

Does Open Access Gain More Altmetric Attention Score? An Investigation into OA and NOA Articles in Nature

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ABSTRACT

The purpose of the study is to explore the differences in altmetric benefits among OA and NOA access articles by taking the top 10 articles in the Business and Commerce domain from Nature journal. Furthermore, this paper investigates the correlation between article access and altmetric attention score. The result reported that higher article access led to higher article attention scores ($r(9) = .965$). Twitter was the main source of altmetrics for all the articles and the U.S public were the major tweeter. There was no significant variation between OA and NOA articles in gaining social media attention ($p\text{-value} = 0.520$). The result of the study gives a better idea for the scholarly community to choose their preferred channel and mode for diffusing their scientific output for maximum academic and social benefit. The study is the first of its kind to explore the altmetric benefits of OA and NOA articles especially in the domain of business and commerce.

Keywords: Altmetric attention score, Altmetrics, Non-open access (NOA), Open access (OA), Tweets

INTRODUCTION

The scholarly community has a wider choice of publication ranging from traditional to electronic (way), commercial to non-commercial (type), open to non-open (access). E-publications have overpowered traditional publications with reach and availability to the end-user (Cox, 2003). The research impact measurement has been eased with the introduction and implementation of different metrics including traditional and alternatives to the conventional citation metrics. Citation analysis has been treated as a major and a primary method of scholarly impact measurement for research publications (Yang *et al.*, 2018), at the same time, it has been highly condemned due to self-citation (Waltman and Caspar, 2016) and other manipulations, such as data misuse,

plagiarized citations, internal promotion of one's research and so on (Lopez-Cozar *et al.*, 2012). The demand for a substitute over conventional citation metrics led to the evolution of altmetrics which helps to gauge the wider impact of research output considering social media crowdsourcing data (Taraborelli, n.d.; Academy, 2018; Bornmann, 2014). Bornmann (2015) defined altmetrics as "data sources, tools, and metrics (other than citations) that offers relevant information on the impact of scientific outputs by counting how many times an article tweeted, shared, bookmarked, liked, accessed or read in the social media platform".

The scientific outputs being switched on in open access mode have found more citations because of their easy visibility and accessibility (Antelman, 2004; Donovan and

Watson, 2011; Gargouri *et al.*, 2010; Ottaviani, 2016). As far as altmetrics is considered, to what extent open access helps to get more social media citation is still undiscovered. This study would be such a way to explore the variation in altmetric benefits among OA and NOA articles being published in Nature Journal.

RESEARCH OBJECTIVES

1. To understand the major online attention of the articles.
2. To know the social media citations to the articles (Altmetric Attention Score).
3. To calculate the Mendeley readership of the articles.
4. To check the major tweeters of the articles geographically and demographically.
5. To estimate the correlation between altmetric attention score and article access.
6. To compare the altmetric score of OA and NOA articles.

RESEARCH HYPOTHESES

1. There is a positive correlation between article access and altmetric attention score.
2. Open access articles bag a more altmetric attention score compared to non-open access.

DATA AND METHOD

Data for the study were collected from Nature journal on 16th January 2020 which has incorporated *Altmetrics.com* for giving the altmetric score for the articles. For the present study, we have selected the *Business and Commerce* domain (<https://www.nature.com/subjects/business-and-management>). Top 10 articles in terms of article access and altmetric attention score from the sub-areas of Business and Commerce viz. *Business and Management*, *Economics and Finance* were selected for further

analysis. The corresponding article access and altmetric attention score have been counted by the AR score harvested in the altmetric badges of each article. To know the correlation between article access and altmetric score, a Pearson correlation test was run and for determining the difference between the altmetric benefits among OA and NOA publications, One-Sample T-Test was applied.

DATA ANALYSIS AND INTERPRETATION

Table 1 show the top 10 articles which have been selected from Nature journal under the subject category of Business and Commerce and further have had a choice of sub-areas as Business and Management, Finance and Economics. We have selected five OA and NOA articles to compare the altmetric benefits. The article titled “Genome-wide analysis identifies molecular systems and 149 genetic loci associated with the income” authored by W. David Hill is the highly accessed article with a 75000 access count and 2990 altmetric attention score. Geocoding of worldwide patent data penned by Gaetan de Rassenfosse is the least altmetric scored article with 32 social media citations and has been accessed 1619 times.

Major online attentions

Data in Table 2 shows the major online attention received by each paper. Of the 10 papers, the 9th one has got the highest twitter citations with 5043 followed by the 8th and 7th with 889 and 479 citations respectively. The former is the highly socially cited paper in which the share of Twitter is creditable. Tweets-metrics can reflect the impact of scientists such as public outreach and science communication (Haustein *et al.*, 2014). The twitter citations have a positive correlation with the altmetric score of the article (Ravikumar and Khonglam, 2018). It is also visible from the table that many papers are yet to be picked up on other social platforms thereby the caption and mention metrics are found very little or even zero.

Table 1: Top 10 articles with Altmetric attention score and article accesses

S.No.	Title	Author	Publication Year	Sub-Area	Type of Access	AAS	AA
I	Complex economic activities concentrate in large cities.	Pierre-Alexandre Balland	2020	1	B	325	378
II	Metrics for sustainable development goals: renewable energy and transportation.	Jonathan J. Buonocore	2019	1	A	59	2487
III	The critical role of second-order normative beliefs in predicting energy conservation.	Jon M. Jachimowicz	2019	1	B	214	1337
IV	What do postdocs need to succeed? A survey of current standing and future directions for Australias researchers	Margaret C. Hardy	2016	1	A	85	1178
V	A scalable goal-setting intervention closes both the gender and ethnic minority achievement gap.	Michaéla C Schippers	2015	1	A	263	15000
VI	A quantitative analysis of 10 multilateral development banks' investment in conventional and renewable power-generation technologies from 2006 to 2015.	Bjarne Steffen	2018	2	B	37	1238
VII	Complex economic activities concentrate in large cities.	Pierre-Alexandre Balland	2020	3	B	325	378
VIII	Comparing meta-analyses and pre-registered multiple-laboratory replication projects.	Amanda Kvarven	2019	3	B	565	723
IX	Genome-wide analysis identifies molecular systems and 149 genetic loci associated with income.	W. David Hill	2019	3	A	2990	75000
X	Geocoding of worldwide patent data	Gaétan de Rassenfosse	2019	3	A	32	1619
	Total					4895	99338

1-Business and Management, 2- Finance, 3-Economics

A-Open Access, B-Non-Open Access, AA -Article Accesses, AAA-Altmetric Attention Score

Table 2: Major online attentions

Article #	I	II	III	IV	V	VI	VII	VIII	IX	X	Total
Twitter	478	23	79	116	182	69	479	889	5043	58	7416
News Outlet	1	5	19	3	22		1	2	6	-	59
Blog	-	1	3	-	2	1	-	3	2	-	12
Mendeley	-	5	89	8	131	57	-	-	-	10	300
Facebook	-	-	2	1	4		-	1	2	-	10
Google +	-	-	-	-	6	2	-	-	-	-	8
Reddit	-	-	-	-	2		-	3	9	-	14
Video	-	-	-	-	1		-	-	-	-	1
Wiki	-	-	-	-	1		-	-	-	-	1
Citeulike	-	-	-	-	1		-	-	-	-	1

Major Tweeters and user Category

According to the data in Table 3, Picture 1 and Figure 1, the 2nd paper has the least number of tweeters. Of the ten papers, eight papers got the highest number of tweeters from the US with 6216 total tweeters which are accounted for 83.81% of the total tweeters for the ten papers. This study correlates with the study findings of Vysakh and Babu (2019). A study report reveals that 87% of Americans heard about Twitter (Baer, 2008). It is also ostensible from the table that the major user category who use to tweet/mention/cite the papers on

Twitter is the general public which goes in line with the study finding of Zhou and Na (2019) and Batcha (2018).

Mendeley Readership

Concerning the Mendeley readership and the discipline wise readers, the data in Table 4, article 5 got the high number of Mendeley readers with 131 readers followed by Article 3 and 6 with 89 and 57 readerships. PhD Students and Researchers are the top readers for the articles which correlate the study findings of Haustein and Lariviere (2014). The discipline wise readership

Table 3: Major tweeters and user category

Article #	Tweeters	Country	Tweets	Percentage	User	Count	Percentage
I	420	US	79	16.53	Public	313	75
II	16	India	3	13.04	Public	15	94
III	71	US	17	24	Public	46	65
IV	96	US	46	48	Public	51	53
V	138	US	30	22	Public	126	91
VI	45	US	7	16	Public	35	78
VII	422	US	79	19	Public	314	74
VIII	802	US	201	25	Public	493	61
IX	4222	US	803	19	Public	2952	70
X	43	Switzerland	5	12	Public	34	79
Total	6275	-	1270	-		4379	-

Picture 1: Geographical distribution of tweets



Figure 1: Number of Tweepers

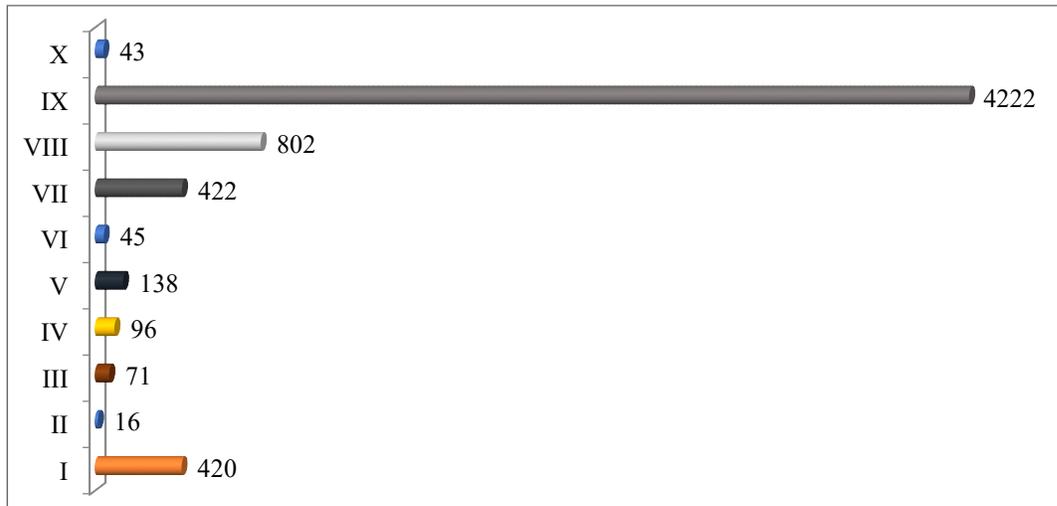


Table 4: Mendeley readership

Article #	Mendeley	User Category	Count	Percentage	Discipline	Count	Percentage
I	-	-	-	-	-	-	-
II	5	Researcher	3	60	Agriculture & Biological Science	1	20
III	89	Student-Master	25	28	Psychology	17	19
IV	8	Student-PhD	3	38	Social Science	2	25
V	131	Student-master	28	21	Psychology	34	26
VI	57	Student-PhD	15	26	Energy	10	18
VII	-	-	-	-	-	-	-
VIII	-	-	-	-	-	-	-
IX	-	-	-	-	-	-	-
X	10	Researcher	3	30	Economics	4	40
Total	300		77			68	

shows that 2 papers (Article 3 and 5) got the highest number of readers from Psychology with 17 and 34 readers respectively. Even though the Mendeley readership metrics score is very less according to our study, it could be used as a novel measure to capture the knowledge transfer across various disciplines and has a positive correlation with the altmetric score (Mohammadi and Thelwall, 2013).

Correlation and Altmetric Benefits

Table 5 demonstrates the association between the article access and altmetric attention score. It has resulted from the Pearson correlation test that higher article access

led to higher altmetric score ($r(9) = .965, p = .00$). So, the first hypothesis is accepted. To check the altmetrics benefits among open and non-open access articles, One-

Table 5: Correlation between article accesses and Altmetric attention score

		AAS	AA
AAS	Pearson Correlation	1	.965**
	Sig. (2-tailed)		.000
	N	10	10
AA	Pearson Correlation	.965**	1
	Sig. (2-tailed)	.000	
	N	10	10

** . Correlation is significant at the 0.01 level (2-tailed).

Table 6: Difference in Altmetric benefits among open and non-open access articles

	Access	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
AAS	Open Access	5	685.8	1291.258	.672	8	.520
	Non-Open Access	5	293.2	192.2296	.672	4.177	.537

Sample T-Test was applied and the result is given in Table 6. It is ostensibly that there is no significant difference in gaining altmetric attention among open and non-open access articles (p -value = 0.520) which correlates the study finding of Gaule and Maystre (2011); Koler-Povh *et al.* (2014); Wray (2016) and ironical to the study finding of Ottaviani (2016); Gargouri *et al.* (2010); Antelman (2004) and Donovan and Watson (2011); Holmberg *et al.* (2019); Antelman (2004); Wohlrabe and Birkmeier (2014); Wang *et al.* (2015). The second hypothesis is so rejected.

CONCLUSION

The current study aims at determining whether OA publications gain more Altmetric attention compared to NOA publications. It is found that OA articles don't find more social citations. But to an extent, it can be said that the article access rate would stretch out as it is freely available, in unlocked mode and mostly free from copyright restrictions. If an author wishes to publish in an open-access journal to spread the research findings for the public good, the impact factor does not matter (Sood *et al.*, 2017). The self-selection of higher quality articles and making them available in OA might help to boost the citations and social media attention (Gaule and Maystre, 2011). It is also recommended that authors can make use of social media platforms for publication, which helps to globalize the research output and thus, the broader impact tracing with altmetric tools easily. The current study is conducted with a limited sample and an extended study would give more insights on the open-access advantages of getting citations as well as social media citations of articles. A similar kind of study can also be conducted in other domains to prove the same.

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