

Article

The Demographics of Deception: What Motivates Authors Who Engage in Misconduct?

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Abstract: We hypothesized that scientific misconduct (data fabrication or falsification) is goal-directed behavior. This hypothesis predicts that papers retracted for misconduct: are targeted to journals with a high impact factor (IF); are written by authors with additional papers withdrawn for misconduct; diffuse responsibility across many (perhaps innocent) co-authors; and are retracted slower than papers retracted for other infractions. These hypotheses were initially tested and confirmed in a database of 788 papers; here we reevaluate these hypotheses in a larger database of 2,047 English-language papers. Journal IF was higher for papers retracted for misconduct ($p < 0.0001$). Roughly 57% of papers retracted for misconduct were written by a first author with other retracted papers; 21% of erroneous papers were written by authors with >1 retraction ($p < 0.0001$). Papers flawed by misconduct diffuse responsibility across more authors ($p < 0.0001$) and are withdrawn more slowly ($p < 0.0001$) than papers retracted for other reasons. Papers retracted for unknown reasons are unlike papers retracted for misconduct: they are generally published in journals with low IF; by authors with no other retractions; have fewer authors listed; and are retracted quickly. Papers retracted for unknown reasons appear not to represent a deliberate effort to deceive.

Keywords: data fabrication; data falsification; scientific fraud; plagiarism; misconduct

1. Introduction

Because the scientific literature is a tangible record of a search for truth, [1] missteps and errors are displayed openly for later scientists to see. The literature is assumed to be self-correcting, because misinformation is so visible. Papers are purged [2] if they result from scientific misconduct or serious

error [3]. Yet the assumption of self-correction highlights a paradox; if the literature does self-correct, then research misconduct should ultimately be futile, because it will eventually be revealed [4]. Why then would someone fabricate or falsify data?

Because of the apparent futility of fraud, it was hypothesized that retractions arise primarily from inadvertent error [5]. This hypothesis was amply disproven by a finding that at least 67% of retractions are due to misconduct, including data fabrication or falsification [6].

The futility of fraud suggests that the motivations for misconduct are fundamentally different from motivations that can result in other retractable offenses, such as scientific error, duplication, or plagiarism [4]. Thus, the differences between papers retracted with and without misconduct could potentially yield insight into the motivations of authors who engage in misconduct. We test this general hypothesis using an extended dataset [6] derived since the initial study [4].

2. Methods

Our goal here is to reexamine a number of *a priori* predictions formulated several years ago [4]. The new database was compiled by searching PubMed on 3 May 12, to identify English-language articles indexed as retracted [6]. Articles were classified as to cause of retraction into categories of misconduct (data fabrication or data falsification), suspected misconduct, scientific error, plagiarism, duplicate publication, other, or unknown [6]. “Misconduct” and “suspected misconduct” are here combined to form a single category of misconduct. Retraction announcements were used, together with a search of annual reports of the Office of Research Integrity (ORI). If the reason for retraction remained unclear, additional information was sought from *Retraction Watch* (<http://retractionwatch.wordpress.com>), on-line newspapers, and public records. Each classification decision was independently reviewed by all authors of the original paper and discrepancies were resolved [6]. Journal impact factor (IF) was abstracted from the 2011 edition of the Journal Citation Reports Science Edition (Thomson Reuters), released 28 June 12 [7]. If possible, the 5-year IF was used because it is more stable. Statistical analyses were performed using features native to Excel.

3. Results and Discussion

3.1. Results

No information is available as to the reasons for retraction of 178 out of 2,041 articles, or 8.7% of articles analyzed (Table 1). Papers with an unknown reason for retraction appeared in journals with a lower IF than papers with a known reason for retraction ($p < 0.0001$). Often, articles retracted for unknown reasons appeared in journals that were not among the subscription holdings available at several large universities. Papers retracted for an unknown reason were less often written by an author with other retractions ($\chi^2 = 41.57$; $p < 0.0001$), and were retracted in less time than other retracted papers ($p < 0.0001$).

Table 1. Comparison of articles for which a retraction notice was available and the reason for retraction could be determined (“Known”) vs. articles for which no retraction notice was available or the reason for retraction could not be determined (“Unknown reasons”).

	Known reasons		Unknown reasons		χ^2 or T	
	Mean	SD	Mean	SD	value	p value
Sample n	1,863	-	178	-	-	-
Journal IF	7.71	9.79	3.12	4.76	6.169	<0.0001
Repeat offenders (%)	709 (38.1)	-	24 (13.5)	-	41.568	<0.0001
# Authors per paper	5.04	3.31	4.29	2.96	2.907	<0.004
Months to retract	33.95	34.81	22.03	25.42	4.448	<0.0001

Comparing papers retracted for misconduct to papers retracted for reasons other than misconduct (Table 2), journal IF was higher among fraudulent papers ($p < 0.0001$). Roughly 57% of fraudulent papers were written by a first author with other retracted papers, whereas only 21% of papers retracted for reasons other than misconduct were written by an author with other retractions ($\chi^2 = 246.3$; $p < 0.0001$). Average number of authors was significantly higher for fraudulent papers ($p < 0.0001$), and fraudulent papers were retracted significantly more slowly than papers retracted for reasons other than misconduct ($p < 0.0001$).

Table 2. Comparison of articles for which retraction was explained as a result of known or possible fabrication or falsification (“Misconduct”) vs. articles for which retraction was explained as the result of any other cause (“No misconduct”).

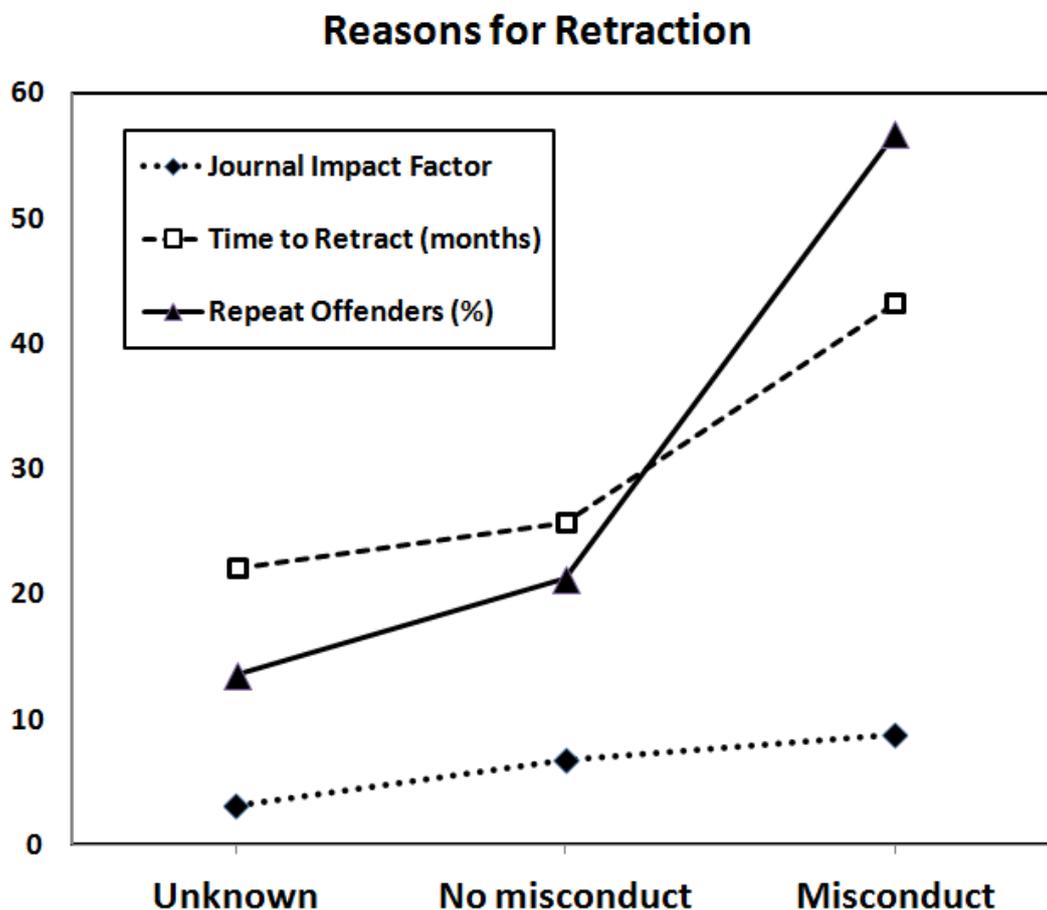
	Misconduct		No misconduct		χ^2 or T	
	Mean	SD	Mean	SD	value	p value
Sample n	881	-	982	-	-	-
Journal IF	8.75	10.12	6.77	9.40	4.376	<0.0001
Repeat offenders (%)	500 (56.8)	-	209 (21.3)	-	246.345	<0.0001
# Authors per paper	5.53	3.34	4.60	3.23	6.106	<0.0001
Months to retract	43.23	37.47	25.66	29.91	11.234	<0.0001

A plot of the demographics of papers retracted for unknown reasons (Figure 1) suggests that they are more like papers retracted without evidence of scientific misconduct.

3.2. Discussion

This work replicates and extends an earlier study [4], using a larger and more authoritative database.[6] The demographics of papers retracted for misconduct are substantially different from papers retracted for other issues (Table 2), as predicted by the “deliberate fraud” hypothesis:[4] authors of fraudulent retracted papers appear to target high-IF journals (Table 2); to have other retracted papers (Table 2); to diffuse responsibility across more co-authors (Table 2); and to delay retracting fraudulent papers (Table 2). These results confirm that papers retracted for misconduct represent a deliberate effort to deceive.

Figure 1. Comparison of parameters for papers retracted for “Unknown” reasons to papers retracted for either “Misconduct” or “No misconduct”; all points shown are averages. Papers retracted for “Unknown” reasons ($n = 178$) are more similar to papers retracted for “No misconduct” ($n = 982$) than to papers retracted for “Misconduct” ($n = 881$).



This database improves upon the first database in several important ways. The database used here spans the years from 1973 to 2012 [6], rather than the more limited span of years reported in the first study, from 2000 to 2010 [4]. The new database contains 2,047 retracted articles [6], rather than 788 retracted articles [4], so the new database is 2.6-fold larger. The original database relied only upon published retraction notices to determine reasons for retraction, and such notices can be cryptic [4]; this led to errors in determining why some articles were retracted [6]. The new database used information gleaned from a wide range of sources, in addition to the published retraction notices, with a focus on reports from the ORI, to determine why articles were retracted [6]. This new information led to a reevaluation of the reason for retraction [6] of a substantial number of papers. Overall, 15.9% of retractions from the original study [4] were reclassified as being due to misconduct.

Our results are substantially different from an earlier study that found that, compared to papers retracted for error, papers retracted for misconduct have fewer authors and appear in low-IF journals [8]. This earlier study evaluated 395 papers retracted between 1982 and 2002 [8], so the period of overlap between the two studies is complete, but we evaluated an additional 1652 retracted papers. The earlier analysis [8] concluded that only 27.1% of papers were retracted for misconduct (falsification, fabrication, or plagiarism), whereas we found that 67.4% of papers were retracted for misconduct

(falsification or fabrication) [6]. Nevertheless, the studies concur in finding that erroneous studies are withdrawn more rapidly than fraudulent studies [8].

Our results appear to differ from newly-reported findings that retracted randomized clinical trials (RCTs) have significantly fewer authors than case-matched unretracted RCTs. The number of authors of retracted RCTs averages 5.0 (± 3.2 SD), whereas unretracted RCTs average 6.7 (± 5.8 SD) authors (Steen and Hamer, this journal). In contrast, retracted fraudulent papers have an average of 5.5 (± 3.3 SD) authors, whereas papers retracted for other reasons have an average of 4.6 (± 3.2 SD) authors (Table 2). Two possibilities could explain the apparent discrepancies. First, RCTs may generally have more authors than other types of published studies; RCTs often involve multiple sites and may require the time and effort of more investigators. Alternatively, it is possible that retracted articles in general have fewer authors than unretracted articles; it would require a case-control matching of retracted to unretracted articles to address this question, and this research has not been undertaken to our knowledge.

Conclusions here may be controversial because plagiarism is treated as a lesser offense than either fabrication or falsification of data. However, a clear distinction is drawn between plagiarism of words and plagiarism of data. Word plagiarism can be inadvertent, careless, or even innocent [9], meant to flatter not deceive [10], whereas data plagiarism must be considered misconduct. Plagiarism of data requires either that plausible circumstances be fabricated under which the allegedly “new” data could have been acquired, or that old data be altered—and so falsified—to appear new. Word plagiarism may be less harmful than data plagiarism, in that word plagiarism is unlikely to have an impact on patient treatment. This is because word plagiarism alone cannot affect the results of a meta-analysis, whereas data plagiarism could potentially lead to the same data being counted twice in a meta-analysis. Such “double-counting” would give inordinate weight to one set of experimental results and could result in an unrealistic between-study homogeneity [11].

It is a controversial decision to lump all word plagiarism together, whether extensive copying of whole paragraphs or minor use of a few words. However, retraction notices virtually never provide detail as to how extensive the plagiarism was in a particular retracted paper. It would be interesting to compare papers retracted for extensive plagiarism and those retracted for minor plagiarism, but it is not clear how such a study could be undertaken.

A limitation of the present study is that retraction of a paper for fraud probably makes it more likely that other papers by the same author will be examined closely. Therefore, other papers that are tainted by misconduct are more likely to be identified and retracted. In contrast, papers retracted for error are unlikely to lead to reexamination of an author’s published opus. Hence, we cannot distinguish between two possibilities: that fraudulent authors are more likely than other authors to produce multiple fraudulent papers; or that fraudulent authors are more vigorously expunged from the literature. Both possibilities may be true.

Another limitation of the present work is that we cannot really address the motivation of authors who commit fraud. We can only hypothesize what trends might correlate with a deliberate effort to deceive and test those hypotheses. However, confirming the hypotheses does not prove an effort to deceive. The only way to prove such an effort is for authors to confess it and we do not anticipate such an outcome.

A third limitation of this work is that we cannot be certain that the causes of retraction cited in the retraction notices are true. Some retractions attributed to error could actually be due to fraud; it is not

in an author's interest to be open about having committed fraud. Retraction notices are often cryptic or ambiguous, which may be motivated by the retracting author's desire to deny fraud. Most authors with multiple retractions have probably committed fraud, except in a limited number of retractions that were due to an error so pervasive that it discredits several linked papers or a long period of research.

4. Conclusions

Our results suggest that articles for which the reason for retraction is unknown are probably not examples of misconduct (Figure 1). This conclusion cannot be certain, but the demographics of papers retracted for an unknown reason (Table 1) are not consistent with the goal of a noteworthy paper. Therefore, papers retracted for unknown reasons appear not to represent a deliberate effort to deceive.

These findings are potentially important for several reasons. Reclassification of the reasons for retraction of 15.9% of papers in the first database [4] had raised a possibility that our earlier conclusions were incorrect. However, the present reanalysis confirms our earlier conclusions. Second, our findings are a striking confirmation of the hypothesis that misconduct is deliberate, goal-directed behavior, with the goal being a noteworthy paper.

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Conflicts of Interest

The author declares no conflict of interest.

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