Data Labs

Data Collection Projects
For Introductory Psychology

Tom Ludwig
Hope College
Background and Rationale

- Growing consensus – we need to improve the scientific literacy and quantitative literacy of psychology students

- Upper-level courses have taken this to heart
  - adding “research-like” experiences

- Harder to do in introductory psychology
  - larger class sizes (and time pressure)
  - varied backgrounds of students
Data Labs Projects

- One *observation* project (Counting eye blinks)
- One *survey* project (Correlating “Big Five” factors with self-reported happiness)
- Four *experiment* projects
  - lexical decision task
  - visual search task
  - mental rotation task
  - impression formation task
Eye Blinks Observation

- Students sit in “observation circles”, and take turns speaking for 30 seconds on a shared topic.
- Other students count eye blinks and rate apparent level of anxiety.
  - Then enter blink count and anxiety rating.
- Analysis tests for gender difference in blink rate, and correlation between blink rate and anxiety.
- Surprise: high variability in blink counts for the same speaker.
Big Five Personality Survey

- Students take online survey including subscales measuring personality, happiness, and gratitude
- Students plot their own Big Five profile on a Star Graph, and compare it with group results
- Analysis tests for correlation between Big Five factors and happiness, and between gratitude and happiness
- Surprise: conscientious students rate themselves as happier!
Lexical Decision Experiment

- Four-letter string is flashed to LVF or RVF
  - *Examples*: soap, waer, tent, rinb,
- Students indicate “word” or ‘non-word”
- Analysis tests for visual field difference
  - Speed (RT) and accuracy (PC)
- Surprise: strong RVF advantage for words, but not for non-words
Visual Search Experiment

- Students search for target (orange square) among distractor objects

- Analysis tests for search type difference in RT

- Surprise: increasing number of objects in a feature search doesn’t increase RT
Mental Rotation Experiment

- Letter R (normal or mirror image) is displayed in one of six orientations

- Analysis tests for increase in RT as angular rotation increases

- Surprise: RT decreases after rotation passes 180
Impression Formation Experiment

- Students read descriptions of two groups of people performing “good” or “bad” behaviors.

- Then students rate the groups on overall impression and estimated frequency of behaviors.

- Analysis tests for group difference in ratings, with smaller group (“minority”) receiving lower ratings.

- Surprise: actual ratio of good to bad behaviors is identical for both groups.
Data Labs Projects

- Materials for each Data Lab
  - faculty guide (explains process, provides tips)
  - background readings for students
  - student handouts (guidelines, data sheets)
  - data collection software (and data viewer)
  - Excel spreadsheet for simple data analysis
  - Word template for report (simple worksheet, or complete lab report)
Let’s follow the recommended sequence for one project

Observation Projects
- Counting Eye Blinks

Survey Projects
- Happiness and the Big Five Traits

Experiment Projects
- Lexical Decisions: Exploring Brain Hemisphere Differences
- Visual Search: Serial vs. Parallel Processing
- Mental Rotation: Testing Spatial Thinking
- Impression Formation: Shaping Attitudes
Print the Data Sheet

Visual Search Experiment

Description: This Data Labs Project uses the experiment method. Students participate in an online experiment that presents 4 or 16 shapes on the screen (blue or orange squares or triangles). Students must decide as quickly as possible whether one of the shapes is the “target” (an orange square). The statistical analysis looks for differences in decision speed depending on the number of objects and the degree of similarity between the target and the distractor shapes.

Step 1: Participate in the Experiment
- Read the Instructions for Students (PDF)
- Print the Data Sheet for this Experiment (PDF)
- Run this online Experiment

Step 2: Read the Background Information
- Wikipedia article on Visual Search (PDF)
- Treisman and Gelade (1980) - Original research article (PDF)
- Nakayama and Silverman (1986) - Follow-up research (PDF)

Step 3: Analyze the Results
- View Summary of Results from All Participants
- Download Raw Data from All Participants
- Download Spreadsheet Template for Statistical Analysis (XLS)

Step 4: Write the Lab Report
- Print the Report Worksheet for this Experiment (PDF)
- Download the Report Template for this Experiment (DOC)

Additional Information for Instructors
- Menu of Resources for Instructors
Visual Search Experiment

Description: This Data Labs Project uses the experiment method. Students participate in an online experiment that presents 4 or 16 shapes on the screen (blue or orange squares or triangles). Students must decide as quickly as possible whether one of the shapes is the "target" (an orange square). The statistical analysis looks for differences in decision speed depending on the number of objects and the degree of similarity between the target and the distractor shapes.

Step 1 : Participate in the Experiment
- Read the Instructions for Students (PDF)
- Print the Data Sheet for this Experiment (PDF)
- Run this online Experiment

Step 2 : Read the Background Information
- Wikipedia article on Visual Search (PDF)
- Treisman and Gelade (1980) - Original research article (PDF)
- Nakayama and Silverman (1986) - Follow-up research (PDF)

Step 3 : Analyze the Results
- View Summary of Results from All Participants
- Download Raw Data from All Participants
- Download Spreadsheet Template for Statistical Analysis (XLS)

Step 4 : Write the Lab Report
- Print the Report Worksheet for this Experiment (PDF)
- Download the Report Template for this Experiment (DOC)

Additional Information for Instructors
- Menu of Resources for Instructors
Copy Individual Results

Your Results

<table>
<thead>
<tr>
<th></th>
<th>Mean RT in milliseconds</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Feature Search</td>
<td>Conjunctive Features Search</td>
</tr>
<tr>
<td>4 Objects</td>
<td>469</td>
<td>664</td>
</tr>
<tr>
<td>16 Objects</td>
<td>580</td>
<td>1076</td>
</tr>
<tr>
<td>Overall</td>
<td>525</td>
<td>870</td>
</tr>
<tr>
<td>4 Objects</td>
<td>100%</td>
<td>90%</td>
</tr>
<tr>
<td>16 Objects</td>
<td>90%</td>
<td>70%</td>
</tr>
<tr>
<td>Overall</td>
<td>95%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Before you move on, copy your results to your data sheet.
View Pooled Group Results

Results: Visual Search Experiment

Mean RT in Milliseconds

<table>
<thead>
<tr>
<th></th>
<th>Single Feature Search</th>
<th>Conjunctive Features Search</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Objects</td>
<td>768</td>
<td>843</td>
</tr>
<tr>
<td>16 Objects</td>
<td>773</td>
<td>1036</td>
</tr>
<tr>
<td>Overall</td>
<td>771</td>
<td>940</td>
</tr>
</tbody>
</table>

Percentage Correct

<table>
<thead>
<tr>
<th></th>
<th>Single Feature Search</th>
<th>Conjunctive Features Search</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Objects</td>
<td>97</td>
<td>95</td>
</tr>
<tr>
<td>16 Objects</td>
<td>96</td>
<td>95</td>
</tr>
<tr>
<td>Overall</td>
<td>96</td>
<td>95</td>
</tr>
</tbody>
</table>

Overall Mean RT

Mean RT for Each Condition

Time (ms)

- Single Feature
- Conjunctive Features
Visual Search Experiment

Description: This Data Labs Project uses the experiment method. Students participate in an online experiment that presents 4 or 16 shapes on the screen (blue or orange squares or triangles). Students must decide as quickly as possible whether one of the shapes is the "target" (an orange square). The statistical analysis looks for differences in decision speed depending on the number of objects and the degree of similarity between the target and the distractor shapes.

Step 1 : Participate in the Experiment
- Read the Instructions for Students (PDF)
- Print the Data Sheet for this Experiment (PDF)
- Run this online Experiment

Step 2 : Read the Background Information
- Wikipedia article on Visual Search (PDF)
- Treisman and Gelade (1980) - Original research article (PDF)
- Nakayama and Silverman (1986) - Follow-up research (PDF)

Step 3 : Analyze the Results
- View Summary of Results from All Participants
- Download Raw Data from All Participants
- Download Spreadsheet Template for Statistical Analysis (XLS)

Step 4 : Write the Lab Report
- Print the Report Worksheet for this Experiment (PDF)
- Download the Report Template for this Experiment (DOC)

Additional Information for Instructors
- Menu of Resources for Instructors

Raw Data from Visual Search Experiment

Notes: Each row represents one participant. To use this dataset in your own

1. Drag across the entire data table to select all the data, including a blank
2. Copy the selection to the clipboard (Edit menu > Copy).
3. Launch your spreadsheet program and open a blank spreadsheet.
4. Select the top left cell in the blank spreadsheet, and paste the data table
5. If the data table doesn't look right, cancel the paste (Edit menu > Unde
Text).
6. Save the spreadsheet with a descriptive name (such as VisualSearch

<table>
<thead>
<tr>
<th>RT_1</th>
<th>RT_2</th>
<th>RT_4</th>
<th>RT_16</th>
<th>RT_16</th>
<th>RT_16</th>
<th>RT_16</th>
<th>RT_16</th>
</tr>
</thead>
<tbody>
<tr>
<td>764</td>
<td>1074</td>
<td>847</td>
<td>1011</td>
<td>756</td>
<td>863</td>
<td>1252</td>
<td>966</td>
</tr>
<tr>
<td>573</td>
<td>648</td>
<td>577</td>
<td>640</td>
<td>576</td>
<td>647</td>
<td>576</td>
<td>710</td>
</tr>
<tr>
<td>653</td>
<td>504</td>
<td>626</td>
<td>750</td>
<td>651</td>
<td>614</td>
<td>721</td>
<td>866</td>
</tr>
<tr>
<td>833</td>
<td>699</td>
<td>663</td>
<td>929</td>
<td>752</td>
<td>874</td>
<td>534</td>
<td>964</td>
</tr>
<tr>
<td>752</td>
<td>964</td>
<td>772</td>
<td>864</td>
<td>715</td>
<td>869</td>
<td>829</td>
<td>999</td>
</tr>
<tr>
<td>819</td>
<td>1074</td>
<td>654</td>
<td>939</td>
<td>810</td>
<td>827</td>
<td>1067</td>
<td>1041</td>
</tr>
<tr>
<td>713</td>
<td>822</td>
<td>709</td>
<td>832</td>
<td>721</td>
<td>705</td>
<td>966</td>
<td>1139</td>
</tr>
<tr>
<td>899</td>
<td>1127</td>
<td>572</td>
<td>1054</td>
<td>576</td>
<td>822</td>
<td>568</td>
<td>1285</td>
</tr>
<tr>
<td>952</td>
<td>1073</td>
<td>659</td>
<td>1060</td>
<td>588</td>
<td>946</td>
<td>971</td>
<td>1174</td>
</tr>
<tr>
<td>815</td>
<td>1043</td>
<td>658</td>
<td>1003</td>
<td>840</td>
<td>790</td>
<td>676</td>
<td>1215</td>
</tr>
<tr>
<td>806</td>
<td>533</td>
<td>606</td>
<td>935</td>
<td>774</td>
<td>841</td>
<td>637</td>
<td>1029</td>
</tr>
<tr>
<td>954</td>
<td>1134</td>
<td>593</td>
<td>1134</td>
<td>521</td>
<td>1066</td>
<td>1085</td>
<td>1202</td>
</tr>
<tr>
<td>764</td>
<td>1119</td>
<td>856</td>
<td>967</td>
<td>728</td>
<td>800</td>
<td>1094</td>
<td>1173</td>
</tr>
<tr>
<td>640</td>
<td>809</td>
<td>701</td>
<td>748</td>
<td>578</td>
<td>601</td>
<td>724</td>
<td>854</td>
</tr>
<tr>
<td>750</td>
<td>572</td>
<td>748</td>
<td>874</td>
<td>712</td>
<td>788</td>
<td>783</td>
<td>960</td>
</tr>
<tr>
<td>748</td>
<td>860</td>
<td>761</td>
<td>828</td>
<td>740</td>
<td>756</td>
<td>761</td>
<td>989</td>
</tr>
</tbody>
</table>
Raw Data from Visual Search Experiment

Notes: Each row represents one participant. To use this dataset in your own statistical analysis, follow these instructions:

1. Drag across the entire data table to select all the data, including a blank line above and below the table itself.
2. Copy the selection to the clipboard (Edit menu > Copy).
3. Launch your spreadsheet program and open a blank spreadsheet.
4. Select the top left cell in the blank spreadsheet, and paste the data table into the spreadsheet (Edit menu > Paste).
5. If the data table doesn’t look right, cancel the paste (Edit menu > Undo), then try again, pasting the data as plain text (Edit menu > Paste Special > Unformatted Text).
6. Save the spreadsheet with a descriptive name (such as VisualSearch_Data.xls)

<table>
<thead>
<tr>
<th>RT_f</th>
<th>RT_c</th>
<th>RT_4</th>
<th>RT_16</th>
<th>RT_f4</th>
<th>RT_c4</th>
<th>PC_f</th>
<th>PC_c</th>
<th>PC_4</th>
<th>PC_16</th>
<th>PC_f4</th>
<th>PC_c4</th>
<th>PC_c16</th>
<th>sx</th>
<th>hp</th>
<th>groupcode</th>
<th>sessionTime</th>
</tr>
</thead>
<tbody>
<tr>
<td>784</td>
<td>1074</td>
<td>847</td>
<td>1011</td>
<td>798</td>
<td>770</td>
<td>896</td>
<td>1252</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>F</td>
<td>R</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:58:13</td>
</tr>
<tr>
<td>573</td>
<td>645</td>
<td>577</td>
<td>540</td>
<td>575</td>
<td>570</td>
<td>579</td>
<td>710</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>M</td>
<td>R</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:58:25</td>
</tr>
<tr>
<td>633</td>
<td>804</td>
<td>686</td>
<td>750</td>
<td>651</td>
<td>614</td>
<td>721</td>
<td>886</td>
<td>90</td>
<td>95</td>
<td>100</td>
<td>85</td>
<td>100</td>
<td>80</td>
<td>100</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:58:31</td>
</tr>
<tr>
<td>833</td>
<td>959</td>
<td>863</td>
<td>929</td>
<td>792</td>
<td>874</td>
<td>934</td>
<td>984</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>F</td>
<td>R</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:58:52</td>
</tr>
<tr>
<td>792</td>
<td>864</td>
<td>772</td>
<td>884</td>
<td>715</td>
<td>869</td>
<td>829</td>
<td>899</td>
<td>95</td>
<td>85</td>
<td>85</td>
<td>95</td>
<td>90</td>
<td>100</td>
<td>80</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:59:00</td>
</tr>
<tr>
<td>819</td>
<td>1074</td>
<td>954</td>
<td>938</td>
<td>810</td>
<td>827</td>
<td>1097</td>
<td>1051</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>100</td>
<td>90</td>
<td>90</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:59:02</td>
</tr>
<tr>
<td>713</td>
<td>929</td>
<td>709</td>
<td>932</td>
<td>721</td>
<td>705</td>
<td>696</td>
<td>1159</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>M</td>
<td>A</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:59:03</td>
</tr>
<tr>
<td>999</td>
<td>1127</td>
<td>972</td>
<td>1054</td>
<td>975</td>
<td>822</td>
<td>968</td>
<td>1285</td>
<td>90</td>
<td>90</td>
<td>85</td>
<td>95</td>
<td>90</td>
<td>80</td>
<td>100</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:59:06</td>
</tr>
<tr>
<td>952</td>
<td>1073</td>
<td>965</td>
<td>1060</td>
<td>958</td>
<td>946</td>
<td>971</td>
<td>1174</td>
<td>95</td>
<td>100</td>
<td>100</td>
<td>95</td>
<td>100</td>
<td>90</td>
<td>100</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:59:07</td>
</tr>
<tr>
<td>815</td>
<td>1046</td>
<td>858</td>
<td>1003</td>
<td>840</td>
<td>790</td>
<td>876</td>
<td>1215</td>
<td>95</td>
<td>95</td>
<td>90</td>
<td>100</td>
<td>90</td>
<td>90</td>
<td>100</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:59:21</td>
</tr>
<tr>
<td>808</td>
<td>933</td>
<td>806</td>
<td>935</td>
<td>774</td>
<td>841</td>
<td>837</td>
<td>1029</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>M</td>
<td>L</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:59:31</td>
</tr>
<tr>
<td>994</td>
<td>1134</td>
<td>993</td>
<td>1134</td>
<td>921</td>
<td>1066</td>
<td>1065</td>
<td>1202</td>
<td>85</td>
<td>90</td>
<td>95</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:59:40</td>
</tr>
<tr>
<td>764</td>
<td>1119</td>
<td>896</td>
<td>987</td>
<td>728</td>
<td>800</td>
<td>1064</td>
<td>1173</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>F</td>
<td>R</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 12:59:43</td>
</tr>
<tr>
<td>540</td>
<td>809</td>
<td>701</td>
<td>748</td>
<td>678</td>
<td>601</td>
<td>724</td>
<td>894</td>
<td>95</td>
<td>100</td>
<td>100</td>
<td>95</td>
<td>95</td>
<td>100</td>
<td>100</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 13:02:32</td>
</tr>
<tr>
<td>750</td>
<td>872</td>
<td>748</td>
<td>874</td>
<td>712</td>
<td>788</td>
<td>783</td>
<td>960</td>
<td>95</td>
<td>95</td>
<td>100</td>
<td>90</td>
<td>100</td>
<td>90</td>
<td>100</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 13:55:00</td>
</tr>
<tr>
<td>748</td>
<td>830</td>
<td>751</td>
<td>828</td>
<td>740</td>
<td>755</td>
<td>761</td>
<td>899</td>
<td>95</td>
<td>95</td>
<td>90</td>
<td>100</td>
<td>90</td>
<td>90</td>
<td>100</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 13:55:09</td>
</tr>
<tr>
<td>594</td>
<td>795</td>
<td>634</td>
<td>756</td>
<td>590</td>
<td>598</td>
<td>677</td>
<td>913</td>
<td>90</td>
<td>100</td>
<td>90</td>
<td>100</td>
<td>80</td>
<td>100</td>
<td>100</td>
<td>HOPEC-S12-01</td>
<td>2012-02-23 13:55:13</td>
</tr>
</tbody>
</table>
Move Data to Excel Statistics Template

Raw Data from Visual Search Experiment

Notes: Each row represents one participant. To use this dataset in your own

1. Drag across the entire data table to select all the data, including a blank
2. Copy the selection to the clipboard (Edit menu > Copy).
3. Launch your spreadsheet program and open a blank spreadsheet.
4. Select the top left cell in the blank spreadsheet, and paste the data there.
5. If the data table doesn’t look right, cancel the paste (Edit menu > Undo Text).
6. Save the spreadsheet with a descriptive name (such as VisualSearch).
Data Labs: Visual Search Experiment – Report Worksheet

1. Introduction: Concepts. Briefly introduce the topic of visual search and explain why it is important in our daily life. Based on the background readings, describe the purpose of this experiment.

2. Introduction: Variables and Hypotheses. Every experiment involves at least one independent variable (a variable that gets manipulated) and at least one dependent variable (a variable that gets measured). Name and describe the two independent variables and the two dependent variables in this experiment, and explain why each is an independent or dependent variable. Hint: Look at your data sheet. Based on the background readings, state the three main hypotheses of this experiment as testable predictions: one about the type of search, one about the number of objects, and one about the interaction reflected in the slope of the RT line graph.

3a. Results: Main Effects. Describe the t-test results for the "main effect" of each of the two independent variables (include the t-value, degrees of freedom, and p-value for each t-test, and report the mean RTs for each comparison), and state whether the results supported the first two hypotheses.

3b. Results: Interaction Effect. Describe the t-test results for the "interaction effect" of the two independent variables (include the t-value, degrees of freedom, and p-value for each t-test, and report the mean RTs for each comparison), and state whether the results supported the third "interaction" hypothesis.

4a. Discussion: Comparison with Individual Results. Overall, how similar were your own individual results to the pooled results? Describe how your results are similar or different from the pooled results.

4b. Discussion: Search Type. Describe the difference between "feature search" and "conjunctive search" on a visual search task, and briefly report the results from our participants in the feature search and conjunctive search conditions (no statistics here, please).

4c. Discussion: Serial vs. Parallel Processing. Briefly describe the difference between "parallel processing" and "serial processing." Based on Treisman's Feature Integration Theory, explain what type of processing is needed in conjunctive search as compared to feature search, and describe how the "pop-out" phenomenon contributes to the RT difference between these two types of search.
The title of the document is "Or Full Lab Report Template." The main body of the text is about searching for a target: Serial vs. parallel processing in visual search. The introduction section includes a discussion on why it is important to cite your textbook (Myers, 2013) as a reference for the importance of this topic. The abstract section should include one background sentence introducing the topic of visual search, one sentence describing the participants, one sentence describing the task, and two sentences describing the main results. The abstract should be typed as one paragraph.

The introduction section should begin by introducing the topic of visual search. It should explain why it is important and cite sources as needed. The next section, "Methods," should describe the participants (study, age group, gender), the procedure used (such as the visual search task), and the materials used (such as the stimuli). The results section should describe the findings of the study, including any statistical analyses performed. The discussion section should interpret the results and compare them to previous research. Finally, the conclusion section should summarize the main findings and suggest future research directions.
Data Labs

Data Collection Projects
For Introductory Psychology

Tom Ludwig
Hope College

ludwig@hope.edu