

# Should research misconduct be criminalized?

Research Ethics  
2020, Vol. 16(1-2) 1–12  
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DOI: 10.1177/1747016119898400  
journals.sagepub.com/home/rea  


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## Abstract

For more than 25 years, research misconduct (research fraud) is defined as fabrication, falsification, or plagiarism (FFP)—although other research misbehaviors have been also added

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in codes of conduct and legislations. A critical issue in deciding whether research misconduct should be subject to criminal law is its definition, because not all behaviors labeled as research misconduct qualifies as serious crime. But assuming that *all* FFP is fraud and *all* non-FFP not is far from obvious. In addition, new research misbehaviors have recently been described, such as prolific authorship, and fake peer review, or boosted such as duplication of images. The scientific community has been largely successful in keeping criminal law away from the cases of research misconduct. Alleged cases of research misconduct are usually looked into by committees of scientists usually from the same institution or university of the suspected offender in a process that often lacks transparency. Few countries have or plan to introduce independent bodies to address research misconduct; so for the coming years, most universities and research institutions will continue handling alleged research misconduct cases with their own procedures. A global operationalization of research misconduct with clear boundaries and clear criteria would be helpful. There is room for improvement in reaching global clarity on what research misconduct is, how allegations should be handled, and which sanctions are appropriate.

## Keywords

Research misconduct, scientific misconduct, fabrication, falsification, plagiarism, research fraud

## Introduction

A number of countries have established criminal penalties for sports doping within their jurisdictions and the USA is working toward criminalizing doping fraud in international sports, outside its borders (Ruiz, 2018). So, while society has addressed grave misconduct in sports for a long time—misconduct that involves a limited number of individuals—the scientific community has been largely successful in keeping criminal law away from the cases of research misconduct. Science self-correction (Alberts et al., 2015) seems to be the underlying main reason for this situation: in most countries, research misbehaviors are subject to codes of conduct and allegations are looked into by committees of scientists. One may wonder whether this is better or worse than a legal approach.

Retraction of flawed work is a major mechanism of science self-correction. Yet, not all authors found guilty of research misconduct have articles retracted (Drimer-Batca et al., 2019). Data show that although there is an increasing number of retracted biomedical and life-science papers—67% of which are attributable to misconduct (Fang et al., 2012)—only 39 scientists from 7 countries have been subject to criminal sanctions between 1979 and 2015 (Oransky and Abris, 2017). The debate on whether research misconduct should be considered a criminal offence or not has had a rather low profile in the past. This has changed in recent years.

**Table 1.** Research misconduct definition. 2017 Danish law<sup>a</sup> on research misconduct (Minister of Higher Education and Science, Denmark, 2019).

The law defines research misconduct as

Fabrication, falsification, and plagiarism committed willfully or gross negligent in planning, performing, or reporting of research

–Fabrication: Undisclosed construction of data or substitution with fictitious data

–Falsification: Manipulation of research material, equipment or process as well as changing or omitting data or results making the research misleading

–Plagiarism: Appropriation of others' ideas, processes, results, texts, or specific terms without rightful crediting

<sup>a</sup>The law is peculiar in regard to research misconduct in private companies. Here, the private company should give consent to being examined. Another peculiarity is that decisions are anonymized.

## Research misconduct

In 1992, in the USA, research misconduct was defined as fabrication (making up data or results), falsification (changing data or results), or plagiarism (using ideas or words of another person without giving appropriate credit) (FFP), in proposing, performing, or research reporting (National Academy of Sciences, 1992). This definition has been widely accepted: all 22 countries with national policies on research misconduct included FFP in the definition of research misconduct (Resnik et al., 2015). However, other types of misconduct, such as unethical authorship or publication practices, and conflicts of interest mismanagement and another 11 unethical behaviors were also included in the definition of research misconduct in national policies (Resnik et al., 2015). Recently updated codes of conduct have maintained FFP in the definition but some have also added other misbehaviors (Netherlands Code of Conduct for Research Integrity 2018; National Health and Medical Research Council, Australia, 2018). The European Code includes a number of examples of other “unacceptable” practices, such as manipulation of authorship, withholding research results, or exaggerating the importance and practical applicability of findings (ALLEA, 2017). The revised Dutch Code says that noncompliance with 23 out of 61 standards for responsible conduct of research can be considered research misconduct. If that is indeed the case depends on how severe that noncompliance is in terms of the assessment criteria specified in the code (Netherlands Code of Conduct for Research Integrity, 2018). The Australian Code defines misconduct as a serious breach of the Code which is also intentional, reckless, or negligent—with no mention of FFP (National Health and Medical Research Council, Australia, 2018). In Canada, research misconduct includes a number of research misbehaviors in addition to FFP (National Research Council Canada, 2018). The recently updated Danish law on research misconduct defines it as FFP (Table 1).

Other stakeholders have defined research misconduct in various ways. The Council of Science Editors added mistreatment of research participants to the

classical FFP (Council of Science Editors, 2018). The International Committee on Journal Medical Editors added the purposeful failure to disclose conflicts of interest to FFP (ICMJE, 2018). Specially designed for surveys, Anderson et al. (2007) considered 22 actions of research misconduct and grouped them in 6 categories: data, methods, policy, outside influence, credit, and “cutting corners.” Kuroki (2018) proposed a new classification of research misconduct considering its societal consequences: class I (betrayal of the truth): fabrication and falsification; class II (betrayal of trust): plagiarism, irreproducibility, and inadequate research practice; and class III: risk to safety of health and industrial products. Finally, up to 60 research misbehaviors have been surveyed to participants of research integrity conferences: fabrication and falsification ranked highest on impact on truth, whereas plagiarism was ranked high on impact on trust (Bouter et al., 2016).

Between 2000 and 2017, 15,000 articles were published on research misconduct (Kornfeld, 2018). Misconduct undermines integrity, trust, and credibility of research both within the scientific community and the public. Beyond FFP, there is no consensus of what type of misbehaviors should constitute research misconduct, yet this is relevant for detection and sanctioning. Research is a global enterprise. In order to prevent and minimize research misconduct, a global operationalization with clear boundaries and clear criteria would be helpful.

## How common is research misconduct?

As of May 2012, there were 2047 retracted articles in PubMed. Most of the retractions (67%) were for misconduct (i.e., 53% for FFP and 14% for duplication); since 1975, the percentage of retracted papers has increased 10-fold (Fang et al., 2012). The Retraction Watch database—the largest of its kind—currently includes more than 18,500 retracted articles (Retraction Watch database, 2019). A recent analysis of 10,500 retracted papers up to 2016 showed that 0.04% of papers are retracted, the annual rate of retractions is about 1000, the rate of increase is slowing down since 2012, and 43% of the 946 papers retracted in 2014 were due to FFP (Brainard and You, 2018). It should be acknowledged that a retraction does not necessarily mean that the researcher has committed research misconduct: in some 50% of retraction notices, FFP was implicated and other types of misbehavior accounted for an additional 10% (Brainard and You, 2018). The Retraction Watch database hosted 4898 medical articles retracted up to December 2018, usually for more than one reason: in 759 (16%) articles with fabrication/falsification of data, images or results were involved; in 780 (16%) any type of plagiarism; 41 (1%) retractions had serious issues with participant’s informed consent; and 184 (4%) had no research ethics committee approval (Retraction Watch database, 2019).

Publication bias and outcome reporting bias are two of the main issues regarding research communication misbehaviors leading to waste of billions of dollars

(Chan et al., 2014). These biases in clinical trials are of special relevance to clinical practice. Eighty-five percent of unpublished studies were never submitted to journals: investigators claimed that the two main reasons were lack of time and low priority (Song et al., 2014). Outcome reporting bias is common in medical journals and could have implications for physicians' treatments of patients (Becker et al., 2014; Dwan et al., 2014). There are a number of different attempts to assess the occurrence of research misconduct (Table 2).

## Research fraud

Back in 1995, Malcom Pearce was removed from the British medical register for publishing two fraudulent papers based on fabricated data (Lock, 1995). In 2000, research misconduct started to be considered as a criminal offence which is not different from financial fraud because resources are misused in both instances, and the investigation to be conducted is more aligned to police procedures than to those of academia (Smith, 2013). That “misconduct” is a euphemism for “fraud” and the fact that the police could do a better job than academia in alleged cases of research misconduct was also discussed 13 years later (Editorial, 2013). But, apart from a number of articles that argue the commentators' opposite points of view (Bhutta and Crane, 2014; Smith, 2013), not much has fundamentally changed: self-regulation is the dominant way to handle allegations of research misconduct all over the world—often with an explicit view to optimize opportunities for learning and prevention (Bouter, 2018). Universities and research organizations typically have their own guidelines on research integrity and responsible conduct of research, and their own procedures to investigate alleged cases of research misconduct. One obvious difficulty is that they have to investigate themselves which may lead to protecting their own reputation leading to a lack of transparency. Thus, a quarter of the 136 institutions belonging to Universities UK do not report publicly on cases of misconduct and have no intention to do so in the future (Iacobucci, 2018). In the USA, the US Office of Research Integrity deals, under defined circumstances, with alleged misconduct of research conducted or supported by the Public Health Service (Office of Research Integrity, 2019). Few countries have or plan to introduce bodies to address research misconduct that are independent from research institutions and universities (Table 3).

## The boundaries of research misconduct

A critical issue in deciding whether research misconduct should be subject to criminal law is its definition. Once the boundaries of the concept are (reasonably) well drawn, the debate on whether the courts of law should deal with misbehaving scientists becomes clearer. Only serious cases of research misconduct should be

**Table 2.** Some different ways to assess the occurrence of research misconduct.

Topic	Survey/findings
Research misbehaviors	3200 US National Institutes of Health investigators (Martison et al., 2005) Serious misbehaviors that would get researchers into institutional or federal trouble: –Falsification: 0.3% –Plagiarism: 1.3% –Circumvention of “certain minor aspects of human-subject requirements”: 7.6% –“Changed the design, methodology, or results of a study in response to pressure from a funding source”: 15.5%
Research misbehaviors	Systematic review of 21 surveys, 18 in the meta-analysis (Fanelli, 2009) Observed: –Falsification/fabrication: 14% –Other questionable practices: 72% Admitted: – Falsification/fabrication: 2% –Other questionable practices: 34%
Research misbehaviors	Twenty-two observed and admitted research misbehaviors surveyed to biomedical researchers from academia ( $n = 617$ ) and industry ( $n = 100$ ) (Godecharle et al., 2018) Observed: –Falsification/fabrication: 16% (academia) and 12% (industry) –Plagiarism: 34% (academia) and 51% (industry) –Circumvention of human-participants research requirements: 18% (academia) and 9% (industry) –Gift authorship: 76% (academia) and 50% (industry) Admitted: Gift authorship: 42% (academia) and 25% (industry)
Authorship	Prolific authors (five or more articles published per week) (Ioannidis et al., 2018) Authorship criteria: 70% admitted not fulfilling the four International Committee of Medical Journals Editors criteria more than 25% of the time
Duplication of images	– After visual screening of more than 20,000 images published in 40 journals during 1995–2014, it was concluded that 3.8% of articles contained problematic images, with at least half of them exhibiting features suggestive of deliberate manipulation (i.e., falsification) (Bik et al., 2016) – In one top scientific journal, they found that 59 (6.1%) of 960 papers during 2009–2016 contained inappropriately duplicated images; 5 (8.5%) were retracted. If this proportion were representative, some 35,000 papers are candidates to be retracted due to image duplication (Bik et al., 2018)
Statistical analyses	Survey of 390 biostatisticians (Wang et al., 2018) Researchers often make inappropriate requests regarding the analysis of their data. Among the most severe inappropriate requests were to – “interpret the statistical findings on the basis of expectations, not actual results,” 30% – “ignore violations of assumptions that would change results from positive to negative,” 29% – “remove or alter some data records to better support the research hypothesis,” 24% – “not report the presence of key missing data that might bias the results,” 24%

(Continued)

**Table 2.** (Continued)

Topic	Survey/findings
Fake review process	<ul style="list-style-type: none"> <li>–Was the (or one of the) reason behind 600 medicine retracted papers up to December 2018 (Retraction Watch database, 2019)</li> <li>–A journal retracted 107 papers in a single note (Stigbrand, 2017)</li> <li>–This problem is of such magnitude that the Committee on Publication Ethics (COPE) has issued brand new guidelines on publication process manipulation (COPE, 2018)</li> </ul>

**Table 3.** Examples of countries with specific independent bodies to investigate alleged cases of research misconduct.<sup>a</sup>

Country	Name	Comment
Austria	Agency for Research Integrity	Active since 2009 (Editorial, 2018)
Denmark	Committee on Research Misconduct <sup>b</sup>	Active since 2017 (Minister of Higher Education and Science, Denmark, 2019)
France	Office of Research Integrity	Announced in 2018 (Dunphy, 2018)
Sweden	Research Misconduct Board	Proposed by the government in 2018 (Government offices of Sweden, 2019)
UK	National Research Integrity Committee	Asked by Members of Parliament to the government in 2018 (Iacobucci, 2018)
USA	The Office of Research Integrity	Active since 1992 <sup>c</sup> (Office of Research Integrity, 2019)

<sup>a</sup>From an informal standpoint, the European Network of Research Integrity Offices (ENRIO) brings together experts of 31 organizations within 23 European countries.

<sup>b</sup>From 1993 up to 2017, the Danish Committees of Scientific Dishonesty, under the Danish Act on the Research Advisory System, also dealt with cases on questionable research practices.

<sup>c</sup>In 1989, the Public Health Service created the Office of Scientific Integrity (OSI) in the Office of the Director, NIH, and the Office of Scientific Integrity Review (OSIR) in the Office of the Assistant Secretary for Health (OASH). In May 1992, OSI and OSIR were consolidated into the Office of Research Integrity (ORI) in the OASH.

considered as fraud and, hence, criminalized, i.e., merit criminal punishment such as fines or incarceration. All are serious cases and nothing but serious cases. Fabrication, falsification, or plagiarism could be firm candidates to be considered as fraud. But assuming that *all* FFP is serious misconduct and *all* non-FFP not is far from obvious (Bülow and Helgesson, 2019).

Falsification and fabrication are broad categories. One could invent data in a low-budget study with limited scientific impact or in a highly expensive research with important significance in its discipline . . . and beyond. Selective reporting of outcomes in clinical trials can be research misconduct when it is intentional or grossly negligent and potentially harmful to patients. It also seems reasonable to

consider that the magnitude of the misused budget and the societal (or ecological) consequences of the falsification or fabrication are relevant in setting the boundaries of criminalization. But there is the need to specify the limits of both the amount of money and societal consequences to decide what ought to be considered serious enough as fraud under criminal law. Be that as it may, recent surveys showed that for 66% of Americans, fabrication and falsification should be a crime; 65% supported fine and/or probation, whereas 35% preferred incarceration (Picket and Roche, 2018).

The situation with plagiarism is rather like that of falsification and fabrication. One could commit plagiarism of data ( $n = 83$  articles in Retraction Watch database for medicine), images ( $n = 70$ ), text ( $n = 337$ ), or the whole article ( $n = 346$ ) (Retraction Watch database, 2019). Most readers would agree that these are very different situations, and the same could be said within each of the four types of plagiarism mentioned. All should not be managed in the same way. Drawing the limits of what is serious enough to fall under criminal law is the key problem.

## **Should research misconduct be criminalized?**

The current situation regarding research misconduct has slowly moved forward. National and supranational bodies have issued updated codes of conduct. In absolute numbers, the problem is still growing as the number of scientists increases, as does the pressure to publish. Transferring alleged research misconduct cases from academia to the courts is controversial. Denmark started in 1992 and introduced a new law in 2017 focusing on FFP (Minister of Higher Education and Science, Denmark, 2019); Sweden will follow in 2019 (Government offices of Sweden, 2019). China has announced an extensive punishment system—including restrictions on jobs outside academia or prevention from getting a bank loan, running a company, or applying for a public service job—for scientists guilty of “major” research misconduct; the definition of “major” still being undefined (Cyranoski, 2018).

Criminalization of research misconduct could improve research integrity by deterrence. However, once research misconduct is considered fraud, a new problem may arise: all other research misbehaviors—commonly named as “questionable research practices”—that fall outside the legal scope could be regarded as less relevant, they will “not count” (Bülow and Helgesson, 2019). This would seriously impact research integrity practice since, as has been shown, there are many different misbehaviors that research institutions should tackle. To address this, in Denmark, the Danish Committee on Research Misconduct is responsible for alleged cases of misconduct (Table 1), whereas research institutions are responsible of questionable research practices cases (Minister of Higher Education and Science, Denmark, 2019). Other countries should consider that alleged cases of research misconduct should not be investigated by the institution to which the



researcher belongs to. Meanwhile, most universities and research institutions will continue handling alleged research misconduct cases with their own procedures, many not meeting reasonable standards and lacking transparency (Grey et al., 2019; Gunsalus et al., 2018).

## Conclusion

There is room for improvement in reaching global clarity on what research misconduct is, how allegations should be handled, and which sanctions are appropriate. Many stakeholders need to work together to improve the situation. It is unlikely that a research integrity organization with global authority will emerge, but a strong statement that is widely supported can unify and inspire the field. A good example is the Singapore Statement (Singapore Statement on Research Integrity, 2010), which is mentioned in virtually all continental and national codes of conduct on research integrity. Future initiatives are needed to create a more detailed consensus, preferably in the form cocreation by the main stakeholders.

## Authors' Contribution

R Dal-Ré conceived the idea and wrote the first draft of the manuscript. All authors provided comments and edits throughout the drafting process for important intellectual content. All authors approved the final version of the manuscript and are accountable for all aspects included in it.


## Declaration of Conflicts of Interest


The authors declare no competing interests.

## Funding

This work required no funding. All articles in Research Ethics are published as open access. There are no submission charges and no Article Processing Charges as these are fully funded by institutions through Knowledge Unlatched, resulting in no direct charge to authors. For more information about Knowledge Unlatched please see here: <http://www.knowledgeunlatched.org>

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