Opportunistic Biases: Their Origins, Effects and an Integrated Solution
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Researchers commonly explore their data in multiple ways before choosing the analyses they will present in the final versions of their papers. While this improves the chances of finding publishable results, it introduces an “opportunistic bias,” such that the reported effects are stronger or otherwise more supportive of the researcher’s theories than they would be without the exploratory process. Scientists across many disciplines are increasing their concern about how these biases are affecting the quality of research. After discussing why this occurs, we describe the research practices that create opportunistic biases, consider the impact of opportunistic biases on scientific research, and present a multifaceted solution to ameliorate these effects.

Consider a study conducted to examine the correlation of a measure of social deficits with 8 negative personality traits. The observed correlation is a combination of two factors: the true relation between the measures and the influence of random factors. In the figure below, the open circle represents the true relation, the arrow represents the effect of random factors, and the filled circle represents the observed relation. Although there is some error in the measurement of each relation, on average the random factors cancel so we have unbiased estimates.

Let us say that the researcher decided to write a paper based on the four strongest relations. In this case, the random factors will not cancel out. This is because a relation is more likely to be in the top four if its random effect was positive. This means that on average, we can expect that the observed estimates will be somewhat stronger than the true relations.

So what happens when someone attempts to replicate the estimates presented in the paper? The graph below shows the same data as before with the addition of replicated estimates, represented by the shaded circles. In the replication, the true relation stays the same but the random factors are all completely new.

As before, the random factors will cancel out on average, so the replicated estimates will be unbiased and lower than the original estimates.

In sum, selecting only large estimates for presentation will produce a positive bias in the results. This means that the estimates will not accurately reflect the true relations, and you can expect that the estimates will drop upon replication.

Procedures that create opportunistic biases
Any analytic methods that increase the number of analyses researchers can examine before deciding what they will include in their final papers will lead to opportunistic biases. Below are some common examples.

- Examine a large collection of variables
- Examine different ways of transforming variables
- Examine the same hypothesis using different analyses
- Conduct studies examining the same hypothesis using different methods
- Examine the same hypothesis in different subgroups of participants
- Scrutinize undesirable findings more closely than desirable findings
- Keep collecting data until desirable results are found
Some of these procedures are performed so often that they are considered to be common practice, so that many researchers are unaware that the techniques are problematic. Procedures like those described above are considered by some researchers as valid ways to “get to know the data” before deciding what to include in a research report. Although this allows researchers to present more consistent narratives in their papers, the selection process introduces opportunistic biases into their results.

**Effects of opportunistic biases**

The prevalence of opportunistic biases in published research has had several detrimental effects. Its most direct influence is that researchers cannot place as much confidence in the validity of studies they read in academic journals. Even though experts in the field have reviewed and accepted published articles, it is not uncommon for researchers to find that published results fail to replicate in later studies, and that the replicated effects are weaker than those found in the original study.

The presence of opportunistic biases has also negatively affected the reputation of scientific research. Doubt is often cast on the validity of research findings because the investigators are seen to be motivated by political, economic, or social agendas. This is at least partly because the investigators are given a great deal of latitude in deciding exactly what aspects of their research they will report and how they will present the results, which some use to make their conclusions more consistent with their beliefs. When the public learns of studies using such practices, the reputation of all scientific research suffers.

**An integrated solution**

Methodologists have proposed a number of solutions to either reduce the prevalence of procedures that create opportunistic biases or else protect the field from the erroneous conclusions that can result from their use. Below is an illustration of a multifaceted strategy that takes advantage of the variety of suggested solution to provide and integrated perspective on how to prevent opportunistic biases.

**Step 1. Base theories on research that was not affected by opportunistic biases.** At the initial stage when investigators are developing their research ideas, they should do their best to base their studies on past research that has not been influenced by opportunistic biases.

**Step 2. Conduct research in ways that limit the influence of opportunistic biases.** Studies using methods that prevent the influence of opportunistic biases should only produce a minimal number of false results, so researchers can be more confident that their findings truly reflect relations among the constructs they are investigating.

**Step 3. Draw conclusions that do not overstate study results.** No study is perfect, and truthfully admitting a study’s limitations helps others to accurately evaluate its findings. It can also help preserve a researcher’s reputation should future investigations reveal that the initial interpretation was incorrect.

**Step 4. Encourage others to critique your research.** Even though the revision of a specific article will stop after it has been published, the scientific process itself is iterative and is strengthened by feedback between authors and readers. Changing scientific culture to be less accepting of opportunistic biases. Researchers will be more likely to perform all of the above steps to the extent that the scientific community as a whole is less accepting of opportunistic biases.

**Conclusions**

The last 5 years have seen increases in papers concerned with questionable research methods, the replicability of findings, and the benefits of open science. Scientific culture is changing so that researchers must now be more concerned about how opportunistic biases might influence their results. It is therefore important that researchers consider the ways that their current research practices might introduce selection biases into their findings and learn new practices that can help reduce the effects of opportunistic biases on the results they report.

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