Checklist for Quantitative Social Science Articles
Recommendations by the "Academy of Sociology (AS)"

May 25th, 2020

The purpose of this document is to provide a checklist for quantitative social science articles. A good article will achieve most of the items in this checklist. Go through all items and check whether your article fulfills them. Be aware that not all items may apply to your article.

A second purpose is to standardize the reporting in social science articles. Studies showed that many published articles in the Social Sciences do not fulfill even minimal reporting standards (e.g., Bernardi et al. 2017, Damian et al. 2019, Kohler et al. 2018). With this document we intend to contribute towards such minimal reporting standards.

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General Recommendations

Writing style

1. A necessity for any analytical social science article is a clear and precise writing style.
   - 1.1. An explicit argumentation is essential. Verbalize every step of your argumentation.
   - 1.2. Avoid obscure sentences.
   - 1.3. Define central terms and use them consistently.
   - 1.4. Ensure that all abbreviations are spelled out in full the first time they are used.
2. Always use the past tense when describing other researcher's findings and your own methods and results.
3. Ensure that all authors have carefully checked the final version of the manuscript. Manuscripts with many typos and inconsistent formatting make a bad impression.

Title	4. Title and subtitle should be brief, concise, but also complete according to the paper's content. Summarize the paper's subject clearly. 5. Consider whether your title should address the purpose of the study (e.g. as a question) or its conclusion (e.g. as a statement). 6. Address the empirical character of the study. 7. In case of an empirical study, mention the country of investigation. 8. Ensure that the paper can be found in online databases in the appropriate field of research (see The London School of Economics and Political Science (2011a) for recommendations). 9. Ensure that title and abstract are complementary.
Abstract	10. Provide an informative and balanced summary of what was done and what was found. 11. Avoid a specialized, technical language. 12. Suggested structure (West et al. 2018, The London School of Economics and Political Science 2011b, Koopman 1997): 12.1. Relevance of the field of research, conclusion on previous studies or state of research, raised research question or open topic to be addressed (15% to 20% of the abstract). 12.2. The paper's approach and specific subject (15 to 20% of the abstract). 12.3. Data and methods (15% to 50% depending on the character of the paper), address design, country, name of study/dataset number of participants, and kind of statistical analysis (if relevant). 12.4. Summarize central results and present core conclusions (as much space as possible). 12.5. The paper's added value to the field of research (if space is left).
Introduction	13. Explain the scientific background and rationale for the investigation being reported ("Why is the study needed?"). 14. Avoid phrases such as "We are the first …", "Our study is pathbreaking …", "We are using the most up to date methods …", etc. 15. Explore the scientific contribution of your research. 16. Develop and justify your research question and strategy of empirical analyses from the state of research. 16.1. It is essential that you state your research question explicitly and clearly. Use a numbered list, if there are more than one. 16.2. The list of research questions should match all methods, results and conclusions precisely. In general, no methods, results and conclusions should appear in the paper unless they are linked to a research question. 17. Communicate that study design, data, and statistical methods are appropriate to answer your research question. 18. Provide some very basic information on the data set and the number of cases. 19. Consider that journals (particularly economics ones) may expect a short summary of the main findings already at the end of the introduction.

Theory

20. Discuss both theoretical and empirical publications relevant for your research question. It is essential to search for and give due credit to studies of a similar nature wherever they originate and whatever their conclusions. Selective citation is a common source of bias. (West et al. 2018)
21. Develop hypotheses or research questions both (!) on the basis of theoretical arguments and existing empirical results. It is insufficient to simply state: "Authors A, B and C found that X affects Y. Hence, I expect that X affects Y".
22. Limit your hypotheses/research questions to a small number, but avoid at the same time the publication of 'least publishable units'.

Methods

23. Structure the methods section with subheadings (e.g. Data, Variables, Methods). (Details on data description see items 56 ff.)
24. All variables used should clearly be connected to a research question.
    - 24.1. Define all outcomes, treatments, confounders, moderators, and mediators (if applicable).
    - 24.2. Report coding and descriptive statistics (mean, standard deviation, minimum, maximum, number of cases) for all variables used in the analyses. It is helpful to present descriptive statistics and coding in one table (possibly in an appendix).
25. Methods should closely fit the research questions. Justify your choice of methods.
    - 25.1. Describe the methods used in a clear and concise manner. Use standard terminology.
    - 25.2. If you use standard statistical methods (i.e., means, OLS/logit regression) no detailed description is needed. Methods that many readers may not know, should be described in sufficient detail.
    - 25.3. Describe any methods used to examine subgroups and interactions.
    - 25.4. When doing mediation analysis use a test on whether the effect changed significantly after introducing the mediator into the model (for instance a Sobel-test) (Mustillo et al. 2018).
    - 25.5. With non-linear regression models (logit, probit, poisson, etc.) do not use the coefficient of the interaction term to draw conclusions about statistical interaction (Mustillo et al. 2018). Current best practice is described in Mize (2019).
26. Mention the software (including the version!) used for analysis. Give credit to developers of routines (e.g., cite authors of Stata ado-files that you used).
27. Consider that the descriptions in the methods section are essential for readers to evaluate your work (evaluation transparency). Moreover, a transparent description is a necessary condition for your empirical work being replicable (replicability transparency) (Damian et al. 2019).

Results

28. Link the sequence of analyses with the sequence of hypotheses/research questions in the theory section.
29. Figures and tables:
    - 29.1. Prefer a graphical presentation of results compared to tables. In case of graphical presentation, provide detailed tables in an appendix or as additional material to be downloaded.
    - 29.2. Cite (and discuss!) all your figures and tables in the text.
    - 29.3. Do not report all the results presented in your figures and tables, but focus on the variables that are related to your hypotheses.
    - 29.4. Ensure that readers are able to understand your figures and tables without any additional information (i.e., state clearly in the title the content, use meaningful variable labels, add a note that fully explains what is done, etc.).
    - 29.5. Report number of cases in figures and tables.
    - 29.6. Provide goodness of fit statistics.
30. Significance testing:
    - 30.1. State what test statistic you are using (e.g. t-value, F-value, etc.).
    - 30.2. Do not use $p < .10$ or one-tailed tests without giving good reasons (Mustillo et al. 2018).
    - 30.3. Do not present only *s. Present in addition either, S.E.s, test statistics, or exact p-values.
    - 30.4. Always use the phrase "*statistically* in/significant".
    - 30.5. Avoid justifying variable choice based on statistical significance.
    - 30.6. Avoid interpreting statistically insignificant effects as zero effects (Bernardi et al. 2017). If you want to claim that there was no effect use for instance Bayes factors (West 2016).
    - 30.7. Over-reliance on the statistical significance of parameter estimates without attention to their substantive significance and interpretation is a serious weakness that should be avoided. It is insufficient to simply state "The effect is significant".
31. Effect sizes and confidence intervals (see Cumming 2014):
    - 31.1. Therefore, always report (and discuss) estimated effect sizes including their confidence intervals. The best way to do so is by a coefficient plot (Jann 2014).
    - 31.2. With non-linear models, effect sizes should be reported in a comprehensible way (e.g. average marginal effects on probabilities).
    - 31.3. Clearly separate between reporting and interpreting (discussing) your empirical results. Some people prefer to interpret results in the discussion section.
32. Online appendix: Provide additional material that might be important to judge your results in an online appendix (correlation of variables, results of robustness checks, etc.)
33. Never say: "Available upon request". Make it available in an online appendix.

Discussion	34. Summarize key results with reference to study objectives. Discuss the results relative to your hypotheses/research questions. 35. Address unexpected results. Try to explain them by additional literature and/or analyses. 36. Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias. 37. Give a (cautious) overall interpretation of the results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence. 38. Discuss the generalizability (external validity) of the study results. 39. What are the theoretical, practical, or even the political implications of the results?
References	40. Cite all studies that you used in developing your arguments, theory, data analysis, and so on (see item 20). Cite also the data (item 61) and program packages used (item 26). Cite all relevant work (i.e., avoid citation circles). On the other hand, do not cite papers without good reason (i.e., avoid spurious citations).
Acknowl-edgement	41. List all persons who provided useful feedback to earlier versions of the paper (don't forget journal reviewers and editors if applicable). 42. Name conferences at which earlier versions of the paper were presented and received valuable feedback.
Disclosure statement	43. Give the source of funding and the role of the funders for the study.
Data note Open materi-als Open Code Open data	44. Provide links to the online appendix, replication files, and data repository (where appropriate). Preferably use permanent, open data repositories and digital object identifiers (DOIs). 44.1. Make all materials used for collecting the data open to the public. Lay out detailed descriptions of data collection procedures in an online appendix. 44.2. Make all code available in a well-documented form in order to enable the replication of all your results, graphs, and tables (replication package). 44.3. Make your data available in order to ensure the reproducibility of your research. If data do not require protection, depose them in an open data repository. Use a "Secure Data Center" if higher standards of data protection have to be achieved. If the data cannot be made available to the scientific community, increase the credibility of your findings by providing as much information as possible on the data. 44.4. Strive to fulfill the requirements of the AEA data policy (American Economic Association 2019). This is the most demanding data policy we know of and it should become standard in the social sciences.

Additional Recommendations for "New Style" Causal Analysis Articles

General	45. Concentrate on only *one* research question. It is difficult enough to provide a valid answer to a single social science research question. 46. Be explicit about the causal objective of your study. Avoiding the "C-word" introduces ambiguity and lowers quality (Hernán 2018). 47. Provide a systematic review of previous research on your research question. Helpful might be a plot of reported effect sizes and their confidence intervals (called "forest-plot" in meta-analysis).
Theory	48. "Theory-guided" research means that you closely theorize the causal structure of the research question at hand. 48.1. A graphical representation of the causal structure might be helpful (e.g. by a DAG) (Kohler et al. 2018). 48.2. It is necessary to theorize not only the treatment effect, but all (!) other important causal paths (confounders, mediators, moderators). Be as complete as possible on the causal structure. 48.3. Control for all available confounders. Be transparent on unavailable confounders and the potential for confounding bias. 48.4. Do not control for colliders (endogenous selection bias). 48.5. Do not control for mediators if you are interested in the total causal effect (overcontrol bias).
Methods	49. Clearly define the parameter of interest (e.g. total causal effect, direct effect that remains after controlling for mediators, etc.). Discuss your identification strategy for the parameter of interest. 50. This could be done in a section called "Methods and Analytical Strategy". Some argue that it might be helpful to do this before describing data and variables, because only after knowing the identification strategy one can judge the quality of the data.
Results	51. Instead of traditional significance testing concentrate on the effect size and its confidence interval (coefficient plot). An introduction on how to make the transition from "null hypothesis significance testing" to more informative statistical methods can be found in Fidler & Cumming (2019). 52. Always discuss substantive significance. 53. Do not discuss effects of control variables. In most cases they will not represent causal effects (Keele et al. 2020).
Robustness	54. Include a robustness section where you (seriously) test your main results. Alternatives to debatable design/modelling decisions should be tested. Science is institutionalized doubt! So be your own "advocatus diaboli" and try out alternative specifications. 55. You might use multimodel analysis (Young 2018) to be transparent on the range of possible results.

Specific Recommendations for Studies using Observational Data

(Primary) Data description	56. General rule: Report all central elements in the paper. Provide a detailed technical report in the appendix or as additional material that can be downloaded. 57. Setting: describe the setting, locations, relevant dates – including periods of recruitment, exposure, follow-up –, and data collection. 58. Sampling: 58.1. Provide information on the sampling frame. 58.2. Describe the sampling design used. It is insufficient to simply state: "We used a representative sample". 58.3. Give the eligibility criteria as well as the sources and methods of selection of participants. 58.4. Report numbers of cases at each stage of study – e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed. Give reasons for non-participation at each stage of analysis. 58.5. Accordingly report response rates. 58.6. Describe methods of follow-up. 59. Data collection: Describe the data collection mode. All instruments used for data collection should be made available online.
(Secondary) Data description	60. General rule: Report all central elements in the paper. Refer to the detailed technical report that most data producers provide. 61. Cite the data: Follow the citing rules as recommended by the data producers.
Variable description	62. Describe in detail all variable transformations. In case of complex variable transformations, whose descriptions would take too much space, provide a detailed technical report for the appendix or as additional material that can be downloaded. 63. Discuss the validity of all your instruments. If variables were not surveyed by standard instruments, report the related instruments in the text or in an appendix. If a scale is an "ad hoc creation" by you it is necessary that you validate the scale according to the standards of measurement science (Mustillo et al. 2018). If multiple-item measures are used to build summated scales instead of measurement (factor) models, provide an estimate of scale reliability (Trizano-Hermosilla & Alvarado, 2016).

Data handling	64. Sample Selection: Provide a detailed step by step overview of the cases excluded from the analysis sample. 64.1. Ideally this is done in the form of a flow chart/table (probably in the appendix). 64.2. Define the starting sample and describe each exclusion and how many cases you lose by this step. 64.3. Ideally provide a comparison of some socio-demographics from the starting and the final analysis sample. 65. Missing values 65.1. Explain how missing data were addressed. 65.2. Panel studies: If applicable, explain how loss to follow-up was addressed. 65.3. Address for which population your study is finally able to provide information. 66. Describe any efforts to address potential sources of bias (e.g., weighting, using selection models, etc.). 67. If applicable, describe analytical methods taking account of sampling strategy.

Specific Recommendations for Studies using Experimental Data

Methods	68. Trial design: 68.1. Give a description (and justification) of trial design (such as parallel, factorial) including allocation ratio. 68.2. Report important changes to methods after trial commencement (such as eligibility criteria), with reasons. 69. Recruitment: 69.1. State/Give dates defining the periods of recruitment and follow-up. 69.2. Explain why the trial ended or was stopped? 70. Participants: 70.1. Give the eligibility criteria for participants. 70.2. For each group, report the numbers the numbers of participants who were randomly assigned, received intended treatment, and were analyzed for the primary outcome. 70.3. For each group, report losses and exclusions after randomization, together with reasons. 71. Intervention: 71.1. Describe settings and locations where the data were collected. 71.2. Explain the interventions for each group with sufficient details to allow replication, including how and when they were actually administered.

	72. Outcome: 72.1. Provide completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed. 72.2. Report any changes to trial outcomes after the trial commenced, with reasons. 73. Sample size: 73.1. How was the sample size determined? 73.2. When applicable, give an explanation of any interim analyses and stopping guidelines. 74. Randomization: specify the type of randomization; details of any restriction (such as blocking and block size). 75. Sequence generation: 75.1. Describe the method used to generate the random allocation sequence. 75.2. Explain the mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned. 75.3. Describe who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions. 76. Blinding: 76.1. If done, specify who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how? 76.2. If relevant, provide a description of the similarity of interventions. 77. Statistical methods: 77.1. Describe statistical methods used to compare groups for primary and secondary outcomes. 77.2. Describe methods for additional analyses, such as subgroup analyses and adjusted analyses.
Results	78. Baseline data: Provide a table showing baseline demographic and other relevant characteristics for each group. 79. Numbers analyzed: For each group, describe the number of participants (denominator) included in each analysis and whether the analysis was done by original assigned groups. 80. Outcomes and estimation: For each primary and secondary outcome, report results for each group, and the estimated effect size and its precision (such as 95% confidence interval). 81. Ancillary analyses: Report results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory. 82. Harms: Report all important unintended effects in each group.

Further Sources

More details on data and variable description with **survey data** can be found in the "GESIS Survey Guidelines" (https://www.gesis.org/en/gesis-survey-guidelines/home).

A checklist specific for **cross-national survey research** can be found in Damian et al. (2019).

A Transparency Checklist that mainly pertains to **experimental studies** is described in Aczel et al. (2020). It is available online (http://www.shinyapps.org/apps/TransparencyChecklist/) and after filling it out, a report can be created to be submitted along with the article. Thus, the degree of transparency of the article can be documented against journal editors, reviewers, and readers.

Many reporting guidelines exist for **Health Research** (an overview can be found on the Homepage of the Equator-Network: https://www.equator-network.org/).

A checklist for agent-based **simulation models** is the so-called ODD+D protocol (Müller et al. 2013).

Acknowledgement

We were inspired and made extensive use of the STROBE-Statement (https://www.strobe-statement.org/) on observational studies, and of the CONSORT-Statement (http://www.consort-statement.org/) on experimental studies.

We also made use of the checklist provided by the editors of "Addiction" (West et al. 2018)

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