PROPOSAL

Bayesian Evidence Synthesis

Thom Volker, 5868777

Supervisor: Irene Klugkist

Methodology and Statistics for the Behavioural, Biomedical and Social Sciences

Utrecht University

August 28, 2020

Word count: 313

In recent years, a meta-analytic way of thinking has been advocated in the scientific community (Cumming, 2014). Additionally, the importance of replication has been legitimately supported (e.g., Open Science Collaboration, 2015; Baker, 2016; Brandt et al., 2014). However, most of the attention has been focused on studies that are highly similar, using an identical methodology and research design. These studies, commonly referred to as exact, direct or close replications, are merely concerned with the statistical reliability of the results. Unfortunately, if the results of these studies depend on methodological flaws, inferences from all studies will lead to suboptimal or invalid conclusions (Munafò & Smith, 2018). A safeguard against this deficiency is available in the form of conceptual replications, which primarily assess the validity of a study. That is, conceptual replications are a way of investigating whether the initial conclusions hold under different conditions, using varying measurement instruments or choosing different operationalizations. Voor mijn gevoel kan de relevantie nog verder benadrukt worden door te zeggen dat onderzoekers ook onbewust verschillende (te rechtvaardigen) keuzes maken mbt de analyse (*garden of forking paths*), maar ik vind dat ook weer niet zo goed passen bij de rest van dit stuk.

As a consequence, multiple studies regarding the same hypotheses arise and as per the cumulative nature of science, synthesizing the results is required to build a robust and solid body of evidence. When the studies are highly similar, established methods as (Bayesian) meta-analysis and Bayesian updating can be used to pool the results (Glasauer, 2019; Lipsey & Wilson, 2001; Sutton & Abrams, 2001) Heel vreemd, maar ik kan echt zo goed als niks over Bayesian Sequential Updating vinden. Ondanks dat het in deze bron (Glasauer) wel oke uitgelegd wordt, is het niet echt ons interessegebied geloof ik.

1 Introduction

2 References

Baker, M. (2016). Reproducibility crisis. *Nature*, *533*(26), 353–366. https://doi.org/10.1038/533452a

Brandt, M. J., IJzerman, H., Dijksterhuis, A., Farach, F. J., Geller, J., Giner-Sorolla, R., ... Van't Veer, A. (2014). The replication recipe: What makes for a convincing replication? *Journal of Experimental Social Psychology*, *50*, 217–224. https://doi.org/10.1016/j.jesp.2013.10.005

Cumming, G. (2014). The new statistics: Why and how. *Psychological Science*, *25*(1), 7–29. https://doi.org/10.1177/0956797613504966

Glasauer, S. (2019). Sequential bayesian updating as a model for human perception. In S. Ramat & A. G. Shaikh (Eds.), *Mathematical modelling in motor neuroscience: State of the art and translation to the clinic. Gaze orienting mechanisms and disease* (pp. 3–18). https://doi.org/10.1016/bs.pbr.2019.04.025

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis.* SAGE publications, Inc.

Munafò, M. R., & Smith, G. D. (2018). Robust research needs many lines of evidence. *Nature*, *553*(7689), 399–401. https://doi.org/10.1038/d41586-018-01023-3

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

Sutton, A. J., & Abrams, K. R. (2001). Bayesian methods in meta-analysis and evidence synthesis. *Statistical Methods in Medical Research*, *10*(4), 277–303. https://doi.org/10.1177/096228020101000404