

Reflection on Common misconceptions about data analysis and statistics.

The article gives a detailed explanation and example for common misconceptions about statistical analysis. After reading through the article, one common misconception that really surprised me is that we should not be misled by the word “significant” in traditional hypothesis testing and we should not overuse hypothesis testing. (Motulsky, 2014) In our experimental research, there are few possible reasons to avoid using hypothesis testing.

Firstly, we should not use hypothesis testing if we are not going to make a crisp decision. The decision to add a “star-sign” on our produced figure is not important at all. Only report the statistical hypothesis testing when we want to make a decision.(Motulsky, 2014)

Secondly, we should identify what answer is in the first place and fully understand what hypothesis testing will tell us. There are two questions that confuse us: one is that how likely is the null hypothesis given the data, another one is that how unlikely the data is assuming the null hypothesis is true. These are totally different questions and actually, the first one is often the question we want to answer whereas the P-value gives us the answer for the second question. Statistical hypothesis testing will not give us the answer we want to know and we should be aware of that. (Motulsky, 2014)

Thirdly, there are many scientists that not use strict statistical hypothesis testing. Usually, we make conclusions based on a 0.05 significance level. But if the P-value is slightly larger than that, many scientists will use a periphrasis of stating something like “almost significant”. (Motulsky, 2014)

Fourthly, if we want to use the P-value to make a decision, we might make a wrong decision. In some cases, there might be a type I error which misled us to a wrong conclusion. If our null hypothesis is actually true, the P-value might be small by the opportunity in some cases. The 5% significance level often leads to misunderstandings.(Motulsky, 2014)

Lastly, it might be misleading of the word “significant”. There are two scenarios. The first one refers to whenever the P-value is smaller than the significance level. The second one refers to the considerable impact made by a large enough effect. We should not get confused when using the word “significant”.(Motulsky, 2014)

To conclude, we should never use hypothesis testing when are not going to make a decision based on one analysis. And instead of using the word “significant” in a scientific paper, we should report the P-value and the threshold together with our decision. We should be aware of all those misleading meanings when performing hypothesis testing.

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>

