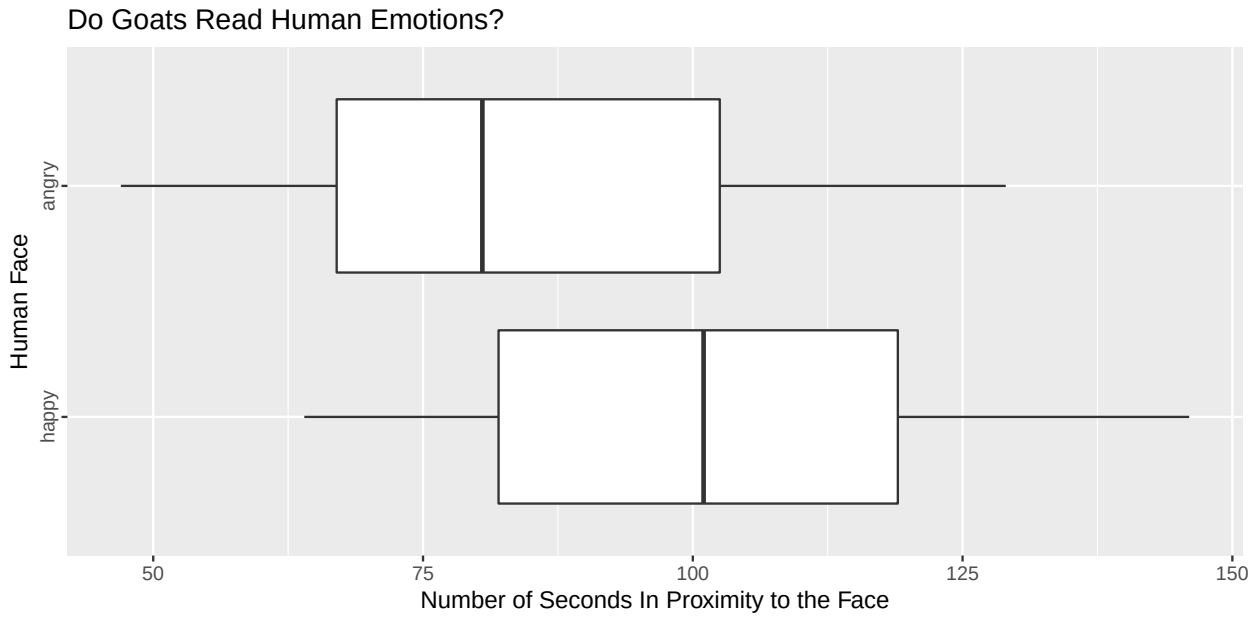
Chapter 6 Scenarios

Human Social Cues

According to past research, dogs are very good at perceiving human facial communication cues because of their domestication as companion animals. Horses, too, understand human expressions of anger, reacting with increased heart-rate and negative body language.

Goats, however, were domesticated not as companion animals, but for food and milk. Selective breeding in goats was used to optimize coat color, milk production, and meat quality, rather than prosocial behavior toward humans. Researchers decided to test whether understanding of human social cues is a product of domestication even in the absence of selection for prosocial behavior, or whether it results from selectively breeding for cross-species social comprehension. Specifically, the researchers examined 35 goats from a goat sanctuary in the United Kingdom to test whether goats also display a preference for human faces showing positive emotion.

To test this theory, goats were led into a pen which had an image of either a happy human face or an angry human face on a metal board placed at approximately goat-height. Each of the 35 goats was randomly assigned to view either the happy or angry face. During each 4 minute trial, researchers recorded the amount of time (in seconds) each goat spent in proximity to the face.



You can find the data at https://srvanderplas.github.io/unl-stat218-materials/handouts/goat_means.txt (use this data in the applet).

1. Is this an experiment or an observational study? Why? In your explanation, identify the observational/experimental unit and the explanatory variable or treatment.

2. Does this study use random assignment? What implications does that have for the conclusions that can be drawn?

3. Does this study use random sampling? What implications does that have for the conclusions that can be drawn?

4. What is the population parameter of interest? What is the corresponding sample statistic? Use correct notation.

5. What are the null and alternative hypotheses for this experiment?

6. Using the Multiple Means applet, conduct 1000 simulations of this experiment. Note: You will need to open this file and paste it into the applet. What is your sample statistic, according to the applet?

7. What does one simulation represent?

8. Describe the distribution of the simulated sample statistics. Where is it centered? Is it symmetric?

9. What is your simulation p-value? Show or describe the calculation you used to determine your answer.

10. Construct and interpret an approximately 95% **simulation** confidence interval for the amount of extra time goats spent around the happy human face. Show your work.

11. What are the validity conditions for theory-based inference for this type of data? Are they met? Why or why not?

12. Assuming the validity conditions are met, calculate the standard error of $\overline{x}_{\text{happy}} - \overline{x}_{\text{angry}}$. Show your work, including the formula you used.

13. Using theory-based inference, calculate a standardized t-statistic and conduct a test of the null hypothesis in question 5. Interpret your result.

Wizards and Vampires

Read the Introduction, Method, and the 1st paragraph of the Results sections of the research report "Becoming a Vampire Without Being Bitten: The Narrative Collective-Assimilation Hypothesis" by Gabriel & Young, published in Psuchological Science in 2011[1]. A PDF of the study is available in the Box folder at https://unl.box.com/v/vampire-wizard-study. An explanation of the Implicit Association Test used in the study can be found at https://implicit.harvard.edu/implicit/iatdetails.html.

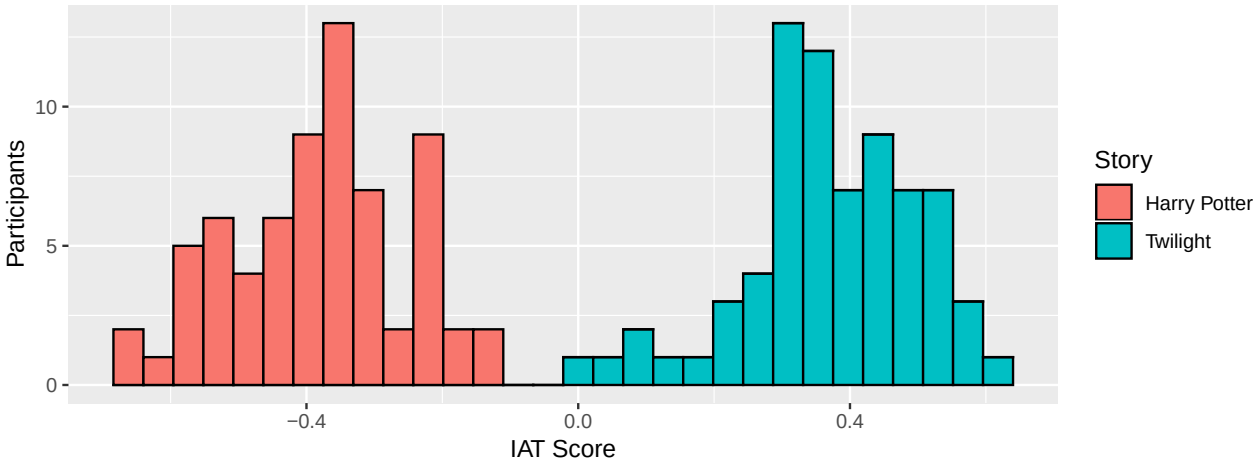
1. Is this an experiment or an observational study? Why?

2. Was random sampling, random assignment, both, or neither used in this study? What are the implications?

3. What is/are the explanatory variable(s)? How are they calculated? (You may have to read the additional information about the IAT) What does this variable mean in real life?

The study does not report the full dataset, but we can simulate study results for the IAT using the values which are reported. We will use the IAT score, rather than the narrative collective-assimilation score, for the rest of this problem.

[1]DOI: https://journals.sagepub.com/doi/abs/10.1177/0956797611415541



Story	N	Mean	SD
Harry Potter	68	-0.381	0.130
Twilight	72	0.370	0.126

4. Is it appropriate to use theory-based inference for this problem?

5. What is the relevant population parameter and corresponding sample statistic, in symbols?

6. What is the standard error of the sample statistic? Show your work, including the formula you used.

7. Construct and interpret a 95% confidence interval for the difference in IAT scores for participants who read Twilight and the participants who read Harry Potter.