JMP Instructional data set 020

Jealous Behavior in Dogs

JMP STATISTICAL DISCOVERY

JMP platforms and statistical methods

Distribution:	Histogram; box plot; summary statistics; one-sample t-test
Fit Y by X:	Two-sample t-test
Specialized Modeling:	Paired t-test
Formula Editor:	Creating a new variable

Problem statement

Psychology researchers from University of Auckland designed an experiment to study the behavior of dogs in potential jealousy-inducing social interactions [1].

The study selected 18 dogs (11 female, seven male). Each of the dogs (the subjects) experienced two test conditions. The Dog Condition was such that the subject first saw its owner next to a realistic looking fake dog. The fake dog was then concealed from view from the subject using a barrier. The owner interacted with the fake dog (e.g., petting), though the subject dog could not directly see the fake dog that the owner was interacting with. This condition was to test if the subject dogs were potentially envisioning the interaction.

The other experimental condition (Cylinder) allowed the subject dog to see its owner interacting with a fleece cylinder as if it were a dog, although the subject can clearly see it is simply a non-dog object. In this condition, the fake dog was also placed so that the subject dog could see it was in the same room, but its owner was not interacting with it.

Following the two experimental conditions, a third trial was conducted (Confirmation). In this trial, the owners interacted with a fake dog that was visible to the subject dog for the entire time. This trial ensured that all the subject dogs would react enough to a visible jealousy-inducing condition and also create a baseline of the amount of force each dog would apply in such a condition.

Data

IDS_020_A.jmp

Subject	Dog's name
Sex	Dog's sex
Order	Order the dog was presented the two experimental conditions
Condition	The experimental condition (Dog, Cylinder)
Max Force	Maximum pulling force (Newtons) dog exerts on a leash for that experimental trial.

IDS_020_B.jmp

Subject	Dog's name
Sex	Dog's sex
Order	Order the dog was presented the two experimental conditions
Dog	Maximum pulling force (Newtons) dog exerts on a leash in "dog experimental condition"
Cylinder	Maximum pulling force (Newtons) dog exerts on a leash in "cylinder experimental condition"
Confirmation	Maximum pulling force (Newtons) dog exerts on a leash in "confirmation experimental condition"

Exercises

Note: Exercises 1 and 2 uses data set 'IDS_020_A', and exercises 3 and 4 uses data set 'IDS_020_B'.

1. Summarize the Max Pull Force in each condition (Dog, Cylinder) with a histogram, boxplot, and summary statistics. Write a few sentences or two describing these variables?

> ***Instructions:***
> *Analyze > Distribution. Place 'Dog' and 'Cylinder' in the Y, Columns role. Click OK.*

2. Conduct a Two-sample independent t-test comparing the average Max Pull Force between the Dog and Cylinder Condition? Is there statistical evidence of a difference between the two conditions? Create a line graph comparing the 'Max Force' between the two conditions with each dog identified separately. Are there any dogs with results much different than most of the dogs? Why is a two-sample independent t-test analysis not the best way to compare the two conditions?

> ***Instructions:***
> *Note: You'll need to use the 'Stacked' data set and exclude the 'Confirmation' condition.*
>
> *In the stacked data table, click Filer Views tab in the scripts panel in the upper left. Click the "+" symbol. In the Table Filer that has opened up on the right, select 'Condition' and click the "+" symbol. Now highlight 'Cylinder' and 'Dog' categories. You'll see the data table has now removed the 'Confirmation' rows.*
>
> *Analyze > Fit Y by X. Choose 'Max Force' for the Y, Response role and 'Condition' for the X, Factor. Click OK.*
> *Under the red triangle in the report window, select t Test.*
>
> *Graph > Graph Builder. Place 'Max Force' on the Y axis. Place 'Condition' on the X. Place 'Subject' in the Overlay role. Choose line graph from the graph palette.* 

3. Conduct a Two-sample paired t-test comparing the average Max Pull Force between the Dog and Cylinder Conditions? Is there statistical evidence of a difference between the two conditions? Describe that difference.

> ***Instructions:***
> *Note: You'll need to use data set "IDS_020_B" for Exercises 3 and 4.*
>
> *Analyze > Specialized Modeling > Matched Pairs.*
> *Place both 'Dog' and 'Cylinder' in the Y, Paired Response role. Click OK.*
>
> *Graph > Graph Builder. Place 'Max Force' on the Y axis. Place 'Condition' on the X. Place 'Subject' in the Overlay role. Choose line graph from the graph palette.*

4. Conduct a One-sample t-test comparing the difference in the Max Pull Force between the two conditions to 0. Compare the t-test statistic and p-value from this test to the ones produced in the Paired t-test done in Exercise 3. Comment on the result.

> ***Instructions:***
> *Highlight both the 'Dog' and 'Cylinder' columns in the data table. Right-click on the highlighted area and choose New Formula Column > Combine > Difference.*
> *A new column will be created that is the difference between the two force values for each dog.*
>
> *Analyze > Distribution. Place 'Dog-Cylinder' in the Y, Columns role. Click OK.*
> *Choose Test Mean under the red triangle next to the 'Dog-Cylinder' title.*
> *Use "0" for the Hypothesized Mean. Click OK.*

5. What are some ideas for further experimentation that could help in better understanding how and why dogs exhibit jealous behavior?

Supporting materials

1. Bastos, Amalia P.M. ; Neilands, Patrick D. ; Hassall, Rebecca S. ; Lim, Byung C. ; Taylor, Alex H. (2021) "Dogs Mentally Represent Jealousy-Inducing Social Interactions" *Psychological Science*, Vol 32(5) 646-654. https://journals.sagepub.com/doi/10.1177/0956797620979149

A brief news article from the Association for Psychological Science summarizing the research.
https://www.psychologicalscience.org/news/releases/2021-april-dogs-jealous.html

2-minute video describing the research including commentary from one of the researchers.
https://www.youtube.com/watch?v=frMJ22hK0nM

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