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Publication Bias: A Threat to the Objective Report of Research Results

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Submitted to ERIC database, March 2009

The paper was initially presented at the 2007 annual meeting of the
Northeastern Educational Research Association, Rocky Hill, CT.

Abstract

Ethical practices in education and research should take into consideration the publication of results that failed to conform to popular theories and models. This paper focuses on issues related to publication bias. It is possible that researchers are unaware of the threats publication bias poses to the validity and objectivity of research.

Publication Bias: A Threat to the Objective Report of Research Results

“Unfortunately, we are not able to publish this manuscript. The manuscript is very well written and the study was well documented. Unfortunately, the negative results translate into a minimal contribution to the field. We encourage you to continue your work in this area and we will be glad to consider additional manuscripts that you may prepare in the future. (cited in Sterling, Rosenbaum, & Weinkam, 1995, p. 109).

This letter, sent by the editor of a major environmental/toxicological journal explaining why a manuscript had been rejected, demonstrates some form of *publication bias*. Scargle (2000) explained that “*publication bias exists if the probability that a study reaches the literature, and is thus available for combined analysis, depends on the results of the study.*” (Scargle, 2000, p. 92). Publication bias, otherwise called positive-outcome bias, is the tendency to publish research with a positive outcome that appears significant more frequently than research with a negative outcome. As the case above suggests, publication bias often takes place on the part of reviewers and editors who are less likely to publish negative or near neutral results, meaning findings that are not statistically significant. Some other sources of publication bias from the part of the reviewers and editors might include jealousy, revenge, and prejudice against certain topics, individuals, or institutions (McCutchen, 1997, as cited in Wilson, 2002).

However, publication bias is also caused by investigators who don't submit their negative outcome studies for publication, but rather hide those in their file drawers (“file-drawer effect”) (Dickersin, 2004; Torgerson, 2006). Research has shown that the main reasons investigators fail to submit their research for publication are the negative results themselves, and lack of motivation when the results are not interesting (Thornton & Lee, 2000). Researchers may also

not submit their work if they feel that the study was poorly designed and are aware of serious limitations (Thornton & Lee, 2000). Moreover, a consequential drive by overcommitted researchers to publish only their statistically significant positive studies makes them hesitate to submit anything less exciting for publication (Shields, 2000). Finally, another common cause is the perceived bias of the peer review system in favor of papers that report the detection of significant positive effects (Shields, 2000). Yet, the issue becomes even more serious as investigators do not submit their studies for publication because their new findings are either contrary to their earlier research or reveal that their interventions affect the subjects negatively. Thus, a broader definition of publication bias would suggest that it is any influence that reduces the amount of good science appearing in the literature (Scholey & Harrison, 2003), and it is damaging to the process of scientific research whether it takes place on the part of reviewers, journal editors, or investigators.

There is a large body of evidence confirming that publication bias is a substantial problem, and it poses a serious threat to the objective report of research results. Recently, Torgerson (2006) conducted an extensive historical overview of problem of publication bias within healthcare, psychological, and educational literature. Her study disclosed that over several years, significant numbers of studies having non-statistically significant findings have probably not been published in any major journals in the fields. She concluded that for more than 40 years various methodological and empirical researchers have been reporting significant evidence for a file-drawer effect in research, yet the problem persists. How what is excluded compares to what is included in the literature remains an unanswered question. But what if the numerous missing studies systematically showed different results than those included in the literature? What are the

true reasons these studies remained unpublished? Are we doing scientific research, and are we really learning the truth?

Researchers (e.g., Ioannidis, 2005; Scargle, 2000) argued that only a small number of studies lost in the file-drawer can produce a significant bias in psychic, medical, and social science research. The file-drawer effect has proven to be a major threat to the validity of systematic reviews and meta-analyses in nearly every field. If publication bias exists in the literature, researchers searching for potentially relevant studies to include in systematic reviews or meta-analyses will find considerably more studies with significant positive results than studies with significant negative results (Wilson & Lipsey, 2001). Thus, if the reasons why studies remain unpublished are associated with their findings, reviews or meta-analyses based only on published data may reach misleading conclusions.

Apparently, once the problem exists at the lower level, it is inherited and expanded, and is difficult to be detected and fixed. Results from reviews and meta-analyses can be trusted only if all studies that have been carried out in the field of interest are fairly represented in the literature. Such a thing can be accomplished only if publication bias is prevented for occurring in the first place (Thornton & Lee, 2000). Prevention of publication bias is important both from a scientific perspective (sharing and consuming complete knowledge) and from the perspective of those who combine results from a number of studies to formulate general conclusions (reviews and meta-analysis) (Dickersin, 2004).

Dickersin, Min, and Meinert (1992) argued that the “file-drawer effect” actually influences publication of research results more than rejection by journals. Themes associated with publication bias of this form include *under-reporting* research and *hyper-claiming*. These topics are concerned with tendencies of the investigators to manipulate the truth of their research

in order to get published. Research on under-reporting and hyper-claiming try to investigate *what* is not reported in the literature and *why*, as well as *how objectively* studies are reported.

Rosenthal (1994) argued that one's decision not to publish when a study has been really badly done, so called "*self-censoring*", is admirable and that simply starting over might be a better choice even though it seems waste of information. However, unfortunately, self censoring does not always occur for the right reasons. "*Failing to report data that contradict one's earlier research, or one's theory, or one's values, is poor science and poor ethics.*" (Rosenthal, 1994, p. 7). Investigators should submit and (try to) publish their negative research results because failure to do so contributes to publication bias. Experimental results that are disappointing or uninteresting, for which no significant effects could be detected, are as valuable as the positive and exciting ones. Of course, exciting results may worth space in more prestigious journals, but less thrilling findings should also be made available to those who may need to know that finding (Rosenthal, 1994). If negative results are not made retrievable, researchers could be wasting time and other resources examining empirical questions that have already been examined.

With respect to biomedical sciences, Chalmers (2004) emphasized that underreporting research - or selective reporting - is scientific misconduct which can result in the continued use of medical treatments that are unnecessarily dangerous, ineffective, unpleasant, and costly, because studies that do not (re)confirm the expected benefits of those treatments remain unpublished. For example, in 1993, Cowley and his colleagues published a shocking article describing how failing to publish their own findings from a 1980 study let them repeat a serious mistake:

[The 1980 study] was designed to investigate the effect of lorainide on arrhythmias, and was never intended to be large enough to allow any conclusions to be reached about an

effect of lorainide on survival.... We thought that the increased death rate was an effect of chance... and the study was therefore never published (Cowley, Skene, Stainer, & Hampton., 1993, p.165).

A similar study was again conducted by the researchers 13 years later (in 1993), where nine patients died among the 49 assigned to lorainide compared with only one patient among a similar number assigned to placebos. Clearly, in some fields, underreporting research might cause a lot of damage. Although less severe, in education and social sciences, underreporting research may mislead competent researchers to try costly interventions associated with time-consuming data collection processes, attempting to replicate some desirable outcomes.

Underreporting/ selective reporting research is not only concerned with investigator's failure to report their negative results, but also with failure to report their results with sufficient detail to allow judgments to be made about their validity. Sales & Folkman (2000) argued that investigators should report their methods and analyses in a manner that allows reviewers to draw reasonable conclusions about the validity and generalizability of their research findings.

“Researchers should not report results selectively when a more comprehensive reporting would likely lead the reader to questions the reliability of findings.”(Sales & Folkman, 2000, p. 83).

Key details and procedures such as participations rates, sampling rates, sampling biases, and data manipulation (e.g., deletion of outliers) should be reported. Unexpected observations, flaws, and limitations of the study that the investigator is aware of should not be concealed. Any additional data analysis that might have been undertaken by the investigator should be included in the manuscript, even if the findings do not support the conclusions offered (Chalmers, 1990). *“In summary, the idea is to try to give all the information to help others to judge the value of your*

contribution, not just the information that leads to judgment in one particular direction or another.” (Feynman, 1985, as cited in Wilson, 2002).

Perhaps the biggest evidence of under reporting research can be found in the field of medicine, where many publications of studies sponsored by the pharmaceutical industry ignore the negative results of a treatment and only report the most favorable findings. Funding sources can exert great pressure on scientists to suppress or minimize inconclusive results and reports of adverse effects. In an investigation of factors associated with the publication of research findings in the medical field and field of medicine, analysts Dickersin, Min, and Meinert (1992) examined the fates of approved research proposals. They found that of 285 studies approved by a committee between 1984 and 1987 that had been completed by 1990, 138 had been published. Of the 138 published studies, the proportion of drug company-sponsored studies represented was significantly smaller than that of studies supported by government or voluntary organizations. The analysts concluded that data management by companies is a major reason for no publication, since companies often allow only favorable findings to be shared with the world.

Maybe an opposite tendency, yet closely related to underreporting of research results, is overselling of research results, so called *hyperclaiming*. Authors often exaggerate about the merits of their work, by reporting only a subset of the data analysis, and by avoiding a thorough discussion of the deficiencies of that work. An extreme example of overselling research in the recent years is the publication of the initial paper on Cold Fusion, by Fleischmann and Pons, in the Journal of Electroanalytical Chemistry in 1989 (cited in Wilson, 2002). The authors had gained worldwide attention by reporting that they had successfully induced a sustained nuclear fusion reaction at room temperature in a small jar on a laboratory tabletop. Many labs around the world repeatedly failed to replicate these findings within the months followed, as Fleischmann

and Pons had hyperclaimed about their research results. Perhaps, another example of overselling research would be leaving aside your initial hypothesis testing, because it did not work as you expected, and try multiple other hypotheses until you find something more exciting to report.

Although, methods of detecting, correcting for, and preventing publication bias in literature reviews and misanalysis have been developed (Ioannidis, 2005), this process is not that simple. As discussed previously, preventing publication bias from occurring in the first place would be the optimal solution (Thornton & Lee, 2000). Journal editors should encourage the submission and publication of good quality studies regardless of the direction (positive or negative) of their findings. Reviewers should focus more on the quality of a study - appropriate theoretical framework, good design (e.g., randomized design, sufficient power), transparent methods and procedures, appropriate statistical analysis, valid interpretation of the findings and inferences - rather than on the direction of the findings (positive or negative). Good quality studies having null or negative results should have the same chance of being published as those with outcomes in the positive direction. Apparently, bad quality studies should not get published even if the results are promising. Moreover, reviewers should always ask for a section on the limitations of the study, to avoid the problem of overselling research/ hyper claiming.

Recently, a group of psychologists have made an extreme attempt to prevent publishing bias. In 2002, they launched a new journal dedicated to experimental studies in psychology which fail to reject the null hypothesis – the Journal of Articles in Support of the Null Hypothesis (JASNH). According to the editors,

[O]ther journals and reviewers have exhibited a bias against articles that did not reject the null hypothesis. We seek to change that by offering an outlet for experiments that do not reach the traditional significance levels ($p < .05$). Thus, reducing the file drawer problem,

and reducing the bias in psychological literature. Without such a resource researchers could be wasting their time examining empirical questions that have already been examined. We collect these articles and provide them to the scientific community free of cost.” (JASNH, 2007, para.1).

The innovative idea of having journals dedicated to the publication of null results sounds promising; however this method addressed the problem publication bias only to some extent. Giving researchers the opportunity to publish their null results in some journal, is different than allowing equal chances for good quality studies to be published in any journal regardless the direction of their findings.

The key is to addressing publishing bias, and associated problems such as underreporting/selective reporting and hyperclaiming, is firstly to encourage investigators to submit good quality studies for publication regardless their findings; and secondly, to communicate to journal editors, reviewers, and investigators that null or negative results are as welcome and valuable as positive ones, and that focus should be on the quality of a study. From the investigators’ standpoint, knowing that their null or negative results are valuable to the research world might increase their motivation to submit their negative studies for publication (Thornton & Lee, 2000). On the other hand, reducing the perceived bias that reviewers favor manuscripts that report the detection of significant positive effects (Shields, 2000), might decrease the likelihood that investigators will try to mislead the reviewers (and consumers) by either underreporting or hyperclaiming.

At the expense of maybe more trouble-causing ethical issues in research, publication bias is sometimes given less attention in research ethics modules/courses. A quick search in the Internet for research ethics modules/courses showed that publication bias is not as a popular topic as human participants and consent, intellectual property, plagiarism, and authorship.

However, along with discussions on under-reporting and hyperclaiming, publication bias is fairly well represented as a topic in ethics related journals articles. Extreme incidents of publication bias, used as examples in journal articles, are usually taken from the medical field; however the problem exists in nearly every field including education, and social sciences (Scargle, 2000; Torgerson, 2006). Apparently, publication bias poses serious threats to the integrity of scientific research. It prevents us from consuming objective, true, and unbiased research, and introduces much error in what we read and believe. Thus, publication bias and relevant topics should be addressed in research ethics modules and courses.

Within several organizations and universities researchers (including reviewers) are often required to complete research ethics modules, courses, or trainings. Including topics of publication bias into such courses would be beneficial. Although not likely, it is possible that researchers are unaware of the threats publication bias poses to the validity and objectivity of research. Besides raising awareness, training would help investigators understand what really reviewers and journals editors look for, which should be good quality studies. On the other hand, training would help reviewers learn how to better detect problems of selective reporting and hyperclaiming, and how to ask for important revisions and clarifications to be made, before they accept a manuscript for publication. Better publication practices will lead to objective and unbiased research, and therefore to a better world.

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