Impact of Article Page Count and Number of Authors on Citations in Disability Related Fields: A Systematic Review Article

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Abstract

Background: Citation metrics and total publications in a field has become the gold standard for rating researchers and viability of a field. Hence, stimulating demand for citation has led to a search for useful strategies to improve performance metric index. Meanwhile, title, abstract and morphologic qualities of the articles attract researchers to scientific publications. Yet, there is relatively little understanding of the citation trend in disability related fields. We aimed to provide an insight into the factors associated with citation increase in this field. Additionally, we tried to know at what page number an article might appear attractive to disability researchers needs. Thus, our focus is placed on the article page count and the number of authors contributing to the fields per article.

Methods: To this end, we evaluated the quantitative characteristics of top cited articles in the fields with a total citation (≥ 50) in the Web of Science (WoS) database. Using one-way independent ANOVA, data extracted spanning a period of 1980-2015 were analyzed, while the non-parametric data analysis uses Kruskal-Walis test.

Results: Articles with 11 to 20 pages attract more citations followed by those within the range of zero to 10. Articles with upward 21 pages are the least cited. Surprisingly, articles with more than two authors are significantly ($P<0.05$) less cited and the citation decreases as the number of authors increased.

Conclusion: Collaborative studies enjoy wider utilization and more citation, yet discounted merit of additional pages and limited collaborative research in disability field is revealed in this study.

Keywords: Article page count, Bibliometric, Citation counts, Disability, Number of authors

Introduction

Article citation represents not only a measure of the recognition an article receives and its impact in the scientific fields but also projects the future direction and trends of research. Consequently, numerous studies are under way to establish a common factor among the highly cited articles for several reasons. Accumulation of citations qualitative and quantitative influence is essential in order to advance a career (1). Universities and academic institutions also sought prestige and quality ranking through citation counts (2). Moreover, journals use citation count to progress their index of quality (3). Thus, the relevance of citation in the advancement of scientific know-

ledge has been adequately established in the literature (4-6). Strategies to improve citation counts vary across disciplines (3, 7-9). Common variables that attract citation across disciplines include journal impact factor (10-12) and open access as against restricted access (13, 14). Additionally, article publication age, co-authorship network (15) and the number of references are likely to attract citation, because *the more authors are cited in an article the more they are likely to "return the favor" in the future*, thereby increase the citation count (16). Consequently, there is evidence to suggest that author's academic age, affiliation and past records may influence the popularity of an article through the accumulation of citation.

The impact of article length on citation count appeared differently across disciplines (7). For example, in astronomy and astrophysics fields it has been found that the longer an article the more citation it will likely receive (3, 17). Whereas, in the field of clinical microbiology and infectious diseases, however, brief reports are more appealing to researchers than full-length articles (18). Furthermore, research grant, professional inputs, and the established reputation in the scholarly world of research are variables gained from collaborative work and have an influence on citation counts (19). Consequently, the shift in emphasis towards collaborative work has continued and even accelerated for good (20). An increase in the number international collaboration suggests a collective influence and therefore more citation (21).

Despite the multitude acknowledgment on the advantage of increasing citations count, there have generally been very few bibliometric studies conducted in the disability related field of research. Previous disability studies conducted focuses on the following areas: a) medical rehabilitation (22, 23), b) prosthetics (24), and c) physical therapy (23, 25, 26). Interestingly missing in the bibliometric studies are data gained from keywords focusing on disability outside the impairments of disabled people.

Those previous bibliometric studies acknowledged the need to improve citation counts in the field but do not go further to justify how or why.

Our study proposed providing an insight into the factors associated with a citation increase in the top journals in the disability related field, with a focus on the article page count and the number of authors contributing to the fields per article.

Understanding the Models of Disability
In history of most societies, persons with disabilities (PWD) experienced a degree of mobility restriction on the ground of their body limitation (27). Two main models characterized the view about disability in the recent years, the medical and the social model of disabilities. The medical model locates the source of the inability within the body of PWD (28). Thus, terminologies like "epileptic" and "arthritic" are ascribed to a person's attributes in the medical model of disability. The more acceptable social model redefined the primary sources of disablement as environmental factors rather than personal impairment. Hence, the inability of the society to make an adjustment in the environment gives birth to the barriers. Thus, terminologies like access, accessibility, accommodation, assistive technology, architecture and planning become enshrined in disability studies.

Thus, this research focused on the social model of disability and searched for related articles found in the (WoS) within the period of three and a half decades (1980-2015).

Methods

Following the social model of disability, keywords related to PWD and environmental relationship are used within the advanced search interface of the Web of Science (WoS) database. While terminologies related to medical issues are excluded, disability in relation to access and accessibility to facilities and services to persons with a different form of impairment are utilized. *(TI = (**disability**)) AND (TS = ((access) OR (accessibility) OR (accessible) OR (accommodation) OR (architecture) OR (Planning) OR ("Assistive technology") OR ("Universal Design") OR (Inclusion) OR (Participatory) OR (Attitude) OR (Resilience) OR ("Person* with dis-*

abilities") OR (Disabled) OR (Disablement) OR (Barrier) OR (Exclusion) OR (Experience) OR (Communication) OR ("Communication device") OR (Information) OR ("Speech impairment") OR ("Sign Language") OR ("Hearing impairments") OR (Braille) (Mainstreaming) OR (Education) OR (Employment) OR ("Reasonable Accommodation") OR ("Sensory Impairment") OR (Stigma) OR ("Visual impairments") OR (Facility) OR (Pathway) OR (Infrastructure) OR (Wheelchair) OR ("Mobility Restriction") OR ("Physical impairment") OR ("Mobility impairment"))).

Downloaded Microsoft excels records analysis was analyzed using IBM SPSS 21 software. Data was presented as mean (SEM). Data were first analyzed for normality and decision of normality was based on Kolmegronov-Smirnov test result. Parametric data were analyzed by one-way independent ANOVA while non-parametric data were analyzed using Kruskal-Walis test. The Tukey Post Hoc test was used to precisely detect the significant variable after using ANOVA. For correlation study, Spearman's correlation was used to test all data.

Results

This study considered all articles that attracted total citation ≥50. The total number of articles equals 297 and the total citation equals 25255. Fig. 1 shows the corresponding total citation (TC) for the various article page counts ranges. Articles having page count within 11 to 20 pages attract more citations followed by those within the range of zero to 10. Articles with page count within 21 to 30 attract even lesser citation and those with pages more than 30 attract the least citation. When we statistically test this difference (Table 1), it was not significant ($P>0.05$).
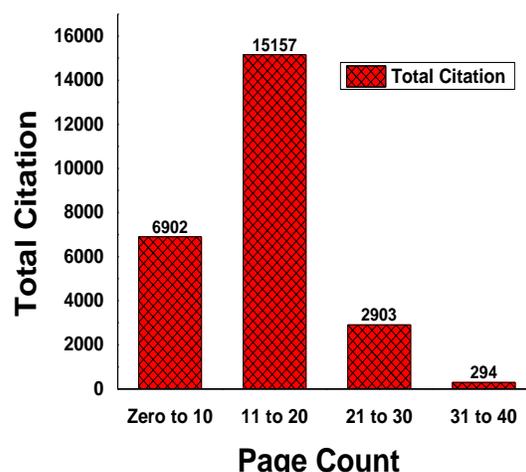

Fig. 1: Total citation count based on the range of article page count

Table 1: Difference in mean total citations among different page count grouping

Page Count Grouping	Mean (SEM)	Mean Rank	Chi-square (df)	*P*-Value (2 tail)
Zero to 10	81.20 (4.77)	145.81	2.027 (3)	0.567
11 to 20	85.15 (3.30)	147.64		
21 to 30	96.73 (11.54)	168.94		
31 to 40	73.50 (15.12)	127.78		

Values represent mean (SEM). Kruskal-Walis was used to analyze all data. P<0.05 was taken to be statistically significant at 95% confidence interval. df= degree of freedom.

Literally, the more the number of authors contributing to an article should translate into more traffic for the article and hence increase the chance of getting more citation. The number of authors contributing to the articles is presented in Fig. 2a and the corresponding number of published articles. Articles with two contributing authors are more among the articles that attracted more than 50 citations in the disability-related field. Publications with a single author article and then three and four authored articles followed the doubled authored ones, respectively. It is manifest from the result, that articles with more than four authors are less common in this field.

When we statistically test the difference in the amount of total citations attracted by respective groups, the difference between one, two, three and four authored articles were significantly different (*P<0.0001*) as contained in (Fig. 2a). Precisely, publications authored by four people attract significantly less total citations than one

(*P<0.0001*) and two (*P<0.001*) authored publications (Fig. 2b). Meanwhile, total citation attracted by three researchers authored articles are also higher than that of four researchers authored but this difference was not statistically significant (*P=0.058*).
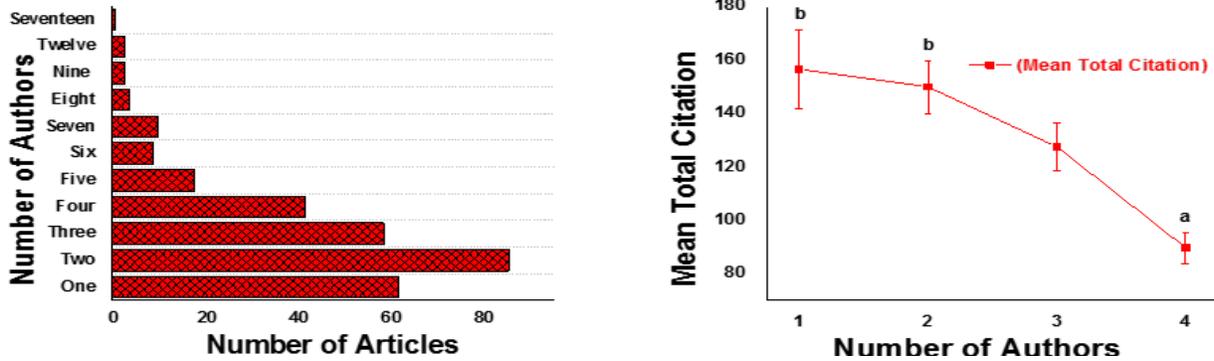

Fig. 2: (a) the number of authors that contributed to each article and the total amount/number of the published articles (b) Mean plot of the total citation for the different number of authors. One-way ANOVA followed by Tukey post hoc test was used to analyze all data. Different letter denotes a significant difference (*P<0.001*) from each other while the same letter shows non-significance (*P>0.05*)

Table 2: Difference in mean total citations among different page count grouping

Number of Author Group	Total Citation Mean (SEM) (n=20)	F-Stat (df)	*P*-Value
One	156.45 (14.79)	8.354 (3)	<0.0001*
Two	149.90 (9.91)		
Three	127.50 (9.13)		
Four	89.65 (5.89)		

Values represent mean (SEM). One-way independent ANOVA was used to analyze all data. P<0.05 was chosen to be statistically significant at 95% confidence interval. df= degree of freedom.
*=P<0.0001

Furthermore, correlation studies were performed to detect the relationship between total citation and article page count and cited reference count respectively. Fig. 3 show the scatter plot of the relationship between TC and page count. There was a very weak negative correlation between both variables with a correlation coefficient of -0.008 (Table 3). As expected, this correlation was

not statistically significant (*P>0.005*). In addition, the relationship between cited reference count and total citation is also presented in a scatter plot as shown in Fig. 4. Testing this relationship statistically indicated a positive correlation between TC and cited reference count (0.017) but this difference was not also significant (*P>0.005*).
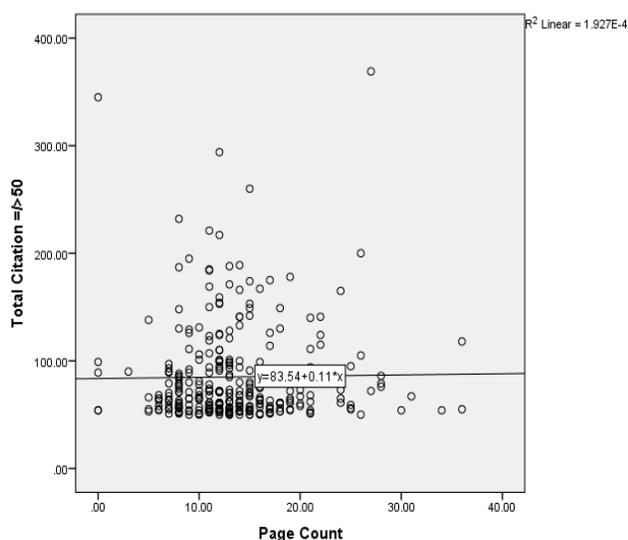
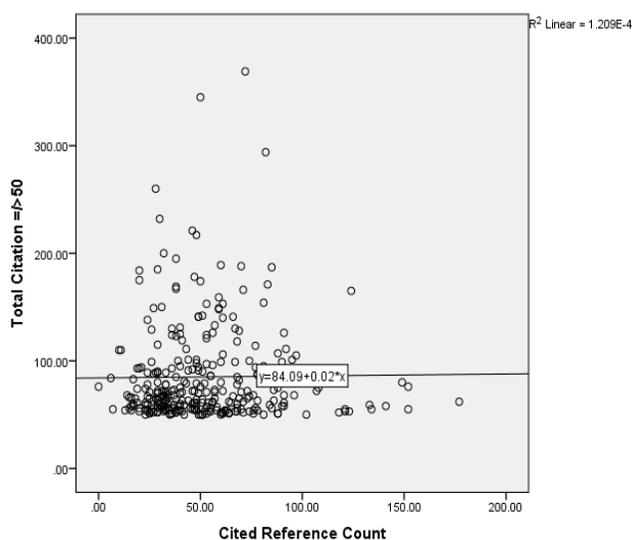**Fig. 3:** Scatter plot showing the relationship between total citation and page count

Fig. 4: Scatter plot showing the relationship between Total Citation and Cited Reference counts

Table 3: Correlation between articles with total citations greater than 50 (n=297) and article page count

	Mean (SEM) (n=297)	Sig. (2-tail) P-Value	Correlation (r)
Total Citation	85.03 (2.682)		
Article Page Count	13.461 (0.334)	0.885	-0.008

Values represent Mean (SEM). Spearman's correlation was used to test all data. *P*<0.05 was statistically significant.

Table 4: Correlation between articles of total citations greater than 50 (n=297) and cited reference count

	Mean (SEM) (n=297)	Sig. (2-tail) P-Value	Correlation (r)
Total Citation	85.03 (2.682)		
Cited Reference Count	51.62 (1.616)	0.766	0.017

Values represent Mean (SEM). Spearman's correlation was used to test all data. *P*<0.05 was taken to be statistically significant

Discussion

Scientific articles need to be read, understood and found useful by other researchers in the field before it could receive a citation from such users. A correlation between page counts and the number of contributing authors measured against the citation matrix. We rearranged the articles according to their corresponding total citation and considered those articles that attracted 50 and above citations. We discovered that articles with 50 and above citation were approximately 297 (n=297). The rest of the 9474 articles received lower than 50 citations. Before citing an article, it is expected that researchers will take the article and read it and that the number of pages in the article may have a bearing on whether a researcher may feel inclined to read the article or not. An article that appeared bulkier than normal may not receive favorable disposition from disability researchers probably because of the research period and rigor or inadequate collaboration in the field.

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We arranged the page count of the articles and then grouped the articles with less than 10, 11-20 pages, 21-30 and within the range of 31-40 pages. The corresponding total citation is presented alongside it. The purpose is to know at what page number an article may appear attractive and responsive to disability researchers needs. Thereby making people read it more and consequently to be cited. In this study, we discovered that articles with 11-20 pages attract more citations in the disability-related fields. Conversely, articles with barely 10 pages may appear less enticing to disability researchers. Researchers may not feel inclined to read what may appear unsubstantial at the face value. Researchers may get fed up when an article page count exceeds 20. Thus, following the same reasoning article with page count greater than 31 are more prone to be disregarded as the finding of this study indicated (see Fig. 1). Thus, the more the number of pages the less attractive it becomes in this field. This finding corroborates with the assertion of (7) that the influence of an article length on citation count appeared differently across disciplines.

We further grouped the articles taken into account based on their number of authors 1, 2, 3, 4, 5, 6, 7, 8, 9, 12 and 17 authors as they manifest in the data of the top cited articles of upward 50 citations. Thus, in our study, we now proceeded to check whether the number of authors affects the rate of citation. We analyzed the (n=297) articles and discovered that articles with two authors attract more citation in disability-related fields with upwards of 80 citations. The single-authored articles attract upwards of 60 citations. The more the number of authors and the more the paper may have a chance of being searched by other researchers, owing to the fact that a paper might be attracted through the presence of a particular author or the other (3). Contrarily, with a slight exception in the articles of seven authors, citation drastically declined as the number of contributing authors increases in the disability field as contained in the WoS database collection. Therefore, in disability related field many people should not contribute to an article. This may mean disability researchers are not prevalent in

collaborative research. Besides, for authorship to attract significant attention in this field the number of collaborators should be limited to a maximum of four. Two authored article was the most suitable followed by a single authored. Our findings corroborate with the assertion that *strategies to improve the citation count vary across disciplines* (3, 7, 8). However, this finding is conflicting with the essence of collaboration. Collaborative research save cost, diffused ideas, and enhanced awareness among partners (15) and therefore may attract more citation. This may help explain why only (n=297) out of the (n=9474) articles received 50 or more citations in the field.

We proceeded to the use of statistical analysis to test if the number of authors will have a significant impact on the citation the article will receive. Consequently, one author has a mean total citation of 156.45, two authors have mean total citation of 149.90, three authors have 127.50 and four authors have a mean citation of 89.65. Similarly, the ANOVA test revealed that the articles are very significantly different ($P<0.001$) from each other. Moreover, Tukey post hoc test distinguished the significantly different data using the Mean plot. The results (b; Fig. 3), show that four is significantly different from two and four is significantly different ($P=0.001$). Likewise, one author is also significantly different ($P<0.0001$) from four authors. This means that a paper with a single author is more likely to get more citation than the paper with four authors. Likewise, articles of double authors are likely to get more citation than four, but the difference between the single and doubled authored articles is not predictably much. The statistical result shows a very weak and negative correlation between TC and page count. As expected, this correlation is different, but not statistically significant ($P>0.05$), meaning to say that although researchers publishing more pages attract less citation, the relationship is not strong to guarantee consistency empirically.

In the quest for greater understanding of what has been referenced, cited papers would have a significant relation to the papers that referenced them. Thus, we now proceeded to check on the

correlation between the source and the referenced papers. Again, we discovered that in disability related field of study, there was not a so strong relationship between articles and the articles that referenced them (less than 2%). This is highly atypical of other fields, where the number of reference citation is correlated with citation counts because the more authors are cited in an article the more likely they are to "return the favor", thereby increase the citation count (16).

In a nutshell; 1) articles receiving citations in the field are limited, 2) The more the number of pages above 10 the less likely the article will attract considerable citation, 3) Collaborative research with more than two authors may decrease the chances of the article to attract citation and that 4) there is a weak relationship between cited articles and those that cited them in the field. To overcome these anomalies, the acceptance requirements for publication in the field may need to be reviewed by the journals in WoS under disability-related fields of study.

Conclusion

In our study, we have endeavored to show the quantitative characteristic of the effect of the article page count and the number of authors on top cited articles in disability related field of study. 96.86% of the articles published in disability related field of study have less than 50 citations each. Articles that made it to the top exhibit certain characteristics of having approximately 11-20 pages and two authors per article. Top cited articles in disability related field are characterized by a limited number of authors. Moreover, for an article to draw significant attention to the number of collaborators should be limited to a maximum of four; two authors are preferable in this field. This finding presents the need to devise a means of encouraging collaborative work in the field. This research has suggested that establishing connections between the past and the present studies, collaborative endeavors, and publication requirements in the disability related field of

study might present a good starting solution to the problems of limited citation in the field.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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References

1. Donaldson MR, Cooke SJ (2013). Scientific publications: Moving beyond quality and quantity toward influence. *Bio Sci*, bit007.
2. Bruns SB, Stern DI (2015). Research assessment using early citation information. *Scientometrics,*1-19.
3. Falagas ME, Zarkali A, Karageorgopoulos DE, Bardakas V, Mavros MN (2013). The impact of article length on the number of future citations: a bibliometric analysis of general medicine journals. *PLoS One,* 8:e49476.
4. O'Sullivan KE, Kelly JC, Hurley JP (2015). The 100 most cited publications in cardiac surgery: a bibliometric analysis. *Ir J Med Sci,* 184:91-9.
5. Gul S, Nisa NT, Shah TA, Shah MUA, Wani AB (2015). Research output on Lavender, 2008–2012. *Eur J Integr Med*, 7 (5):460–466.
6. Cobo MJ, Martínez MA, Gutiérrez-Salcedo M, Fujita H, Herrera-Viedma E (2015). 25years at Knowledge-Based Systems: A bibliometric analysis. *Knowl-Basedb Syst,* 80:3-13.
7. Lokker C, McKibbon KA, McKinlay RJ, Wilczynski NL, Haynes RB (2008). Prediction

of citation counts for clinical articles at two years using data available within three weeks of publication: retrospective cohort study. *BMJ,* 336:655-657.

8. Judge TA, Cable DM, Colbert AE, Rynes SL (2007). What causes a management article to be cited—article, author, or journal? *Acad Manage J,* 50:491-506.

9. Doslu M, Bingol HO (2015). Context sensitive article ranking with citation context analysis. *Scientometrics,*1-19.

10. Willis DL, Bahler CD, Neuberger MM, Dahm P (2011). Predictors of citations in the urological literature. *BJU Int,* 107:1876-1880.

11. Patsopoulos NA, Analatos AA, Ioannidis JP (2005). Relative citation impact of various study designs in the health sciences. *JAMA,* 293:2362-2366.

12. Ekeroma AJ, Shulruf B, McCowan L, Hill AG, Kenealy T (2016). Development and use of a research productivity assessment tool for clinicians in low-resource settings in the Pacific Islands: a Delphi study. *Health Res Policy Sy,* 14:1.

13. Kim H-E, Jiang X, Kim J, Ohno-Machado L (2011). Trends in biomedical informatics: most cited topics from recent years. *J Am Med Inform Assn,* 18:i166-i170.

14. Norris M, Oppenheim C, Rowland F (2008). The citation advantage of open-access articles. *J Am Soc Inf Sci Tec,* 59:1963-1972.

15. Guns R, Rousseau R (2014). Recommending research collaborations using link prediction and random forest classifiers. *Scientometrics,* 101:1461-1473.

16. Gilbert GN (1977). Referencing as persuasion. *Soc Stud Sci*, 113-122.

17. Ball P (2008). A longer paper gathers more citations. *Nature,* 455:274-275.

18. Mavros MN, Bardakas V, Rafailidis PI, Sardi TA, Demetriou E, Falagas ME (2013). Comparison of number of citations to full original articles versus brief reports. *Scientometrics,* 94:203-206.

19. Subramanyam K (1983). Bibliometric studies of research collaboration. *J Inf Sci,* 6:33-38.

20. Laband DN (1986). Article popularity. *Econ Inq,* 24:173-180.

21. Wagner CS, Leydesdorff L (2005). Network structure, self-organization, and the growth of international collaboration in science. *Res Policy*, 34:1608-1618.

22. Shadgan B, Roig M, HajGhanbari B, Reid WD (2010). Top-cited articles in rehabilitation. *Arch Phy Med Rehab,* 91:806-815.

23. Roberts D (1992). Coverage by four information services of the core journals of rehabilitation and related topics. *Scand J Rehab Med,* 24:167-173.

24. Eshraghi A, Osman NA, Gholizadeh H, Ali S, Shadgan B (2013). 100 top-cited scientific papers in limb prosthetics. *Biomed Eng Online,* 12:119.

25. Bohannon RW, Gibson DF (1986). Citation analysis of physical therapy. *Phys Ther,* 66:540-541.

26. Wakiji EM (1997). Mapping the literature of physical therapy. *Bulletin Of The Medical Library Association,* 85:284.

27. Liasidou A (2016). Disabling discourses and human rights law: a case study based on the implementation of the UN Convention on the Rights of People with Disabilities. *Discourse-Studies in the Cultural Politics of Education,* 37:149-162.

28. Oliver M (1990). The individual and social models of disability. Joint workshop of the living options Group and the Research Unit of the Royal College of Physicians.