Written evidence submitted by
Dr Gesche M Huebner, University College London (RES0010)

Disclaimer: The below draws heavily on a paper co-written with other authors at UCL (Huebner, G.M., Nicolson, M., Fell, M., et al., 2017). However, as there was no time to coordinate a response with the co-authors all of the below should be taken to represent the views of myself only.

The following lays out a response to “what further measures if any are needed”, and “what matters should be for the research / academic community to deal with, and which for Government”.

There are several tools that could help to promote research integrity (Huebner et al., 2017). They are presented subsequently, split up depending on who should be the bodies to implement them. The discussed tools are both relevant for increasing academic rigour and for aiding replication studies which are crucial in establishing valid findings. Some are more relevant for increasing rigour (e.g. using reporting guidelines and pre-analysis plans), others more directly for replicating research (e.g. funding replication studies). The reason for discussing them jointly is that rigour and replicability impact each other: If scientific studies have been conducted with insufficient rigour, they will likely fail to be replicated. A high probability that attempts at replication will be made is likely to increase rigour in all studies.

1. Academics & journals
   1.1. Pre-analysis plans and trial registration
   Two key practices undermine the replicability and rigour of research: (1) the ‘file drawer’ problem, whereby results that do not exceed conventional thresholds required for statistical significance are less likely to be submitted or accepted for peer-reviewed publication; (2) ‘fishing’, whereby researchers (or research funders) consciously or unconsciously select analysis specifications that support their prior beliefs or desired conclusions (Lin & Green, 2016).

   Trial registration can help to overcome the file drawer problem making it possible for anyone to find the trial(?) regardless of whether the study is subsequently published.

   To minimise the ‘fishing’ problem, researchers should produce pre-analysis plans (PAPs) which state key outcome measures and a step-by-step plan of how the analysis will be conducted, e.g. including what covariates and statistical tests will be used and how missing data will be handled. These PAPs are pre-registered online. In any subsequent publication, any deviation from the PAB needs to be declared and justified. It is important to point out that pre-analysis plans should not be used to make it ‘mandatory’ for researchers to follow their PAPs unquestioningly regardless of future events. They should merely make it incumbent on the researcher to highlight what analyses were planned and justify any variations in the analysis, to minimise the risk that analysis decisions are being chosen to suit particular conclusions or theoretical standpoints.

   Journals could encourage the use of trial registration and PABs, either through mandating them for publication or through distinguishing these papers.
1.2. **Research synthesis**

In many instances, individual studies will be limited in the extent to which their results can be generalized across populations and similar but not identical designs. Generalizability and robustness can be enhanced through synthesis of the findings of multiple studies in the form of a review. Hence, putting greater emphasis on reviews would help to systematically summarize all findings on one topic. This could again be facilitated more by journals calling for more review studies and demanding high rigour within them such as outlined below. This might include:

- **Clearly stated objectives and review protocol.**
- **Systematic search.**
- **Assessment of validity of identified studies.**
- **Systematic extraction, synthesis and presentation of study characteristics and findings** which might include statistical meta-analysis.

1.3. **Reporting research**

The full, precise and accurate reporting of research is key, to ensure full interpretability of the work including a judgement on its merit, to allow its replication, and to compare it to other studies.

To reduce subjectivity in the decision of what ‘full, accurate reporting is’, sets of guidelines have been developed specifying what aspects of studies should be reported. The specific guidelines differ according to type of study (see Table 1, taken from Huebner et al., 2017).

**Table 1: Leading reporting guidelines by study type.**

<table>
<thead>
<tr>
<th>Study type</th>
<th>Reporting guidelines</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomized trial</td>
<td>CONSORT</td>
<td>Requires flowchart of phases of trial and includes 25-item checklist (see (Schulz, Altman, &amp; Moher, 2010)</td>
</tr>
<tr>
<td>Systematic review</td>
<td>PRISMA</td>
<td>Flowchart and 27-item checklist (see (Liberati et al., 2009)</td>
</tr>
<tr>
<td>Predictive model</td>
<td>TRIPOD</td>
<td>22-item checklist (see (Moons et al., 2015). See also (Bennett &amp; Manuel, 2012) for alternative proposals.</td>
</tr>
<tr>
<td>Qualitative study (interviews and focus groups)</td>
<td>COREQ</td>
<td>32-item checklist (Tong, Sainsbury, &amp; Craig, 2007)</td>
</tr>
</tbody>
</table>

Journals could again encourage the use of reporting guidelines through mandating them or having a reward system.

1.4. **Publication of datasets with computer code in data repositories**

Making data publicly available is a key aspect in preventing data fraud and in promoting scientific integrity and replication studies. Errors (intentional or unintentional) in analysis could be identified by others. The real strength of publication of datasets and computer code is in combination with PAPs: If neither data collection tools, variables to be used in analyses nor exclusion criteria have been pre-specified, uploaded data could still be manipulated. Together with PAPs, though, cherry-picking of results and other forms of p-hacking could be
uncovered. There are further benefits to depositing data: e.g. it increases the visibility of the research as data sources can be cited, it is economic as data can be re-used, it can give further discoveries that the original authors had not thought of, and it can help to establish collaboration.

Uploading data is quite straightforward, however, it needs to be ensured that confidentiality of research participants is ensured, i.e. all data need to be de-identified. Also, a meta-document or ‘ReadMe’ document needs to be prepared to help others to understand variables measured.

Journals should ideally mandate making data available and provide access to suitable data bases, and include any costs for this in their usual publication fee, if any.

2. Journals

2.1. Having dedicated replication streams and / or special issues on replication

Replicating studies is a crucial step in establishing if a finding is valid beyond one study and can also deter academics from manipulating their data or cherry-picking results if they must expect attempts at replication. At the moment, most journals submissions call for novel findings, discouraging attempts at replication as they would be hard to publish. Dedicated streams or Special Issues for replication are needed.

3. Research councils

3.1. Funding replication studies

Research councils should make funding explicitly available for replication studies. Again, grants call for novel, ground-breaking research making it hard to get replication work funded. There should be dedicated grants for replication studies.

3.2. Limit the number of publications that can be listed in grant applications.

This is already established by various funding organizations that only the top 5 publications can be listed; which might take the pressure away to publish ‘as much as possible’.

3.3. Include evidence of research rigour in CV (evaluation)

CVs, if preformatted, should have a category asking for evidence of research rigour, such writing of PABs and pre-registering trials. Reviewers should be instructed to take this into account.

4. Universities

4.1. Teach students about ‘research integrity’

Greater emphasis needs to be put on teaching students – potential future academics – how to conduct reliable, valid, replicable research and which tools help to do so. Whilst some disciplines such as psychology, others do not. Guidance such as ‘The Concordat to Support Research Integrity’ is important; but it currently does not seem to lead to enough actions in practice. A more stringent audit scheme seems needed.

4.2. Evaluate evidence of research rigour in applicants

Applications and interviews for academic posts should include sections on eliciting an applicant’s thoughts around research quality and how they have previously demonstrated
their awareness of these topics in their research, and answers be included in evaluation of suitability for the post.

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References


