

**Research Reproducibility 2020**  
**Educating for Reproducibility: Pathways to Research Integrity**

**AUTOMATED SCREENING OF COVID-19 PREPRINTS: CAN WE HELP AUTHORS  
TO IMPROVE TRANSPARENCY & REPRODUCIBILITY?**

Peter Eckmann<sup>1</sup>, Nico Riedel<sup>2</sup>, Halil Kilicoglu<sup>4</sup>, Cyril Labbé<sup>5</sup>, Gerben ter Riet<sup>6,7</sup>,  
Jennifer Byrne<sup>8</sup>, Guillaume Cabanac<sup>9</sup>, Amanda Capes-Davis<sup>10</sup>, Bertrand Favier<sup>11</sup>,  
Shyam Saladi<sup>12</sup>, Peter Grabitz<sup>2,3</sup>, Alexandra Bannach-Brown<sup>2</sup>, Robert Schulz<sup>2,3</sup>,  
Sarah McCann<sup>2,3</sup>, Rene Bernard<sup>13</sup>, Anita Bandrowski<sup>1</sup>, Tracey Weissgerber<sup>2,3</sup>

<sup>1</sup> Department of Neuroscience, University of California at San Diego and SciCrunch Inc.,  
La Jolla, California, United States

<sup>2</sup> QUEST – Quality | Ethics | Open Science | Translation, Berlin Institute of Health,  
Berlin, Germany

<sup>3</sup> Charité – Universitätsmedizin Berlin, Berlin, Germany

<sup>4</sup> School of Information Sciences, University of Illinois at Urbana-Champaign,  
Champaign, Illinois, United States

<sup>5</sup> Université Grenoble Alpes, CNRS, Grenoble INP, LIG, Grenoble, France

<sup>6</sup> Department of Cardiology, Amsterdam UMC, University of Amsterdam, Amsterdam,  
The Netherlands

<sup>7</sup> Urban Vitality Center of Expertise, Amsterdam University of Applied Sciences,  
Amsterdam, The Netherlands

<sup>8</sup> New South Wales Health Statewide Biobank, New South Wales Health Pathology and  
Faculty of Medicine and Health, The University of Sydney, New South Wales, Australia

<sup>9</sup> UMR 5505 IRIT, Université de Toulouse, UPS, Toulouse, France

<sup>10</sup> CellBank Australia, Children's Medical Research Institute and The University of  
Sydney, Westmead, New South Wales, Australia

<sup>11</sup> Université Grenoble Alpes, TIMC UMR5525, La Tronche, France

<sup>12</sup> California Institute of Technology, Pasadena, California, United States

<sup>13</sup> NeuroCure Cluster of Excellence, Charité - Universitätsmedizin Berlin, Corporate  
Member of Freie Universität Berlin, Humboldt-Universität zu Berlin, and Berlin Institute  
of Health, Berlin, Germany

**Correspondence to:**

Dr. Tracey Weissgerber, [tracey.weissgerber@charite.de](mailto:tracey.weissgerber@charite.de), [@T\\_Weissgerber](https://twitter.com/T_Weissgerber)  
Dr. Anita Bandrowski, [abandrowski@health.ucsd.edu](mailto:abandrowski@health.ucsd.edu), [@Anitabandrowski](https://twitter.com/Anitabandrowski)

## ABSTRACT

**Introduction:** The COVID-19 pandemic has thrust preprints into the spotlight, highlighting their advantages and disadvantages. The lack of peer review allows publication to occur with unprecedented speed, but this has raised concerns among biomedical scientists about the quality of the reported research. Staff scientists at preprint servers check whether manuscripts are indeed about science and prevent publication of unvetted preprints on topics that could damage public health, but rapidly assessing manuscript quality is not feasible on a large scale.

**Objectives:** The study had three primary objectives in regard to COVID-19 preprints: 1. Test the feasibility of automatically and publicly evaluating preprints on a large scale; 2. Assess the prevalence of common quality problems in preprints; and 3. Compare the quality of preprints to published papers.

**Methods:** The following tools were used to screen preprints: SciScore, OddPub, limitation-recognizer, Barzooka, JetFighter, and Seek&Blastn. Along with a tool that extracts data from PDF-formatted preprints, a tool that formats, publishes, and Tweets reports, and a PostgreSQL database, these tools were combined into a Docker pipeline. Tweets are sent out automatically on @SciScoreReports.

**Results:** While a substantial fraction (36.2%) of analyzed preprints addressed study limitations, the proportion of preprints that met other quality criteria was much lower, with only 20% addressing sex as a biological variable, 14.3% sharing open code, 13.6% sharing open data, 7.6% including non-colorblind safe images, and 7.3% showing misleading bar graphs. Additionally, National Institutes of Health rigor criteria were addressed at a lower rate in COVID-19 preprints than papers in PubMed Central. Both authors and non-authors interacted with the automated Tweets containing reports for preprints, and the number of followers from both biomedical fields and the general public steadily increased, reaching over a hundred within two months.

**Conclusion:** This project shows that it is feasible to conduct large-scale automated screening of preprints for common quality criteria and provide feedback to study authors and readers before publication. These reports can publicly raise awareness about factors that affect study quality and reproducibility, while helping authors to present their research in a more transparent and reproducible manner.