.20
4	Editorial	193	0.45	89.65
5	News	102	0.24	89.89
6	Others	4341	10.11	100.00
	Total	42933	100.00	

Distribution of Languages in the Literature of Learning Disabilities

Table-3 shows the distribution of citations according to language during the study period i.e. 1974-2013. As the table shows that out of a total of 42933 records, 40050 of them were in English language forming 93.28% of the total followed by German, French, Spanish, Japanese, Russian, Chinese, Polish, Portuguese, Italian, Dutch, Swedish, Hebrew, Hungarian, Czech, Finnish, Norwegian, Danish, Rumanian and Other languages.

Table-3: Distribution of Languages in the literature of Learning Disabilities

S.No.	Language	No. of records	%	Cumulative %
1.	English	40050	93.28	93.28
2.	German	905	2.11	95.39
3.	French	484	1.13	96.52
4.	Spanish	373	0.87	97.39
5.	Japanese	252	0.59	97.98
6.	Russian	217	0.51	98.48
7.	Chinese	151	0.35	98.83
8.	Polish	106	0.25	99.08
9.	Portuguese	74	0.17	99.25
10.	Italian	68	0.16	99.41
11.	Dutch	50	0.12	99.53
12.	Swedish	25	0.06	99.59
13.	Hebrew	21	0.05	99.63
14.	Hungarian	21	0.05	99.68
15.	Czech	20	0.05	99.73
16.	Finnish	20	0.05	99.78
17.	Norwegian	20	0.05	99.82
18.	Danish	16	0.04	99.86
19.	Rumanian	11	0.03	99.89
20.	Other languages	49	0.11	100.00
Total		**42933**	**100.00**	

Country-Wise Distribution of Records

Table 4 shows the country wise distribution of 'Learning Disabilities' records. It is observed that United States has contributed the highest number of records in the study. Next major contribution belongs to England, Netherland, Germany, Switzerland, Ireland, France and Italy. India has the 18th position among the countries.

Table 4: Country-wise distribution of records

S.No.	Country	Frequency	Percent
1.	United States	21637	50.40
2.	England	9896	23.05
3.	Netherlands	3214	7.49
4.	Germany	1645	3.83
5.	Switzerland	743	1.73
6.	Ireland	670	1.56
7.	France	642	1.50
8.	Italy	481	1.12
9.	Japan	424	0.99
10.	Spain	371	0.86
11.	Canada	325	0.76
12.	China	248	0.58
13.	Denmark	241	0.56
14.	Australia	220	0.51
15.	Russia	218	0.51
16.	Brazil	190	0.44
17.	Poland	175	0.41
18.	India	159	0.37
19.	Scotland	150	0.35
20.	Austria	122	0.28
21.	Norway	114	0.27
22.	Sweden	87	0.20
23.	South Africa	70	0.16
24.	Belgium	59	0.14
25.	Israel	50	0.12
26.	New Zealand	48	0.11
27.	Czechoslovakia	47	0.11
28.	United Arab Emirates	45	0.10
29.	Croatia	37	0.09
30.	Finland	37	0.09
31.	Hungary	36	0.08
32.	Korea (South)	28	0.07
33.	Mexico	28	0.07
34.	Singapore	28	0.07
35.	Greece	24	0.06
36.	Romania	22	0.05
37.	Argentina	20	0.05
38.	Egypt	16	0.04
39.	Chile	14	0.03
40.	Thailand	12	0.03
	Other Countries	340	0.79
	Total	**42933**	100.00

Relative Growth Rate (RGR) and Doubling Time (Dt)

The analysis of data on the literary output in Learning Disabilities has been done with parameters such as Relative Growth Rate (RGR) and Doubling Time (Dt).

It is seen from Table 5 that RGR has been decreasing from 1974 (0.67) to 2013 (0.09) but in fluctuation trend. On the other hand, the Doubling Time (Dt) has also shown an fluctuation trend. The data in Table 5 reveals that doubling time has increased from 1.04 in the year 1974 to 9.95 in the year 2012 but it is in fluctuation trend

Table 5: RGR and Dt for Learning Disabilities Research Output by Year-wise

Sl. No.	Year	Quantum of Output	Cumulative Total of Output	W_1	W_2	$1-2^{\bar{R}(aa^{-1}\,year^{-1})}$ RGR	Dt (a)
1	1974	314	314		5.75		
2	1975	299	613	5.75	6.42	0.67	1.04
3	1976	330	943	6.42	6.85	0.43	1.62
4	1977	307	1250	6.85	7.13	0.28	2.47
5	1978	391	1641	7.13	7.40	0.27	2.54
6	1979	459	2100	7.4	7.65	0.25	2.78
7	1980	456	2556	7.65	7.85	0.20	3.53
8	1981	465	3021	7.85	8.01	0.16	4.24
9	1982	541	3562	8.01	8.18	0.17	4.12
10	1983	561	4123	8.18	8.32	0.14	4.80
11	1984	634	4757	8.32	8.47	0.15	4.70
12	1985	513	5270	8.47	8.57	0.10	6.94
13	1986	560	5830	8.57	8.67	0.10	6.88
14	1987	531	6361	8.67	8.76	0.09	7.88
15	1988	554	6915	8.76	8.84	0.08	8.51
16	1989	596	7511	8.84	8.92	0.08	8.24
17	1990	699	8210	8.92	9.01	0.09	7.44
18	1991	594	8804	9.01	9.08	0.07	9.50
19	1992	641	9445	9.08	9.15	0.07	9.46
20	1993	733	10178	9.15	9.23	0.08	8.89
21	1994	746	10924	9.23	9.30	0.07	10.08
22	1995	790	11714	9.3	9.37	0.07	10.11
23	1996	750	12464	9.37	9.43	0.06	11.44
24	1997	869	13333	9.43	9.50	0.07	10.19
25	1998	858	14191	9.5	9.56	0.06	11.48
26	1999	936	15127	9.56	9.62	0.06	10.79
27	2000	1083	16210	9.62	9.69	0.07	9.44
28	2001	1175	17385	9.69	9.76	0.07	9.45
29	2002	1253	18638	9.76	9.83	0.07	9.50
30	2003	1369	20007	9.83	9.90	0.07	9.39
31	2004	1658	21665	9.9	9.98	0.08	8.30
32	2005	1671	23336	9.98	10.06	0.08	8.91
33	2006	1815	25151	10.06	10.13	0.07	9.54
34	2007	1978	27129	10.13	10.21	0.08	8.84
35	2008	2220	29349	10.21	10.29	0.08	9.00
36	2009	2261	31610	10.29	10.36	0.07	9.73
37	2010	2376	33986	10.36	10.43	0.07	9.40
38	2011	2586	36572	10.43	10.51	0.08	9.00
39	2012	2755	39327	10.51	10.58	0.07	9.95
40	2013	3606	42933	10.58	10.67	0.09	7.93

Activity Index

In Table 6, Activity Index for India has been calculated to analyse how India's research performance changes over different years. The data reveals that, Indian efforts in Learning Disabilities research is greater in 14 years out of 40 years of study, since the Activity Index is higher than 100, in those 14 years, which reflects higher activity of Learning Disabilities research than the World's average.

In the years, where the Activity Index is less than 100, reflects lower activity of Learning Disabilities research than the world average. The Activity Index (AI) for India was peak in 1992 (294.87) and there were no record in the year 1974 to 1976, 1978 to 1980, 1982 to 1987 and 1997.

As seen in the table which indicates that the world output on Learning Disabilities grew almost uniform rate by year after year except few years. It was peak in 2013.

In the case of Indian output the growth reaches in inconsistent manner and reaches its peak in 1992. In other words, the year 1992 has marked the highest quantum of research output in India.

Table 6 - World's Output vs. India's Output

S. No.	Year	Worlds'Output	India's Output	Activity Index
1.	1974	314	0	0.00
2.	1975	299	0	0.00
3.	1976	330	0	0.00
4.	1977	307	1	87.95
5.	1978	391	0	0.00
6.	1979	459	0	0.00
7.	1980	456	0	0.00
8.	1981	465	2	116.14
9.	1982	541	0	0.00
10.	1983	561	0	0.00
11.	1984	634	0	0.00
12.	1985	513	0	0.00
13.	1986	560	0	0.00
14.	1987	531	0	0.00
15.	1988	554	1	48.74
16.	1989	596	1	45.31
17.	1990	699	2	77.26
18.	1991	594	3	136.37
19.	1992	641	7	294.87
20.	1993	733	2	73.67
21.	1994	746	4	144.78
22.	1995	790	3	102.54
23.	1996	750	**1**	36.00
24.	1997	869	**0**	0.00
25.	1998	858	1	31.47
26.	1999	936	4	115.39

27.	2000	1083	2	49.86
28.	2001	1175	6	137.88
29.	2002	1253	3	64.65
30.	2003	1369	2	39.45
31.	2004	1658	3	48.86
32.	2005	1671	15	242.39
33.	2006	1815	9	133.89
34.	2007	1978	5	68.26
35.	2008	2220	5	60.82
36.	2009	2261	12	143.31
37.	2010	2376	10	113.64
38.	2011	2586	16	167.07
39.	2012	2755	15	147.02
40.	2013	3606	24	179.71
Total		**42933**	**159 (0.37)***	**100.00****

* Percentage of world output

** Average of Activity Index

Conclusion

In the field of medicine, the results show that Learning Disabilities studies literature is growing year after year except few years. It also shows that maximum number of records covered by journal articles in MEDLINE in the field of Learning Disabilities. United States has contributed the highest number of records in the study. Next major contribution belongs to England, Netherland, Germany, Switzerland, Ireland, France and Italy. India has the 18th position among the countries. Indian efforts in Learning Disabilities research are greater in 14 years out of 40 years of study, since the Activity Index is higher than 100, in those 14 years, which reflects higher activity of Learning Disabilities research than the World's average.

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