The effects of anti-anxiety medicine on memory recall

Huy Phan, Dong Dong and Ngan Nguyen

Dr Zhe Wang

Objective:

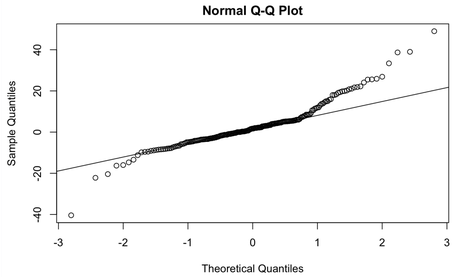
Due to the immense pressure of the modern world, the tendency to use anti – anxiety drug has been on the rise. Therefore we decided to investigate their effects on memory recall.

Introduction:

This experiment took 198 Islanders who mimic real-life humans in response to external factors and simulate addiction to anti-anxiety medication. Participants with a fully developed prefrontal cortex were given Alprazolam (Xanax), Triazolam (Halcion), and sugar pills (Placebo). They were given a memory test both before and after drug administration. They were divided into two groups: happy group was primed with positive memory while sad group recalled negative memory.

Methodology and results:

Hypothesis: The mean of time difference doing memory test before and after drug exposure is not equal to 0



Based on the Q-Q plot, the data follows a normal distribution.

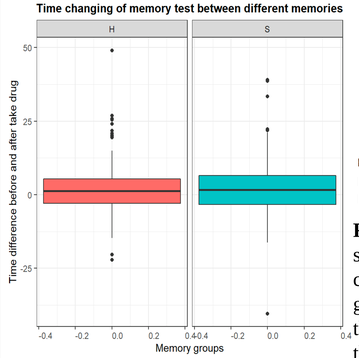
```
        One Sample t-test

data:  islander$Diff
t = 3.8657, df = 197, p-value = 0.0001504
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 1.447293 4.461798
sample estimates:
mean of x
 2.954545
```

Result: By conducting one-sample t-test, we can see that the time participants take memory tests after using drugs is significantly different from before use. With 95% confidence, we conclude that the time difference range from 1,45 to 4.46 so the drugs seem to make people do the test slower.

Methodology and results:

Two sample t-test for happy group and sad group




```
        Welch Two Sample t-test

data:  H and S
t = -0.2876, df = 194.76, p-value = 0.7731
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -3.464183  2.579334
sample estimates:
mean of x mean of y
 2.733333  3.175758
```

Happy and sad group

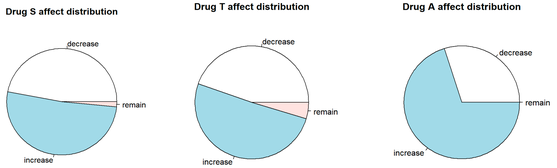
H

S

Result: From the t-test, there is no statistically significant difference in the time changing of the memory test between the two groups. In the box plot, the changing time of the memory test after exposure to drugs in the happy group is similar to that in the sad group.

Methodology and results:

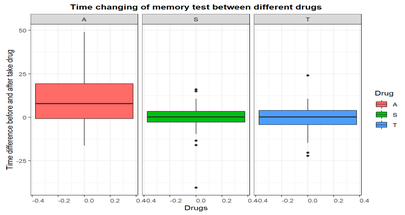
Pie charts showing affect distribution for different types of drug



Results: From three pie charts, the participants who are exposed to Alprazolam (Xanax) take a longer time to finish the memory test than before.

Methodology and results:

ANOVA test for different types of drug

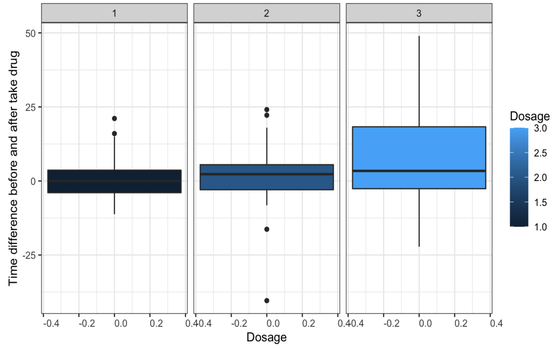



```
             Df Sum Sq Mean Sq F value   Pr(>F)
Drug          2   4305  2152.4   22.71 1.36e-09 ***
Residuals   195  18481    94.8
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Results: From the ANOVA test, there is a significant difference in the time changing of memory test between three types of drugs. In the box plot, the changing time of memory test after exposure to Alprazolam (Xanax) is significantly higher than that after exposure to Triazolam (Halcion), and sugar pills (Placebo).

Methodology and results:

ANOVA test for different doses

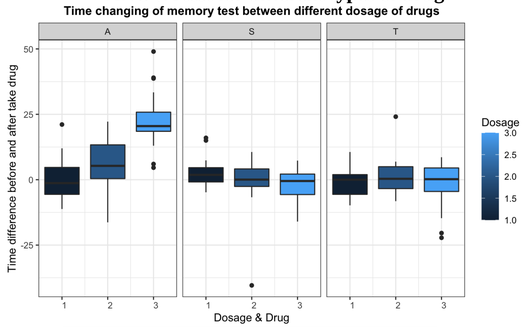



```
             Df Sum Sq Mean Sq F value  Pr(>F)
Dosage        1   1143  1143.1   10.35 0.00151 **
Residuals   196  21642   110.4
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Result: According to the ANOVA test, there is a significant difference between the effect on the memory of using different anti-anxiety medicine doses. We can observe from the boxplot that the higher doses being used, the slower the subjects take the memory test.

Methodology and results:

ANOVA test for different types of drug




```
             Df Sum Sq Mean Sq F value   Pr(>F)
Drug          2   4305  2152.4   24.11 4.45e-10 ***
Dosage        1   1161  1160.7   13.00 0.000396 ***
Residuals   194  17320    89.3
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Result: Based on the result of the ANOVA test, the effect of changes in dosage in the three types of drugs significantly differs from each other. Observing the boxplot, Drug A has a notable higher side effect than the other two drugs. When using more doses, the participants using drug A take remarkably more time doing the memory test. For drug T using participants, the time slightly increases when taking a higher dosage, while in contrast, it tends to decrease in drug S using participants.

Conclusion

From the result, it can be seen that Alprazolam (Xanax) has a significant effect on participants' ability to recall memory whether it is positive or negative memory. When the drug Alprazolam (Xanax) is used in stronger doses, its side effect makes participants take a notably longer time to recall the memory. Therefore, when using the drug Alprazolam (Xanax), people should be conscious of its side effect on memory recall.

The medicine Alprazolam (Xanax) is also being cited as one of the most regularly given anti-anxiety drugs and one of the easiest to become addicted to, making this case appear to be a prevalent issue. Hopefully, this study can serve as a backbone/foundation for future research on the safety of anti-anxiety medications.

References:

Melinda. (2022, April 6). *Anxiety medication*. HelpGuide.org. Retrieved April 28, 2022, from https://www.helpguide.org/articles/anxiety/anxiety-medication.htm

The Pros and cons of 6 leading anxiety medications. Banner. (n.d.). Retrieved April 28, 2022, from https://www.bannerhealth.com/healthcareblog/better-me/how-to-evaluate-the-pros-and-cons-of-6-top-anxiety-medications

Ait-Daoud, N., Hamby, A. S., Sharma, S., & Blevins, D. (2018). *A review of Alprazolam use, misuse, and withdrawal*. Journal of addiction medicine. Retrieved April 28, 2022, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5846112/

Chowdhury, Z. S. (2016). *The effect of chronic alprazolam intake on memory, attention, and psychomotor performance in Healthy Human Male Volunteers*. Behavioral neurology. Retrieved April 28, 2022, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4947648/

Data source:

The data set can be found on Kaggle (https://www.kaggle.com/datasets/steveahn/memory-test-on-drugged-islanders-data). It was made and collected by Steve Ahn.