Group 2's Consulting Report

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Introduction

Razan came to us with questions about her study of the impact of exercise on brain activation. She had three main questions.

1. Are there differences in brain region activation before and after the exercise intervention?
2. Is there a correlation between fitness and brain region activation?
3. Are there differences between the control group and the treatment group?

Due to participant drop-out, there were 15 individuals in the study, and because of this many statistical tests would lack sufficient power to confidently make conclusions. If, for example, we ran an ANOVA test, we would risk having either a type I or type II error where we reject a hypothesis that is the true hypothesis. Below, we have several figures that illustrate the data, but we do not make conclusions about relationships between variables.

Change in VO_2 Max

The treatment group performed an aerobic/endurance exercise training program for 12 weeks (n=10). The control group performed a resistance training program for 12 weeks (n=5), since resistance training has been shown to not impact cardiopulmonary fitness

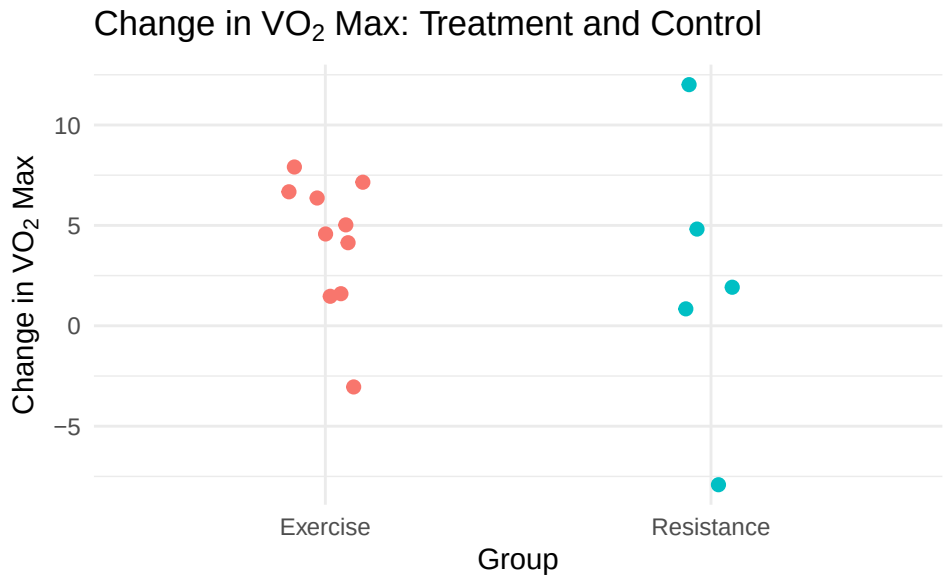

Figure 1: We can see the differing spreads in the treatment and control groups. The minimum and maximum change of VO_2 max in the control group is each more extreme than the minimum and maximum in the treatment group. In both groups, most participants have a positive change of max VO_2

Change in VO_2 Max, Fitness, and Brain Activation

The abscissa of each point in the below figure shows the change of VO_2 max, and the y axis shows the change in brain region activation. The data are mainly distributed in the first and fourth quadrants. As noted above, one participant each in the control group and treatment group had a negative change in VO_2 max.

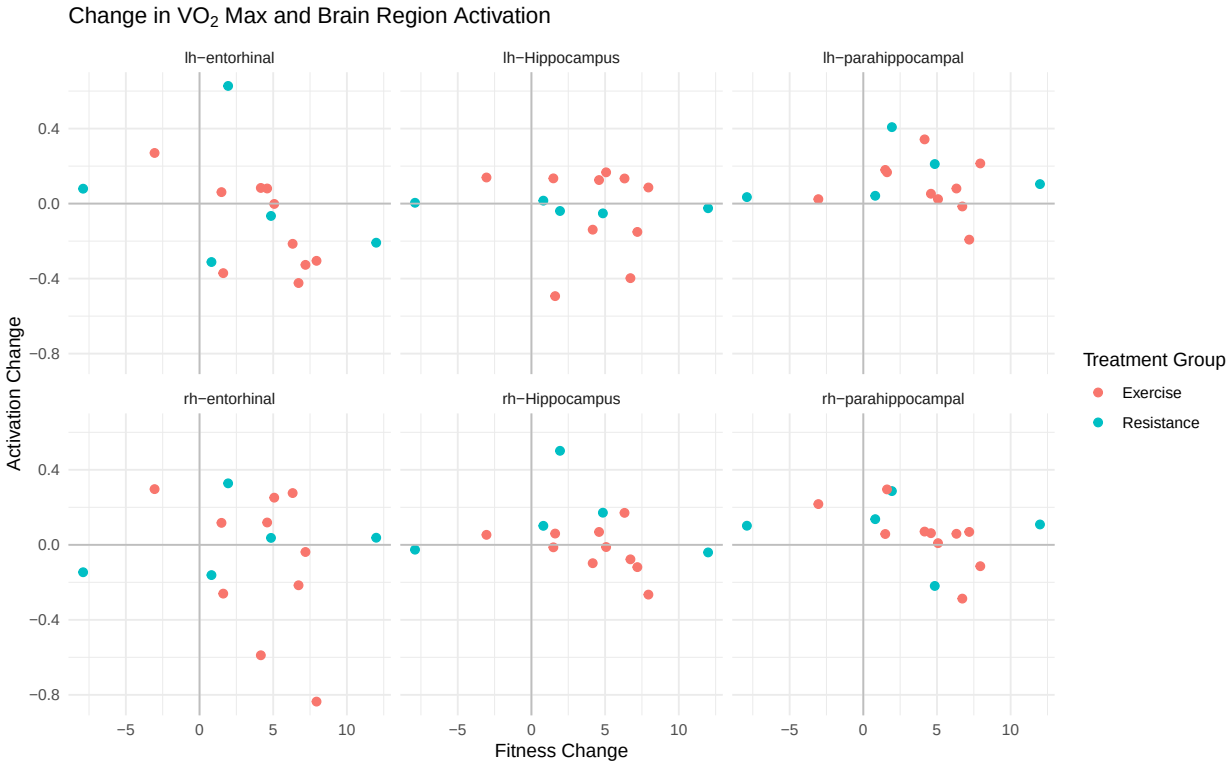

Figure 2: Based on the plot, there is not a statistically significant difference in the change of VO_2 max between the treatment and control groups. Again, the range of VO_2 max in the control group is greater than that in the treatment group. The ranges for change in brain region activation are also similar in each region.

The below plot shows change in brain region activation for each measured region. The x-axis shows the pre-treatment level of activation and the y-axis shows the post-treatment level for the same participant. If a point falls in the first or third quadrant, their activation remained either positive or negative for both readings, but if a point is in the second or fourth quadrant, the activation changed from either

1. negative in the first reading to positive in the second reading or
2. positive in the first reading to negative in the second reading.

Below is a slightly different way to evaluate change in brain region activation. Instead of a scatterplot we have created a histogram.

Conclusion

Client Questions

1. Are there differences in brain region activation before and after the exercise intervention?
2. Is there a correlation between fitness and brain region activation?
3. Are there differences between the control group and the treatment group?

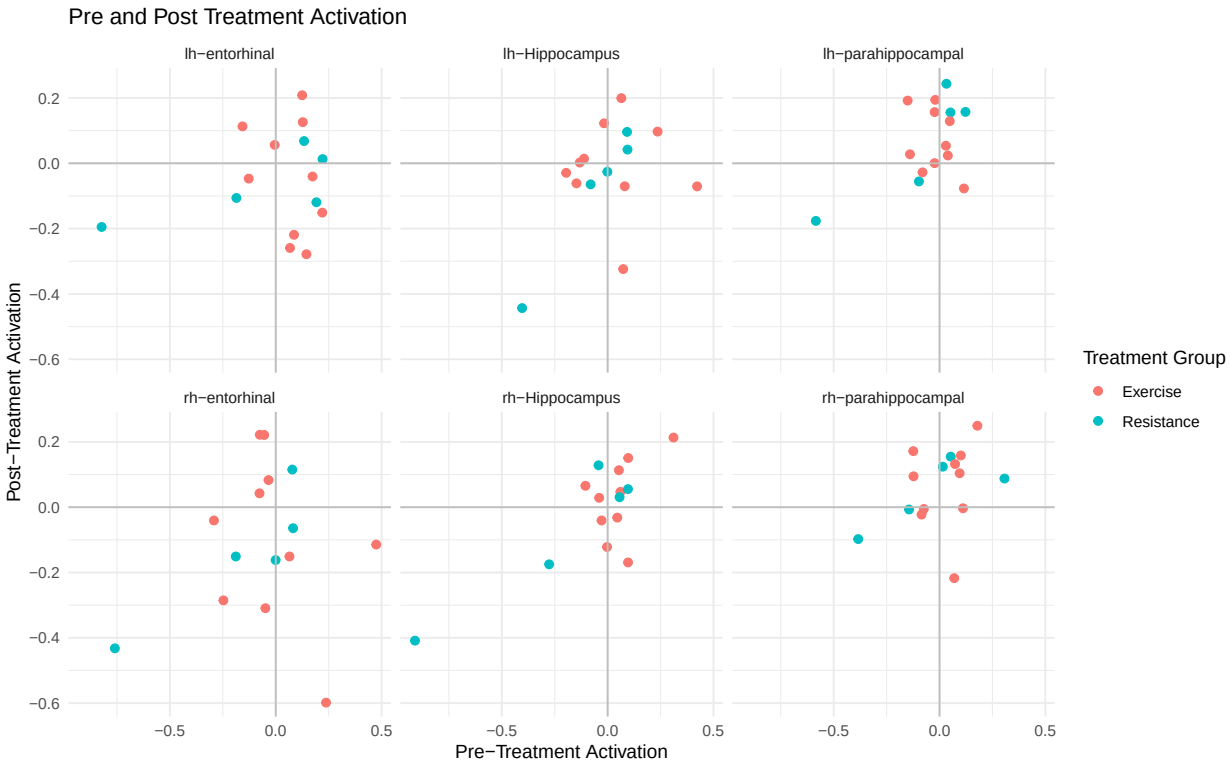

Figure 3: Each region shows a slightly different pattern of points, but no single plot stands out as having a distinct pattern

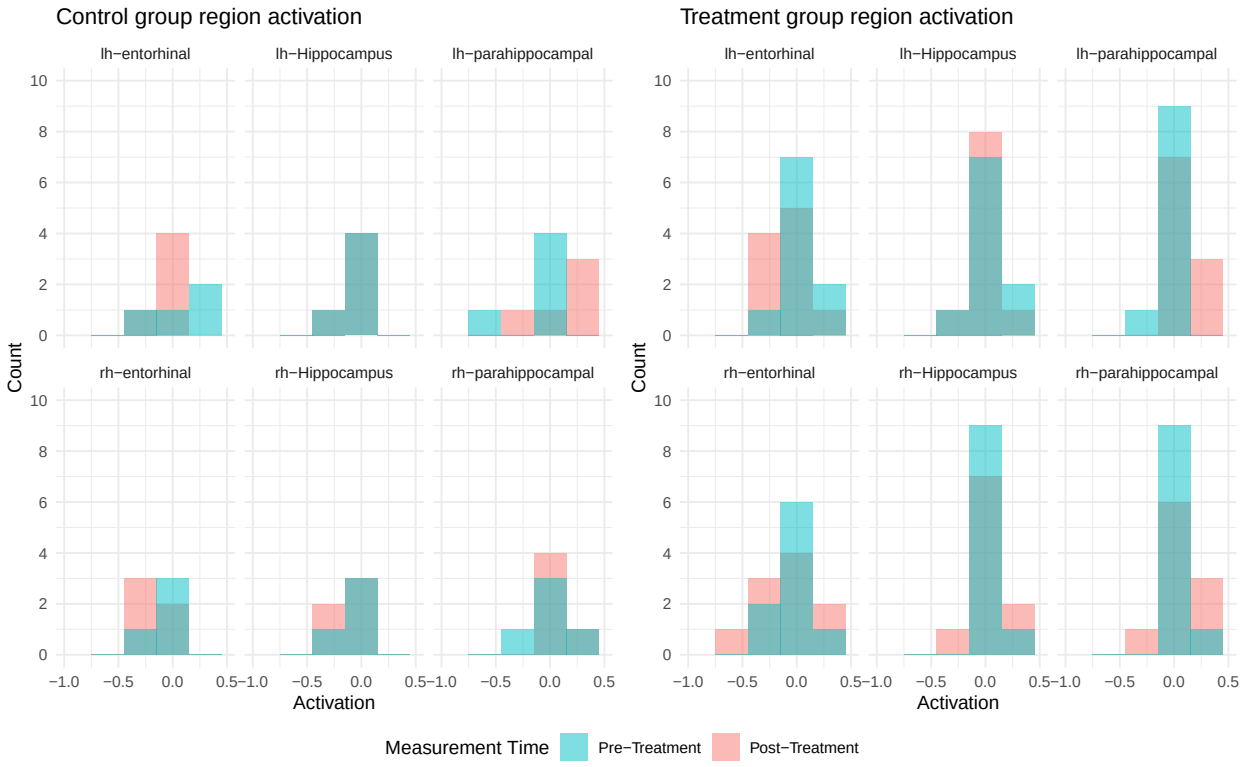

Figure 4: Since there is overlap between the bars, there is not a strong difference in pre and post treatment brain region level of activation.

Based on the provided data, the exercise intervention leads to impacts of varying degrees depending on the individual. Based on our exploratory analysis, there is not a strong linear relationship between fitness and brain region activation. ***Do we have a line of code for this?*** **The coefficients in the correlation test are small enough to show a lack of significance.** The differences between control and treatment groups follow a similar pattern and we were not able to detect a significant difference.