**Psychology 100 Lab Exercise – Lexical Decisions Experiment**

## Lab Report Samples

***Most students do a very good job with the sections of the lab report on the theory of the right visual field advantage, the specific hypothesis for this experiment, and the results from the experiment. But many have problems with the description of the independent and dependent variables, and with the description of the experimental procedure. Here are some samples from a June Term PSY 100 course showing fairly good student responses to the questions in the Lab Report Worksheet.***

*1. Our experiment used a “lexical decision” task – deciding whether a string of letters forms an English word – in order to explore brain hemisphere differences in word recognition. Based on the background readings noted above, describe the main hypothesis for this experiment*

1) Based on the background reading, the main hypothesis for this experiment would be that normal subjects would be able to correctly identify more words and non words when a string of letters are flashed in their right visual field rather then their left visual field. They will also be able to spot the real words from the non-words faster when they are flashed in the right visual field. This is because the stimuli that are flashed in the right visual field go to the left hemisphere which specializes in language functions.

1.The main hypothesis for this experiment: Words flashed in the right visual field will be recognized faster and with more accuracy than those presented in the left visual field. The reason for this being the main hypothesis is due to the hemispheric differences in the brain. Based much upon the studies of split-brain patients, it has been concluded that the left hemisphere of the brain initially receives information from the right visual field. The right hemisphere initially receives information from the left visual field. As the book states, when words are flashed to the right hemisphere perception takes a fraction of a second longer. Why is this? It takes a fraction of a second for the right hemisphere to send the information via the corpus callosum to the left hemisphere, which is better at interpreting verbal cues.

In conclusion, my final hypothesis goes like this: If the left hemisphere controls language functions, then words flashed in the RVF will be recognized faster and with more accuracy than those in the LVF.

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*2. 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 of them is an independent or dependent variable.*

2) The independent variables are the visual field (left and right) and the word that is flashed (word or non-word). The visual field is an independent variable because it is changed. Half of the time the word/non-word is flashed on the left side and the other half of the time it is flashed on the right side. The words that are flashed are also an independent variable. Half of the time a real word is flashed, and the other half of the time a non-word is flashed. The word variable is not constant. The dependent variables are the percentage correct and the reaction time. The percentage correct is a dependent variable because the percentage correct is measured. The reaction time is also a dependent variable. The reaction time is measured as well. Both of these variables are measured to see the effect that the independent variables have on each individual.

2. From the experiment that was performed, the *independent variables* included the location of the letter formation (word or non-word), with respect to the visual field it was in and whether the letter formation was a word or non-word. The location varies between the left and right visual fields. A word will appear in either the left or right visual field. The letter formation will either form an English word or a jumble of letters. The recognition of this condition should vary according to the visual field. These two variables are independent variables because they are changed and varied to elicit different responses from the subject. They are the raw variables that are the input for the experimental results. The experiment yielded two *dependent variables*: accuracy of response, a percentage of correct and incorrect responses, and the quickness to respond, measured in reaction time. Both of these variables are divided into criteria pertaining to word or non-word and right and left visual field. These two factors are dependent because they are the product of the subject’s reactions to the independent variables. As the independent variables are the input, the dependent variables are the measurable output of the experiment. They will be the basis for the data we collect and the conclusions that we make about our hypothesis.

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*3. Describe the procedures this experiment used to present the stimuli and collect the behavioral responses from the participants.*

3. The experiment looked into the issue of hemispheric differences in the brain and the speed with which people can recognize an English word. This was tested through a series of trials. There were 15 participants used in this trial, 10 males and 5 females. The participants were informed that each trial would contain 4 letters which would appear in one of small boxes on the screen in front of them. Half of the time these 4 letters would form a real English word, the other half of the time the letters would be random letters or nonsense. During each trial the participant should keep his or her focus directly on the trial number between the two boxes. Each participant was reminded that the trial would not produce accurate results if their eyes moved toward the box where the letters appeared. When the participant was ready to see the words, they would press the space bar with their left hand and a word would appear in one of the boxes a half second later, but never in both boxes. As soon as the letters appeared in the box the participant would have to decide whether the letters were a word or a non word. If the letters formed a word the participants were told to press the letter M with their right middle finger. If the letters formed a non word the participant was informed to press the N key with the first finger on their right hand. It was again reiterated that the participants eyes must not move towards the box where the words appear. It was also stressed that the speed with which the decision is made is very important. Participants were asked to make decisions as quickly as possible. The participant first went through 12 practice trials, followed by the 90 trials used to make up the data necessary for the experiment. As the participants went through the trials, their reaction time and percentage correct for words and non words were tallied according to which visual field was presented with the letters. This was done in an effort to see the effects on reaction time and accuracy caused by the two visual fields. After each participant finished the trials, they were asked to write down their results on a printout provided before the start of the experiment. The information was marked in graphs based on reaction time and percentage correct. The overall mean RT and percentage correct in one graph. The other graph showed how the numbers varied in the right visual field and left visual field with regards to words or non words.

3. The experiment required use of a computer-based test. All the test subjects (students taking the online Psychology 100 course) visited the site and had to present basic background information about themselves, including their gender and hand preference. After presenting instructions as to how to perform the test, there were twelve sample trials so that the test subjects were aware of how the experiment would work. This helped reduce any error that may have occurred due to inexperience or misunderstanding. Next, each test subject performed sixty trials during which he or she stared at a black x in the middle of the computer screen. On either side of the x was a box. One at a time, a word or a nonword was flashed into one of the boxes. The choice of whether or not the word flashed was a real word or nonword and if it appeared in the right or left box was randomly chosen by the computer. During the course of the trial, 30 words were flashed to the left box and 30 to the right, though the order was random. Subjects were not supposed to move their eyes to focus on the word when it appeared, but rather just look at the x. When the word appeared, he or she had to determine if it was real or not and indicated their response by pressing “M” when it was a real word and “N” when it was a nonsense word. After each trial, “Correct” or “Incorrect” appeared at the bottom of the screen. To advance to the next trial they pressed the space bar. The computer kept track of which words they correctly and incorrectly identified as “word” and “nonword,” as well as the reaction times for each trial. At the end of the experiment, the results were presented in a table.

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*4. Using complete sentences, describe the pooled results for the individuals who participated in this experiment (including the mean RT and PC values, as well as the t-value and p-value from the t-tests). Did the results support the hypothesis you described in question 1 above? Next, plot the pooled results as line graphs in the bottom portion of your data sheet, and try to explain what the graphs tell us about visual field differences (or hemispheric differences) in word recognition. Plot your own results as line graphs in the top portion of your data sheet. Compare your own individual results to the pooled results. Describe how they are similar or different from the pooled results.*

4. There were 15 participants in the experiment and the mean reaction time for real words flashed to the left vision field was 837.1 milliseconds and to the right vision field was 776.7 milliseconds. The mean reaction time for nonwords flashed to the left vision field was 850.6 milliseconds, and to the right vision field was 816.3 milliseconds. The percent correct of real words flashed to the LVF was 78.1% and to the RVF was 85.3%. The percent correct of nonwords flashed to the LVF was 85.9% and to the RVF was 86.7%. Without looking at the t and p-values, it appears that when words, both real and nonsense, were flashed to the RVF, they were responded to more quickly and accurately than words flashed to the LVF. However, we need to examine the p-value to determine whether the difference is statistically significant or not. If it is significant, it is not likely the difference is due to chance, but rather that a real difference exists. If it is insignificant, the difference between values will be attributed to chance. The t-statistic in the comparison of real words flashed to the LVF vs. RVF is 4.02 and the corresponding p-value for this comparison is 0.032. Because the p-value is less than 0.05, we can say that it is statistically significant and the chance that this big of a difference could have happened by chance alone is very small. Therefore, we can conclude that when real words are flashed to either field of vision, words flashed to the RVF, and therefore directly sent to the left hemisphere, are responded to in a shorter amount of time. The t-value for the response time for nonwords flashed to the LVF vs. RVF is 2.24 and the corresponding p-value is 0.141. Because the p-value is greater than 0.05, it is statistically insignificant. In the analysis of percent of correctly identified words and nonwords, the results are similar. The t-value for percent of correctly identified real words for LVF vs. RVF is 5.26 and the corresponding p-value is 0.010, an even smaller p-value than the response times. Therefore, the difference is statistically significant, and we can conclude that real words flashed to the RVF are correctly responded to more often than real words flashed to the LVF. Lastly, when looking at the percent correct of nonwords flashed to the LVF vs. RVF, the t-value is -0.41 and the p-value is 0.421, indicating a statistically insignificant difference. Gathering all these observations and test results together, we can conclude that real words flashed to the right vision field are responded to faster and more accurately than words flashed to the left vision field. My hypothesis was partially correct. I hypothesized that there would be a significant difference in percent correct and response time for both real AND nonsense words flashed to the RVF. However, the experiment found that this is only true for real words. Therefore, my hypothesis concerning real words can be accepted, but for nonwords must be rejected. After plotting the pooled results in line graphs, you can visually see that the right hemisphere correctly recognizes words and nonwords more quickly and more accurately than words flashed to the left hemisphere. When comparing my own results with the pooled results, my reaction times in identifying nonwords were quite a bit faster and more accurate than the pooled results. On the other hand, for real words, my reaction time (for the LVF) was slower and percent correct lower (for LVF and RVF) than the mean. However, the trend of my results was consistent with that of the pooled results in the sense that my reaction time was faster and percent correct higher for both words and nonwords flashed to my RVF. It would be interesting to calculate the p-value for my individual results to see if the difference is statistically significant or not.

4. When looking at the pooled data from all of the 15 students studied, we can see that 14 of these students were left-handed. With having only one student left-handed we are unable to draw any conclusions on the difference in hand preference and the percent correct or reaction time. All of the reaction time numbers were measured in milliseconds. The mean reaction time for words in the left visual field was 837.1 which is slower than those in the right visual field (776.7). The t-value for this test was 4.02 and the p-value was .032 meaning that these results are statistically significant. This supports what I predicted in my hypothesis. The reaction time for words is faster in the right visual field than in the left visual field. For non-words in the left visual field the mean reaction time was 850.6 which was again slower than those in the right visual field (816.3). The t-test results for this showed a t-value of 2.24 and a p-value of .141. This means that there is no significant difference in the reaction times between the right visual field and the left visual field when identifying non-words. This does not support my hypothesis. I predicted that the right visual field would be faster, but it does not reject my hypothesis either because the results are not significant. When studying the effect of the visual field on the percent correct, we see that in words the left visual field is lower than the right. The right visual field had 85.3 percent of words correct while the left visual field only had 78.1 percent correct. The t-test for the words showed a t-value of 5.26 and a p-value of .010. These are significant and show a higher accuracy rate in the right visual field as was predicted in my hypothesis. When looking at the result in the non-words we can see that the mean percent correct in the left visual field was 85.9 which is less than the 86.7 percent correct average from the right visual field. The t-tests reported a t-value of -0.41 and a p-value of .421 which means that there is no significant difference in the accuracy in non-words between the left and right visual fields. This neither supports or rejects my hypothesis since the data was not significant we cannot draw any conclusions from the results of this portion of the experiment. When looking at the graphs that were plotted using the pooled and individual results there are some differences. The individual results for reaction time were slower than the pooled results and the percent correct were higher than the pooled results. In both of the graphs you can see that the right visual field generally produced faster and more accurate results for both the words and the non-words. When comparing the individual and pooled graphs one reason the individual results had higher accuracy could be because it had a slower reaction time. By taking longer it may have given the brain longer to process the information and produce better accuracy.

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*5. In your own words, describe the “direct access” model and “relay” model of hemispheric specialization, and explain why both models would predict a right visual field advantage on our lexical decision task.*

5. There are two important models of hemispheric specialization. One model is the Direct Access Model which says that the hemisphere that first receives the information is the one that will process it. While one hemisphere is favored for a specific task the hemisphere that first receives the information will do the work. This model works to prove our hypothesis because the left hemisphere would be the first to receive information from the right visual field and is favored as the processing hemisphere. However, the Relay Model states that the information is brought in and moved to the hemisphere that is most suited to process it. This model also supports our hypothesis because the information brought in from the right field of vision would be processed faster because it doesn’t have to travel to the opposite hemisphere as a info from the left field of vision would.

5. The “direct access” model of hemispheric functioning follows a “winner takes all” mentality where whichever hemisphere of the brain receives the information first processes it as well and quickly as it is able. This model still considers each hemisphere to have its own specialties, but that simply gives the hemisphere of a certain specialty an advantage when it does receive the specific type of information. When applied to this experiment the “direct access” model would explain that the left hemisphere is specialized to the language tasks required so it was able to respond more accurately and rapidly to the words it received but only received the information from the right visual field. The right hemisphere still received the words from the left visual field but is not able to process them as well as the left hemisphere.

 The “relay” model of hemispheric function operates along a type of “dibs” system where the hemisphere that specializes in an area has a claim to and receives all information pertaining to that area whether it was received by the other hemisphere first or not. Applying this model to the experiment, the “relay” model would explain that the left hemisphere which, again, specializes in the language tasks necessary would receive all the words displayed in both vision fields. Those displayed on the right are directly transmitted to the left hemisphere and those on the left are first sent to the right hemisphere, which then “relays” the image seen to the left hemisphere for processing. This would explain why the relay would take longer and the model supposes that in the transfer between hemispheres a little of the image is lost making the information received in the left less accurate than when it initially arrived in the right.

 As is evident, both models adequately explain the same results which makes it difficult to determine which theory, if either, is the one that acts in the actual brain process.