SIMM32 - Lab assignment for the 2020 spring semester

Lab 7 – Factor analysis

Introduction:

Suppose that you would like to run a direct replication of a recently published research study in the literature. In this lab assignment you will need to calculate the appropriate sample size you need for this upcoming replication study to have a reasonable chance at detecting an effect if it exists.

Task:

Choose a recent study from your field of interest. You can choose any study from your field that was published in the past 6 years. This needs to be a confirmatory study! This means that the study needs to have some hypothesis tested in it which was tested using at least one statistical test.

You can choose any type of confirmatory research study, but you will have the easiest time if you choose an interventional study with a clear primary outcome of interest (e.g. Kearney, D. J., Simpson, T. L., Malte, C. A., Felleman, B., Martinez, M. E., & Hunt, S. C. (2016). Mindfulness-based stress reduction in addition to usual care is associated with improvements in pain, fatigue, and cognitive failures among veterans with gulf war illness. *The American journal of medicine*, *129*(2), 204-214. Which is a study testing the effectiveness of mindfulness based stress reduction therapy on the pain level of gulf war veterans suffering from chronic pain).

Once you have the study selected, estimate the sample size that you would need in this study to have a good chance for detecting the effect. The study and analysis approach must have at least 90% power to detect the effect of primary interest if it exists. The type I error rate should be 5% at most.

Use data from at least three research studies to inform your decisions about sample size. You can do this by finding multiple individual relevant research papers and extracting information about the effect sizes found in these studies, or by looking at the effect size reported in at least one relevant meta-analysis. Use the data from these sources to calculate the sample size needed to reach the desired power and alpha error rate.

What to report:

Your task is to write up the “sample size” section of your research protocol as it would appear in a protocol paper (a paper describing the research plan before data collection starts) or a dissertation research plan.

Start by describing the effect size for which the study is powered to detect. Report how was this effect size calculated. That is, write down what were the data extracted from the previous studies, and how did you derive the effect size out of these data. This can be reported in text, or if many data points were aggregated to get the final numbers entered into the sample size calculation, you can report these in a table format. Clearly reference which data came from which sources so that the reader can assess the relevance of the data to the new study.

Next, describe the process or calculation method used to calculate the sample size target for this new study. Make sure that the sample size calculation is reproducible! Report the software used and its version, and each setting and decision you made in a way that the reader can reproduce the same estimated sample size just by reading your report, without any additional help or information from you! (Share analysis code or syntax if you have any.)

What to discuss:

Discuss what the sample size requirement means for the planned research project: Is it realistic or feasible to collect this amount of data? Is it worthwhile to do this research knowing the amount of resources it would take to collect this much data? Are there ethical concerns regarding the sample size?

How does this planned sample size relate to the sample sizes of previous studies of the same or similar effects.

Would there be a way to decrease the required sample size for the study with some change to the research protocol or methods/tools used? If so, describe these.