Verification Reports: A new article type at *Cortex*

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For several years, *Cortex* has stood at the forefront of a host of reforms to improve the reliability and credibility of our discipline, including Registered Reports (Chambers, 2013), Exploratory Reports (McIntosh, 2017), Badges for Open Practices, and the Transparency and Openness Promotion (TOP) guidelines (Chambers, 2018). Each of these initiatives is proving successful, with the journal receiving over 100 Registered Report submissions (including 23 completed Stage 2 articles so far), the publication of our first two Exploratory Reports (Broadway et al., 2019; Tosi et al., 2020), and more than 66% of all empirical submissions now qualifying for at least one Open Practices badge (including Open Data, Open Materials or Preregistered badges).

This volume sees the introduction of a new article type called *Verification Reports* that complements and extends our existing portfolio. Reforms such as Registered Reports focus on transparency and inferential reproducibility, but no journal has yet created a format focusing specifically on computational reproducibility and analytic robustness. Verification Reports (VRs), first proposed by Srivastava (2018), meet this objective by repeating the original analyses or reporting new analyses of original data. In doing so they provide scientists with professional credit for evaluating one of the most fundamental forms of credibility: whether the claims in previous studies are justified by their own data.

Our detailed VR policy and instructions to authors are available online[1], but four key features are worth highlighting here. First, in the interests of impartiality, all authors of a VR submission must be independent of the original study and its authors. In practice this means that none of the authors of the study (or studies) that are the target of the verification attempt can be authors of a VR investigating that study; nor can any of the VR authors hold active collaborations with any of the original authors.

Second, similar to Registered Reports, VRs will be reviewed over two stages to reduce publication bias. At Stage 1 authors will submit an introduction and proposed analysis plan, either prior to the results being known or with the results temporarily withheld to ensure results-blind evaluation. Submissions will then be assessed by editors and reviewers according to specific criteria, including the relevance of the

[1] Full author guidelines are available at https://www.elsevier.com/__data/promis_misc/VR_GuideForAuthors.pdf

verification attempt to the disciplinary remit of *Cortex*,[2] the value and importance of the verification attempt, and the methodological validity of the reported (re)analyses. Judgments of importance are necessarily subjective, but in general, Stage 1 proposals will be considered of sufficient value where the editors and reviewers decide that the computational reproducibility of the finding in question has not already been established (e.g. through a prior VR or reanalysis) or, for fields where a finding has been replicated many times, where the target study of the verification attempt is particularly relevant (e.g. recent, timely or otherwise influential). Verification attempts that take into account the full basis of published claims are also more likely to be accepted. For example, where the conclusions of the original article were based on multiple studies within one article, a VR is likely to be stronger if it assesses the reproducibility and robustness of all studies in the article rather than a subset.

Following peer review, submissions that satisfy the Stage 1 criteria will be publicly registered and awarded *in-principle acceptance* (IPA), which commits the journal to publishing the completed article regardless of the results. The VR authors then complete their analyses, submitting a full manuscript that includes the results and conclusions. Reviewers and editors will assess this Stage 2 submission according to two criteria: whether the authors adhered to their approved protocol (with any necessary deviations transparently flagged and strongly justified), and whether the conclusions of the analyses are based on the evidence obtained. Crucially, the original analysis plan and Stage 1 criteria are not relitigated, and editors are forbidden from accepting or rejecting the final article on the basis of the results.

The third key feature of this policy is that *Cortex* will also consider verification attempts where sufficient data to conduct the analyses are, for any reason, unavailable to the VR authors. These manuscripts will be considered as *Verification Notes* and will consist of an extended abstract justifying the importance of the original study, a complete accounting of attempts to obtain the original data (which must be exhaustive), and a conclusion that the claims in the original study could not be

[2] Proposals based on published *Cortex* articles will automatically satisfy this criterion and we are also happy to consider proposals that fall within the remit of *Cortex* regardless of the target journal.

independently verified. As with VRs, Verification Notes will focus exclusively on the facts and not include any judgments about the integrity of the original authors.

Finally, since judging the importance and validity of a reanalysis can benefit from intimate knowledge of the original data, the authors of the original study will often be invited to review a VR even when they have engaged in prior contact with the submitting authors. For this reason, we cannot guarantee that any requests by submitting authors to exclude the original authors from the review process will be honoured. At the same time, the editors will take into account the risk of conflict of interest in reviews supplied by original authors. In addition, we will not routinely offer the original authors or any other researchers a right-of-reply to a published VR, though replies and comments from independent researchers may be solicited where the content is scientifically informative.

This volume of *Cortex* not only signals the launch of our VR policy but also the publication of our first exemplar (Chalkia, Van Oudenhove & Beckers, 2020).[3] Through a series of analyses of the original data, the authors assessed the computational reproducibility and robustness of an influential study on memory reconsolidation published in *Nature* by Schiller et al. (2010). Our companion editorial tells the story behind this submission and its accompanying Registered Report (Chalkia, Shroyens, Leng, Vanhasbroeck, Zenses, Van Oudenhove & Beckers, 2020; McIntosh & Chambers, 2020), which together form a sombre monument to the importance of verifying claims sooner rather than later in the research process.

As we embark on this new endeavour, it is important to underline the reasons why VRs are such a vital addition to the publishing toolkit. In any science it is sensible to confirm basic reproducibility before advancing to higher levels of confirmation. This means that before investing in an extension or replication of a study, we should first establish that the claims of the original study are reproducible and robust from the original data. If this test is met then the stage is set and further work can be justified, but if not, a replication or extension may be premature and wasteful.

[3] For logistical reasons, and in contrast to the *Cortex* VR policy from this point forward, this maiden submission was reviewed in a single stage, with results known to the authors and reviewers from the outset. All subsequent VRs will follow the two-stage process.

In this vein, the inaugural VR by Chalkia et al. (2020) – and the accompanying Registered Report which took years for the authors to complete – may prompt the research community to consider whether the chain of verification in our field is as strong as it should be. How many non-replications of previous findings have arisen because the data analyses in the original study were biased or simply wrong? How many such replications or extensions would never have been attempted in the first place if verification studies were commonplace? And how often are original data even available for such independent scrutiny, let alone scrutinised? With VRs our aim is to raise community expectations of such scrutiny, establishing the level of confidence we should place in specific prior claims and hopefully reducing future research waste. We do so with our gaze fixed firmly on the evidence, free from judgments about the integrity of the actors involved.

We look forward to launching this important new initiative and, as always, we welcome feedback from our authors, reviewers, and the wider scientific community.

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