STAT 2300 - Homework 3

Reading

Read Chapter 3

Conceptual Exercises

(don't hand these in - answers are at the end of the chapter)

Chapter 3 # 1, 2, 3, 8, 10, 11, 16

R Exercises

Hand these in as a knit Markdown document

Chapter 3 # 23, 25, 29, 33

Problem A

The didgeridoo is an Indigenous Australian musical instrument. In a 2006 study that won the Ig Nobel Peace Prize, researchers investigated didgeridoo playing as a treatment for sleep apnoea, a breathing disorder that interferes with sleep. The researchers separated 25 patients into a treatment group that received didgeridoo lessons and a control group that did not. From the paper:

> Participants in the didgeridoo group practiced an average of 5.9 days a week (SD 0.86) for 25.3 minutes (SD 3.4). Compared with the control group in the didgeridoo group daytime sleepiness (difference -3.0, 95% confidence interval -5.7 to -0.3, $P = 0.03$) and apnoea-hypopnoea index (difference -6.2, -12.3 to -0.1, $P = 0.05$) improved significantly and partners reported less sleep disturbance (difference -2.8, -4.7 to -0.9, $P < 0.01$). There was no effect on the quality of sleep (difference -0.7, -2.1 to 0.6, $P = 0.27$). The combined analysis of sleep related outcomes showed a moderate to large effect of didgeridoo playing.

a. The paper reports four measurements. All four differences are reported as negative numbers. What does that tell you?
b. Only one of their reported measures did not show a significant improvement for the didgeridoo group. Which one? How do you know it was not significant?
c. Which of their reported measures was the most significant evidence in favor of didgeridoo playing?

Problem B

Suppose you wish to test the side effects of a new vaccine by forming two groups of subjects, one that gets the vaccine and another that gets a placebo. You would like to detect a $1°F$ change in body temperature at the $\alpha = 0.05$ level of significance with a power of 99%. Data on human body temperature suggests that the standard deviation of body temperature is around $0.73°F$. How many subjects will you need in each group?