

Evaluating the Claim that Preregistration and Registered Reports Restrict Exploratory Research

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Abstract

A persistent concern about implementation of preregistration and Registered Reports in psychology is that doing so would reduce the frequency and value of exploratory research, and therefore restrict creativity, serendipity, and discovery. As we are nearly 15 years on from the initial proposal to adopt registration in psychology, it seems time to formally examine whether these concerns have any merit. The purpose of the present study is to find out. In this proposed project, we will examine a matched set of Registered Reports, preregistered articles, and traditional articles (total $N = 300$) for the frequency of reported exploratory research, defined as any analysis that is indicated to not be a planned test of a specific hypothesis. This project will provide strong data that should provide an empirical basis to be used in future discussion about the impact of registration on exploratory research.

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Psychology's replication crisis has led to a host of new policies and practices meant to improve the state of our science (Munafò, 2017). A practice that is central to the reform movement is *preregistration*, which involves creating an accessible and unalterable record of a study plan prior to collecting data and/or conducting analyses (Nosek et al., 2018). Rooted in the clinical trial registry previously developed for medical research (Boutron et al., 2016), preregistration is a practice that supports transparency about researchers' plans, and facilitates comparisons between how those plans correspond to what they actually report (Claesen et al., 2021; Willroth & Atherton, 2024). An early and persistent concern about widescale implementation of preregistration in psychology is that doing so would reduce the frequency and value of exploratory work, and therefore restrict creativity, serendipity, and discovery (Goldin-Meadow, 2016; Scott, 2013). As we are nearly 15 years on from the initial proposal to adopt preregistration in psychology, it seems time to formally examine whether these concerns have any merit. The purpose of the present study is to find out.

Fallout from the Confirmatory/Exploratory Divide

The function that preregistration is meant to serve is not always clear or consistent (Lakens, 2019). Resolving debates about the function of preregistration is outside of the scope of the current project, as are debates about the utility of preregistration (see Lakens, 2019; Syed, 2024; Szollosi et al., 2020 for discussion of these issues). An early prominent argument for preregistration is that it allows for a clearer separation between *confirmatory* analyses, or hypotheses generated prior to the study, and *exploratory* analyses, or analyses for which there were no prior hypotheses (Wagenmakers et al., 2012). This framing was in direct response to concerns about questionable research practices (or *p*-hacking, researcher degrees of freedom, garden of forking paths), in which researchers fail to disclose all of the analyses that were conducted other than the statistically significant results presented in their papers, as well as HARKing (hypothesizing after results are known; Kerr, 1998), in which researchers reframe exploratory findings as though they were confirmatory.

The distinction between confirmatory and exploratory is not always so clear in practice (Szollosi & Donkin, 2021; Wagenmakers et al., 2012). Part of the problem is that there is not a clear or consistent definition of what constitutes exploratory research. Indeed, this is an active area of discussion (Feest & Devezer, 2025), a point we are setting aside due to our focus on whether researchers claim they are doing confirmatory or exploratory work in the context of preregistration. For our purposes, we define exploratory as, "any analysis that is indicated to not be a planned test of a specific hypothesis," which is how the term is generally used in the debate about preregistration. The lack of clarity of terms is related to the fact that confirmatory/exploratory forms a continuum of potential data analytic approaches (Wagenmakers et al., 2012). Accordingly, many have moved away from emphasizing the distinction in the context of preregistration in favor of a distinction between data-independent and data-dependent decision-making (e.g., Srivastava, 2018). Nevertheless, the confirmatory/exploratory distinction was prominent as preregistration was gaining momentum. Despite proponents of preregistration arguing to the contrary (Chambers, 2013; Wagenmakers et al., 2012), there were quickly concerns expressed that preregistration would both *restrict* and *devalue* exploratory research. The message about the utility of preregistration was seemingly taken by many to mean that only confirmatory research via preregistration was research worth doing.

A similar concern has been expressed about Registered Reports (see Besançon et al., 2021). Registered Reports are a more restrictive version of preregistration that embeds the practice into the process of peer review. The review process for Registered Reports is separated into two distinct

sections: Stage 1, consisting of the Introduction, Method, and Planned Analyses, which are prepared prior to executing the study; and Stage 2, consisting of the previous sections plus the Results and Discussion, submitted for review following completion of the study. Review platforms¹ make acceptance decisions based on the Stage 1 manuscript and review process, addressing the question: will this study produce worthwhile knowledge, regardless of the results? If the answer is yes, then the review platform agrees to accept the full Stage 2 once complete, regardless of the results. Registered Reports are intended to address the problem of publication bias, or the fact that the published literature does not adequately represent the universe of studies completed, but rather studies have been selected via a biased process (most typically in favor of statistically significant findings). Addressing the problem of publication bias reduces the motivation to engage in questionable research practices, HARKing, and other unscientific behaviors (Chambers, 2013).

Registered Reports make a very clear distinction between data-independent and data-dependent decision making, which loosely align with confirmatory and exploratory analyses, because anything not specified as hypothesized in the Stage 1 manuscript is considered to be exploratory. Importantly, there is absolutely no restriction on including exploratory analyses within Registered Reports. Researchers can include planned exploratory analyses in their Stage 1 proposal, and are free to add whatever they wish at Stage 2, within reason, so long as they are clearer labeled as exploratory and are not given undue weight when interpreting the full findings of the study (Chambers & Tzavella, 2022).

Nevertheless, Registered Reports are confirmatory-focused, and indeed use language and procedures that are much more aligned with quantitative hypothesis-testing approaches compared to other approaches. That said, Registered Reports can and have been used with a wide variety of research designs, including qualitative studies (Karhulahti et al., 2023), secondary data (Davis-Kean et al., 2024), meta-analyses (Kathawalla & Syed, 2021), and many more. Concerns about the heavy focus on confirmatory approaches led to the development of a companion format, Exploratory Reports, wherein researchers largely eschew inferential statistics in favor of extensive descriptive statistics and data visualizations (McIntosh, 2017). Despite the fact that they were introduced many years ago, Exploratory Reports have been taken up by few review platforms and are seldom used.

Taken together, both preregistration and Registered Reports seek to improve the transparency and clarity with which researchers describe the epistemic status of their work. The intention is *not* to favor one form of inquiry over another, although we recognize that in practice this could very well be what happens. Rather, the intention is to support clearer delineation of confirmatory/planned and exploratory/unplanned analyses via a dedicated subsection of the Results section or clear and specific language that denotes an analysis as exploratory. Despite many proponents of preregistration being clear about this intention (Wagenmakers et al., 2012), concerns persist (McDermott, 2022). As an ostensibly empirical science, however, at some point concerns need to be adjudicated via data.

The only relevant data of which we are aware comes from a recent Ph.D. thesis from O'Mahony (2023). Embedded within a much larger examination of similarities and differences between Registered Reports ($n = 170$) and traditional articles ($n = 340$), the findings indicated that

¹ We use the term “review platforms” instead of the more common “journals” in recognition of the growing prominence of journal-independent review platforms, such as PCI Psychology (Bottesini et al., 2025) and MetaROR (MetaROR, n.d.). Thus, “review platforms” is a more inclusive term for the current landscape of scientific dissemination.

exploratory research was in fact *more* commonly identified in the Registered Reports (75%) compared with the traditional articles (57%). This finding runs counter to the many critics claiming that preregistration would *reduce* the frequency of exploratory research.

The Present Study

The purpose of the present study is to conduct an initial investigation into whether preregistration and Registered Reports restrict exploratory research, or any analysis that is indicated to not be a planned test of a specific hypothesis. We do so by comparing the prevalence of exploratory research across articles with preregistered studies, Registered Reports, and traditional articles (henceforth, we use the term “registration” to refer to both preregistered studies and Registered Reports). The purpose of the study is not to get a population estimate of exploratory research in psychology, but rather examine the specific claims that registration would lead to a decrease in exploratory research. The competing views on the practice of registration and its relation to exploratory research would lead to two divergent data patterns:

1. If registration restricts exploratory research, then traditional articles should include greater reports of exploratory research than registered studies (Figure 1a).
2. If registration clarifies the status of exploratory research, then, consistent with O’Mahony (2023), registered studies should include greater reports of exploratory research than traditional articles (Figure 1b).

The primary goal of the current project is to determine which of the aforementioned two data patterns is most consistent with the data. Our hypothesis is that the data will be more consistent with pattern 2, that is, we anticipate finding a greater frequency of exploratory research in registered articles compared to traditional articles.

Importantly, the current study will not be able to actually assess the frequency of exploratory research, *per se*, but rather the frequency with which exploratory research is reported and transparently described. It is for this reason that we hypothesize that registered articles will report more exploratory research than traditional articles. This line of argument also suggests that there could be differences between preregistered articles and Registered Reports. Several studies have reported that researchers often do not adhere to their preregistration plans nor do they transparently disclose deviations from their plans (Claesen et al., 2021; van den Akker et al., 2023; Willroth & Atherton, 2024). Thus, an article could be preregistered but essentially indistinguishable from a traditional article in its reporting. Registered Reports, however, are much more regulated given how the review process operates, and should thus have clear and transparent reporting. Accordingly, we hypothesize that there will be a greater frequency of exploratory research reported in Registered Reports compared with preregistered and traditional articles.

We additionally take on some exploratory analyses, for which we do not seek to test any specific hypothesis, to examine whether reporting practices have changed over time. Although exploratory, our interest in this question is sparked by several possibilities that we can imagine. Two speculations about change over time include:

3. Because of the heightened interest in transparent reporting over the last 15 years, we may see an increase in traditional articles labeling analyses as exploratory. (Figure 1c). Including an analysis

of traditional articles prior to the implementation of registration in psychology would address this point.

4. The early days of registration in psychology may have been associated with less than ideal implementation by authors, reviewers, and editors, due to the fact that it was a new and unfamiliar practice. Accordingly, some may have had more rigid views about what was permissible to include in registered studies. Thus, there could be less exploratory research in registered studies when the practices were initially adopted but have subsequently increased over time (Figure 1d).

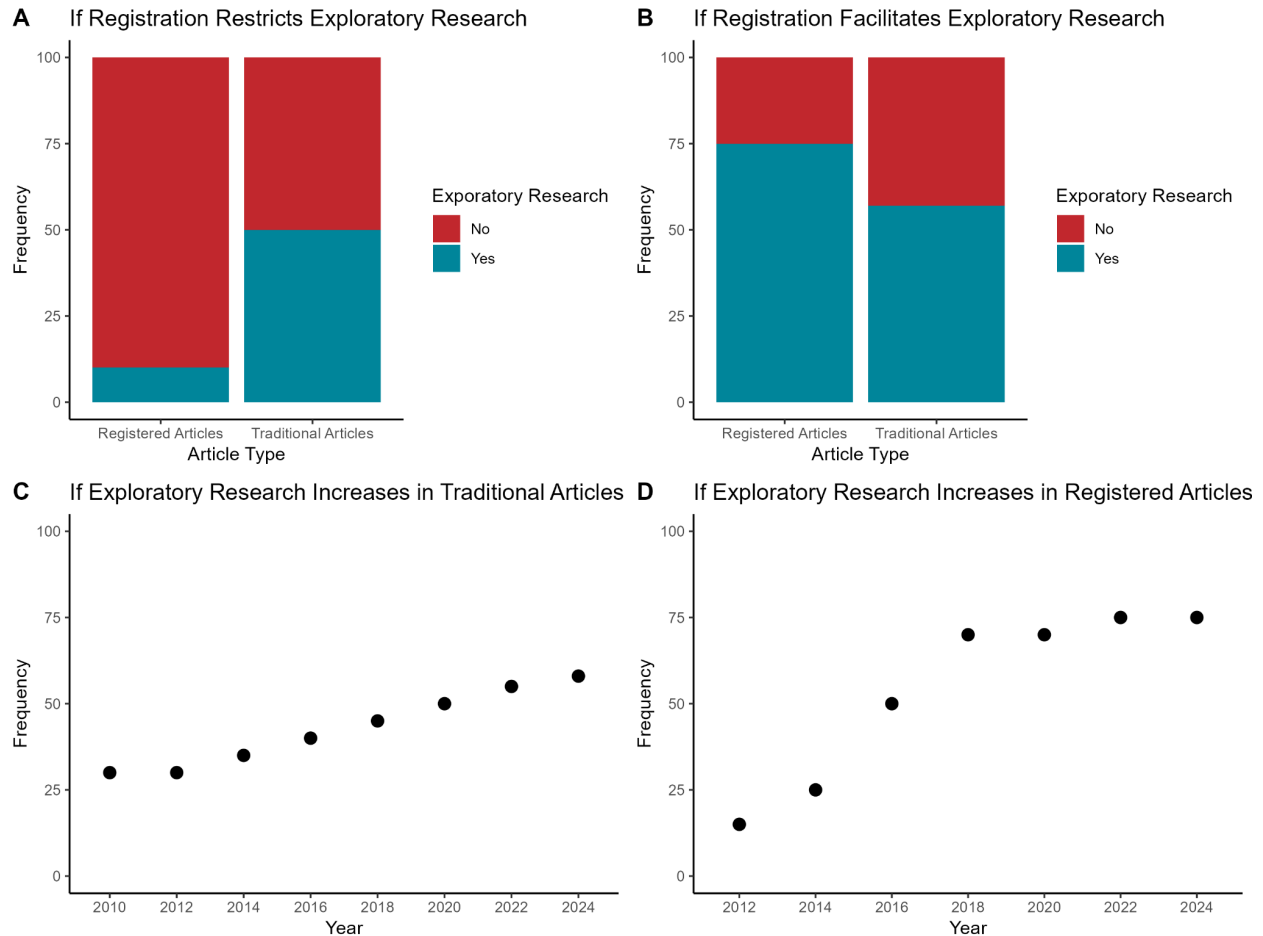


Figure 1. Four hypothetical data patterns.

Method

Article Selection Process

The corpus of articles for analysis will consist of three types of articles, defined as follows:

Articles reporting a preregistered study (“preregistered articles”): An empirical article that includes at least one study, or set of analyses, that is a) stated to be preregistered and b) includes

an accessible link to the registration. For multi-study articles, only one of the reported studies needs to be preregistered to be included in this category.

Articles reporting a Registered Report (“Registered Reports”): An empirical article that includes at least one study that is a) stated, or clearly implied, to be a Registered Report and b) for which the accepted Stage 1 manuscript can be located (either via an included link in the published Stage 2 manuscript or via manual search). For multi-study articles, only one of the reported studies needs to be a Registered Report to be included in this category.

Articles with no reported registrations (“traditional articles”): An empirical article that includes no statements or link regarding any form of registration. This group of articles will consist of two sub-groups: a group of articles that is matched to the target registered articles and a second group of articles published in 2010, prior to the adoption of registration in psychology. The year 2010 was selected because it immediately predates major awareness of the replication crisis in psychology, and registration had not yet been introduced to psychology.

For all types of articles, any type of empirical study will be included, whether quantitative, qualitative, mixed methods, or meta-analyses.

Most of the meta-scientific research on preregistration has relied on one of two datasets: articles that were 1) part of the Center for Open Science Preregistration Challenge or 2) included in a public database listing articles that received a preregistration badge. Both are limited: the Preregistration Challenge was a unique experience with specific guidelines and a review process by the Center for Open Science. The badge database includes articles published only up to 2020. Neither is specific to psychology.

The reason these limited resources have been used is that identifying a proper set of articles is no easy task. We adopt an approach that we believe is well-suited to our research questions.

We will first start with journals that are documented to publish Registered Reports. These journals are a good starting point, because publishing Registered Reports is a strong signal that the journal values registration for empirical studies. Accordingly, if the criticism that registration restricts exploratory work is true, it should be most evident in the articles published in these journals.

Liu et al. (2025) recently published a metascientific study of Registered Reports in psychology that serves as a useful starting point. Through their search process, they identified 47 journals that publish Registered Reports and were classified as psychology journals by the 2023 Clarivate Journal Citation Report (see list at <https://osf.io/jwaf9>). This is not an exhaustive list, as some journals that publish the format were not included². This is not a problem for the current study, as we are not seeking to generate population estimates of how often exploratory work is published in the literature, but rather the relative prevalence of exploratory work in different article types.

² e.g., *Comprehensive Results in Social Psychology*, likely excluded at least in part because it only publishes Registered Reports, and thus no companion traditional article could be included for comparison.

Within these journals, they identified 237 Registered Reports published up to April 1, 2023, with the first published Registered Report appearing in *Cortex* on February 13, 2015³. Liu et al. (2025) excluded replication studies from their set, as well as articles for which they could not identify a match and one article that had been retracted, bringing the total for analysis to 119. We also chose to exclude replication studies from the current project, as they have a different function from original research and thus could show disparate patterns.

The articles identified by Liu et al. (2025) will be our initial set (see list at <https://osf.io/xmdv7>), which will be augmented by a manual search of the table of contents of the 47 journals for additional Registered Reports published between April 1, 2023 and April 1, 2026. Any additional Registered Reports identified will be added to the Liu et al. set. All articles included in this set will be examined by the authorship team to ensure they meet the criteria of a Registered Report given previously.

From this final set, which should consist of at least 200 articles, we will randomly select 75 articles for further analysis. Using these 75, we will locate companion articles for the 75 preregistered and 150 traditional articles (75 of each group). The total sample of articles will be 300 across the four types, which is informed by our power analysis (described in the subsequent section).

Companion articles will be selected based on the following criteria, modified from the criteria used by O'Mahony (2023).

Journal - the companion articles must be selected from the same journal as the Registered Report.

Timeframe - The companion articles should be selected from the same issue as the Registered Report. If no companion article is available in the same issue, we will examine the prior issue. If none is available in the prior issue, we will examine the subsequent issue. We will continue this process until a companion is identified. *Timeframe* of the selected article will be coded as 1 - same issue, 2 - within two issues on either side, 3 - within four issues on either side, or 4 - more than five issues apart.

Topic - The companion articles should generally be the same substantive topic of the Registered Report, broadly conceived. *Topic* will be coded as 1 - very similar (e.g., both focused on factors related to depression), 2 - somewhat similar (e.g., both focused on psychopathology), or 3 - not similar (e.g., both are related to clinical psychology). Ideally, all included articles would have a rating of 1 or 2. However, *Topic* is of secondary importance to *Timeframe*, so a rating of 3 for *Topic* will be acceptable if it allows *Timeframe* to remain 2 or lower.

Design - The companion articles should generally be the same design, for example experimental, intervention, observational, qualitative, or meta-analysis. *Design* will be coded as 1 - very similar, 2 - somewhat similar, or 3 - not similar. Ideally, all included articles would have a rating

³ For accuracy, it is important to note that Sassenhagen and Bornkessel-Schlesewsky (2015) is the first Registered Report published in *Cortex*, a journal that pioneered the format, but that a special issue of the journal *Social Psychology* published in 2014 (Nosek & Lakens, 2014), one year earlier, consisted of 15 Registered Reports that were all replications (and thus were excluded from Liu et al. (2025)).

of 1 or 2. However, *Design* is of secondary importance to *Timeframe*, so a rating of 3 for *Design* will be acceptable if it allows *Timeframe* to remain 2 or lower.

The additional group of 75 traditional articles published in 2010 will be selected from the same journals as the Registered Reports. Starting with the first issue published in 2010, we will identify an empirical article that matches the previously selected companion traditional articles based on *Topic* and *Design*, using the same criteria described above. The selected articles must have a score of at least 2 for each of *Topic* and *Design* to be included.

Power Analysis

Full details of the power analysis are available at <https://osf.io/n9dr6>; here, we provide a summary. The arguments made in the literature that registration will restrict exploratory research has often used extreme language such as that it will “put researchers in chains” (Scott, 2013), “stifle discovery” (Goldin-Meadow, 2016) and serves as a “stranglehold” on research (McDermott, 2022). The severity of this language clearly implies a large effect, that we would see a dramatically lower rate of exploratory work in registered compared to non-registered studies. The only available evidence, however, indicates a moderate difference in the *other* direction, with a greater prevalence of exploratory research in Registered Reports compared with standard reports (O’Mahony, 2023). The effect size in O’Mahony (2023) is not reported, but we can use the reported test statistic, $\chi^2(1, N = 510) = 16.19$, $p < 0.001$, to calculate it as $\phi = .18$. This corresponded to an approximate difference in prevalence of 20%.

It is difficult to say what effect size is the smallest that would be meaningful. Our goal in this project, however, is to address the extreme claims about the damaging impact of registration. Thus, absent any evidence, we would thus primarily be interested in large effects. O’Mahony (2023) provides evidence of a moderate effect, albeit in the other direction. That this effect was found in a registered thesis using a large sample of articles suggests that there is low risk of bias. Thus, we used $\phi = .18$ as our estimate for the present study. The `pwr.chisq.test` function from the *pwr* package in R (Champely et al., 2020) indicated a necessary total sample size of 304 for a 2x2 contingency table (registered vs. not registered), with $\alpha = .05$ and $\text{power} = .80$. That assumes that we are collapsing the two registered articles types together and two traditional articles types together and comparing them against each other. If, instead, we compared all four articles types, but assumed that the pattern of exploratory research would be the same across the two broad categories, then that would yield an effect size of Cramer’s $V = 0.21$ and a suggested sample size of 216. Relaxing these assumptions in different ways leads to a range of effect sizes from Cramer’s $V = 0.18$ - 0.28 and a range of sample sizes from $N = 120$ - 306 . Taken together, the power analysis indicates a total sample of 300 articles will be sufficient for the aims of the study.

Article Coding

Coding will be done at the article-level rather than individual studies within articles. That is, assessment of our target categories described below will be made based on their appearance in any aspect of the article and not related to a specific study. An argument against this approach may be that some articles consist of a mix of registered and non-registered studies, and therefore we should only code the registered studies for the presence of exploratory analyses. We do not take this

approach because, if at the article level researchers used a mix of registered and non-registered studies in order to include both confirmatory and exploratory analyses, then this approach would be entirely consistent with the argument of registration advocates that registration does not inhibit exploratory research. Thus, coding at the article level provides the clearest indication of the use of exploratory research in the context of registration.

Importantly, in the current project we remain agnostic about the quality of the registrations themselves. There have been several studies indicating that registrations lack specificity and that researchers often engage in undisclosed deviations from their registrations (Claesen et al., 2021; van den Akker et al., 2023). These are important issues but not our concern here, as we are focused on the implications of the practice of registration regardless of how that practice is implemented.

Each article will be coded for the following:

Statements of Exploratory Research

One of the limits of the O'Mahony (2023) study is that it did not include a clear definition of what constitutes "exploratory." In the current project, the presence of exploratory research will be coded in accordance with our definition, "any analysis that is indicated to not be a planned test of a specific hypothesis." We will code for any explicit or clearly implied mention of exploratory tests, exploratory analysis, unplanned analysis, or speculative analyses. "Clearly implied" is a subjective criterion but is included here for cases where raters can determine that the analyses were exploratory absent an explicit statement. For example, if researchers state a research question, but indicate that they made no hypotheses about that question, then that would be considered exploratory even if they did not explicitly label it as such. Additionally, any tests that are labeled as robustness tests, sensitivity tests, or tests of alternative explanations, and are explicitly or clearly implied to be exploratory or unplanned, will be coded as exploratory research.

Importantly, not all uses of the word "explore" or "exploratory" necessarily indicate exploratory research. For example, following a hypothesized statistically significant interaction effect, authors may state that they "explored" or "probed" the interaction via simple slopes analysis. That kind of follow-up test is directly related to the hypothesis about the interaction and is conducted to gain greater clarity on the specific nature of the interaction. It also reflects the broader problem in psychology with the lack of specificity when proposing hypotheses about interaction effects (Baranger et al., 2023). An additional case that does not necessarily meet the criteria for exploratory research is the use of "exploratory factor analysis" as an analytic technique. This type of analysis is sometimes used in an exploratory way that is consistent with our definition, and sometimes used to test confirmatory hypotheses (despite its name). In both of these cases, the type of analysis could reflect exploratory research by our definition, but it will depend on the specific use in that study. Thus, the context will be taken into account when coding rather than simply examining the articles for keywords..

Three sections of each article will be inspected and coded for the presence of exploratory research: 1) the end of the Introduction section, where the researchers discuss the aims of the study; 2) the Data Analysis Plan/Results⁴ sections(s), and 3) the Discussion section. For each section, raters

⁴ Not all articles will include a Data Analysis Plan section, and some may include it as a subsection of the Results section, and so for that reason we are treating them as the same unit.

will code for the presence or absence of mentions of exploratory research. Although O'Mahony (2023) also included an "uncertain" category, any article that would potentially be coded as uncertain would not meet our coding criteria and thus should be coded as absent.

Section Headers Indicating Exploratory Research

Raters will code presence/absence for the inclusion of section headers that explicitly indicate exploratory analyses. The full articles will be examined, but these are most likely to appear in the Results section when present.

Coding Difficulty

Raters will code for how difficult it was to determine their rating, which also can serve as a useful indicator of their confidence in their ratings. We will use the system from O'Mahony (2023): 1 - Very easy, 2 = Somewhat easy, 3 = Somewhat difficult, and 4 = Very difficult. Raters will provide a global rating for difficulty, rather than for each section.

Rater Training and Reliability

The raters for this project will consist of the four authors, a professor of psychology and three doctoral students in social psychology. We conducted a pilot coding process of six articles based on the preliminary coding categories. This pilot process indicated that the coding system was sufficiently clear and applicable, and led to some minor refinements in the definition and scope of the categories.

Formal training and establishing reliability will be done following the review process of this proposal, given that the coding system may change. The training phase will use articles that are not part of the focal set but share similar characteristics (i.e., articles of the three types that were published in psychology journals across the same time range). We will draw from the following journals that were not included in the focal set: *Assessment*, *Clinical Psychological Science*, *Journal of Personality*, *PloS ONE*, and *Social Psychological Bulletin*.

The training phase will consist of four steps:

Step 1 will be for the rating team to become familiar with the coding system and how to apply it to the articles. We will independently code two articles during a project meeting and then have a discussion about our coding system.

Step 2 will involve the raters independently coding a set of five articles. This coding will be subject to reliability analysis using average pairwise percent agreement and Fleiss's Kappa to quantify the degree of agreement. The raters will then have a meeting in which they discuss the disagreements.

Step 3 will be a repeat of Step 2 but with 10 new articles. Once again, average pairwise percent agreement and Fleiss's Kappa will be used to quantify the degree of agreement. If percent agreement exceeds .80 and Kappa exceeds .60, then the training phase will be complete. If not, then we will continue the training phase with a new set of 10 articles until these thresholds are reached.

The focal set of 300 articles will be coded by the four raters, arranged in two teams of two raters each. Each team will code 100 unique articles, with the remaining 100 articles being coded by all four raters. The coding will proceed across 8 weeks, with the coding for each week alternating between the 25 common articles and 50 unique articles. Percent agreement will be assessed for each batch, and the raters for that batch will meet to resolve discrepancies via discussion. All data and code will be made openly available at <https://osf.io/4vbtq/>.

Planned Analysis

Hypothesis Tests

To test our first hypothesis, that there will be a greater frequency of exploratory research in registered articles compared to traditional articles, we will take an average of the exploratory research ratings (across Introduction, Results, and Discussion sections) and compare those averages between registered and traditional articles. This will be done using a 2x2 chi-square test of independence ($\alpha = .05$).

A secondary test of the hypothesis will compare whether or not there is an explicit header for exploratory research, again comparing registered and traditional articles using a 2x2 chi-square test of independence ($\alpha = .05$).

Exploratory follow-up tests will examine variations in the specific sections (e.g., Introduction vs. Results sections), but no inferential tests will be used and no p -values will be reported for these analyses.

To test the second hypothesis, that there will be a greater frequency of exploratory research reported in Registered Reports compared with preregistered and traditional articles, we will conduct a 3x3 chi-square test of independence ($\alpha = .05$) comparing the average exploratory research rating across Registered Reports, preregistered studies, and traditional articles. Follow-up analyses will examine the cell-wise adjusted standardized residual, with inference about deviations based on exceeding the threshold of ± 1.96 .

A secondary test of the hypothesis will compare whether or not there is an explicit header for exploratory research, again comparing Registered Reports, preregistered studies, and traditional articles using a 3x3 chi-square test of independence ($\alpha = .05$). Follow-up analyses will examine the cell-wise adjusted standardized residual, with inference about deviations based on exceeding the threshold of ± 1.96 .

Exploratory follow-up tests will examine variations in the specific sections (e.g., Introduction vs. Results sections), but no inferential tests will be used and no p -values will be reported for these analyses.

Exploratory Analyses

We will conduct extensive exploratory analyses of the data, focusing on generating plots and reporting effect sizes. No inferential statistics will be used and no p -values will be reported. One set of planned exploratory analyses is to examine change over time in reports of exploratory research,

separated by article type. We will additionally examine variations in coding difficulty by article type, and whether this has changed over time.

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