Playing Games with a Purpose

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web.grinnell.edu/individuals/kuipers/stat2labs

Memorathon:
Interactive Web-based Games

Sequence Length: 3

♦ **Repeat a series of lights and sounds.**

♥ **Series continues to get longer until you make an error.**

♣ **Students can design their own research question relating to short term memory (serial recall)**

http://www.cs.grinnell.edu/~kuipers/statsgames/
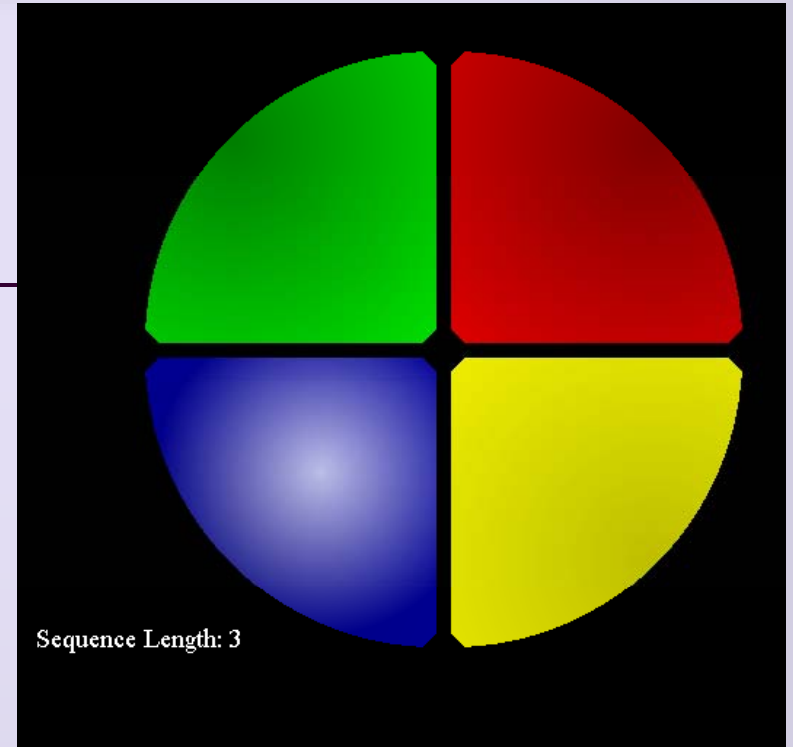
Student Handout: Memorathon Lab: Conducting a Hypothesis Test on Student Memory
Background:
Memory is the process of retaining and recalling knowledge or experiences. Human memory is very complex and can be tested in many ways. Serial recall, or memory span, is a measure of how many items a subject can remember in a specified order without an error. Memorathon is web-based game in which a person is expected to repeat a sequence of buttons. Each time you successfully repeat the given sequence of buttons, the sequence gets longer. The challenge is to remember as long a sequence as possible. You can go to the above site and leave all the variables blank when you are simply trying out the game. However, if you want to find your score in the database of results, a specific course and participant ID will be needed.

Go to the web site http://www.cs.grinnell.edu/~kuipers/statsgames/Memorathon/
- Speed: Medium
- Colors: Multicolor
- Sound: Standard
- Label: Standard
- # buttons: 8 buttons
- Check the Participant Info box
  - Participant ID: use a secret name, any combination of letters and numbers with no spaces. Do not use a name or term that will identify you.
  - Group ID: _____

Conduct a hypothesis test about students in our course
(e.g. on average can students recall more than ____ items?)

1. State the null and alternative hypotheses corresponding to the objective of this study.

2. All students in the class should play the game. Each student will be considered a subject in this study. In this test, we are simply conducting a test on the average number of items recalled. However, we want to make the conditions as similar as possible for all subjects. Determine the settings for each of the following variables on the Memorathon Game:
        Speed:
        Colors:
        Sound:
        Label:
        # buttons:

3. List any other conditions that should be controlled during this study.

4. Why is it important to attempt to ensure that all subjects play the game under the same conditions?

5. After all students complete the game, use the Recorded Data button to view all data from our study (use same Group ID as above). Copy and paste the data into Minitab, Excel, or other statistical software package. Create a histogram and box plot of your data. Are there any outliers or skewness shown in your plots? Are there any errors in the data? Correct or delete any data that is clearly wrong.

6. Use appropriate statistical techniques to calculate a p-value for your study.

7. What assumptions need to be checked before we can conclude the analysis in Question 6) is appropriate?

8. State your conclusions *in context*. For example, explain whether we can use this data to conclude that our results hold for all students at our school.

STAT 2 LABS

Sample Games and Class Activities

Lab Name	Topic	Discipline	Description
Memorathon	Hypothesis Testing • (Z-test or 1-sample t-test) • 2-sample t-tests (or ANOVA) • Research Project	Psychology (Serial Recall-What Influences Memory)	An on-line in which you are expected to repeat a sequence of buttons. Each time you successfully repeat the given sequence of buttons, the sequence gets longer. The challenge is to remember as long a sequence as possible. Students have the opportunity to design multiple versions of the this game in order to test which variables have the largest effect on memory.
Shapesplosion	Hypothesis Testing • (Z-test or 1-sample t-test) • 2-sample t-tests (or ANOVA) • Research Project Simple Linear Regression	Psychology (Distracters in task completion)	An on-line game in which you are expected to place specifically shaped pegs into the appropriate holes within a short time period. In the project, students are asked to use this game to design an experiment, collect and analyze data. This game is specifically designed so that students have the opportunity to develop and test their own unique research question.

Labs, student handouts and instructor notes are available at:
http://web.grinnell.edu/individuals/kuipers/stat2labs/Labs.html

Student ID: [   ]
Course ID: [   ]
Any alphanumeric code with no spaces is acceptable.

External Variables
[   ]
[   ]
[   ]

Color
⊙ Color (classic)
○ No Color
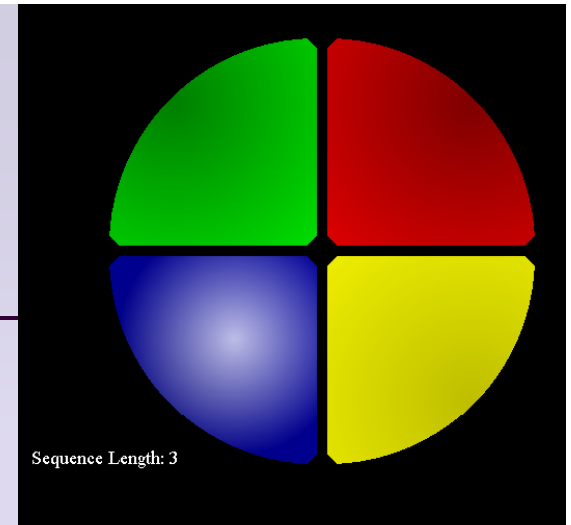
Sequence Speed
○ Slow
⊙ Medium
○ Fast

Memory or Random?
⊙ Sequential
○ Random

Sound
⊙ No Sound
○ Sound

Numbered Buttons?
⊙ Nope
○ Yes, please.

How many buttons?
⊙ Four (classic)
○ Eight

[Submit]

Sequence Length: 3

- Focused research question, but students still allowed to choose which factors and levels to test.

- Can create unique variables of interest.
  - *Does sound help music majors more than math majors?*

- Emphasis is on statistical thinking with real applications, not calculations.

- EASY data collection that instructors can validate.

Using Memorathon as a Research Project

- **Read article by Surprenant, A. M. (2001)**
  - Identify units, explanatory and response variables, objective of the study, lurking variables
- **Play the Memorathon game and develop your own research hypothesis**
  - Clearly define a problem and state the objectives of your experiment
  - Identify units, response and explanatory variables
  - What other factors need to be controlled
  - Choose an experimental design
  - How does your experiment build on previous work?

Using Memorathon as a Research Project

- **Understand the Context of your Study**
  - Discuss the study with a psychologist
  - Prepare questions for a cognitive psychologist
  - Write lab procedures
  - IRB proposal?
- **Conduct the study**
  - Discuss final design with professor
  - Collect data
- **Write research paper**
  - Submit 1st draft in class for peer review
  - Revise paper
  - Submit final paper, peer comments, data, and variable descriptions

Shapesplosion:

♦ **Place pegs in the appropriate holes.**

♥ **Game "explodes" if you do not go quickly enough.**

♣ **Relates to a common Psychology research:**

   The Stroop effect [red green]

   Effect of music in task completion

♠ **Structured but flexible data collection techniques.**

http://web.grinnell.edu/individuals/kuipers/stat2labs/Perfection.html

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