

**Social Psychologist's Perception and Criticism of the Reform Movement and Its Recent
Efforts to Improve Science**

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Abstract

As answer to a perceived crisis, Psychology has recently experienced a variety of efforts to reform science. However, the proposed solutions and attitudes of people promoting them have also received criticism. To examine this situation, we believed it is informative to ask researchers directly affected about their perception of these recent reform endeavours. We surveyed 74 researchers from five Dutch universities, who self-identified as social psychologists. Using a Mixed-methods approach, we asked them how they identified with the movement behind the reforms, how they perceive the movements contributions and whether they feel influenced by the ways criticism is outed. Specific focus lied on analysing the text-answers and coding ways in which participants criticised the movement. Results of our quantitative items showed no tendencies for strong opinions. More interesting were the observed (sub)themes. Participants criticized the conduct of reformers and specifically 'Bropenscience'. The input of reformers was criticized for missing constructivity, a connection to real research practices, and being over-generalizing. Furthermore, respondents wished reforms would focus more on issues like theory, (ecological) validity, diversity, equity and the academic system/culture. Though the greatest finding, limiting the validity of the whole work, was that participants had numerous problems with the construct and label of a "reform movement", that we adopted from existing literature. Among others, they were unsure who it refers to and questioned its homogeneity. Finally, I concluded that future research should use more specific descriptions of developments and people engaged in reforming science should examine the discussed concerns.

Keywords: replication crisis, reform, Open Science, Metascience

Social Psychologist's Perception and Criticism of the Reform Movement and Its Recent Efforts to Improve Science

One of the most important contemporary issues in Psychology is probably the perception of a research crisis. According to ShROUT and RODGERS (2018) this crisis can be described as unfolding on three levels: a new awareness and understanding of questionable research practices (QRPs), the revelation of fraud cases and the failure to replicate a high percentage of research findings (p.489). Later was especially illustrated by the work of the Open Science Collaboration (OSC, 2015), who could only replicate 37% of the results of 97 studies significantly, and the two Many Labs projects (Klein et al., 2014; Klein et al., 2018) with somewhat higher replication rates, but a few limitations in their study designs that could partially explain the more optimistic results (Guttinger, 2020).

Especially social psychology has been in the centre of criticism. Prominent fraud cases like Diederik Staples (Bhattacharje, 2013), widely discussed controversies like Bem's (2011) article claiming to provide evidence for precognition, and the research surrounding power posing (Gelman & Geurts, 2017) focused attention on the field. Additionally, one of the biggest takeaways of the OSC study (2015) was that replication problems were systematically greater for the field of social psychology.

As answer to the crisis, a variety of changes have been proposed, including new research practices, policy changes, normative principles and a strong focus on Open Science and Meta Science. However, the proposed solutions and the attitudes of people promoting them have also been criticized. In this paper, I want to investigate these inconsistencies and believe it is most informative to ask researchers in a particularly affected field how they view the recent reform efforts. In the following, I will offer a short description of what became called a reform movement and discuss a variety of issues surrounding the recent reform efforts.

Theoretical framework

The reform movement

An adequate account of all attempts to change science for the better, that happened since the early 2010s, would go beyond the scope of this paper. Some talk of a rather “fragmented discourse” (Zwaan, 2017, p. 1), but others do identify a movement, including “meta science as a social movement” (Peterson and Panofsky, 2021; Peterson and Panofsky 2020), “open scholarship, open science and replication” as “ethico-political projects” (Penders et al, 2019) and a reform movement at large (Derksen & Field, 2021, Devezer et al., 2021; Flis, 2019; Scheel et al., 2021; Spellmann & Kahneman, 2018; Wiggins & Christopherson, 2019). Although, one could argue about the composition and coherence of the movement as a societal group, in the following, we will be using the latter term ‘reform movement’ to summarize all people sharing concerns with regards to improving science through either meta-scientific or transparent/open science practices.

Replication

Most reform efforts in the last years intended to increase the amount of replication studies done in research (Wiggins & Christopherson, 2019). New infrastructures for sharing data were established and changes to the incentive system proposed. Still, opinions tend to differ about the importance of replication itself and whether to engage in direct versus conceptual replication. Some, including the social psychologists Crandall and Sherman (2016), argued for the superiority of conceptual replication as it strengthens theoretical development and the generalizability of findings. Others have argued for the need of direct replication studies, as conceptual replications are especially vulnerable to confirmation bias, publication bias and do not provide enough evidence for the reliability of results (Pashler & Harris, 2012; Wiggins & Christopherson, 2019; Zwaan et al., 2018). Then again, scholars

questioned whether replicability overall can be used as a universal “epistemic criterion for the quality of scientific findings” across research fields (Guttinger, 2020, p.8; Leonelli, 2018).

Overly generalizing solutions

The latter connects to researchers generally warning of implementing policies and proposing methodological standards that are overly generalizing (Devezer et al., 2021; Guttinger, 2020; Leonelli, 2021). Devezer et al. (2021) call for statistical and formal rigour, that includes “scientific nuance” and “not losing sight of the context of inference” (p.20). And Leonelli (2021) highlights that Open Science policies need to take epistemic diversity in all its facets into account, because they otherwise risk “acting as a reactionary force reinforcing conservatism and inequity in research” (p.5). As factors influencing epistemic diversity, she does not only include theoretical and methodological considerations, but also socio-cultural, infrastructural and institutional factors (Leonelli, 2021).

Publication pressure and publication bias

A further debate spans around the influence of the academic system and its demands on researchers. Identifying the causes for the replication crisis only as questionable research practices, statistical problems and or replicability would ignore these greater underlying dynamics (Hoole, 2019). This includes worldwide publication pressure for researchers and how it can steer researchers into engaging into unattractive practices (Hoole, 2019), combined with desirability of publishing in high-impact journals (Wiggins & Christopherson, 2019). The problems resulting out of their preferences for accepting novel, as well as for not publishing failed replications or zero-findings have been widely demonstrated (Wiggins & Christopherson, 2019; Wilson & Wixted, 2018). Wilson & Wixted (2018) even showed how the preferences for surprising and risky studies could partially explain lower replication successes in social psychology. As response, reforms have proposed solutions how journals can incentives better research like batches for Open science practices (Kidwell et al., 2016),

and guidelines for journals to conquer publication bias (Wiggins & Christopherson, 2019). Still, high demands on researchers to produce output stays a vital problem, not addressed enough (Hoole, 2019).

The tone debate

An issue that goes beyond methodological and theoretical disagreements is well described by Derksen and Field (2021). According to them, cases of rude conduct and personal attacks have drawn attention to the tone of debate itself and how reformers express their critique. These phenomena might be fuelled by the relocation of discourse to new platforms like Twitter, Facebook, or blogs. Derksen and Field (2021) identified several underlying themes, including diversity, inclusion, and power. Regarding power, they showed how critics justified harsh discourse with the fight against a greater system and people in power. Latter would be guarding traditional scientific culture and use the focus on tone to distract from the main problems and own mistakes. It is comprehensible, that others conversely consider the attackers as holding the power, e.g. to influence careers. Interestingly, Derksen and Field (2021), also show how the proposed answers calling out for peer-reviewed and controlled debates being placed back into journals, represent a problem of power. According to them, new channels like social media opened up the discourse for “everyone” leading to a “democratisation of debate”, and therefore oppose traditional outlets (Derksen & Field, 2016, p.4).

Philosophical foundations

A last source of criticism relates to the notion that reformers might have given too little emphasize to discussing the underlying philosophical foundations of science (Wiggins & Christopherson, 2019, p.209). Flis (2018) for example recognises, that while reformers acknowledge that factors like incentives allow or even encourage the influences of researcher's biases on the research process, this conception of “science as a social system”

(p.168) is inconsistent with a positivistic and post-positivistic view of science promoted among some reformers.

Similarly, Wiggings and Christopherson (2019), and Morawski (2020) point out that reformers might have missed out on critically reviewing objectivistic ideals and objectivism as an epistemology. Just as Flis (2018), they identify an idea around reformers, that the right methodological system can control, maybe even remove, any biases from scientists. As response, Wiggings and Christopherson mentioned that a commitment to objectivism would not remove, but rather conceal hidden biases and values (2019).

Research goals

For sure the discussed issues do not give a complete picture of the efforts to reform science. What should be clear is that they have been surrounded by debated and also received criticism. For example, when Devezer et al. (2021) identified that methodological reforms tended to “over-generalize” (p.1) and Derksen and Field (2021) showed how reformers have been criticized for rude conduct. This paper assumes that asking social psychologist, presumably one of the biggest witnesses of change in psychology, about their views, could add value to the discussion. Therefore, goal of this study is to investigate social psychologists' general perception of the movement. I will try to examine a) how they relate to the movement , b) how do they perceive its contributions and c) their opinions about the tone and attitude of the movement. Yet, the biggest focus will lie on exploring how social psychologists criticize the movement, and whether this represents the criticism we found in the literature.

To reach this goal, our bachelor group send a survey to social psychologist at five Dutch universities. Aims for this were purely explorative as this is a pilot study. The pilot is supposed to test the survey we developed, so that future projects can use our insight and asses social psychologist's perception of the movement on a larger scale. We used a Mixed-

methods approach, as we wanted to focus especially on exploring the opinions and feedback in the provided text-answers.

Methods

Ethical Considerations

The project was approved by the BSS-Psychology Ethics Committee at the University of Groningen. The code for approval is PSY-2122-S-0016. Participation was voluntary and could be ended at any time during the survey. Participants provided informed consent prior to data collection. Data was processed anonymously. During the survey, we did not collect personal data such as name or email address, or metadata such as IP addresses to avoid that answers could be linked back to the participants. Due to privacy concerns with regards to the open questions, we decided against our original plan of storing data on the open science framework (OSF).

Researcher Description

Before writing this thesis, I had little prior knowledge about the reform movement and the everyday reality of researchers. I had little insight on platforms like Twitter or blogs, where controversies related to the reform movement did partially unfold. My knowledge is solely based on the referenced papers and few lectures. Furthermore, I had no insight into the societal composition of the movement as a group. Latter might have led to a design of the survey where too little attention was paid to the difference of defining the movement as one homogeneous group as opposed to a loose group of individuals, small groups, organizations and attempts to change the status quo. While I tend towards the second definition, the survey uses one of a rather homogenous group. This difference is essential, as we probably would have changed our questions, assuming a different underlying reality. And it affects the informative value and validity of our used questions. Furthermore, I appreciate the overall

objective of change, specifically on institutional level, be it the citation rating systems or democratizing universities. On the other hand, I acknowledge that the tone debate highlights problematic behaviors of certain reformers.

Participants

Our target population consisted of social psychologists. The focus of our pilot study was the thematic analyses and to integrate feedback on our survey before future distribution. Therefore, we aimed for a relatively small minimum sample size of 20 participants. We deemed a response rate of 10% as realistic and in turn contacted 246 psychologists.

Using a convenience sample, we approached researchers from University of Groningen (UG) (102), VU Amsterdam (27), University of Amsterdam (47), Tilburg University (34), Radboud University (RU) (36). The universities were selected because they clearly separated social psychology from other departments such as organizational psychology and because email addresses were easily extractible from researcher profiles on the websites. The selection sequence began with our own university (UG) since we expected the highest response rate from them. All members from the departments were included, with exception of secretaries and external affiliates; that is, from researchers to PhD candidates, to full professors and lecturers.

Procedure

We sent a Qualtrics link, the informed consent form and an explanation of our study aim to our target population via email. We also informed that the resulting data will be used for bachelor theses and could result in publication in a scientific journal. The survey ran for three weeks. Two reminder emails were sent after our initial invitation. In our last email we explained that we decided against the publication of the data on OSF. The invitation emails and informed consent form can be found in Appendix B.

Limitations of the sampling procedure

As we worked with a convenience sample, certain types of responses may be under- or overrepresented. Moreover, it is possible that researchers who participated in our study are different from those who chose not to fill out the survey. For example, those with stronger opinions on the reform movement and its practices could be more likely to answer. In addition, a heated Twitter debate occurred days prior to survey distribution. The debate unfolded in response to a researcher criticizing a newly published study by social psychologists (Brown, 2021). It involved allegations of bullying and sexism, as well as discussions about the conduct of reformers. Therefore, polarized opinions on the reform movement and social psychology might have been exacerbated by the debate. Furthermore, university webpages could be outdated and not account for individuals who have switched to other research fields and did not actively publish in social psychology recently. We tried to account for this by asking participants for their broad field of expertise.

Survey Design

The survey was hosted on Qualtrics and was anticipated to take participants 15 minutes to complete. All items in the survey were novel and self-generated for the purposes of this study. Yet, we based our survey on unpublished qualitative work produced in bachelor and master theses which investigated psychologists' perspectives on the replication crisis and open science practices (Futjes, 2021; Hershler, 2021; Nicolai, 2021; Pool, 2021; Sales, 2021; Schmidt, 2021; Schwarzbach, 2021). Additionally, we consulted survey designs used in studies which assessed the role of replication in ecology (Fraser et al., 2020) and psychology (Agnoli et al., 2021).

The full survey can be found in Appendix C and is separated into 12 blocks. Following a brief introduction and provision of informed consent, the first block collected demographic

information from the participants, including the country in which they worked (item Q1), field of expertise (item Q2), current job position (item Q3), and how long they have been working in academic settings (item Q4). Then, relevant definitions of concepts such as *Open Science*, *Metascience*, *Reform Movement* and different kinds of replication were displayed (Block 2), which stayed accessible throughout the survey. The following parts also included blocks that served the focus of other students in my thesis group. They explored participant's views on epistemology and ontology (Block 4), replication (Block 6), Open Science (Block 7) and whether they were actively using Open Science (Block 8), but this paper will not further focus on these sections.

The relevant parts for my research question were blocks 3, 5, 9, 11 and 12 (Appendix C). In section 3, we tried to acquire a general understanding of our participants' relationship with the reform movement by asking whether they identified with it (Q6) and whether they are part of it (Q7). In section 5, we asked respondents about their satisfaction with the quality of research in their field (Q22). This question was included to provide a broader picture of their attitude towards the current state of research. Sections nine concerned the specific perception of the reform movement. Participants were asked whether they believe that reformers understand the practices of their field (Q47), whether they address the most pressing issues (Q49) and whether the proposed solutions solve problems in their field sufficiently (Q51). Lastly, participants could indicate whether they felt affected by attitudes of the movement and whether they perceived the tone of the debate as problematic (Section 11). Therefore, we asked whether the critique makes them feel like they have to prove their innocence (Q66), whether the tone of the reform movement's members should be more nuanced (Q67) and whether they are less likely to engage with proposed reforms because they feel the reform movement is prejudiced against their field (Q68). Furthermore, I deviated from my original research plan, by not using items Q53 and Q57, as I realized this would have

exceeded the scope of this thesis. After the survey, respondents were given the opportunity to provide feedback on the survey (Section 12).

Data Analysis

Our 246 invitations resulted in 94 responses, corresponding to a higher-than-expected response rate of approximately 38 percent. Seventeen participants that did indicate to not work in the field of social psychology were excluded. Of the remaining respondents, 15 did not finish the complete survey. While no initial planning was made for such a case, I chose to exclude three of them, as they only provided information concerning their demographics. They would have skewed the demographic statistics otherwise. The other 12 partial responses were not excluded. Instead, number of responses per item are presented. None of the remaining 74 participants indicated to have answered dishonestly or without paying attention. Though, unfortunately only people who fully completed the survey could answer those questions.

Quantitative Analysis

Statistical analysis and visual presentation of the data was done with the open-source software JASP. Most questions presented sliders, which participants could use to mark their agreement with a statement. The items had integers as output ranging from 0 (no agreement at all) to 100 (complete agreement). As the data was ordinal with an upper and lower end, having an underlying normal distribution was theoretically almost impossible (Heller et al., 2016). Therefore, we chose medians and inter quartile ranges (IQRs) instead of means and standard deviations as measures of (central) tendency. Results were visualized with boxplots containing the medians, IQRs, all data points and outliers.

Items Q2 (fields of expertise), Q3 (job positions) and Q7 (being part of the movement) were to be answered by checking boxes, with Q2 and Q3 allowing more than one answer.

Here, percentages and frequencies of responses and, if present, response combinations were reported.

Thematic Analysis

Optional and mandatory open questions were analysed using a thematic approach. The approach was based on a guide by Braun and Clark (2006), a review of their work by David Byrne (2021) and Carla Willig's work (2013). Goal was to understand and group ways in which participants criticized the reform movement. Furthermore, I also reviewed and grouped relevant feedback to the quantitative survey items.

The coding was done inductively, i.e. not using "a pre-existing coding frame" (Braun & Clark, 2006, p.83). Furthermore, I worked within an essentialist/ realistic framework, using a semantic approach. Frequencies of codes were not presented, because I assumed that the unequal number of questions focussing on certain topics (e.g. greater focus on tone debate) would have influenced them disproportionately.

First, all answers to all open questions in the survey were put in one document. I then familiarized myself with the answers, noted ideas and highlighted everything I perceived relevant to my research question. In collaboration with two other students with similar focusses, we discussed the answers and checked for differing interpretations. Using the notes, I developed a first incomplete scheme of codes, themes, and examples on paper. I then uploaded the document to the webpage of the qualitative analysis program Atlas.ti and coded everything thoroughly. The following process entailed a constant moving back and forth between reviewing the coded data, the overviews created by Atlas.ti, and reorganizing themes, codes, and other notes on paper.

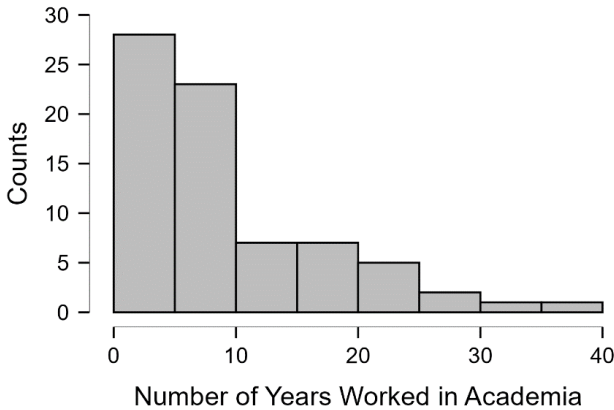
Results

Demographics

Of the 74 participants 70 were currently working in the Netherlands, one in China, one in Indonesia, one in Israel and one in Poland (Q1). Thirty-nine respondents reported to have other fields of expertise next to social psychology (Q2). The frequencies of these fields are shown in table A1 (Appendix A). The frequencies of current job positions (Q3) reveals that the sample represents a rather young academic group with many PhD students ($n=35$, ~47%), followed by 17 assistant professors (~23%), 8 associate professors/UHDs (~11 %), 6 full professors (~ 8%), 3 postdocs (~4%) and 5 other positions (~7%). The respondents worked on average 9.56 years in academia with a minimum of 0.25 and a maximum of 37 years ($n=74$, $SD=8.34$, Q4). But as shown in figure 1, the distribution is clearly positively skewed with a median of 6 years.

Figure 1

Number of Years Worked in Academia



Note: n = 74, M=9.56, Mdn = 6, SD = 8.34

Quantitative Analysis

Figure 2 shows the boxplots for all relevant slider items. Already notable is that all items show wide spreads of answers. Thus, when referring to tendencies in this analysis, it will refer to the boxplot showing a greater proportion of answers on one side of the agreement-interval. Still, one needs to be aware that those tendencies would have been clearer and stronger, if they would have had smaller spreads.

Question Q7 ($n = 74$) showed that 28 participants (37.84 %) identified themselves as belonging to the reform movement, almost as many as the 32 participants (43.24 %) who did not identify themselves as belonging. 14 people (18.92 %) indicated that they “Don’t know” whether they are a part. Results for item Q6 ($n = 74$, $Mdn = 70.00$, $IQR = 53.75 - 84.75$) show that a majority of participants tend to identify with the reform movement, meaning that more than three-quarters of the respondents put their slider at the upper half of the continuum.

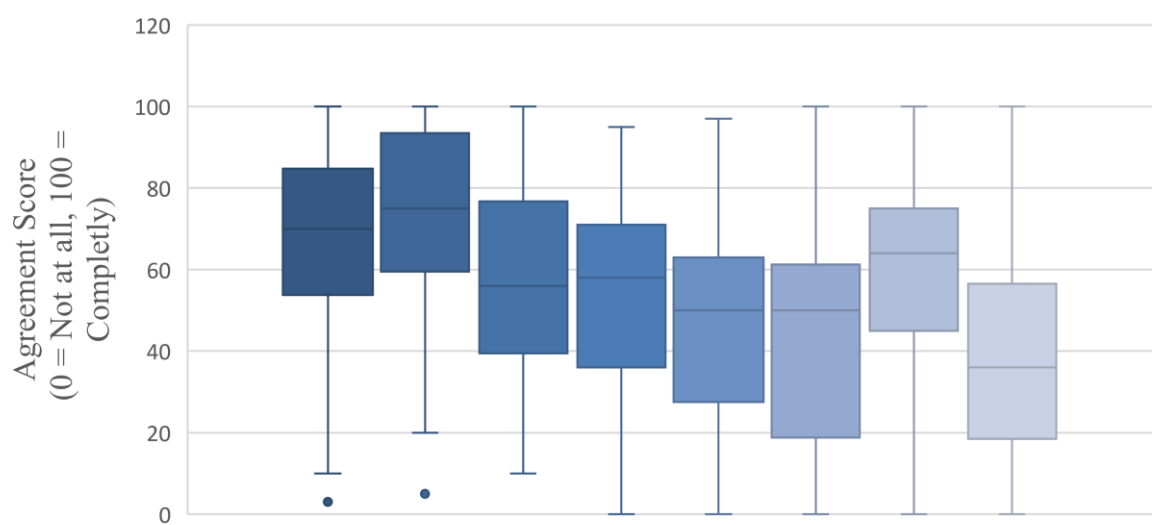
Furthermore, a vast majority agrees that the research quality in their field needs to be improved (Q22, $n = 71$, $Mdn = 75.00$, $IQR = 59.50 - 93.50$). Our results show that the participants do not have clear opinions about perceiving the reform movement as understanding the practices of the respondents’ field (Q47, $n = 56$, $Mdn = 56.00$, $IQR = 39.50 - 76.75$) and to thinking “the reform movement addresses the most pressing issues regarding scientific quality” (Q49, $n = 59$, $Mdn = 58.00$, $IQR = 36.00 - 71.00$). Similarly, the analysis of item Q51 showed no tendency to agree or disagree with the statement: “the proposed solutions solve the problems my field sufficiently” ($n = 55$, $Mdn = 50.00$, $IQR = 27.50 - 63.00$).

Looking at the last block of questions, no tendency to agree or disagree with the statement that critique makes the respondents feel like they must prove their innocence was visible (Q66, $n = 56$, $Mdn = 50.00$, $IQR = 18.75 - 61.25$). Furthermore, there was a small tendency to agree that the tone of the reform movement’s members should be more nuanced

(Q67, $n = 52$, $Mdn = 64.00$, $IQR = 45.00 - 75.00$). With a comparable intensity participants tended to disagree that they are less likely to engage with reform practices due to prejudice by reformers (Q68, $n = 55$, $Mdn = 36.00$, $IQR = 18.50 - 56.50$).

Figure 2

Boxplots for Examined Slider Items with Medians and Outliers



- Q6: "Please indicate the extent to which you identify with the reform movement."
- Q22: "I think that research quality in my field is something that needs to be improved."
- Q47: "I have the feeling that people in the reform movement understand the practices of my field."
- Q49: "I feel like the reform movement addresses the most pressing issues regarding scientific quality in my field."
- Q51: "The proposed solutions solve the problems in my field sufficiently."
- Q66: "The critique about my field of research from the reform movement makes me feel like I have to prove my innocence."
- Q67: "The tone of the members of the reform movement should be more nuanced."
- Q68: "I am less likely to engage with the proposed reform practices because I feel the reform movement is prejudiced toward my field of research."

Thematic Analyses

Criticism

The diverse criticisms mentioned by the participants were organized into three overarching themes: criticism about the conduct of reformers (table A2), criticism about the contributions and input of reformers (table A3), and issues reformers seem to miss (table A4). Elaborate coding schemes can be found in Appendix A.

Conduct of reformers

The first theme summarized all criticism about the conduct of the people promoting reforms (table A2). Participants mentioned rude conduct like: “non-constructive criticism (sometimes downright bullying)” or “putting individual researchers on the spot”. Some identified the source of this disrespectful or even abusive behaviour among a few people who taint the reputation of other reformers, e.g.: “a handful of maniacs on twitter” or good reformers being “under the shadow of the bad apples”.

This criticism about the conduct of researchers also included allegations of sexism, which were marked with an extra code. Several answers referred to the previously mentioned debate (Brown, 2021) and to the term “bropenscience” or a “bro culture”. A third code summarized responses that criticised reformers for superficially using the topics they promote, only to advance their careers or collect funding.

Input of reformers

Participants pointed out that reformers' contributions have been too little constructive. For example, they perceived reformers as criticizing practices and not presenting alternative methods. Similarly, people wished for a narrative “less based on distrust” or observed “too much emphasis on fraud hunting”.

Proposed solutions were criticized for being too generalized. Recommendations and standards would not be applicable to certain research designs like “longitudinal designs, ESM data with multiple measurements, including variables for exploration”. Or they would not take different epistemologies or subfields of social psychology into account.

Furthermore, it was criticised that the reformers are missing the connection to the reality of practicing research and that this would negatively influence their judgments. They would have no “sense of realism or experience with actual data collection” or would have “no experience in doing research in specific fields (other than meta-science)”.

Missed issues

The first topic some participants perceived to be missed by reformers was the validity of research, and particularly ecological validity. Answers criticised that a focus on replication would not make up missing ecological validity. And this would apply specifically in social psychology where “the integration of all the reductionist findings is lacking, ..., needed to approach the complex reality”. Others criticized “the pressure to make research more like standardized cognitive experiments that have no relation to the outside world”.

Secondly, focus on theory development, including how to measure them, was perceived to miss. Technical aspects like statistics or open science practices would not cure the underlying problem: “lack of good theory”.

In a dominant code, responses were summarized focusing on problems resulting from the infrastructure of science, and academic culture. Issues included “publication pressure, lack of funding or competitiveness”, “hierarchical rigid structures”, open access journals being considered “less prestigious”, “the problem of companies funding research”, “nepotism, favouritism”, or the incentive system.

Participants also pointed out that “the competitive culture in academia” perpetuates an inequality caused by the “lack of means” available to the researchers. In the analysis process this was understood as linking academic culture/infrastructure and the next code, which summarized all statements requesting that the reform movement should focus more on “diversity and equity”. It included references to “an imbalance in terms of who has access to resources”, resulting in individuals as well as countries without financial resources, being unable to do qualitatively better science. Also, references to non-western cultures being systematically underrepresented in research were included in this code.

Answers called for more collaboration in science, e.g. under the term “team science”. And respondents perceived more focus should lie on slow science, “where quality research is prioritized over fast mass publication”. This involved considering less publications per year as an accomplishment and spending more time on considered, robust research. Lastly, specific criticisms and missed issues which could not be fitted in existing codes, and were not considered as essential were summarized under “others”.

Problems with the label ‘reform movement’

Throughout the survey, answers reflected that respondents were not used to the label and /or had problems with the construct of the reform movement (table A5, Appendix A). Participants were not sure when our definition would include someone as being a member. Among others, participants were uncertain whether one had to practice certain methods, needed to be an activist, or had to do research on improving science. Similarly, it was questioned which fields are still included in our definition (slow science, for example) or whether it was smarter to differentiate between Metascience and Open Science.

Other respondents rejected the label actively. Several comments perceived the movement as not being a homogeneous group and that therefore it was not possible to make generalizing claims. It was called a “broad field” as well as a group of “loosely linked

initiatives". One response pointed out that "the people within the reform movement not even agreed themselves at A) what are the problems and b) what should be done." Other respondents felt that the label created an unnecessary division between people, a "them vs. us" scenario. Similarly, other answers reflected the view that the values the reform movement represents are inherent to being a researcher. Therefore everyone would be part of the reform.

Problematic Identification and Belonging Items

Feedback showed that participants had an ambiguous understanding of what it means to identify with (item Q6) and belong to the reform movement (item Q7). Part of this ambiguity was summarized in the previous theme. Another part is seen in the fact, that the answers showed multiple interpretations of identification and belonging. For example, people used the identification item to express their identification with a specific group, and others with the ideals of reforming science. For the use of future research, I coded the relationships to the movement that the participants described (table A6, Appendix A). They lied on dimensions of sharing ideals, sympathizing with a specific group, valuing the methodological changes, and proactively supporting reforms, or not doing the respective.

Discussion

This study tried to investigate social psychologist's perception of recent reform efforts, which we called the reform movement. Our quantitative results revealed a consensus that research quality in their field needs to be improved. On the other hand, our participants as a group showed no univocal tendency to view the ways the reform movement addresses these problems as either positive or negative. Some counted for feeling that criticism induces the need to prove one's innocence. Furthermore, participants tended to agree that the tone of reformers should be more nuanced. And they also tended to indicate that prejudice on their field would not make them engage less with practices prosed by reformers. The thematic

analysis revealed that participants criticized the conduct of reformers and specifically 'Bropenscience'. Input of reformers was criticized for missing constructiveness, a connection to real research practices, and being over-generalizing. Furthermore, respondents wished reforms would focus more on issues like theory, (ecological) validity, diversity, equity, the academic system/culture, as well as team and slow science.

Identification and Belonging

The first aim of this study was to investigate how social psychologist relate to the reform movement. Our quantitative analyses showed that most participants tended to identify with the movement, but answers were widely spread. In addition, the thematic analysis found uncertainty and differing, ambiguous interpretations about the meaning of identification. This might imply problems with the validity of the item and makes it unclear what was measured. That a one-dimensional measure of identification could be problematic is in line with research on social identity. Scholars like Cameron and Lalonde (2001) and Obst et al. (2011) show how multi-dimensional measures are needed to describe the concept.

Surprisingly, almost as many subjects in our sample recognized themselves as part of the movement, as those not believing to be a member. This could be explained by people engaged with reforms being also more interested in a survey researching the topic. However, I believe one should not ignore the relatively high percentage of people being uncertain about their membership and the feedback showing similar uncertainty and differing, ambiguous interpretations about the meaning of belonging. It is very likely that the definition of the reform movement in the survey added to this confusion (Appendix C). It is rather vague and could have allowed for those differing interpretations of belonging. Other problems with the label could also have played a role, but this will be discussed in more detail later. Again, it seems like the validity of this quantitative item is limited.

More informative about how participants related to the reform movement were the dimensions I coded during the thematic analysis. They summarized ways the participants actually used in their text answers to describe their relationship to the movement. Those dimensions included sharing ideals, sympathizing with a specific group, valuing the methodological changes, proactively supporting reforms, or not doing the respective.

Problematic Label

Probably the most important finding was that our participants had a variety of problems with the label and construct “the reform movement” itself. They were unsure, who the definition would refer to or were simply not used to it. Others did actively reject the label and questioned the existence and homogeneity of the group. These problems unfortunately decrease the validity of all items in the survey that referred to the term. It becomes unclear who the questions and the respondents' answers refer to.

Unfortunately, it was not very surprising that the participants had those problems with the construct that we took over from publications by Flis (2019), Derksen & Field (2021), Spellmann & Kahneman (2018) and Wiggins & Christopherson (2019). First, references to a reform movement are not used frequently in other literature, which could explain why respondents were not used to it. Secondly, I realized already earlier the problem of assuming a homogeneity of the group, an assumption underlying most items in our survey. Interestingly, Flis (2021) pointed out in a symposium that it is a general sociological problem to not misuse these kinds of labels when grouping people and that he rather uses them as “useful fictions” during analyses (Center for Open Science, 2021, 19:20). Unfortunately, these insights became apparent not until after sending out the survey. More research in the beginning about who constitutes the movement would have been helpful but was prevented by time pressure to

develop a research question and the survey. Still, no paper exists yet that examines in detail who the reform movement is or is not.

Perception of the reform movement's contributions

Another aim of this study was to examine how participants perceived the contributions of the reform movement. Our quantitative results revealed a consensus that research quality in the respondents' fields needed to be improved. On the other hand, our participants as a group showed no univocal tendency to view the ways the reform movement understands and addresses these problems as either positive or negative. It could be possible that trends can become more visible in a greater sample. But the great variance in opinion could also relate back to the uncertainty about who the reform movement refers to.

Tone and Conduct

Participants tended to agree that the tone of reformers should be more nuanced. Again, the data was widely spread, but the tendency is also supported by the text-answers. Although I subscribed to inductive coding, in the process of forming themes it was noticeable that several responses clearly related to the tone debate as described by Derksen and Field (2016). However, as the participants also showed criticism on the career focus of researchers, it was decided to compose a theme relating to conduct overall. Still, the criticism about rude conduct by reformers and furthermore allegations of sexism clearly match and support the analysis of the current situation by Derksen and Field (2016). One person even endorsed Susan Fiske's description of her critics as "methodological terrorism" (Fiske, 2016a, p.1), a popular case also used by the two authors. She suggested the discourse had developed into "uncurated, unfiltered trash talk" and to critics as terrorists and "bullies" (Fiske, 2016a p.1). Others referred to "bropensience" and in this context specifically to the recent twitter debate (Brown, 2021).

Theory Development and Measurement

Our participants are not the first suggesting that reforms should focus more on theory development, how to measure them or that replication and open science practices do not compensate for “the lack of good theory”. Researchers like Scheel et al. (2021) have pointed out that post-replication crisis reforms have focused on “tightening the screws on hypothesis testing” but ignored “that the input for the testing machinery is missing” (p.2). They suggest researchers should spend more time on nonconfirmatory work like “forming concepts, developing valid measures, establishing the causal relationships between concepts and the functional form of those relationships” or identifying “auxiliary assumptions” (p.1). Similar arguments are made by Smaldino (2019), while he explains how the better replication rate of cognitive compared to social psychology in the OSC study (2015) could be explained by better underlying theories and their measurements.

Reductionism and Ecological Validity

Answers in our sample criticised missed ecological validity and reductionistic research. This demand is also not new to scholars. But, as Holleman et al. (2020) suggest, those requests seldomly specify how to reach the point where research resembles ‘reality’. For them ecological validity is “ill-formed, lacks specificity, and falls short of addressing the problem of generalizability” (Holleman et al., 2020, p.1). Still, if a future project wants to use the criticism identified in this pilot, they should also include missed ecological validity or reductionism. While it might be a controversial point, it should be of interest, how prevalent this perception is in a more representative sample.

Other criticisms

That participants emphasized reforms should focus more on problems surrounding academic culture and the infrastructure of science, matches well with the opinions of Hoole

(2019) who's paper I discussed in the introduction. The same applies for the claim that the proposed solutions are too generalized and do not take epistemic differences into account (Devezer et al., 2021; Guttinger, 2020; Leonelli, 2021). Furthermore, Leonelli's paper (2021) describes similar to our respondents how reforms should not ignore problems of diversity and equity. Among others, she referred to a study by Vermeir et al. (2018), that send a survey to researchers in Bangladesh and Tanzania. Participants in this study claimed that editors of international journals would prefer the use of expensive software and perceive their use of free, open software as indicating low-quality research (Vermeir et al., 2018).

Recommendations for Future Research

The thematic analyses in our study did not provide a representative (quantitatively) picture of the perceived relevance of the issues. Therefore, future research could use our list of the found criticism, and the problems that were perceived to be not in the focus of reform efforts, to quantitatively research how relevant each issue is seen by social psychologists. When doing so, future research should change the research question into asking for an evaluation of specific reform attempts in social psychology instead of an evaluation of the vague construct of a reform movement. Though, if future research still wants to examine the relationship of participants to such a movement, I recommend to a) refer to a more tangible group like an Open Science Movement and b) rather assess a variety of more specific dimension like the dimensions I identified earlier. They included sharing ideals, sympathizing with a specific group, valuing the methodological changes, proactively supporting reforms or not doing the respective.

Furthermore, this study concentrated solely on working out the problems that participants believed to be outside of the focus of the reform movement. On the other hand, the open-end answers provided in this survey could also be used to investigate which problems social psychologists think to exist in their field at all. Future research could

reanalyse the data and subsequently develop a representative study investigating how social psychologist weigh the importance of all their field's problems.

Conclusion

People commenting on the recent reform efforts, whether they view them from a meta scientific or a history of science perspective, should be aware of the problems I identified surrounding the construct of a "reform movement". Furthermore, the measures we used to examine the relationship between our respondents and this construct, namely the uni-dimensional measurement of identification and belonging, proved to be vague and problematic. Instead, if future research still wants to research the relationship towards the reform movement, it should instead use the dimensions I identified in the coding process. Also, I recommend that future analyses should be more precise in who they refer to, e.g, by refining the definition of the movement. Furthermore, the criticism our participants outed matched the opinions found in the literature very well. I think people engaged in reforming science should examine these concerns, in order to adjust their focus.

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Appendix A**Table A1***Frequencies of fields of expertise next to social psychology*

Fields of Expertise	Frequencies
Cognitive psychology	5
Developmental psychology	3
Environmental psychology	9
Experimental psychology	11
Clinical (neuro) psychology	2
Biological psychology	3
Industrial and organizational psychology/ work psychology	5
Personality psychology	5
Political psychology	6
Quantitative psychology	6
Others	4

Note. Some participants indicated multiple extra fields.

Table A2*Codes and responses relating to criticism about the conduct of reformers*

Codes	Coding Rules	Examples of Quotes
Rude conduct	To code when outed criticism relates to the conduct within the reform debates.	“When I consider the movement from a social identity perspective, all I can see is a bunch of cis-het privileged white men trashing the work of others on blogs and twitter, never apologising for their attitudes, and engaging in mansplaining. To be honest, Susan Fiske wasn't wrong to call these people "methodological terrorists".”
Allegations of sexism	To code when the respondents criticise reformers with refereing to sexism or specifically to "bropenscience".	“The recent debates on sexism and and the bro culture within the open science community, have not helped my identification with the people involved.”
Harmful focus on career advancement	To code when the respondents perceive that reformers are focusing too much on improving their own careers.	“I think the open science movement primarily serves the advancement of the careers of those involved.”

Table A3*Codes and responses relating to criticism about the input of reformers*

Codes	Coding Rules	Examples of Quotes
Input of reformers has been insufficiently constructive	To code when the respondents perceived the input of reformers has been too little constructive.	“They harm by belittling people and their work by criticizing methods used, research questions asked, and statistics. I mean how many papers exist regarding "p-values should not be used etc" BUT how many of them are taking the time to tell what else we are supposed to do? Very few, almost none. “
Proposed solutions too generalized	To code when what is described relates to overly generalizing solutions across psychology.	“I think, there is a very strong positivist foundation in the reform movement (at least in open science). The goals of falsification and truth-seeking.... However, some people in the reform movement are generalizing these practices to all methods.”
Reformers are disconnected from the reality of research	To code when the respondent refers to reformers as having no insight into the reality of research.	“In my perspective, many people in this movement have no experience in doing research in specific fields (other than meta-science), which makes it difficult to understand the quality of research and the practices involved.”

Table A4*Codes and responses summarizing issues that are perceived to be missed out by reforms*

Codes	Coding Rules	Examples of Quotes
Missing - validity of research	To code when the respondent perceives that the validity of research is something missed by reformers.	“The pressure to make research more like standardized cognitive experiments that have no relation to the outside world makes me less confident in the movement, to be honest”
Missing – theory development / measurement	To code when the respondent perceives that reform should focus more on theory development or theory measurement.	“Like i wrote before, the open science movement thinks that pre-reg, open materials, and better stats will cure the problems. But the underlying problem is a lack of good theory. None of these things really helps with that.”
Missing - focus on academic system/ culture	To code when the respondent refers to a topic that relates to the academic culture / system and which should be more in the focus of reform.	“Openness and transparency does not intrinsically address any of the underlying issues.... It does not address publication pressure, lack of funding or competitiveness, nor does it change any of the cultural issues— per se”
Diversity and Equity	To code when the respondent perceives that reform should focus more on equity and diversity.	“I think diversity and equity are things that also need to be a part of the discourse. If there's some sort of an imbalance in terms of who has access to resources to engage in open science practices then this so-called "reform movement" will again be perpetuating a messed up power dynamic.”

Codes	Coding Rules	Examples of Quotes
Team Science	To code when the respondent refers to the need for more collaboration in research, or to team science.	"I think we need to establish ways for people to collaborate more (make it easier)"
Slow Science	To code when the respondent refers to the value of slow science, including the appreciation of less, but better publications per year.	"slow science, where quality research is prioritized over fast mass publication."
Other criticism or missed issues	This code should be used when criticism about the reform m. or issues that are perceived as being missed out by reformers are mentioned and other codes do not apply.	"age or generational gap in psychology scholars is still becoming one of the biggest challenges for an open science within psychology, including the mainstream experimental social psychology."

Table A5*Codes and responses that related to problems with label 'reform movement'*

Codes	Coding Rules	Examples of Quotes
Uncertainty who our definition of the movement refers to	To code whenever the respondent expresses uncertainty who our definition of the reform movement refers to.	"Don't know who that refers to"
Better to differentiate between subfields	To code when the respondent asks for or recommend a differentiation between Metascience and Open Science or other subfields/movements.	"I see value in meta science and I struggle with parts of the open science movement. Difficult to combine these sentiments into one answer. Might be better to split out?"
Not used to this label	This code applies whenever the respondents express they are not used to the label "reform movement".	"It is a label that I did not know, so difficult to say I am part of the group or how much I identify."
Label creates unnecessary division	To code, when the respondent perceives the label "reform movement" creates an unnecessary division between social groups.	"Making an identity out of a movement like this may not do justice to the goals we would like to achieve, I would say. It should be about the content, the things we would like to achieve, and not about ""us-versus-them"" or who is superior to one another."

Codes	Coding Rules	Examples of Quotes
Not one homogeneous group	Respondent states that not one homogeneous group as the reform movement exists, or the group is so diverse that it is not possible to make statements about it.	“I don't think that "the reform movement" is a thing. There are several initiatives that are loosely linked.”
Inherent to being a scientist	To code, when the respondent argues that the values, ideas, or practices of reforming science, are inherent to being a researcher.	“being a researcher, and given the - necessary - changes in research practice, in my view, nobody can deny being part of the reform movement.”

Table A6*Codes representing ways the participants related to the movement*

Codes	Coding Rules	Examples of Quotes
Sharing ideals	To code whenever a respondent describes a relationship to the movement on the dimensions of sharing ideals.	"If I share the ideals of a movement but I am not actively participating in it, can I still say that I am part of it?"
Sympathizing with a specific group	To code when the respondent describes their relationship to the movement by sympathizing with a specific group, or not doing the respective.	"the recent debates on sexism and and the bro culture within the open science community, have not helped my identification with the people involved."
Valuing the methodological changes	This code applies whenever the respondents express that they value the methodological changes/ proposed practices, or when they don't do the respective.	"I value the methodological changes but am not an active member of the movement."

Proactively supporting reforms	<p>To code, when the respondent describes their relationship to the movement by either actively supporting reforms vs. not actively supporting reforms.</p>	<p>“I appreciate the purpose, but not sure if I'm doing something proactively to promote the movement.”</p>
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Appendix B

First Email to Participants

Dear [title+ name],

We are contacting you, because we are doing a pilot study for a large-scale study about perceptions of the replication/credibility crisis and the 'reform movement'. In this context, social psychology is a field that is often *talked about*, but in our opinion, not *talked to* enough. We are curious how you, as a social psychologist, have experienced the crisis debate, the reform movement and the proposed changes. The results of this survey will facilitate a critical evaluation of the aims and accomplishments of the reform movement. Because this is a pilot survey, we are especially interested in your feedback about our questions (content, wording, etc.).

We kindly invite you to take part in the survey via this link:

https://rug.eu.qualtrics.com/jfe/form/SV_8quywigev6mhQa2

Participation will take approximately 15 minutes. Your contribution would be greatly appreciated!

In the attachment of this email, you can find more information about the study. Feel free to reply to this email if you have questions or concerns. If you would like to be kept up to date about this research and its results, please send us an e-mail at perceptions.of.reform@rug.nl.

Kind regards,

Robert van Ark, Maria Bompá, Kaiti Evgeniou, Colm Ó Fuartháin, Rafael Funke and Larissa Hoß

Research team:

Joyce Hoek, MSc

Nina Schwarzbach, MSc

Sarahanne Field, MSc

Merle Pittelkow, MSc

Dr. Rink Hoekstra

Prof. dr. Don van Ravenzwaaij

Faculty of Behavioural and Social Sciences, Rijksuniversiteit Groningen, the Netherlands

First Reminder Email

Dear [title+ name],

A week ago we contacted you because of our survey about “perceptions of the reform movement”, and we highly appreciate your participation. In case you did already fill out the survey: thank you very much! Please disregard this email. Unfortunately, we cannot remove you from our mailing list, since participation is anonymous.

In case you have not filled out the survey, we would kindly like to remind you that participation in our survey is still possible.

You can participate in the survey using the following link:

https://rug.eu.qualtrics.com/jfe/form/SV_8quywigev6mhQa2

In response to previously raised concerns:

- We invited 250 people to this pilot survey. Therefore, it would be difficult to trace back your identity on the basis of demographic data we ask for.
- If you'd like to give more detailed feedback verbally or via email, please do not hesitate to contact us.
- Some said that the survey takes longer than 15 minutes. Please take into consideration that it might take up to 30 minutes depending on how detailed your answers are.

Thank you in advance,

Robert van Ark, Maria Bompa, Kaiti Evgeniou, Colm Ó Fuartháin, Rafael Funke and Larissa Hoß

Research team:

Joyce Hoek, MSc

Nina Schwarzbach, MSc

Sarahanne Field, MSc

Merle Pittelkow, MSc

Dr. Rink Hoekstra

Prof. dr. Don van Ravenzwaaij

Faculty of Behavioural and Social Sciences, Rijksuniversiteit Groningen, the Netherlands

Second Reminder Email

Dear [title+ name],

We would like to remind you one last time about our survey about “perceptions of the reform movement”. You still have time to fill it out until December 8th, after which the survey will close. Your participation is still highly appreciated!

In case you did already fill out the survey: thank you very much! Please disregard this email. Unfortunately, we cannot remove you from our mailing list, since participation is anonymous.

You can participate in the survey using the following link:

https://rug.eu.qualtrics.com/jfe/form/SV_8guywigev6mhQa2

In response to previously raised concerns:

- We invited 250 people to this pilot survey. Therefore, it would be difficult to trace back your identity on the basis of demographic data we ask for. In addition, we've decided not to publish the data of this pilot survey on OSF or any other open data platform.
- If you'd like to give more detailed feedback verbally or via email, please do not hesitate to contact us.
- Some said that the survey takes longer than 15 minutes. Please take into consideration that it might take up to 30 minutes depending on how detailed your answers are.

Thank you in advance,

Robert van Ark, Maria Bompá, Kaiti Evgeniou, Colm Ó Fuartháin, Rafael Funke and Larissa Hoß

Research team:

Joyce Hoek, MSc

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Faculty of Behavioural and Social Sciences, Rijksuniversiteit Groningen, the Netherlands

Informed Consent Form**INFORMED CONSENT****“PERSPECTIVES OF THE REPLICATION CRISIS, SCIENCE AND THE REFORM MOVEMENT”**

Welcome and thank you very much for participating in our survey. For more information about this pilot study, please refer to the study information form in the email or contact us at: perceptions.of.reform@rug.nl

Please read the information below and indicate whether you agree with it before continuing with this survey. You have the right to take a screenshot of this information.

- I have read the information about the research. I have had the opportunity to ask questions about it.
- I understand what the research is about, what is being asked of me, which consequences participation can have, how my data will be handled, and what my rights as a participant are.
- I understand that participation in the research is voluntary. I myself choose to participate. I can stop participating at any moment. If I stop, I do not need to explain why. Stopping will have no negative consequences for me.

I consent to participating in this study

Study Information Form

INFORMATION ABOUT THE RESEARCH

“PERSPECTIVES OF THE REPLICATION CRISIS, SCIENCE AND THE REFORM MOVEMENT”

➤ **Information about the study**

Over the last decade, psychology has been experiencing what some people call a replication crisis. This crisis has been shocking for many people inside and outside the field of psychology. In order to counteract the challenges, a movement has emerged promoting replicable and open research practices. The movement has proposed practices, normative changes and policy changes. However, the movement has also received some criticism. Some practices and attitudes the new movement proposes seem to not fit with researchers' research, attitudes or working habits. But where does it clash? Because of these inconsistencies, it is important to ask psychology researchers in the fields affected by the crisis how they experience the crisis, the movement and science in general. The current study is a **pilot study**, which aims to facilitate a critical evaluation of the reform movement's aims and accomplishments.

➤ **Why do I receive this information?**

The debate about the replication crisis is often dominated by metascience and open science researchers, and excludes the opinions of researchers outside of these movements. We would therefore like to hear your opinion because of your experience as a researcher in social psychology. By participating in this research, you will be able to share your perspective on the replication crisis debate and the proposed solutions.

➤ **What does it mean to participate in this study?**

We would like to ask you to complete a brief questionnaire, which can be completed in about 15 minutes.

➤ **Do I have to participate in this research?**

Participation in the research is voluntary. However, your consent is needed. Therefore, please read this information carefully. Ask all the questions you might have, for example because you do not understand something. Only afterwards you decide if you want to participate. If you decide not to participate, you do not need to explain why, and there will be no negative consequences for you. You have this right at all times, including after you have consented to participate in the research.

➤ **How will we treat your data?**

Data will be processed completely anonymous. You will participate in this study by clicking on the Qualtrics link. We will not ask for your name or email address during the survey, so answers will not be traceable to you. After data collection and analysis, the full dataset will be made public on OSF for re-use by other researchers.

➤ **What else do you need to know?**

This pilot study will result in six bachelor theses. Furthermore, the analysis of the data may result in a publication in a scientific journal. The study is supervised by Joyce Hoek: PhD student at Behavioral and Social Sciences, University of Groningen.

This study has received ethics approval by the Ethics Committee of Psychology at University of Groningen (EC code:PSY-2122-S-0016). If you have any questions or concerns regarding your rights as a participant you may contact the committee at ecp@rug.nl

You may always ask questions about the study: now, during the study, and after the end of the study by contacting us at: perceptions.of.reform@rug.nl

Appendix C

Reform Movement Pilot Survey

Start of Block 0: Informed Consent

Welcome and thank you very much for participating in our survey. For more information about this pilot study, please refer to the [Study information form](#) or contact us at: perceptions.of.reform@rug.nl. The study will take approximately 15 minutes, contains 11 sections and is best completed on a computer. Please read the information below and indicate whether you agree with it before continuing with this survey. You have the right to take a screenshot of this information. I have read the information about the research. I have had the opportunity to ask questions about it. I understand what the research is about, what is being asked of me, which consequences participation can have, how my data will be handled, and what my rights as a participant are. I understand that participation in the research is voluntary. I myself choose to participate. I can stop participating at any moment. If I stop, I do not need to explain why. Stopping will have no negative consequences for me.

I consent to participating in this study:

- Yes, I consent to participation.
- No, I do not consent to participation.
-

End of Block 0: Informed Consent

Start of Block 1: Demographics

First, we'd like to ask you for some demographic data.

Q1. In what country are you currently working?

▼ Afghanistan ... Zimbabwe

Q2. What is your broad field of expertise?

- Social psychology
 - Developmental psychology
 - Industrial and organizational psychology/ work psychology
 - Environmental psychology
 - Experimental psychology
 - Personality psychology
 - Clinical (neuro) psychology
 - Cognitive psychology
 - Quantitative psychology
 - Biological psychology
 - Political psychology
 - Other, namely: _____
-

Q3. What is your current job position?

- (Undergrad) student
- Research Assistant
- Junior researcher
- PhD student
- Postdoc
- Assistant professor/UD
- Associate Professor/UHD
- Full professor
- Other, namely: _____

Q4. How long have you been working in academia? (years)

End of Block 1: Demographics

Start of Block 2: Terms

To have a consistent and shared understanding throughout the survey, we would like to clarify what the terms mean to us. Throughout the survey, you can always go back to these definitions using a pop-up button found at the bottom.

Direct replication: The attempt to conduct a study in a manner as close to the original as possible (the same population, methodology, and statistical analyses).

Conceptual replication: The attempt to test the same theoretical process or effect as an existing study, or understand boundary conditions of given phenomena, but that uses methods that vary in some way from the previous study.

Successful replication: When the replication study yields results which are sufficiently similar to the original study in terms of the strength of the effect and whether the effect goes in the same direction as the original. 'Sufficiently similar' varies, and is usually defined by the replicating author.

Open science: Open science aims to make science more transparent. Open science practices include among others: preregistration, registered reports, open data, open peer review, and open access publishing.

Metascience: The study of research itself, often with the aim of improving its practice. Meta-researchers study the scientific community and its actors, their methods and reporting, reproducibility, evaluation, behavior, and incentives.

Reform movement: There are many different words describing groups of people that are promoting change in science, including 'meta-science movement', 'open science movement' or 'reformer movement'. In the following we summarize people sharing concern with regards to improving science through either meta-scientific or transparent/open science practices as the 'reform movement'.

Q5. Optional: Do you have feedback on these definitions?



From now onwards, we will refer mostly to the reform movement. You can always go back to the definitions if you are unsure about the terms used in the survey.

End of Block 2: Terms

Start of Block 3: Reform movement

The next questions will be about how the aims of the reform movement resonate with you and your research practices.

Q6. Please indicate the extent to which you...

Not at all

Completely

...identify with the reform movement



Q7.

Do you agree with this statement: "I am part of the reform movement."?

- Yes
 - No
 - Don't know
-

Q8. Optional: Do you have any thoughts with regard to your identification with the reform movement you'd like to add here?

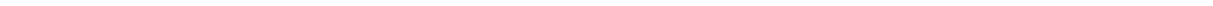
Q9. Optional: Do you have feedback on the questions about identification with the reform movement?

End of Block 3: Reform movement



Start of Block 4: Epistemology/Ontology

We would like to know more about how you think about science and knowledge in general. Please indicate how the following statements relate to your research.



Please indicate how the following statements relate to your research:

	Not at all	Completely
Q10. "For every phenomenon that I study, there are multiple valuable truths."		
Q11. "In my field of research, scientists can ultimately get to/reach the truth."		
Q12. "In my field of research, results depend on the perception of the researcher."		
Q13. "Science should be organized in such a way as to reduce scientists' biases."		
Q14. "In my field of research, the effects are dependent on the time period in which these studies took place rather than universal."		
Q15. "In my field of research, the effects are dependent on the culture where the study took place rather than universal."		
Q16. "In my field of research, the effects are dependent on the experimental setup rather than universal."		
Q17. "It is possible to specify all the boundary conditions that enable a theory to hold true."		
Q18. "Conducting a scientific study requires constant adaptation of the methods used."		
Q19. "The expertise of an individual scientist is important to study a phenomenon."		

Q20. Optional: Do you have any thoughts you'd like to add here?

Q23. Optional: Can you elaborate?

End of Block 5: Research Quality

Start of Block 6: Replication

The next couple of questions will be about replication.

Please indicate the extent to which you agree with the following statement:

Not at all Completely Not applicable

Q24. "New replication studies should attempt to generalise established effects."	
Q25. "New replication studies should attempt to falsify established effects."	
Q26. "New replication studies should attempt to confirm established effects."	
Q27. "Original researchers of a study should participate in the process of replication."	
Q28. "I believe it is important that direct replications are conducted in my field."	
Q29. "I believe it is important that conceptual replications are conducted in my field."	

We would now like to ask some questions about replication and research quality.

Please indicate the extent to which you agree with the following statement:

Not at all Completely Not applicable

Q30. "I believe that successful direct replications are indicative of research quality in my field."	
Q31. "I believe that successful conceptual replications are indicative of research quality in my field."	

Can you elaborate on your previous two answers?

Q32. Why do you think that successful replication is, or is not, indicative of research quality in your field of research? Please indicate what type of replication you are talking about (i.e., direct, conceptual or any other form)?

Q33. Optional: Which quality indicators other than replication do you think are important in your field of research?

Q34. Optional: Do you have any thoughts you'd like to add here?

Q35. Optional: Do you have feedback on the questions about replication?

End of Block 6: Replication

Start of Block 7: Open Science Ideas

The next couple of questions are about your ideas of open science in general.

Please indicate the extent to which you agree to the following statements:

Not at all

Completely

Q36. I think that science in general should be transparent and open if possible.



Q37. Generally, I think that the more transparent and open the research process is, the higher its quality and reliability.



Q38. Optional: Do you have any thoughts you'd like to add here?

Q39. Optional: Do you have feedback on the questions about open science ideas?

End of Block 7: Open Science Ideas

Start of Block 8: Open Science Practices

The next couple of questions are about your thoughts on the practical application of open science.

Q40. Please give an estimate on how many hours of (informal) training on open science practices you have received.

Please indicate the extent to which you agree with the following statements:

Very Little Very Much Not applicable

Q41. "I feel like I have received sufficient (informal) training on how to practice open science."



Q42. "My working environment/colleagues encourage me to use open science methods to conduct my research."



Q43. Which of the following practices are you currently using in your research?

	Never	Rarely	Sometimes	Mostly	Always	I don't know what this means	Not applicable
Preregistration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Registered reports	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Open access publishing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Open data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Open materials (code, metadata)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Open peer review	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Q44. Optional: Alternatively, which other open science practice are you currently using in your research?

	Never	Rarely	Sometimes	Mostly	Always
Other practice:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Q45. Which of the following practices would you like to use (more) in your future research?

- Preregistration
 - Registered reports
 - Open access publishing
 - Open data
 - Open materials (code, metadata)
 - Open peer review
 - Other, namely: _____
 - None
-

Q46. Optional: What would you need to practice (open) science the way you'd like to?

End of Block 8: Open Science Practices

Start of Block 9: Critique

From interviews, we gathered some information about how the reform movement is perceived. We will now like to know how much you agree with the next statements.

Q47. Please indicate the extent to which you agree with the following statement:

Not at all Completely Not applicable

"I have the feeling that people in the reform movement understand the practices of my field."



Q48. Optional: Please explain why (not)?

Please indicate the extent to which you agree with the following statement:

Not at all Completely Not applicable

Q49. "I feel like the reform movement addresses the most pressing issues regarding scientific quality in my field."



Q50. Optional: Please explain why (not)?

Please indicate the extent to which you agree with the following statement:

Not at all Completely Not applicable

Q51. "The proposed solutions solve the problems in my field sufficiently."



Q52. Optional: Please motivate your answer.

Q53. The reform movement prioritizes some solutions over others. Please rank how **you think** the reform movement prioritizes the following issues (1=most priority, 16=least priority):

- _____ Preregistration/registered reports
 - _____ Data/code sharing
 - _____ Research methods other than inferential (qualitative, descriptive, exploratory)
 - _____ Improving statistics (bayesian statistics vs NHST etc)
 - _____ Theory or construct development
 - _____ Bigger sample sizes
 - _____ Slow science
 - _____ Managing competitive culture in academia
 - _____ More collaboration
 - _____ More direct replication
 - _____ More conceptual replication
 - _____ Increasing diversity within universities
 - _____ Increasing the importance of societal impact
 - _____ More freedom to pursue your scientific interests
 - _____ More job security
 - _____ Nuanced reporting of results
-

Q54. Are you sure you finalised the ranking?

- Yes, I am
 - No, I am not
-

Q55. Optional: What problems with regard to the quality of research in your field is the movement missing?

Q56. Optional: Do you have feedback on the questions about the priorities of the reform movement?

End of Block 9: Critique

Start of Block 10: Important Issues To Be Addressed

Q57. In order to improve **research quality** in your field, multiple solutions are suggested. Please rank how important **you think** they are to improve research quality in your field (1=most important, 16=least important).

- _____ More focus on preregistration/registered reports
 - _____ More focus on data/code sharing
 - _____ More focus on research methods other than inferential (qualitative, descriptive, exploratory)
 - _____ More focus on improving statistics (Bayesian statistics and/or NHST etc.)
 - _____ More focus on theory or construct development
 - _____ More focus on bigger sample sizes
 - _____ More focus on slow science
 - _____ More focus on managing competitive culture in academia
 - _____ More focus more collaboration
 - _____ More focus on direct replication
 - _____ More focus on conceptual replication
 - _____ Increasing diversity within universities
 - _____ Increasing the importance of societal impact
 - _____ More freedom to pursue your scientific interests
 - _____ More job security
 - _____ More focus on nuanced reporting of results
-

Q58. Are you sure you finalised the ranking?

- Yes, I am
 - No, I am not
-

Q59. Optional: Did we forget something?



Q60. Optional: Do you have feedback on the questions about the important issues to be addressed?



End of Block 10: Important Issues To Be Addressed

Start of Block 11: Obstacles to Implementation

Researchers also report various obstacles to reforming science. How much do you agree with the following statements?



Q69. Optional: Do you want to elaborate on any of your answers with regard to obstacles for reform?

Q70. Optional: What other obstacles for changing the practices of your field do you see?

End of Block 11: Obstacles to Implementation

Start of Block 12: Feedback

You've now reached the end of the survey.

Q71. Would you like to give more specific feedback on the survey?

Q72. I have honestly answered the questions above.

Yes

No

Q73. I paid attention filling in this survey.

Yes

No

Please press → to submit your answers. You cannot change your answers anymore after submitting.

End of Block 12: Feedback
