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Assessing the Online Scientific Community's Support for Various Reasons for Article Retraction: A Preliminary Survey

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Abstract: A prevailing lay understanding of retraction in the scientific literature is to correct for misconduct and honest errors. Nonetheless, though historically rare, retractions to limit the spread of results deemed socially harmful (i.e., information hazards), have gained increasing traction and become increasingly common. This study sought primarily to determine the extent to which information hazard-based retraction is supported in the scientific community and as a secondary goal whether individual difference variables moderate receptivity. We tasked a diverse sample of researchers across various disciplines who use social media to evaluate scenarios in which a paper was retracted for misconduct, honest errors, and information hazards. Overall, support for retraction on the basis of information hazards was low, suggesting that researchers overwhelmingly support academic freedom as a concept. Nonetheless, left-leaning ideologies predicted slightly greater defensibility of the practice among individuals early in their careers. We provide training suggestions to mitigate reactance toward controversial scientific findings.

Keywords: Retraction; information hazard; political ideology; misconduct; publication ethics.

Introduction

Although scientific research uses rigorous peer review to identify unreliable or invalid findings before publication, this system remains vulnerable to human error.

Identification of a set of published findings as unreliable, erroneous, or even fraudulent may result in retraction of the paper (Vuong et al. 2020; Fang & Casadevall 2011). This process is imperative, given that erroneous findings could misinform future research and impede scientific progress. In fact, the increase in scientific output over the past several decades has seen a corresponding rise in retractions, due to both increased scientific volume and refinements in tools to detect (in)accuracies (Cokol et al. 2008; Greineisen & Zhang 2012; Yeo-The & Tang 2020).

Retractions are most frequently initiated due to the discovery of honest errors and misconduct (Fang et al. 2012; Wagner & Williams 2011). However, recent developments in the sociopolitical landscape of academic research appear to have led to some researchers expressing concerns over the potential harm and outrage from a lay public as a deciding factor for retraction (for a discussion, Gelman, 2020). Such published findings, even if they are valid, could present themselves as what philosophical research in research ethics has deemed "information hazards" to a lay public (Bostrom 2011). Specifically, information hazards are defined as information whose risk lies in the possibility that it could enable harm to another, and recent reports on academic freedom suggest an increase in concern over this concept (German & Stevens 2022).

Beyond genuine scientific concerns acting as motivation to exercise greater caution about what they publish beyond ostensibly scientific reasons, journals may additionally feel pressure to make publication decisions that affirm their commitment to a morally correct stance (Clark et al., 2023; Romans 1999). For example, the National Institutes of Health has restricted access to its Database of Genotypes and Phenotypes based on research questions that could potentially demonstrate a genetic underpinning for specific group-level differences (e.g., sex, race) that could galvanize nefarious interpretations of results (Lee 2022).

Despite this aversion to harm by many governing bodies of science, it remains less clear whether the research community wholly endorses these editorial decisions. Extensive involvement in the research process could foster more resistance to these reasons, albeit with competing interests from various moral positions. This study considered how members of the research community respond to retractions based on the possibility of information hazards and which individual differences could be more predictive of their receptivity (or lack thereof).

I. Reasons for Retraction

Retractions are largely a measure to gatekeep misinformation. This process occurs to identify and remove reports that rely on misleading and fraudulent data, which is oftentimes considered central to the best practices of retraction (Edlund et al., 2022). Such removals could impede the proliferation of misleading data that could have far-reaching negative consequences. For example, multiple expressions of concern (e.g., fabrication)

have emerged about findings from neuroscientist Sylvain Lesné that laid a far-reaching foundation for understanding Alzheimer's Disease (Piller 2022). The import of retraction could be protecting the interest of public health. Though less pernicious than misconduct, myriad studies could have been published featuring researcher degrees of freedom or analytic errors that may have an unknown impact (Nosek et al. 2022; Nuijten et al. 2016). Upon identification of these errors or new reporting conventions, retraction is useful to correct the record.

This coupling of accurate reporting with a desire to reduce hazards could implicate retractions as a safety mechanism. Retraction as a safety device could lead to additional gatekeeping in the scientific review process. Nonetheless, recent discussions on the use of retraction for these purposes have emphasized their deleterious consequences (Edlund et al. 2022). Fringe subsections of the population have historically attempted to use this form of retraction. Examples range from the Soviet tests of "historical materialism" that would exclude Western science from circulation (Graham 2004) to the mischaracterization of sociobiology as genetic determinism (Segerstrále 2013). Such concerns have persisted into modern contexts. Many journals have begun to err on the side of caution and remove various works from the corpus of research (e.g., Nature Communications Editorial 2020). One factor that could motivate these decisions is concern over public outrage despite a study's successful consideration from expert peer reviewers. In recent years, several journals have begun issuing high-profile retractions. Several commentaries from scholars and news reports suggest these retractions were based on the findings being potentially offensive (e.g., Gelman 2020; Retraction Watch 2020a and 2020b).

II. Individual Differences in Receptivity Toward Retraction

Various individual differences could predict an interest in using retraction as a safeguarding procedure. If seen as a means to protect a target group from harm, those whose morality has a basis in harm reduction could view greater defensibility toward these retraction decisions (Armstrong et al. 2019). In fact, these concerns of harm appear to have been an impetus for preventing academic discourse with controversial ideas, as evidenced by recent reports assessing campus climates (Ekins 2017; Kaufman 2021; Knight Foundation 2022). Competing concerns of scientific accuracy and harm reduction foster perceptions of accurately reported results as harmful and dishonest in certain ideological spheres, itself a group-serving bias across the political spectrum (Kubin et al. 2022).

Within academic settings, ideological factors could increase receptivity toward retraction on the grounds of information hazards. Left-leaning individuals emphasize care in their morality (Haidt & Graham 2007). For example, academics of such ideology report greater skepticism to arguments of "nature" shaping sex differences (Geher & Gambacorta 2010). Given the especially large number of left-leaning individuals in academia (ranging

between 71–85%), retraction for certain information hazards could become more defensible (Honeycutt & Freberg 2017; Honeycutt & Jussim 2022; Inbar & Lammers 2012). Potential hazards that could be more defensibly retracted among this population could include those that violate principles of harm reduction. As these ideological factors become more prevalent, an unintentional concern for information hazards could emerge based on a lack of balance in certain perspectives to justify a scientific finding's continued influence in research. There has been considerable interest among scientists to heighten the representation of different viewpoints that could mitigate these potential conflicts in values (Duarte et al. 2015; Redding 2001; Tetlock 1994).

The widespread use of social media among academics (e.g., Twitter) has additionally shaped discourse around retraction. Within these academic spaces, left-leaning ideas have greater salience and could shape perspectives of publication outlets about the potential backlash certain papers could receive (Vogel et al. 2021). This designation could be deleterious to scientific findings due to the frequently swift progression from online sanctions to interfering with academic presentations to a response from an institution, which would all be instead of careful peer review (for editorial accounts, see Bailey 2019; Jussim 2022). These negative responses could be further exacerbated by humans' evolved tendencies to minimize costs to themselves by overestimating the potential damage an action could elicit (Haselton & Nettle 2006). For example, the lay population overestimates harmful reactions to scientific findings as having medium-to-large effect sizes, which fosters an interest in retraction (Clark et al., 2023).

III. Current Research

This study sought to identify the receptivity of researchers across disciplines to various decisions for retraction based on demographic variables. First, we predicted that researchers would report greater receptivity toward retractions based on scientific misconduct and honest error compared to retractions based on a perceived information hazard. Because of the possibility that left-leaning researchers' morality frequently centers around harm reduction (Armstrong et al. 2019), we further predicted that retraction on the basis of information hazards would be more agreeable to left-leaning researchers. Nonetheless, the fact that more experienced researchers favor publishing the truth, even when inconvenient, led us to predict that receptivity toward these retractions would be lower among older populations regardless of ideology (Bruton et al. 2020).

This research was approved by an institutional review board for online data collection. Participants provided informed consent before responding to questions. We provide all data and materials: https://osf.io/7z86x/?view_only=6e41337f49d94d4e8f4ead7b04ee648d [1].

1 We report an alternative analysis in the online supplemental materials that considers an exploratory factor analysis. All six items loaded onto a factor for information hazards, whereas

IV. Method

IV.1. Participants

We recruited a sample of researchers to participate using various social media platforms from the research team (e.g., Twitter, Facebook). This methodological decision was in the service of collecting a representative sample of scientists who would likely be involved in the discourse surrounding information hazards as grounds for retraction. Our survey included multiple bot detection questions and attention checks, a captcha, time to complete, and demographics, excluding any participant who failed the bot or attention check questions, was inordinately fast or slow, or was not a researcher.

Our final sample consisted of 164 completed responses (83 men, 66 women, 15 undisclosed; *MAge*=38.92, *SD*=13.36; 73.2% White). Among our respondents, 78.7% were from social and behavioral sciences; 7.3% were from biomedical and life sciences; 5.5% were from arts and humanities; 4.9% were from physical sciences. Our sample reported being in academia 72.7% of the time (27.3% were graduate students). We used a single item to assess general political orientation (1=*Very Liberal*; 7=*Very Conservative*; *MGrand*=2.46, *SD*=1.41).

In this sample, 26.4% reported having served as a journal editor, whereas the average number of reviews conducted by respondents in a year was *M*=8.90, *SD*=20.41. A sensitivity analysis indicated that we had adequate power to detect relatively small differences between the slopes of lines for interactive effects (Δ=0.03, 1-β=0.80).

IV.2. Materials and Procedure

Participants evaluated a series of scenarios describing the retraction of scientific publications from academic journals. Scenarios varied in categories, which we determined a priori based on both previous research assessing degrees of severity for detrimental research practices to research scientists (Sacco et al. 2018) and recently articulated findings for retractions suggestive of information hazards (e.g., Gelman 2020). Categories represented retraction decisions based on (1) honest errors from the authors (e.g., errors in the data analysis, wherein a corrected analysis yielded different results), (2) misconduct from the authors (e.g., data fabrication), and (3) perceptions that findings could have pernicious implications if published (e.g., extensive negative backlash to its publication

another factor emerged from the other two subscales. This alternative analysis yields results consistent with those reported in manuscript.

Inclusion of all participants in a one-way repeated ANOVA did not meaningfully change the results across sexes.

We conducted an alternative analysis for these effects without including the item directly related to diversity, equity, and inclusion (DEI) in the aggregated variable for information hazards. The reliability without that item in the composite was commensurate to when it was included. A moderation analysis with this modified composite also yielded similar results.

When considering the interactive effects between our continuous predictors with participant gender, no interactive effects emerged.

through social media). This latter category was deemed as information hazards. For a full list of items, refer to Appendix A.

Participants viewed each scenario in random order and reported the extent to which they agreed with each retraction decision (1=*Completely Disagree*; 7=*Completely Agree*). One item negatively loaded for the honest error items, prompting its removal from final analyses (α=0.55). No items were removed for misconduct (α=0.43) and information hazard (α=0.87). Although the reliabilities were low for the former two categories, the a priori nature of our decision for these items led us to find it prudent to consider all items together if they loaded positively[1]. Nonetheless, as indicated below, the misconduct and honest error items operated in a theoretically consistent pattern and did not interact with predictor variables critical to our subsequent analysis. Thus, their inclusion did not undermine the results and interpretation of main findings. The high reliability of information hazard as a construct suggests a general consensus among researchers on this motive behind retraction, whereas the additional categories may have greater heterogeneity.

V. Results

V.1. Primary Analyses

We conducted a 2 (Participant Sex: Male vs. Female) × 3 (Retraction Type: Honest Error vs. Misconduct vs. Information Hazard) mixed-model ANOVA with repeated factors over the latter factor. We report Greenhouse-Geisser corrections for sphericity violations. This analysis specifically considered only men and women, given the small number of individuals who reported being neither in this study. Our analytic decision was based on the within-subjects nature of distinct retraction types and the between-subjects nature of participants' sex.

A Participant Sex main effect indicated that women were more receptive to retraction than men, $F(1, 147)=15.93$, $p<0.001$, $\eta_p^2=0.098$. A Retraction Type main effect also emerged, $F(1.69, 249.48)=628.93$, $p<0.001$, $\eta_p^2=0.811$ (see Table 1). Participants were most receptive toward retraction due to misconduct, followed by honest error, and then information hazard. All means were significantly different from each other ($ps<0.001$, Cohen's $ds>1.11$). Subsequent one-sample t-tests considering support for each type of retraction against the scalar midpoint of 4 led us to find that participants were categorically supportive of retraction due to misconduct and honest error, as means were significantly above the midpoint ($ps<0.001$, $ds>0.71$). Participants were conversely unsupportive of information hazard ($p<0.001$, $d=1.43$). Support for retraction due to information hazard was low overall, suggesting general opposition to the practice.

	Men	Women	Overall
Misconduct	5.51 (0.76)	5.82 (0.65)	5.65 (0.73)
Informational Hazard	1.95 (1.06)	2.78 (1.13)	2.32 (1.16)
Honest Error	4.61 (0.99)	4.78 (0.93)	4.69 (0.97)
Overall	4.02 (0.93)	4.46 (0.90)	

Table 1: Means (and standard deviations) for support for retraction, including both main effects (i.e., Overall) and specific means for men and women with all three types of retraction.

Effects were most superordinately qualified by a Participant Sex × Retraction Type interaction, $F(1.69, 249.48)=6.68$, $p=0.003$, $\eta_p^2=0.043$ (see Figure 1). Simple effects indicated that women reported greater receptivity toward retraction compared to men for both misconduct and information hazard, $Fs>6.84$, $ps<0.011$. However, the effect was substantially larger for information hazard ($\eta_p^2=0.126$) than for misconduct ($\eta_p^2=0.044$). No sex difference emerged for retraction due to honest error, $F(1, 147)=1.04$, $p=0.308$, $\eta_p^2=0.007$.

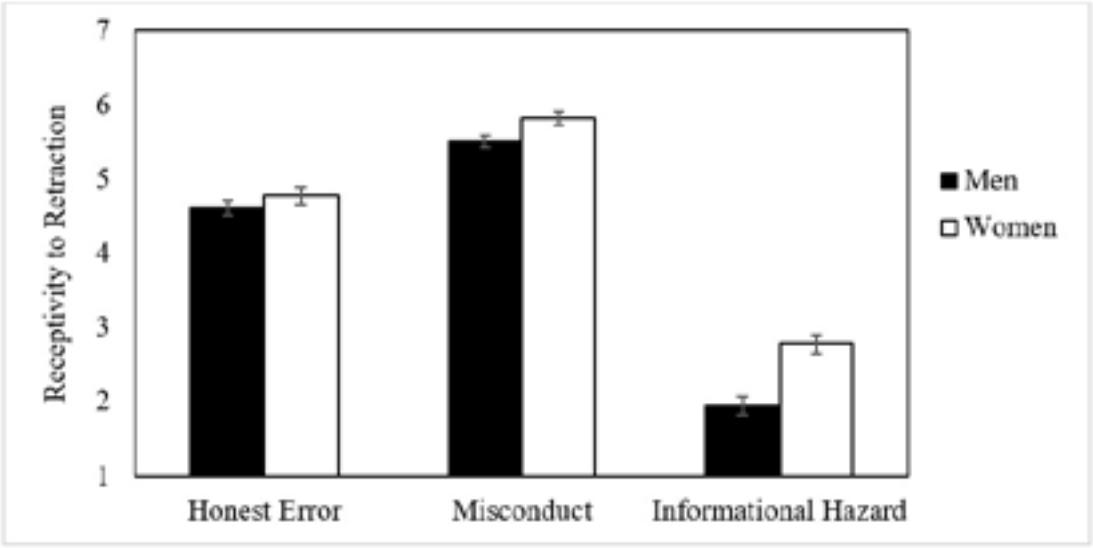

Figure 1: Sex differences in receptivity to retraction decisions (with standard error bars).

V.2. Moderation Analyses

Our next step was three regression analyses considering participant age and political orientation as candidate moderators. All participants were included in this analysis rather than only considering participants disclosing their sex[2]. We used Model 1 of PROCESS with each category of retraction decision as the outcome. This analysis was to address the continuous nature of two predictors in a regression analysis testing for interactive effects. For honest error, neither main effect nor the interaction was significant, $|bs|<0.14$, $ps>0.520$. A similar set of null findings emerged for misconduct, $|bs|<0.12$, $ps>0.438$.

For the information hazard category, a significant negative association emerged for age; increasing age of researchers was associated with less receptivity toward cen-

sorship, *b*=-0.05, *SE*=0.01, *t*=-4.21, *p*<0.001. Another significant association emerged for political orientation; less liberal ideology was associated with less receptivity toward retraction for information hazard, *b*=-0.88, *SE*=0.21, *t*=-4.29, *p*<0.001. The Political Orientation × Age interaction was significant, *b*=0.01, *SE*<0.01, *t*=2.45, *p*=0.015 (see Figure 2)[3].

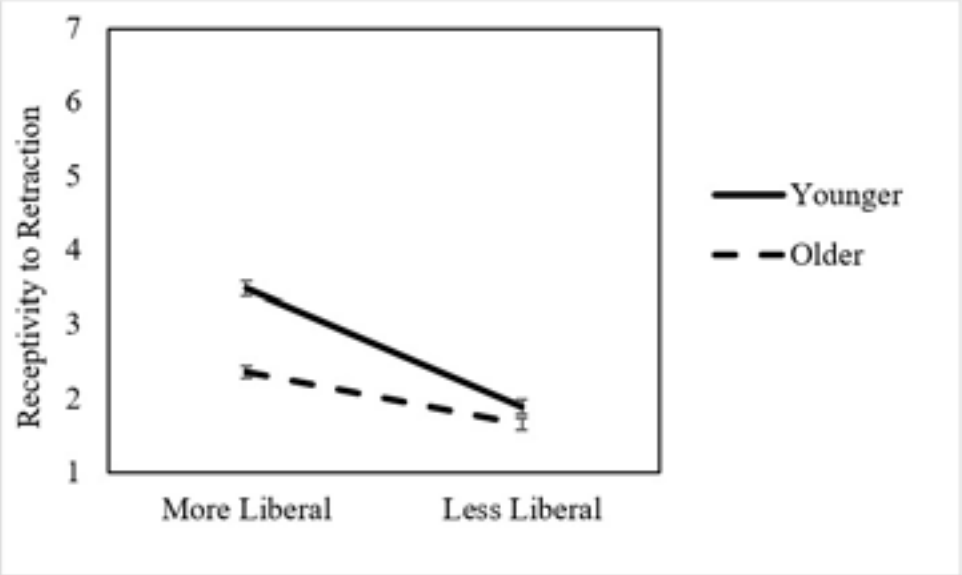

Figure 2: Receptivity toward retraction for the purpose of informational hazard among younger and older researchers as a function of political orientation (with standard error bars). Note. "More Liberal" refers to scores below the mean (-1 SD) and "Less Liberal" refers to scores above the mean (+1 SD), given that we assessed ideology along a 7-point scale with higher scores reflecting a more conservative ideology.

We conducted a floodlight analysis to decompose this interaction comparing high (+1 SD) and low levels (-1 SD) of political ideology as a function of age. Lower levels on the scale reflect a more liberal ideology and higher levels reflect a less liberal ideology. The sample substantially skewed liberal (only 10.1% identified as some kind of conservative), thus leading us to consider effects as more or less liberal instead of comparing liberal and conservative participants. For more liberal participants, older age was associated with less receptivity toward retraction due to information hazard, *b*=-0.04, *SE*=0.01, *t*=-4.85, *p*<0.001. For less liberal participants, no association emerged, *b*=-0.01, *SE*=0.01, *t*=-0.96, *p*=0.336.[4]

VI. Discussion

Results supported predictions based on the reasons for researchers to support various reasons for retraction. Some reasons remained unambiguous, namely misconduct or honest scientific errors. Nonetheless, and most importantly, retraction on the grounds of minimizing information hazards remained dubious. This wariness toward concerns of informational hazard is appropriate, given the general understanding of retraction as

an empirical tool rather than an ideological one (Edlund et al. 2022). If the integrity of science is to be maintained, and if its eroding trust by the public has any hope of repair (Contessa 2022; Nadeem 2022), then science should strive to maintain objective and rigorous standards of retraction to impede the infiltration of extra-scientific attacks on sound science (Kennedy et al. 2022). This is especially critical when considering how information hazards as means to retract are predicated upon perceived dangers rather than actual ones (Clark et al. 2023). The clearly minimal support for information hazard-based retraction, regardless of demographic variables (e.g., sex, political orientation), should not only appeal to the scientific community but could act to restore public trust in science.

Researchers were more accepting of retractions for misconduct than errors. One reason could be what philosophers would posit as a lay theory of retractions as a sanctioning tool against scientists who do not adhere to ethical standards, whereas honest mistakes would fall outside that purview (Resnik & Stewart 2012). Participants did not view honest errors as grounds for punishment. Similarly, other avenues short of retraction can be appropriate to fix various honest errors (e.g., corrigenda). Scientists may be showing compassion for these errors. This implicit understanding of retraction could suggest that especially ideological researchers view campaigns for retraction of controversial findings lead to further sanctions.

The overall aversion to retraction for information hazards may further suggest that an interest in stifling academic freedom is unpopular. Researchers' awareness of the social sanctions imposed by retraction could lead them to recognize the possibility that they could receive sanctions themselves for any work that others may find disagreeable. Thus, their endorsement of retraction for information hazards would be hypocritical. As institutes move forward in their messaging of intellectual freedom among their researchers, it could prove advantageous to articulate the generally low base rates of acceptance among academics for these forms of retractions. This articulation could serve as a normative social influence that would become prescriptive in academic research (e.g., Asch 1956; Berkowitz 1972). These moves would be especially important, considering the pervasiveness of individuals who feel that they cannot express their ideas freely in a given institute out of fear of sanctions (Ekins 2017).

VII. Demographic Differences

Among those politically liberal, younger respondents had greater receptivity toward retraction for information hazards. These findings could reflect the general aversion to causing harm among members of these demographic groups, thus creating tension with a motivation for accurate scientific reporting (Lukianoff 2014; Haidt & Graham 2007; Haidt 2012). It could be possible that younger researchers have not yet received the same amount of training, particularly in research ethics and philosophy of science, as their

older peers to minimize the competition between their two values systems. Experience within given fields could lead researchers to understand the importance of debate, as evidenced by older researchers on the political left being more opposed to retraction for information hazards. These researchers could additionally be less affected by systemic factors that afford them the opportunity to study more controversial findings and report them accurately (e.g., publish-or-perish, sanctions before tenure; Bruton et al. 2020; Gopalakrishna et al. 2022; Honeycutt & Jussim 2020). Younger generations in this study could also be more aware of cancel culture which would inform their receptivity toward these retractions (Atske 2022). Younger researchers on the political left could be acting in a form of self-preservation from other, more fringe groups that could cancel them.

Women were generally more supportive of retractions. Despite being largely opposed, women agreed more with retraction for information hazards than men. This endorsement could reflect women's greater risk aversion relative to men (Eckel & Grossman 2008). Women could further be vigilant to the fact that research has historically been galvanized to marginalize them, prompting an interest in mitigating potential harm (e.g., LeResche 2011). Conversely, men's evolutionary history of risk-taking could position them as less sensitive to the potential ramifications of information hazards (Fessler et al. 2015). This latter point is further reflected by men being less receptive toward retraction due to misconduct in this study, with previous research indicating that women demonstrate greater consistency in probing studies for research integrity across various scenarios as peer reviewers (Sacco et al. 2020).

VIII. Research Limitations and Agenda

Various limitations in the current study emerged that necessitate future research. First, our sample had a considerable skew to the political left. This remains unsurprising considering the ideological asymmetry inherent in academic research (Jussim et al. 2015). Although this could suggest a degree of external validity to our findings, future research would benefit from identifying more researchers whose ideology is on the political right.

It should be further noted the current findings provide no evidence for the superiority or inferiority of any political group. Rather, these findings demonstrate how competing sets of values in partisan environments shape the current publication landscape. Future research would benefit from exploring whether differences in ideology versus ideological extremity are responsible for greater support for retraction based on information hazards. It could be the case that highly right-leaning individuals support retraction of research findings that conflict with their morality (e.g., no psychosocial differences in children raised by same-sex parents compared to opposite-sex parents; Anderssen et al. 2008). These findings would provide a natural comparison for research demonstrating how left-leaning individuals in certain fields (e.g., sociology, gender studies) disfavor scientific evidence demonstrating a biological underpinning to sex differences (Geher &

Gambacorta 2010).

Our retraction scenarios were also very general due to the preliminary nature of this investigation, precluding us from addressing certain granularities in our findings. Future studies could assess reactions to retractions for studies on specific issues that could resonate with one ideological group versus another (e.g., Clark et al. 2023). Partisan decision-making could lead to greater symmetry between endorsement of retractions. We also had a relatively small sample size and cannot wholly verify the representativeness of the sample which makes drawing definitive conclusions muddier. In a follow-up, we replicated these results in larger samples from NIH/NSF-funded researchers and students from a midsized southern University (Sacco et al., under review).

IX. Best Practices

Journals would benefit from a heightened awareness of the potential for extra-scientific pressures to influence their decision making. One route to address these conflicts in retraction decisions is for journals to maintain a rigorous peer review process that accepts the responsibility of choosing to publish each paper. This responsibility would further necessitate that the journal stands by their scientifically based decisions. Journals also need to be aware of the ever-evolving landscape of technology and social media and the potential for new domains of influence on the scientific process, particularly retraction, while also recognizing how limited of a purview that social media has on a lay public's view of science despite the salience of online outrage. This awareness would benefit from further consideration of the consequences that adhering to fringe groups could entail (e.g., suppression of actual findings; see Edlund et al. 2022)

Despite the considerable favorability of academic freedom, future research would benefit from identifying potential boundary conditions for information hazards, wherein suppression of certain scientific findings would become defensible. One condition to consider is whether results could present a risk to (inter)national security. Recent endeavors in research ethics have considered how integrity can be maintained within a global ecology, particularly in light of militaristic actions from countries with nuclear weapons and the weaponization of misinformation (see OECD 2022). Scientific findings' suppression could become more appetitive in the presence of existential threats at the expense of academic freedom.

IX. Educational Implications

Both mentors and young researchers should remain aware of potential biases within their own research and the potential for outside influences. Continued emphasis of the scientific method should be highlighted throughout graduate school and into early career researchers. Researchers should maintain awareness of the proper routes to respond

to bad or unpopular science (e.g., scientific rebuttals, research supporting an opposing theory). Research is naturally combative, which allows new ideas to be tested relentlessly. Nonscientific retractions detract from this edict and weaken science as a whole.

Conclusion

The importance of objective and empirical standards in the decision to retract published findings is uncontroversial. Nonetheless, the growing interest in addressing information hazards from an increasingly ideological academy has led to a concern that speculative, and largely unscientific, reasons can become a major component of retraction decisions. Our results suggest that such interest in retraction appears limited to a specific psychological profile, which warrants future discussion on the empirical value of informational hazard in retraction decisions.

Appendix

Full List of Retraction Scenarios by Category

A paper was retracted due to _____. To what extent do you agree with this decision?

Honest error	Misconduct	Information Hazard
Errors in the data analysis, wherein a corrected analysis yielded different results	Undisclosed conflicts of interest (authors did not declare a conflict of interest when one existed)	Controversial publication (results could be considered politically incorrect to a large number of readers)
Incorrect statistical analysis for the kinds of data it presented	Plagiarism (considerable duplication of text from previously published articles)	Extensive negative backlash to its publication through social media
Unintentionally unverifiable information reported in the paper	"Salami slicing" (authors used a large data set to publish multiple studies without crediting an original dataset, which looks like they collected several datasets)	Subjective interpretation of results from the authors that could be considered offensive
Irreproducibility (independent analysis of the data cannot reproduce what the authors originally reported)	Data fabrication (authors presented data that they made up as if the data were real)	The findings potentially reflecting negatively on a specific group of individuals
The paper being published in error (article was accidentally published twice as a result of publisher error)	The authors not seeking IRB approval before conducting a study on human subjects	A potential for pernicious misinterpretation of the results by a lay public
Disputes over authorship (amount of work contributed by each author does not correspond with author order)	Duplicate submissions (authors submitted a paper to two different journals at the same time)	Findings that could potentially impede the goals of a governing body of science related to diversity, equity, and inclusion (DEI)

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