Citation behavior: A large-scale test of the persuasion by name-dropping hypothesis — Source link ⬏

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Citation Behavior: A Large-Scale Test of the Persuasion by Name-Dropping Hypothesis[1]

Tove Faber Frandsen[2] & Jeppe Nicolaisen[3]

Abstract: Citation frequencies are commonly interpreted as measures of quality or impact. Yet, the true nature of citations and their proper interpretation have been the center of a long, but still unresolved discussion in Bibliometrics. A comparison of 67,578 pairs of cited and uncited studies on the same healthcare topic, with the same publication age (1-15 years) reveals that at the time of citation, the study being cited has on average received about three times as many citations as the uncited study. However, the average citation-gap between cited/uncited studies narrows slightly over time, which fits poorly with the name-dropping interpretation and better with the quality/impact-interpretation. The results demonstrate that authors in the field of Healthcare tend to cite highly cited documents when they have a choice. This is more likely caused by qualitative differences rather than status differences.

INTRODUCTION

Scientific tradition requires that scientists reporting their research adequately refer to publications in the same or related areas (Grafton, 1997). The references are supposed to identify publications from other researchers whose ideas, theories, methods, etc. inspired or were used by the citing author in the research process (Weinstock, 1971). The extent to which this tradition is actually upheld has been debated for quite some time (Nicolaisen, 2007), and studies have revealed that in fact only a much smaller fraction of a citing author's total inspirations end up getting cited in the literature list of the reported research (Brooks, 1985; Brooks, 1986; MacRoberts & MacRoberts, 1986). Sceptics of citation analysis for research evaluation purposes have pointed to this as evidence for their case (MacRoberts & Macroberts, 1996; Seglen, 1997). Proponents, on the other hand, have defended their case by arguing the law of large numbers, stating that as long as citation analyses are based on many reference lists, results are valid (e.g., Narin, 1987; Nederhof & Van Raan, 1987; Small, 1987; White, 2001). The sceptics have countered this by claiming that the law of large numbers is only applicable in cases where bias is distributed randomly, and that biased citing is not random (MacRoberts, 1997). Specifically, it is claimed that authors disproportionately cite works by

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established authorities, so as to gain credibility by association (Gilbert, 1977; Latour, 1987). In the field of Bibliometrics this is known as the *persuasion by name-dropping hypothesis* (White, 2004). Proponents of citation analysis for research evaluation purposes have challenged the hypothesis by pointing to empirical studies of citation distributions that show little or no signs of such biased citing (e.g., Stewart, 1983; Zuckerman, 1987; Moed & Garfield, 2003; Van Dalen & Henkens, 2001; White, 2004). These studies reveal that authors do not tend to favor highly cited names or highly cited publications. On the contrary, most authors cite the entire scale of citation reputation. There is, however, a possible problem associated with taking these studies as evidence against the persuasion by name-dropping hypothesis. They do not really test the essence of the hypothesis. A proper test would investigate whether authors that have a choice between citing equally citable authors or documents tend to choose citing the highly cited ones. This introduces the problem of defining sets of equally citable authors or documents. A problem that seem to have stopped or at least paused the often heated discussion between proponents and sceptics of citation analysis.

We believe to have found a possible solution to the problem. Cohorts of research addressing the same research question may be identified using systematic reviews. The included studies of any given systematic review may then be examined to determine which of the preceding studies were cited. On the basis of that analysis it is possible to match pairs of cited and uncited studies of the same age and to trace their number of citations at the time of citation/not-citation.

In the following we present the results of a large-scale study in which we retrieved 5,843 systematic Healthcare reviews from 53 Cochrane groups. Some did not contain any included studies resulting in 5,042 systematic reviews. In those reviews we were able to match the included studies to 60,495 references in Web of Science resulting in 1,525,651 incidences of a given study citing or not citing a preceding study. We were able to match 67,578 references in pairs of cited and uncited studies with the same publication age resulting in a total of 135,156 data points.

RELATED LITERATURE

Citation analyses are frequent within the health sciences and hold potential for both health care scientists and practitioners (Thomson & Walker, 2015). One area of concern is the use of previous research when designing, conducting and interpreting healthcare research. Borgerson (2014) states that "[c]linical research has at least three problematic features: it tends to be redundant, secretive, and isolated." Research with these features expose trial participants to unnecessary risk and is a waste of resources. A well-known example is the numerous placebo trials on the effects of the drug aprotinin on perioperative blood loss taking place long after strong evidence indicated that the drug was effective (Fergusson et al., 2005). Even though the number of published trials kept rising the number of citations to the previous trials did not increase. Even citations to the largest trial and available reviews were few and probably more than 10,000 patients were enrolled in redundant trials.

Another example is the study by Antman et al. (1992) on the effects of treatments for myocardial infarction showing how science's failure to cumulate evidence led to lethally incorrect advice in textbooks between 1960 and 1990. Advice on life-saving therapies were delayed for more than a decade and other treatments had been recommended long after controlled research had shown them to be harmful. Poor use of prior research is confirmed by several studies. Robinson and Goodman (2011) find that fewer than 25 per cent of preceding trials were cited, comprising fewer than 25 per cent of the participants enrolled in all relevant prior trials. A median of 2 trials was cited, regardless of the number of prior trials that had been conducted. Goudie et al. (2010) find that only 22 per cent of trials reported the use of previous trial(s) for sample size calculations. Meta-analyses relating the results of the trial to previous research were cited in 37 per cent of the report discussion sections. Furthermore, Clarke and Chalmers (1998) find RCTs rarely discuss results in the context of an updated systematic review of earlier trials. Sheth et al. (2011) find higher citation rates ranging from 33 to 70 per cent with an overall citation rate of 48 per cent. However, all studies find that previous literature is not being cited consistently.

The use of previous reviews in reviews seems to be considerably higher although few are described and even fewer mentioned in the discussion of the results (Helfer et al., 2015). Habre et al. (2014) finds that the impact of the systematic review on the design of subsequent research was low and the number of trials published per year had not decreased. A study is more likely to be cited if it is agreement with the more recent trial both in the case of trials and reviews (Helfer et al., 2015; Andrade, Flynn, & Bartanusz, 2013; Sawin & Robinson, 2015). The poor citation of prior studies are the main reason why the citation networks of related trials tend to be disconnected (Robinson et al., 2014).

Most of the abovementioned studies recommend incorporation of systematic methods for identifying previous studies as means to improve the quality of healthcare research. As stated by Clarke, Brice & Chalmer s (2014: 4):

> [We] argue that people designing, funding, conducting and then interpreting new studies should make their decision to do so in light of an up-to-date systematic review and, if possible, meta-analysis of existing related research.

However, in the case of redundant research this viewpoint is challenged by Ker and Roberts (2015) arguing that poor quality is a more important cause of redundant research than the failure to review existing evidence. They find that low-quality trials are a more important cause of 'research waste' than the failure to systematically review the existing evidence. They exclude the poor-quality studies and the number of statistically 'redundant' trials thus reduces from 98 to 15.They find that the main motivation for new trials is concerns about generalisability of results. They even find that systematic reviews showing treatment effects can stimulate an increase in trial activity rather than reduce it.

Summing up, the existing literature shows that previous trials and reviews are only cited to a smaller extent and even less when it comes to discussing recent findings in the light of older studies. However, quality of research is a factor that should be taken in to account before making final conclusions on the consequences.

METHODS

Cohorts of research in healthcare addressing the same research question may be identified using systematic reviews. A systematic review is a research article that identifies all relevant studies, appraises their quality and summarizes their results using a scientific method (Khan, 2003). The term "systematic review" is being used to describe reviews of varying quality (Liu et al., 2014; Moher et al., 2015; Panic, Leoncini, de Belvis, Ricciardi, & Boccia, 2013; Peters, Hooft, Grolman, & Stegeman, 2015; Zorzela et al., 2014). Consequently, for the purpose of this study we use Cochrane reviews. Cochrane Reviews are "systematic reviews of primary research in human health care and health policy" (http://community.cochrane.org/cochrane-reviews) and the use of The Cochrane Library systematic review methodology is associated with an improvement of the methods and quality of the reviews. (Collier, Heilig, Schilling, Williams, & Dellavalle, 2006; Moseley, Elkins, Herbert, Maher, & Sherrington, 2009). Consequently, we use the Cochrane reviews to form the basis of our analyses. A Cochrane review contains a list of included studies and these studies will have similar research questions. The included studies of any given systematic review may then be examined to determine which of the preceding studies were cited in that specific study. An example: 3 studies are included in a Cochrane review; consequently we can assume that they are dealing with similar research questions. Then we match these 3 references to references in Web of Science and see whether or not these studies are citing the earlier studies. Lets say study A was published 2001, study B in 1995 and study C in 1990. Study A can then cite study B and study C, whereas study B can only cite study C and study C is unable to cite either of the two earlier studies. We want to know which of the eligible studies they are citing.

On the basis of that analysis it is possible to analyse cited and un-cited studies. In the following we present the results of a large-scale study in which we retrieved 5,843 systematic reviews from 53 Cochrane groups (withdrawn reviews were excluded). We only include a pair of potentially citing and cited document if the cited / non-cited document is from the same publication year or older as a study in 1995 would not be able to cite a study from 2000. We include pairs of publications with the same publication year although we know that it citing within the same year implies knowledge of the study, citing it and being published, which is a process that can often take more than a year (see e.g. Rosenkrantz & Harisinghani, 2015). However, it does happen and that may be due to preprint, early view etc. Some did not contain any included studies resulting in 5,042 systematic reviews. In those reviews we were able to match the included studies to 60,495 references in Web of Science resulting in 1,525,651 incidences of a given study citing or not citing a preceding study. We were able to match 67,578 references in pairs of cited and uncited studies with the same publication age

resulting a total of 135,156 data points. Figure 1 provides an overview of the data collection process.

Cochrane reviews

We retrieved 5,843 systematic reviews → 801 reviews included no studies

5,042 systematic reviews containing included studies

References in Cochrane reviews

Matching of the included studies to 60,495 references in Web of Science

1,525,651 incidences of a given study citing or not citing a preceding study → 1,390,495 references could not be matched in pairs

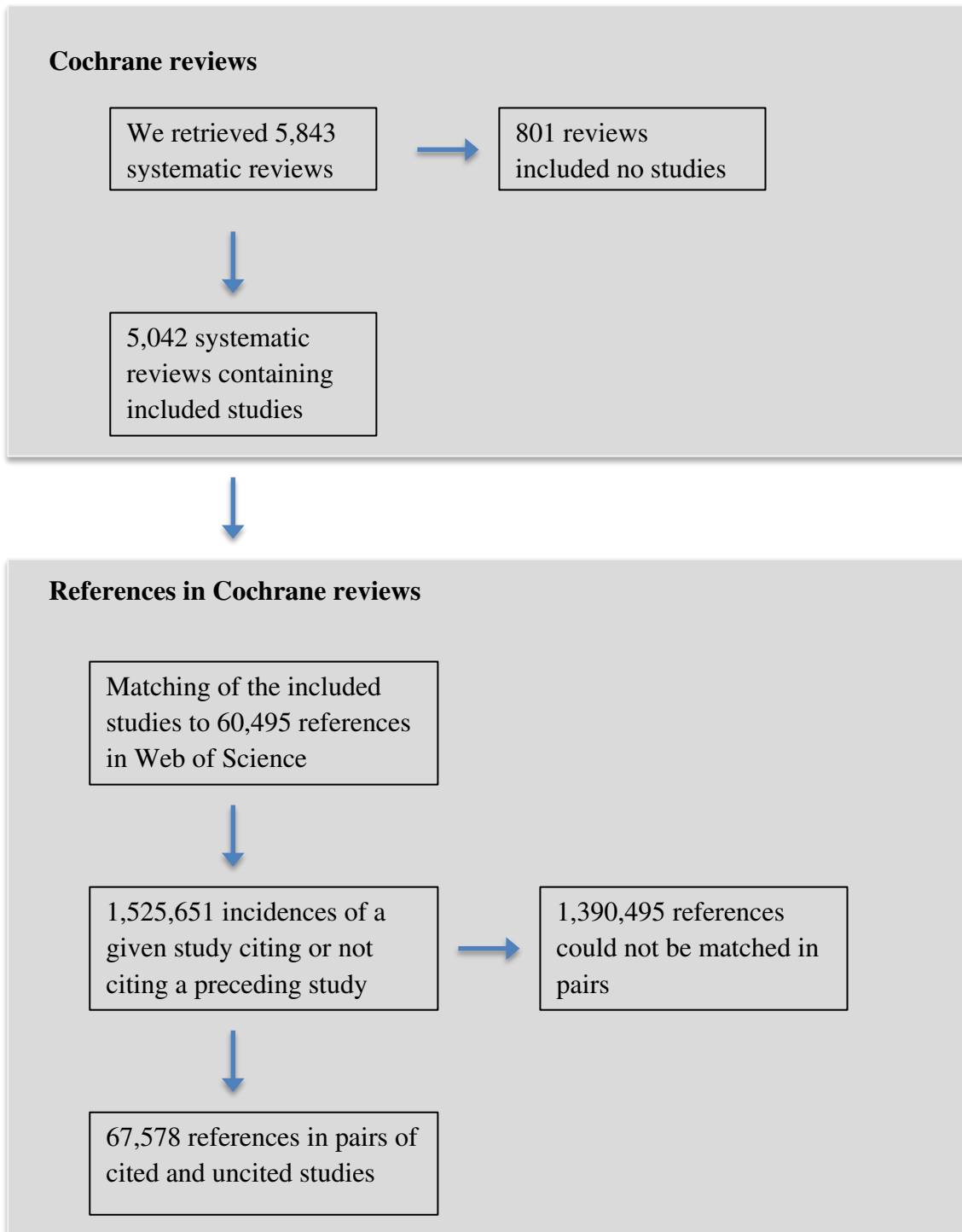67,578 references in pairs of cited and uncited studies

Figure 1. Overview of the data collection process.

The data collected consists of the following information:

- Name of Cochrane group
- Publication year of the citing or potentially citing study
- Publication year of the cited or potentially cited study
- Number of citations received by the cited study at the time of possible citation by the citing study.
- Whether or not the study is actually being cited

In the following we present an analysis of the number of citations to previous trials that were cited in a subsequent study compared to the number of citations to studies of the same age that were not included in the same citing study.

RESULTS

Before turning to the results we will provide some descriptive statistics of the data. Table 1 provides an overview of the number of pairs of the cited and un-cited previous studies in the data analysis.

Difference in years between citing and cited publication	Cited	Un-cited	Number of pairs
1	12632	177770	8705
2	16396	155454	10404
3	15577	139417	9590
4	13573	122807	8106
5	11508	108011	6641
6	9314	94698	5258
7	7766	81204	4267
8	6126	70804	3240
9	5162	61167	2681
10	4067	52463	1986
11	3168	44741	1489
12	2520	38170	1188
13	2098	33488	944
14	1616	29838	654
15	1310	25513	556
16	1041	22751	400

17	780	19830	301
18	694	17035	246
19	510	14670	192
20	403	12846	143

Table 1. Number of cited, un-cited and matched pairs according to the age difference between citing and cited publication. Only the first 20 years are shown.

From table 1 we can see that more than half of the pairs in the data sample are 4 years or younger than the citing publications. The accelerating rates of included publications in Web of Science naturally lead to this distribution of the included pairs.

Figure 2 is an overview of the number of citations received on average by cited and non-cited studies according to age. It is obvious that the number of received citations at the point in time of citation can predict which is document is more likely to be cited. At the time of citation the study being cited has received about three times as many citations as the un-cited – slightly more for younger studies than older. Statistics obviously supports this thesis. We find that difference between the two groups is significantly different from zero, when using a standard t-test and the 5 percent significance level.

The dashed lines show the 95 percent confidence interval for cited and not cited studies.
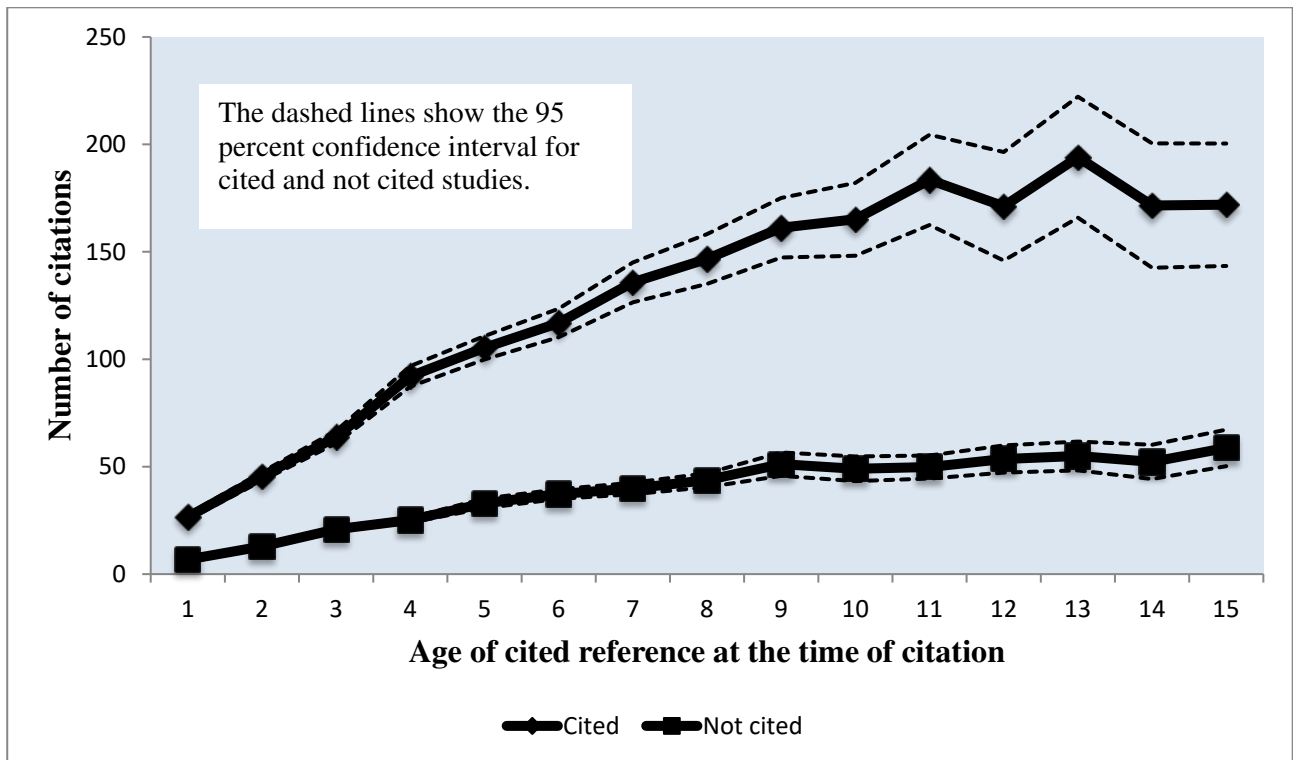
Figure 2. Average number of citations to studies at the time of citation/non-citation separated into the age of the studies.

Figure 3 can elaborate on the differences between cited an non-cited studies. Figure 3 shows the difference in the number of received citations. Note, however, that the negative linear correlation is not statistically significant at the .05 nor at the .1 level (p-value of .17). What we find, however, is that older documents that have had much longer time to accumulate their citation advantages does not differ significantly from younger documents when it comes to the average citation-gap. Thus, we believe to have found a way to measure whether authors that have a choice between citing equally citable documents tend to choose citing the highly cited ones. Our results clearly show a strong tendency towards this. Yet, the missing accumulation of citation advantages over time suggests that this is more likely to be caused by qualitative differences rather than being acts of name-dropping.

The difference in citations = the number of citations to cited / number of citations to un-cited studies.
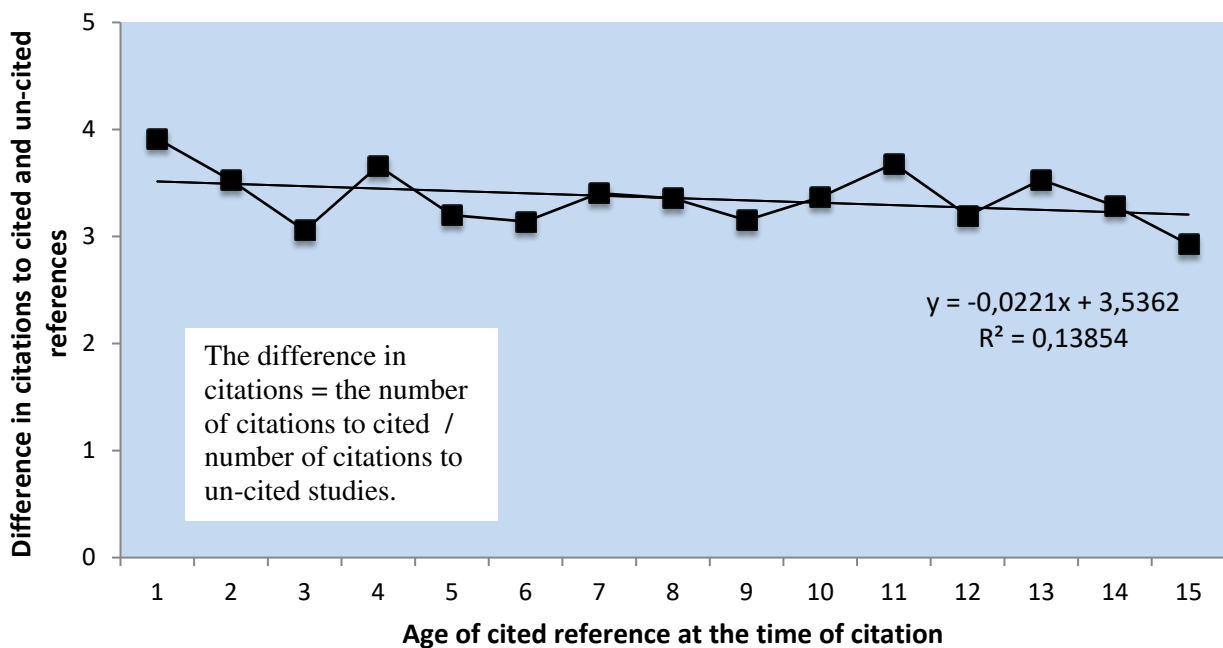
$y = -0,0221x + 3,5362$
$R^2 = 0,13854$

Figure 3. The number of received citations by cited and un-cited studies

DISCUSSION

Redundancy is a well-known problem within healthcare research and exposes trial participants to unnecessary risk as well as wastes resources. Poor use of prior research is also confirmed by this

study showing that there are 9 to more than 30 times as many un-cited as cited studies. However, as some references were not matched and we cannot determine if the unmatched references were distributed evenly across the data set, we cannot make any conclusions regarding whether or not the factors are precise. However, we can see than there seems to be a substantial difference in the number of cited versus un-cited studies. Consequently, not all prior studies seem to be cited consistently in new trials. It may be that reviews are cited to substitute the use of trials, although, that is beyond the scope of this study. However, the lack of citations to earlier studies may not necessarily pose a problem. It may be a question of quality i.e. that poor quality is a more important cause of redundant research than the failure to review existing evidence. In this case we find that not all relevant studies are cited in more recent studies but we also find that authors tend to cite highly cited studies more than less cited studies indicating that they make a selection based on some criteria which may be explained by the name name-dropping hypothesis.

According to Gilbert (1977, p. 116): "Authors preparing papers will tend to cite the 'important and correct' papers, may cite 'erroneous' papers in order to challenge them and will avoid citing the 'trivial' and 'irrelevant' ones. Indeed, respected papers may be cited in order to shine in their reflected glory even if they do not seem closely related to the substantive content of the report". Latour (1987, p. 33–34) speculates along the same lines, arguing that in order to put up a persuasive facade, authors basically fake their scholarship: "First, many references may be misquoted or wrong; second, many of the articles alluded to might have no bearing whatsoever on the claim and might be there just for display". These actions are not presented as being inconsequential. On the contrary, if readers were to find out what is actually going on, the result would be disastrous for the authors. Thus, the issue is not just that scientists and scholars write to persuade and use citations as a rhetorical resource. No, the persuasion hypothesis is the idea that persuasion in science and scholarship relies on misleading manipulation indistinguishable from commercial advertising (Nicolaisen, 2007). White (2004) argues that the persuasion hypothesis should be divided in parts. The first part has to do with what citers say about cited works, or more precisely, the contexts in which they discuss them. White (2004, p. 96) calls this "persuasion by distortion" with the attachment "citers often misrepresent the works they allude to, twisting their meaning for their own ends". The second part has to do with the choice of the cited works themselves, regardless of what is being said about them. White (2004. p. 96) calls this part "persuasion by name-dropping" and notes that it is more or less independent of context: "Citers disproportionately cite works by established authorities, so as to gain credibility by association". This may actually be a little too restrictive. If one reads closely the quotations provided above, it is clear that neither Gilbert (1977) nor Latour (1987) restrict their definition of a citation given just for display to a citation given to established authorities. It could equally well be e.g. a citation to a paper published in a prestigious journal, or a citation to a highly cited paper. Actually, Zuckerman (1987) tested the second part of the persuasion hypothesis using citation frequency of cited papers as her benchmark.

Likewise, the results of our large-scale test relates to the second part of the persuasion hypothesis (persuasion by name-dropping). What they show is that authors in the field of Healthcare, that have a choice between citing equally citable documents, tend to cite the highly cited ones. However, a citation to a highly cited document could be given for other reasons than simply name-dropping. Most obviously, it could be that although the pair of documents is equally citable at face value (they address the same topic), they differ when it comes to quality. One of them is simply better, and is therefore cited more often. The slight decline in the citation-gap between cited/uncited documents over time (figure 3) suggests a more careful interpretation than simply *name-dropping*.

Robert K. Merton famously developed a theory in Sociology of Science that small differences in initial status increase over time to generate cumulative advantages (Merton, 1968). The theory is known as the *Matthew Effect* (from the Gospel According to St. Matthew, where it is stated, "For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath" (25:29). Theoretically, the Matthew Effect may be generalized to all scientific work by hypothesizing that characteristics other than the scientific work itself influence the reception of scientific research. As early as 1970 citation analyses conducted by one of Merton's own former students (Cole, 1970) seriously questioned the adequacy of the Matthew Effect. "The eminence of an author had very little correlation with the reception of new studies. The Matthew Effect described a pattern that did not exist. It was wrong" (Cole, 2004: p. 840). Our result is yet another nail in this coffin. If the theory was correct, the initial citation status of highly cited papers should accumulate over time resulting not in a slight decline in the citation-gap between cited/uncited documents, but in a sizeable increase. What we find, however, is that older documents that have had much longer time to accumulate their citation advantages does not differ significantly from younger documents when it comes to the average citation-gap[4].

By using systematic reviews to identify cohorts of research addressing the same research question, we believe to have found a way to measure whether authors that have a choice between citing equally citable documents tend to choose citing the highly cited ones. Our results clearly show a strong tendency towards this. Yet, the missing accumulation of citation advantages over time suggests that this is more likely to be caused by qualitative differences rather than being acts of name-dropping. This is in line with the results of a recent interview study (Thornley et al., 2015) in which 87 researchers from the US and UK were asked about their reasons for citing five references in a recent publication. Their results show that only 3.8% of the cited references were motivated by the publication's high citation record.

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