

Polished Writing for Week 2

Motulsky (2014) provides some brilliant ideas in the article about common misconceptions in data analysis and statistics. In this writing, I would like to summarize and share some points brought by Motulsky that I think are very helpful and we are supposed to pay more attention to them when working as a statistician.

Firstly, as you conduct a data analysis and try to explore a statistical difference, it is not appropriate to change the research procedure during the study. If it fails to conclude a statistical difference with a p-value smaller than 0.05, you might feel that the research direction is wrong and tend to set up your research in another way you expect. However, this is a violation to the rule of statistical research. As mentioned by Motulsky (2014), either trying different sample sizes or generating a hypothesis based on the data exploration you have done is a form of “P-hacking”, which indicates that the researcher manipulates the experiment process with bias.

Secondly, over interpreting the p-value will lead to a wrong result. P-value is only a measure of the probability to observe an evidence as extreme or more as our observation assuming the null hypothesis is true. This probability has no relationship with how large the statistical difference is. To avoid this misinterpretation, Motulsky (2014) suggests including a measure of the statistical difference and not to include those misleading p-values that are not necessary.

Last but not the least, statistical hypothesis testing is not rigorous in nature and could lead to a wrong result. The meaning of “statistically significant” stands on the assumption that the null hypothesis is true. It is different from how unusual the null hypothesis is based on the observation, which is what we expect. And it is always possible that the significance could be due to a coincidence. Therefore, it is not sufficient to make a conclusion for the research only based on the statistical hypothesis test.

As a researcher in statistical science, you are supposed to be aware of those mistakes brought up by Motulsky (2014) and be careful of the procedures you make. The approach towards the truth is always tough and there is no short path. A rigorous scientific result takes time and efforts, and conclusions drawn by inappropriate manipulations could be completely incorrect.

Reference:

Motulsky, H. J. (2014). Common misconceptions about data analysis and statistics. *Naunyn-Schmiedeberg's Archives of Pharmacology*, 387(11), 1017–1023.
<https://doi.org/10.1007/s00210-014-1037-6>