

## 13.2: Introduction to Main Effects and Interactions

When you conduct a design with more than one IV, you get more means to look at. As a result, there are more kinds of questions that you can ask of the data.

What kinds of questions are we talking about? Let's keep going with our Distraction scenario experiment. We have the first IV where we manipulated distraction. So, we could find the overall means in Spot the Difference activity for the distraction vs. no-distraction conditions (that's two means, one for when participants were distracted and one for the participants who were not distracted). The second IV was reward. We could find the overall means in spot-the-difference performance for the reward vs. no-reward conditions (that's two more means, one for participants who received a reward and one mean when reward was not mentioned). We could do what we already did, and look at the means for each combination, that is the mean for distraction/reward, distraction/no-reward, no-distraction/reward, and no-distraction/no-reward (that's four more means, if you're counting). There's even more. We could look at the mean distraction effect (the difference between distraction and no-distraction) for the reward condition, and the mean distraction effect for the no-reward condition (that's two more). I hope you see here that there are a lot of means to look. And they are all different means. Let's look at all of them together in one graph with four panels (Figure 13.2.1). Remember, the bar graphs in Figure 13.2.1 show the mean for each group; they are not frequency charts.

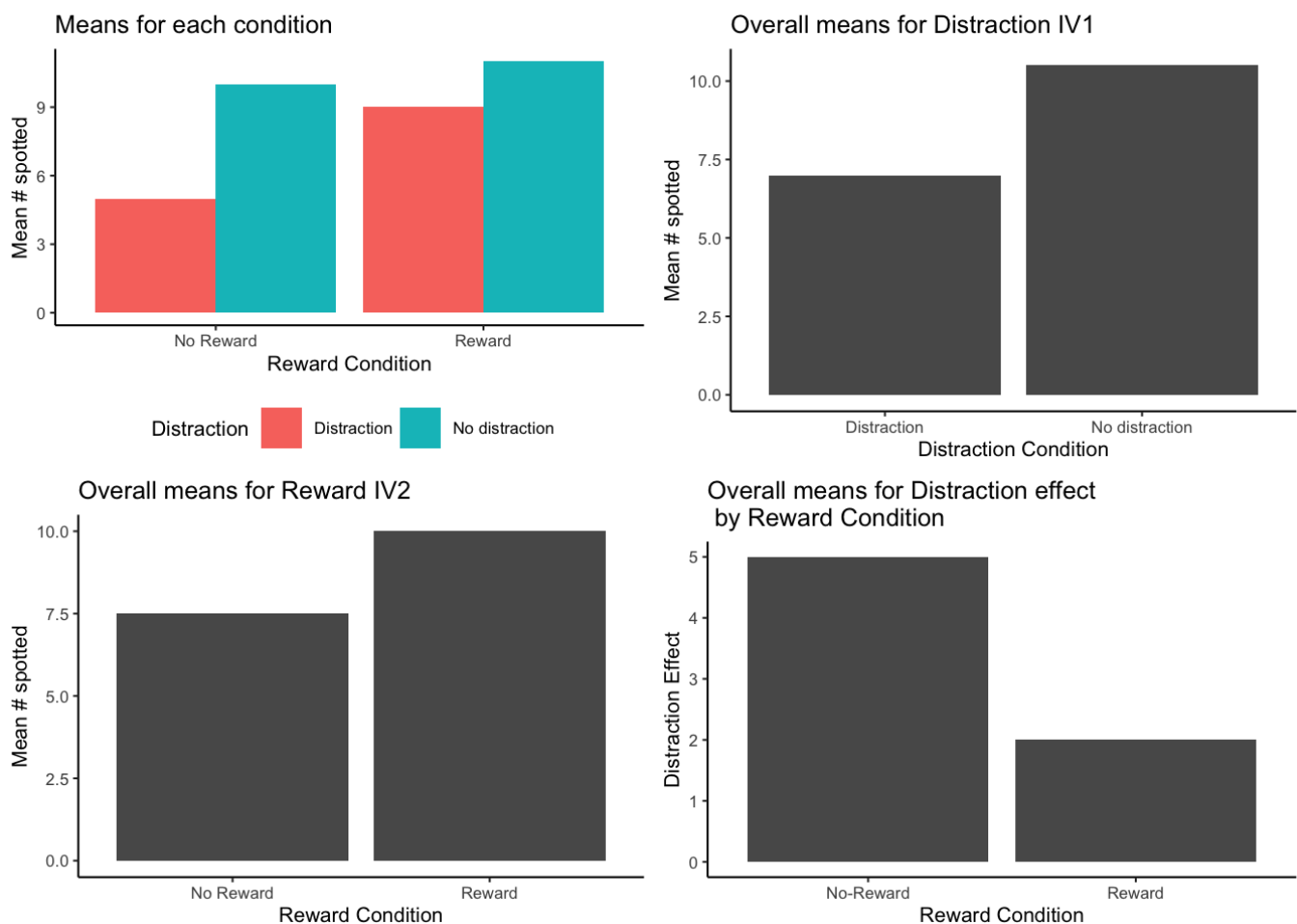


Figure 13.2.1: Each panel shows the mean for different effects in the design. (CC-BY-SA [Matthew J. C. Crump](#) from [Answering Questions with Data- Introductory Statistics for Psychology Students](#))

The purpose of showing all of these means is to orient you to your problem. If you conduct a 2x2 design (and this is the most simple factorial that you can conduct), you will get all of these means. You need to know what you want to know from the means. That is, you need to be able to connect the research question to the specific means you are interested in analyzing.

For example, in our example, the research question was whether reward would change the size of the distraction effect. The top left panel gives us some info about this question. We can see all of the condition means, and we can visually see that the distraction

effect was larger in the No-reward compared to the reward condition. But, to “see” this, we need to do some visual subtraction. You need to look at the difference between the red and aqua bars for each of the reward and no-reward conditions.

Does the top right panel tell us about whether reward changed the size of the distraction effect? NO, it just shows that there was an overall distraction effect (this is called the **main effect** of distraction). Main effects are any differences between the levels of one independent variable.

Does the bottom left panel tell us about whether reward changed the size of the distraction effect? NO! it just shows that there was an overall reward effect, called the main effect of reward. People who were rewarded spotted a few more differences than the people who weren't, but this doesn't tell us if they were any less distracted.

Finally, how about the bottom right panel. Does this tell us about whether the reward changed the size of the distraction effect? YES! Notice, the y-axis is different for this panel. The y-axis here is labeled “Distraction Effect”. You are looking at two *difference scores*. The distraction effect in the no-reward condition ( $10 - 5 = 5$ ), and the distraction effect in the Reward condition ( $11 - 9 = 2$ ). These two bars are different as a function of reward. So, it looks like reward did produce a difference between the distraction effects! This was the whole point of the study. It is these means that were most important for answering the question of the study. As a very last point, this panel contains what we call an **interaction**. We explain this more in the next section, but basically, an interaction shows that the effect of one IV on the DV is changed by the effect of another IV on the DV. The IVs levels can combine or cancel each other out, but the point is that you wouldn't get the full picture of how the levels of either IV affect the DV if you only looked at one at a time. A factorial design lets you look at the combination of the IVs together.

*Pro tip: Make sure you know what you want to know from your means before you run the study, otherwise you will just have way too many means, and you won't know what they mean.*

## Contributors and Attributions

- Matthew J. C. Crump (Brooklyn College of CUNY)

- 

Dr. MO (Taft College)

---

This page titled 13.2: Introduction to Main Effects and Interactions is shared under a CC BY-SA 4.0 license and was authored, remixed, and/or curated by Michelle Oja.

- 9.4: Knowing what you want to find out by Matthew J. C. Crump is licensed CC BY-SA 4.0. Original source: <https://www.crumplab.com/statistics/>.