



Early-Career Researchers' Perceptions of the Prevalence of Questionable Research Practices, Potential Causes, and Open Science

Stefan Stürmer,¹ Aileen Oeberst,² Roman Trötschel,³ and Oliver Decker⁴

¹Department of Psychology, FernUniversität in Hagen, Germany

²Johannes-Gutenberg Universität Mainz & Leibniz-Institut für Wissensmedien, Mainz, Germany

³Leuphana Universität Lüneburg, Lüneburg, Germany

⁴Universität Leipzig, Leipzig, Germany

Abstract: Young researchers of today will shape the field in the future. In light of current debates about social psychology's research culture, this exploratory survey assessed early-career researchers' beliefs ($N = 88$) about the prevalence of questionable research practices (QRPs), potential causes, and open science as a possible solution. While there was relative consensus that outright fraud is an exception, a majority of participants believed that some QRPs are moderately to highly prevalent what they attributed primarily to academic incentive structures. A majority of participants felt that open science is necessary to improve research practice. They indicated to consider some open science recommendations in the future, but they also indicated some reluctance. Limitation and implications of these findings are discussed.

Keywords: early-career researcher, research practices, open science

In the recent years, psychology has faced extensive discussions of trust in psychological data (e.g., Pashler & Wagenmakers, 2012). Debates revolving around the validity and reliability of scientific findings are neither new nor limited to psychology (e.g., Alberts, Kirschner, Tilghman, & Varmus, 2014; Ioannidis, 2005; Stephan, 2012; Yong, 2012). However, the publication of a series of articles questioning the replicability of research findings in psychology (e.g., Open Science Collaboration, 2015), and particularly social psychology, has raised increasing concerns within and outside the field that scientific findings thought to be robust may in fact be “false-positives” (e.g., Doyen, Klein, Pichon, & Cleeremans, 2012; Garrison, Tang & Schmeichel, 2016; Hagger et al., 2016; Pashler, Coburn, & Harris, 2012; Shanks et al., 2013; Wagenmakers, Wetzels, Borsboom, & van der Maas, 2011). This, in turn, has also led to increasing public attention, and ultimately, unfavorable media representations of the field (e.g., Ferguson, 2015).

Previous reports on unreliable findings have often focused on individual scientific misconduct or fraud (see, for instance, Callaway, 2011). By contrast, current debates have increasingly moved from individual-level explanations to analyses at the system level of academic psychology,

especially its incentive structures, norms, and research culture (e.g., Nosek, Spies, & Motyl, 2012). One specific set of system-level explanations revolves around the prevalence of questionable research practices (QRPs) such as failing to report in a paper all of a study's dependent measures, failing to report all of a study's conditions or predictors and the like (Bakker, Van Dijk, & Wicherts, 2012; John, Loewenstein, & Prelec, 2012; LeBel et al., 2013; Simmons, Nelson, & Simonsohn, 2011). Although there is some debate about the exact prevalence of QRPs in psychology (e.g., Fiedler & Schwarz, 2016), in the recent years, disciplinary leaders, journal editors, funding agencies, and others have made recommendations to improve openness and replicability many of which form what has become known as an open science movement (e.g., Nosek et al., 2015). The journal *Social Psychology* substantially contributed to these debates and developments (see, for instance, the Special Issue on “Registered Reports” edited by Nosek & Lakens, 2014, or editorials by Epstude, 2017 or Unkelbach, 2016). The present paper reports the results of an exploratory survey among German social psychology pre-docs and post-docs (hereafter: early-career researchers). Our research adds to previous work by examining

early-career researchers' subjective beliefs about three related issues: (a) the prevalence of QRPs in the German social psychological research community, (b) the perceived causes of QRPs, and (c) the necessity of implementing open science. The present research did thus not set out to contribute to estimations of the "true" prevalence of QRPs, nor did it aim to investigate its "true" causes. Rather, we were interested in understanding early-career researchers' *subjective beliefs* about the state of affairs in social psychology's research culture. This endeavor is important for the following reasons, we believe: As captured in Thomas and Thomas's (1928) famous dictum "If men define situations as real, they are real in their consequences" (pp. 571–572). From this perspective, believing that QRPs are wide spread in the scientific community may in fact be more important than the factual state of affairs. On the one hand, such beliefs may prevent highly qualified early-career researchers to continue their career in this field. On the other hand, such beliefs may also create descriptive norms that ultimately undermine injunctive norms fostering good scientific practice (see Fiedler & Schwarz, 2016, p. 51). Both processes (drop-out, normative shifts) harm the quality of science. Early-career researchers are the next generation. They will shape the cultures and practices of the field in the future. Understanding how early-career researchers perceive the prevalence of QRP, the causes of this prevalence, and ways of improvements are thus an important supplement to a more comprehensive endeavor to ensure the quality of psychological research.

Methods

Participants and Procedure

Invitations were sent via the mailing list of the Fachgruppe Sozialpsychologie (Social Psychology Division) in the Deutsche Gesellschaft für Psychologie (German Psychological Association) and an additional mailing list organized by social psychological pre-docs in the Fachgruppe. At the time of our survey, the Fachgruppe had 547 members, 244 of these were early-career researchers (pre- and post-doc members under age 40). A total of 109 German social psychology self-identified pre- or post-docs followed our e-mail invitation to participate in a web survey carried out in 2016. Eighty-eight (81.7%) respondents completed the survey. Their data were thus included in the present analyses. The data of nine additional respondents who also completed the survey but did not unambiguously self-identify as pre- or post-docs were not considered. Including their data did not change the general pattern of results, however. The resulting sample encompasses roughly 36% of the early-career researchers organized in the Fachgruppe

Sozialpsychologie. Fifty-three (60.2%) of the participants self-identified as pre-docs, 35 (39.8%), self-identified as post-docs. The maximum number of participants belonged to the age group of 26–30 years (50.0%), followed by participants belonging to the age group of 31–35 years (35.2%). The majority of participants were female (70.5%).

Online Questionnaire

The survey was introduced to participants as a study on the situation of early-career researchers in social psychology including questions concerning their person, their workload, and their assessments of current debates in social psychology. A first half of the questionnaire included items pertaining to different aspects of early-career researchers' professional involvement and their well-being (e.g., items pertaining to academic involvement in teaching, research, and administration, workload, perceived stressors). The following report focuses on participants' responses to three sets of items pertaining to QRPs, perceived causes, and open science which were inserted in the questionnaire's second half. All items were created by the authors on the basis of literature reviews and expert discussions. To assess early-career researchers' perceptions of the *prevalence of QRPs* in the German social psychological community, participants were asked to separately indicate how prevalent they believed 14 problematic research practices (including fraud) were in the German social psychological research community using 5-point rating scales (1 = *not at all*, 2 = *slightly*, 3 = *moderately*, 4 = *fairly*, 5 = *very*). To assess *perceived causes of the prevalence* participants were asked to separately rate 13 potential causes of QRPs using 4-point rating scales (1 = *does not apply*, 2 = *does rather not apply*, 3 = *does rather apply*, 4 = *does apply*). Participants also separately rated the perceived necessity of six general *open science practices* with regard to the goal of improving scientific standards in social psychology by using 5-point rating scales (1 = *not at all necessary*, 2 = *slightly necessary*, 3 = *moderately necessary*, 4 = *fairly necessary*, 5 = *very necessary*). Participants also indicated (*yes/no*) whether they planned to consider one or more of the open science procedures mentioned above when conducting own studies in the near future. The full instruction texts (originally in German) as well as the items are provided in the Electronic Supplementary Material (ESM 1), along with English translations and additional information.

Results

Beliefs About the Prevalence of QRPs

In a world in which QRPs are (or are, at least, believed to be) a rare exception, participants' perceived prevalence

Table 1. Perceived prevalence of QRPs and fraud (%)

Item	Response categories					Item statistics	
	Not at all	Slightly	Moderately	Fairly	Very	<i>M</i>	<i>SD</i>
To invent data	55.3	40.0	3.5	0.0	1.2	1.52	0.68
To manipulate/fake data	41.2	51.8	5.9	0.0	1.2	1.68	0.69
To transform data to yield the significance level	8.4	39.8	28.9	14.5	8.4	2.75	1.08
To exclude participants only to reach the level of significance (e.g., through insufficiently justified outlier analyses)	7.1	32.9	31.8	21.2	7.1	2.88	1.05
To terminate data collection when significance level is reached	6.0	32.1	33.3	22.6	6.0	2.90	1.01
Post hoc creation of variables (e.g., composites without theoretical justification)	3.5	30.6	35.3	23.5	7.1	3.00	0.99
Not to provide study materials for independent checks	6.0	32.1	26.2	21.4	14.3	3.06	1.17
To document methods, analyses, and results selectively/incomplete in favor of the hypotheses	7.1	17.6	42.4	21.2	11.8	3.13	1.07
To realize many conditions, but to report only those, producing significant results	3.5	26.7	25.6	23.3	20.9	3.31	1.18
To include covariates in the analyses only to reach the level of significance	4.7	15.3	31.8	28.2	20.0	3.44	1.12
Insufficient power analyses	0.0	8.3	17.9	36.9	36.9	4.02	0.94
Post hoc creation of hypotheses and explanations of data	0.0	5.8	15.1	37.2	41.9	4.15	0.89
To analyze many measures, but to report only those producing significant results	0.0	11.6	8.1	32.6	47.7	4.16	1.00
To conduct many studies, but to report only those producing significant results	1.2	4.7	7.0	27.9	59.3	4.40	0.90

Notes. Table shows valid percent with smallest *N* = 83 due to individual missing data with items sorted by means (upwards). *M* = item mean, *SD* = item standard deviation. Scale ranges from 1 (= *not at all*) to 5 (= *very prevalent*).

ratings would ideally range between “*not at all*” and “*slightly*.” As can be seen in Table 1, this was not the case, however. In fact, only practices of outright fraud (“manipulating/faking data,” “inventing data”) were rated as “*not at all*” or “*slightly*” prevalent by a majority of over 90% of participants. The remaining practices were rated as “*moderately*” to “*very*” prevalent by a majority of at least 51.8% of participants (“transform data to yield the significance level”) rising for some practices to over 90% (e.g., “insufficient power analyses”). The means of these ratings were all significantly above the scale point “*slightly*,” for all one-sample *t*-tests $ts \geq 6.30$, $ps < .001$, 95% CIs $LL \geq .51$. Exploratory comparisons of pre-docs and post-docs did not yield significant group differences on the assessments of any individual item, all $ts \leq |1.43|$, $ps \geq .159$, suggesting relatively similar assessments among both subgroups.

Perceived Causes of the Prevalence of QRP

As can be seen in Table 2, eight causes were rated as “*rather applicable*” or “*applicable*” by a majority of at least 65.9% of participants (“lack of role models for good scientific practice within the community”) rising for some causes to over 90% (e.g., “competition for publications in ‘high impact journals,’” “competition for permanent positions,” “competition for external funding”). The means of these ratings were all

significantly above the scale point “*does rather not apply*,” for all one-sample *t*-tests $ts \geq 6.90$, $ps < .001$, 95% CIs $LL \geq .53$. With regard to two causes participants’ assessments were relatively split (“competition within workgroups,” “lack of effective sanctions of scientific misconduct”). Three causes were rated as “*rather not applicable*” or “*not applicable*” by a majority of at least 61.2% of the participants (“personality traits of those employing problematic practices,” “lack of methodological knowledge among social psychologists,” “lack of knowledge of research ethics among social psychologists”). To summarize, these data suggest that participants place primary responsibility for the prevalence of QRPs on competition and incentives in the academic system. Attributions on factors residing in the individual researcher were relatively rejected as potential causes. Exploratory comparisons of pre-docs and post-docs did not yield significant group differences with regard to these assessments, all $ts \leq |1.57|$, $ps \geq .121$.

Open Science

Seventy-seven participants indicated that they had heard of the open science movement, nine indicated that they had not, and two provided no information. As can be seen in Table 3, all open science practices were rated as “*fairly*” to “*very*” necessary by a majority of at least 50.5% of the

Table 2. Perceived causes of the prevalence of QRPs (%)

Item	Response categories				Item statistics	
	Does not apply	Does rather not apply	Does rather apply	Does apply	<i>M</i>	<i>SD</i>
Competition for publications in "high-impact journals"	0.0	1.2	11.8	87.1	3.86	0.38
Competition for permanent positions (e.g., professorships)	0.0	4.7	16.5	78.8	3.74	0.54
Competition for external funding	0.0	8.1	26.7	65.1	3.57	0.64
Incentives within the publication system (e.g., originality over replication)	0.0	10.8	24.1	65.1	3.54	0.69
Socialization processes and implicit norms within scientific training	0.0	11.6	27.9	60.5	3.49	0.70
The feeling of being at a disadvantage when one meets standards that others circumvent	4.8	13.1	39.3	42.9	3.20	0.85
Lack of awareness of the implications of these practices for science	8.1	16.3	52.3	23.3	2.91	0.85
Lack of role models for good scientific practice within the community	15.3	18.8	42.4	23.5	2.74	0.99
Competition within work groups	12.0	41.0	27.7	19.3	2.54	0.94
Lack of effective sanctions of scientific misconduct	15.1	36.0	29.1	19.8	2.53	0.98
Lack of methodological knowledge among social psychologists	27.1	34.1	30.6	8.2	2.20	0.94
Lack of knowledge of research ethics among social psychologists	35.3	40.0	17.5	7.1	1.96	0.91
Personality traits of those employing problematic practices	44.6	42.2	9.6	3.6	1.72	0.79

Notes. Table shows valid percent with smallest *N* = 83 due to individual missing data with items sorted by means (downwards). Scale ranges from 1 (= does not apply) to 4 (= does apply).

participants ("pre-registration of hypotheses or labeling studies explicitly as exploratory, respectively") rising for some procedures to over 80% (e.g., "complete reporting of studies, analyses and results"). The means of these ratings were all significantly above the scale point "*moderately necessary*," for all one-sample *t*-tests $t_s \geq 5.01$, $ps < .001$, 95% CIs $LL \geq .36$. Exploratory comparisons of pre-docs and post-docs yielded (marginally) significant group differences on four items, indicating that compared to post-docs, pre-docs perceived, overall, a somewhat higher necessity to implement open science practices, $t_s \geq 1.92$, $ps \leq .058$.

Participants also indicated (*yes/no*) whether they planned to consider one or more of the open science procedures mentioned above when conducting own studies in the near future. Approval rates were as follows: "a-priori planning of sufficient sample size" ($N = 78$, 86.7%); "complete reporting of studies, analyses and results" ($N = 76$, 84.4%); "making data, materials and analysis protocols online available at time of publication" ($N = 44$, 49.4%), "pre-registration of hypotheses" ($N = 43$, 47.3%); "participating in the replication and examination of published findings, as far as the circumstances allow to do so" ($N = 36$, 40.0%); "making also the results of unsuccessful replications of findings of other persons (or own findings) available by using online-resources" ($N = 35$, 39.3%). These rates did not differ between pre-docs and post-docs, all $\chi^2_s < 0.95$, $ps \geq .380$.

Finally, participants were also provided the opportunity to highlight critical aspects concerning the open science debate which should be considered more thoroughly in the future. Of the 35 participants who took advantage of this opportunity, about 25% expressed concerns revolving around a discrepancy between the ideal of good science and the actual or established practice (e.g., the perception that journals, reviewers, funding agencies, and hiring committees still decide on the basis of traditional criteria). Further participants were concerned about "naming and shaming" of individual researchers, and others brought up issues of data protection and authors' rights. Additional participants pointed out that the focus of the open science debate on methodological and statistical issues was too narrow while issues concerning the lack of theoretical specificity and formalization were relatively ignored; the demand for large samples may generate resource conflicts and problems within small work groups; the consideration of open science may hamper one's career; future research reports may contain too many irrelevant information; and increasing effort to conduct studies.

Discussion

The findings of this exploratory survey among German early-career researchers can be integrated and interpreted

Table 3. Perceived necessity of Open Science practices (%)

Item	Response categories					Item statistics	
	Not at all	Slightly	Moderately	Fairly	Very	M	SD
To report studies, analyses, and results completely	1.2	3.5	5.8	38.4	51.2	4.35	0.84
A priori planning of sufficient sample size, preferably on the basis of power analyses	1.2	1.2	12.8	32.6	52.3	4.34	0.84
To make the results of unsuccessful replications of findings of other persons (or own findings) available by using online resources	2.3	1.2	15.1	26.7	54.7	4.30	0.93
To participate in the replication and examination of published findings, as far as the circumstances allow to do so	2.3	5.8	22.1	32.6	37.3	3.97	1.02
To make data, materials, and analysis protocols online available at time of publication	1.2	10.5	34.9	26.7	26.7	3.67	1.02
Preregistration of hypotheses of studies (or declare study explicitly as exploratory)	3.5	14.0	26.7	30.2	25.6	3.60	1.12

Notes. Table shows valid percent with smallest $N = 86$ due to individual missing data with items sorted by means (downwards). M = item mean, SD = item standard deviation. Scale ranges from 1 (= not at all) to 5 (= very necessary).

as follows. While there was relative consensus among participants that practices of outright fraud are an exception in German social psychology, a majority of participants believed that QRPs relating to statistical significance seeking, under-powering, selective reporting, or lack of openness were moderately to highly prevalent. Further findings indicated that participants attributed the usage of QRPs primarily to factors residing in the system of academic psychology (e.g., competition for publications, positions, or grants), whereas factors residing in the individual researchers (e.g., personality characteristics, lack of methodological knowledge) were considered less likely.

When evaluating these results, the following limitations have to be kept in mind. All measures for this exploratory study were created ad hoc. Further, the distribution of demographic characteristics of our participants generally corresponds to those found in other samples of German pre- and post-docs (e.g., Rentzsch, Harzer, & Wolter, in press). Still, we cannot determine the representativeness of our sample for the total population of German social psychology pre- and post-docs because, due to a lack of available statistics, the characteristics of the total population are unknown. Our findings are thus preliminary and do not claim to make any final judgments. Importantly, however, we have no indication that our recruitment procedures (sending e-mail invitations to all members of the Fachgruppe/organized pre-docs in Social Psychology) selectively attracted early-career researchers holding an overly critical or pessimistic view of the field. In the following, we will thus offer two interpretations for our results. Both interpretations base on the idea that participants' responses reflect aspects of a *social representation* of academic social psychology. Social representation theory advocates that, in the context of social discourse and communication, members of groups or collectives generate

widely-shared conceptions about issues of concern by integrating their individual experiences with expert knowledge, conventional wisdom, group norms, or cultural beliefs (e.g., Moscovici, 1984). Against this background, one interpretation could be that our findings reflect primarily early-career researchers' acceptance of socially shared rumors, stereotypes, or clichés currently perpetuated about the field. Alternatively, participants' representations could result from an integration of their own "true" socialization experiences with the concerns and empirical findings presented by established researchers. With regard to the situation of early-career researchers both interpretations seem equally troubling. This is, because independent of its accuracy, the perception that QRPs are wide spread in the research community may function in terms of descriptive norms undermining injunctive norms of good scientific practice (e.g., Fiedler & Schwarz, 2016). Our data do not allow us to delineate whether and to what extent our research participants perceived a difference between their own standards and the norms in the field. Following Miller and Prentice (1994) one could speculate, however, that when individuals mistakenly assume that personal standards and perceived research norms differ, such perceptions may yield significant consequences: on the one hand, individuals may feel alienated from their peers and colleagues. On the other hand, and to the extent that they conform to the perceived norms, individuals may contribute to the perpetuation of QRP because they believe that everyone else employs them.

From a different perspective, one could also argue that a representation of social psychology in terms of a "sloppy science" may negatively impact on early-career researchers' social identity derived from their membership in the scientific community. According to social identity theory, group members may use a variety of strategies to cope with

negative social identity ranging from individual strategies (e.g., leaving the group) to collective strategies of social change (e.g., Tajfel & Turner, 1986). From this perspective, the open science movement can be conceived as a collective effort to deal with perceived threats to social psychology's identity as a science. A majority of our participants felt that open science is necessary to improve research practice. A majority of participants also indicated to consider some recommendations in their own future work (e.g., a priori power analyses). Still, with regard to other recommendations (e.g., preregistration) they were more reluctant. In an academic system in which one's academic career critically depends upon high-impact publications, the open science movement creates a social dilemma situation (i.e., what is in the collective best interest of the scientific community is not necessarily in the immediate interest of the individual scientist). Due to greater job insecurity, for early-career researchers this conflict might be more acute than for more established researchers holding permanent positions (e.g., Everett & Earp, 2015; also Stürmer, Oeberst, Trötschel, & Decker, in press). Dependence on senior researchers can also be an issue. In Germany, for instance, where we recruited our sample, early-career researchers are typically dependent on a senior researcher (their academic supervisor) for a considerably longer period of time than researchers in other countries (e.g., Buchholz, Gülker, Knie, & Simon, 2009). Under such circumstances, early-career researchers may thus be particularly cautious to embrace novel research practices that bear the potential to challenge or even question their supervisors' work and convictions.

Like other scientific associations, the Social Psychology Division of the German Psychological Association has recently issued a declaration to support good scientific practice at many levels of scientific conduct, such as teaching, publication, evaluation, and reward (see http://www.sozialpsychologie.de/images/dokumente/stellungnahme_sopsy_forschung.pdf). We hope that, in the long run, this and similar measures will help to reduce beliefs among early-career researchers that bad practices may be common practice in the field. So far social psychology, specifically experimental social psychology, has been a key focus in the debate on replicability. Issues of replicability are neither restricted to experimental research nor to the field of social psychology, however. In closing, we thus wish to encourage similar surveys on early-career researchers' perceptions in other areas of psychology, especially those in which this debate has received relatively little attention so far.

Electronic Supplementary Materials

The electronic supplementary material is available with the online version of the article at <https://doi.org/10.1027/1864-9335/a000324>

ESM 1. Text (pdf).

Online survey – German texts and English translations.

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Received May 5, 2017

Revision received August 27, 2017

Accepted August 27, 2017

Published online November 23, 2017

Stefan Stürmer

Department of Psychology

FernUniversität in Hagen

Universitätsstr. 33

58098 Hagen

Germany

stefan.stuermer@fernuni-hagen.de