FORS GUIDES
to survey methods
and data management

Replication in the Social Sciences

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Abstract:

In the social sciences in recent years, replication has received increased attention, as there has been a growing understanding that for research to be credible it is crucial that studies can be repeated. Replication allows for determining the validity of scientific conclusions. This FORS Guide provides an overview of the concept of replication. Moreover, it provides some practical recommendations to social science researchers regarding what replication materials should include and elaborates on the role of scientific journals in encouraging replications.

Keywords: Open science, Reproducibility, Robustness

The FORS Guides to survey methods and data management

The FORS Guides offer support to researchers and students in the social sciences who intend to collect data, as well as to teachers at university level who want to teach their students the basics of survey methods and data management. Written by experts from inside and outside of FORS, the FORS Guides are descriptive papers that summarise practical knowledge concerning survey methods and data management. The FORS Guides go beyond the documentation of specific surveys or tools and address general topics of survey methodology and data management. They give a general overview without claiming to be exhaustive. Considering the Swiss context, the FORS Guides can be especially helpful for researchers working in Switzerland or with Swiss data.

1.   INTRODUCTION

For research to be credible it is crucial that studies can be repeated and that under the same – or similar – circumstances prior results can be confirmed. When the methodological procedures used to obtain a finding can be reproduced and the finding can be replicated, results from single observations can provide robust scientific evidence (Zwaan et al., 2017).

Acknowledging this, in recent years replication has received increased attention in social science research (Köhler & Cortina, 2019). Yet, in psychology and economics in particular, there have been unsuccessful attempts to produce replications of experimental results, leading to doubts about the credibility of social science research more generally (Camerer et al., 2016; Open Science Collaboration, 2015). This has led to the so-called 'replication crisis' (e.g. Freese & Peterson, 2017; Nature, 2018). While that crisis has shed doubts on scientific research, it also represents an opportunity to improve scientific methods to foster more robust and reliable research (Nature, 2018).

Against this background, there has been a growing understanding that the credibility of the social sciences benefits from initiatives that increase confidence that the findings reported by one researcher – or group of researchers – can be verified by others (Freese, 2007). This aligns with the general movement towards open science and greater transparency in research.

Replication studies can make an important contribution in this respect. They confirm the validity of scientific conclusions and provide insights into what methods are necessary for robust results (Nature, 2018). Hence, replication is not an end in itself, but a central part in the evidence-making process. To take an example from education sciences, replication of findings can lead to stronger policy recommendations, which in turn can improve educational practice and finally children's lives (Makel & Plucker, 2014).

This FORS Guide provides social science researchers with a better understanding of the concept of replication and its relevance, paying particular attention to the disciplines of psychology, economics, and education in the Swiss context. Moreover, it elaborates on what replication materials include as well as on the role that scientific journals play with regard to replication. Based on this, some practical recommendations are offered.

2.   REPLICATION IN SOCIAL SCIENCE RESEARCH

2.1   WHAT IS REPLICATION?

Makel and Plucker (2014, p. 2) define replication as the "purposeful repetition of previous research to corroborate or disconfirm the previous results". There is, however, a large conceptual and practical heterogeneity with regard to what is referred to as replication. In fact, first of all, it is useful to differentiate *reproducibility* and *replication* (Köhler & Cortina, 2019):

- *Reproducibility* implies that the same dataset is analyzed more than once, either by the original researcher (referred to as dependent reproducibility) or by different researchers (referred to as independent reproducibility). When the same sample is analyzed using the same methods, this should lead to the same results.

- *Replication* refers to studying a phenomenon more than once, for example, based on different datasets. The replication can be carried out by the same researchers as the original study (dependent replication) or by different researchers (independent replication). Hence, a replication does not necessarily have to lead to the same conclusion. If replications lead to the same conclusions, this contributes to a strong evidence base. If, on the other hand, replications lead to different findings, this might be due to methodological differences, and additional studies should further assess the phenomenon.

In the literature, reference is also made to direct replications, which refer to a "[r]epetition of an experimental procedure" (Schmidt, 2009, p. 92; see also Open Science Collaboration, 2012). Overall, there is no uniform terminology with respect to replication across, even within disciplines. What exactly replication refers to depends very much on scientific disciplines and research cultures.

While the definitions may be different across disciplines, Freese and Peterson (2017) refer specifically to the social sciences and describe replicability in terms of four main dimensions: verifiability, robustness, repeatability, and generalizability. While these dimensions are closely intertwined, they capture distinct concepts.

1. *Verifiability* involves taking the results of an original study as the object of inquiry. It asks limited questions regarding whether the same results are obtained by doing the same analyses on the same data.

2. *Robustness* describes an analysis on the original data with alternative model specifications to assess if the original finding is the result of analytic decisions or if it holds across specifications.

3. *Repeatability* describes the procedure of collecting or analyzing new data to assess if the results of the study are also found when employing the original methods.

4. *Generalizability* means that the original study provides a premise for research evaluating if similar results are consistent across varying methodologies and settings.

The above shows that there is not (yet) a single established definition of replication. In what follows below, this guide considers replication in a broad sense: What do researchers need if they want to replicate a study in any of the four ways presented above (i.e. verifiability, robustness, repeatability and generalizability (Freese & Peterson, 2017))?

So far, replication is mostly discussed with respect to quantitative social sciences. The question of how to deal with qualitative social science data has only started to emerge. This is also because replication with respect to qualitative data is fundamentally different from quantitative data. As Freese and Peterson (2017, p. 148) put it: "qualitative inquiry poses very different issues about which replication may not even be the best term". What follows in this guide focuses on quantitative social science data.

2.2 WHAT DO REPLICATION MATERIALS INCLUDE?

In order to be able to replicate a study, researchers should make available the material that allows others to fully follow the analysis carried out in the original research. In particular, this includes well-documented data and analysis codes (or scripts), as well as a report of the analytic decisions taken. This is in line with good research practices that include a detailed record of all procedures leading from the original data to the results presented in an article

(Freese, 2007). These materials should also include information on the data and its version, as well as the software (and its version) used. Information on the data includes, for example, the context and mode in which it has been collected, as well as a description of the sampling frame and population. Upon the publication of articles, the replication material should be shared in an appropriate repository which follows the FAIR[1]-principles. Good documentation also benefits the original researcher, as it implies well-justified choices made throughout the analyses, as well as keeping a trace of the decisions taken. For example, this is useful for later revisions of manuscripts.

2.3   THE ROLE OF SCIENTIFIC JOURNALS

One way to motivate researchers to do more replications is to facilitate and encourage them. Scientific journals play a critical role in encouraging researchers to conduct more replications (Makel & Plucker, 2014; Nature, 2018). Moreover, they can require authors to make available publicly the data and code used to produce their results (Gertler et al., 2018). This is more common in economics and political sciences but less so in psychology and sociology (Gertler et al., 2018). For example, the American Economic Association has appointed a data editor to ensure reproducibility in its journals. Moreover, if top scientific journals encourage and publish replication studies, this represents an important incentive for researchers to carry them out. More and more journals insist on transparency and ask researchers to make the data underlying publications available – next, journals should make sharing code and related documentation a condition for publication (Freese & Peterson, 2017). An increasing number of international journals currently do that. For example, highly ranked journals in sociology (Sociological Methodology) now address the topic of replication and impose such requirements (e.g. Willer & Emanuelson, 2021). If prestigious journals ask researchers to deposit replication materials, this represents an important incentive for researchers.

3.   REPLICATION IN THE SWISS CONTEXT

In the Swiss social science community, replication is not yet common. Swiss social science journals have not yet published replication results and do not explicitly encourage authors to carry them out. The journals assessed include the Swiss Journal of Psychology, the Swiss Journal of Sociology, the Swiss Political Science Review, the Swiss Journal of Educational Research, and the Swiss Journal of Economics and Statistics. It can be expected that Swiss journals will also start encouraging replications in the upcoming years, following the example of the leading discipline-specific international journals.

Science funders also play a key role in motivating replications. Therefore, in order to encourage researchers to carry out replication studies, the Swiss National Science Foundation (SNSF) could provide special funds, and journals should explicitly recommend that researchers carry out replication studies. Currently, the SNSF does not explicitly recommend replications.

An important player is the Swiss Reproducibility Network (SRN)[2]. The SRN is an interdisciplinary organization aiming at encouraging reproducible research, including replication, in Switzerland. To that end, the SRN develops training activities, designs and

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[1] Findable, Accessible, Interoperable and Reusable.
[2] For more information see https://www.swissrn.org.

evaluates efforts to improve research, disseminates best practices, and cooperates with stakeholders to coordinate efforts (SwissRN, 2021).

4. IMPLICATIONS FOR SOCIAL SCIENCE RESEARCHERS

Based on the above, some recommendations for social science researchers can be derived.

Recommendation 1 – In your scientific article, provide an as detailed as possible description of the data and the methods.

Recommendation 2 – Many scientific journals now offer the possibility to publish supplementary material along with the article. This goes beyond the actual written article and its main results. If the journal you publish in offers this option, it is recommended that you make available the code and any other documents that allow other researchers to replicate your study. This also includes information on the version of the data, as well as the software (and its version) used for the analyses.

Recommendation 3 – When depositing your data in a repository, make sure the data is accompanied by high-quality documentation. For social science research in Switzerland, FORS can provide you with relevant guidance.

Recommendation 4 – To increase the probability that a replication study will be published, make use of a pre-registration. This involves publicly registering a research plan before collecting the data and executing the analysis (Chambers, 2019). More information on this is contained in the FORS Guide on pre-registration and registered report (Heers, 2020).

Recommendation 5 – To stay up to date with the recent developments with regard to reproducibility in Switzerland, get in touch with the Swiss Reproducibility Network and check out their trainings and other activities (SwissRN, 2021).

5. FURTHER READINGS AND USEFUL WEB LINKS

For an in-depth scientific discussion on replication in the social sciences, see Freese and Peterson (2017). Köhler and Cortina (2019) provide a thorough description of different types of replication and on the differentiation of replication and reproducibility. Wilkinson et al. (2016) give a good introduction to the FAIR-principles. LeBeau et al. (2021) provide an excellent description of reproducible analyses in educational research. This website describes the Social Sciences Replication Project: http://www.socialsciencesreplicationproject.com.

REFERENCES

Camerer, C. F., Dreber, A., Forsell, E., Ho, T.-H., Huber, J., Johannesson, M., Kirchler, M., Almenberg, J., Altmejd, A., & Chan, T. (2016). Evaluating replicability of laboratory experiments in economics. *Science, 351*(6280), 1433-1436. https://doi.org/10.1126/science.aaf0918

Chambers, C. (2019). *The seven deadly sins of psychology: A manifesto for reforming the culture of scientific practice*. Princeton University Press.

Freese, J. (2007). Replication Standards for Quantitative Social Science: Why Not Sociology? *Sociological Methods & Research, 36*(2), 153-172. https://doi.org/10.1177/0049124107306659

Freese, J., & Peterson, D. (2017, 2017/07/31). Replication in Social Science. *Annual Review of Sociology, 43*(1), 147-165. https://doi.org/10.1146/annurev-soc-060116-053450

Gertler, P., Galiani, S., & Romero, M. (2018). How to make replication the norm. *Nature Human Behaviour, 554*, 417-419. https://doi.org/10.1038/d41586-018-02108-9

Heers, M. (2020). Pre-registration and registered reports. *FORS Guides*. https://doi.org/10.24449/FG-2020-00009

Köhler, T., & Cortina, J. M. (2019, 2021/02/01). Play It Again, Sam! An Analysis of Constructive Replication in the Organizational Sciences. *Journal of Management, 47*(2), 488-518. https://doi.org/10.1177/0149206319843985

LeBeau, B., Ellison, S., & Aloe, A. M. (2021, 2021/03/01). Reproducible Analyses in Education Research. *Review of Research in Education, 45*(1), 195-222. https://doi.org/10.3102/0091732X20985076

Makel, M. C., & Plucker, J. A. (2014). Facts Are More Important Than Novelty: Replication in the Education Sciences. *Educational Researcher, 43*(6), 304-316. https://doi.org/10.3102/0013189x14545513

Nature. (2018, 2018/09/01). Learning from replication. *Nature Human Behaviour, 2*(9), 601-601. https://doi.org/10.1038/s41562-018-0441-1

Open Science Collaboration. (2015). Estimating the reproducibility of psychological science. *Science, 349*(6251), aac4716. https://doi.org/10.1126/science.aac4716

Schmidt, S. (2009, 2009/06/01). Shall we Really do it Again? The Powerful Concept of Replication is Neglected in the Social Sciences. *Review of General Psychology, 13*(2), 90-100. https://doi.org/10.1037/a0015108

SwissRN. (2021). *The Swiss Reproducibility Network*. https://www.swissrn.org

Wilkinson, M. D., Dumontier, M., Aalbersberg, I. J. J., Appleton, G., Axton, M., Baak, A., Blomberg, N., Boiten, J.-W., da Silva Santos, L. B., Bourne, P. E., Bouwman, J., Brookes, A. J., Clark, T., Crosas, M., Dillo, I., Dumon, O., Edmunds, S., Evelo, C. T., Finkers, R., Gonzalez-Beltran, A., Gray, A. J. G., Groth, P., Goble, C., Grethe, J. S., Heringa, J., t Hoen, P. A. C., Hooft, R., Kuhn, T., Kok, R., Kok, J., Lusher, S. J., Martone, M. E., Mons, A., Packer, A. L., Persson, B., Rocca-Serra, P., Roos, M., van Schaik, R., Sansone, S.-A., Schultes, E., Sengstag, T., Slater, T., Strawn, G., Swertz, M. A., Thompson, M., van der Lei, J., van Mulligen, E., Velterop, J., Waagmeester, A., Wittenburg, P., Wolstencroft, K., Zhao, J., & Mons, B. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific data, 3*, 160018-160018. https://doi.org/10.1038/sdata.2016.18

Willer, D., & Emanuelson, P. (2021, 2021/02/01). Theory and the Replication Problem. *Sociological Methodology, 51*(1), 146-165. https://doi.org/10.1177/0081175020955216

Zwaan, R., Etz, A., Lucas, R., & Donnellan, B. (2017, 2017/Oct/25). Making Replication Mainstream. *Behavioral and Brain Sciences: an international journal of current research and theory with open peer commentary*, 1-50. https://doi.org/10.1017/S0140525X17001972