

# **Table of Contents**

## Abstract i

## Acknowledgements ii

List of Diagrams iii

List of Figures 1

1. Introduction 1
   * 1. Statement of the Problem 1
     2. Hypothesis 1
     3. Prediction 1
2. Review of the Literature 2
3. Procedures 6

### Findings 11

1. Conclusions 25
2. Recommendations 26

Literature Cited 27

References 28

Appendices 29

1. Statistical Analysis 29
2. Selected Photographs, Graphs, Etc. 31
3. Daily Log 72

Sample Survey 75

**Abstract**

## There are many anatomical differences between males and females, and our experiment tests to see if a difference exists between the minds of males and the minds of females. Because the mind of females is structurally different fro that of males, for example the female has a larger corpus collasum, it would lead us to believe that it will be easier for the female population to recall their subliminal memory., We hypothesized that if we were to conduct an experiment that required the recall of the subconscious then more females will answer correctly when they guess or what they have an educated guess.

## We formed a survey from information taught to us during the beginning of our high school career and we forced seniors to recall these minute details. Since we could not obtain a true simple random sample of the population we resorted to a census of the entire senior class as a representation of the high school population. We contacted the teachers, and distributed permission slips, and conducted the surveys in ways that would most effectively limit bias, based on experience with an experimental group.

## After collecting all of our data we analyzed the results using Minitab and other calculator programs. Unfortunately the results did not turn out as we expected. Although there were a higher number of questions answered correctly by females on guesses than males, the difference was not high enough to be statistically significant. However we did reach two conclusions of significance. We saw that there was higher number of males who knew the answer and got the right answer. We also saw a large number of girls guess and receive the wrong answer. These two results led us to believe that guys may store more in the conscious memory, and girls may be terrible guessers. However our original hypothesis on recalling of subconscious was not supported. Despite the fact that we did not reach a conclusion supportive to our hypothesis we have further proved the equality of the mind between the sexes.**Acknowledgements**

We would like to thank Mr. Thiel for the constant encouragement and valuable input. Thank you for helping us to discover our true interest, no matter how infeasible it may have appeared. Most of all thank you for the captivating title.

## Furthermore, we would also like to thank Mrs. Nash and Ms. Ochsenfeld. Thank you Mrs. Nash for the crash course on Chi-Square Tests and Minitab assistance. We also cannot forget Ms. Ochsenfeld for making Minitab available to us, which was indispensable to the project, and also for teaching us how to interpret our statistics.

In addition the cooperation of many teachers and students were crucial to our project. We especially need to thank Mr. Campbell, for letting us survey his class as the experimental sample. We also need to thank Mr. Ladd, Mrs. Cohn, Mr. Bull, Mrs. Elewski, and Mr. Blanton for making room in their busy schedules to accommodate our experimentation. We would also like to thank our teachers, Mr. Giglio, Mr. Thiel, Mrs. Wohlgemuth, Mr. Hanson, Ms. Ochsenfeld, Ms. Cramer, and Mr. Little for allowing us to miss class and conduct our survey. We also want to thank the students for participating in our project.

Lastly, but certainly not least we need to thank our parents for helping us with the project directly but also indirectly by supporting us through the long nights and giving us constant encouragement.

## **List of Diagrams**

## Oral Speech 9

## Tables

Table #1: Class Period and Teachers 10

Table#2: Right and Knew the Answer 12

Table#3: :Right and Educated Guess 14

Table#4:: Right and Guessed 16

Table#5: Wrong but Confident 18

Table#6: Wrong but Educated Guess 20

Table#7: Wrong and Guessed 22

## Chi-Square Tests

Chi-Squared #1: Right and Knew the Answer 13

Chi-Squared #2: Right and Educated Guess 15

Chi-Squared #3: Right and Guessed 17

Chi-Squared #4: Wrong but Confident 19

Chi-Squared #5: Wrong but Educated Guess 21

Chi-Squared #6: Wrong and Guessed 23

## Tallies of Data

Raw Data #!: Blanton Per. 2 Male 46

Raw Data #2: Blanton Per. 2 Female 47

Raw Data #3: Campbell Per. 2 Male 48

Raw Data #4: Campbell Per. 2 Female 49

Raw Data #5: Cohn Per. 2 Male 50

Raw Data #6: Cohn Per. 2 Female 51

Raw Data #7: Cohn Per. 3 Male 52

Raw Data #8: Cohn Per. 3 Female 53

Raw Data #9: Ladd Per. 3 Male 54

Raw Data #10: Ladd Per. 3 Female 55

Raw Data #11: Cohn Per. 4 Male 56

Raw Data #12: Cohn Per. 4 Female 57

Raw Data #13: Ladd Per. 4 Male 58

Raw Data #14: Ladd Per. 4 Female 59

Raw Data #15: Cohn Per. 5 Male 60

Raw Data #16: Cohn Per. 5 Female 61

Raw Data #17: Elewski Per. 5 Male 62

Raw Data #18: Elewski Per. 5 Female 63

Raw Data #19: Ladd Per. 5 Male 64

Raw Data #20: Ladd Per. 5 Female 65

Raw Data #21: Blanton Per. 6 Male 66

Raw Data #22: Blanton Per. 6 Female 67

Raw Data #23: Bull Per. 6 Male 68

Raw Data #24: Bull Per. 6 Female 69

Raw Data #25: Campbell Per. 6 Male 70

Raw Data #26: Campbell Per. 6 Female 71

## Histograms

Histogram #1: Male/Right/Confident 31

Histogram #2: Female/Right/Confident 32

Histogram #3: Male/Right/Educated Guess 33

Histogram #4: Female/Right/Educated Guess 34

Histogram #5: Male/Right/Guess 35

Histogram #6: Female/Right/Guess 36

Histogram #7: Male/Wrong/Confident 37

Histogram #8: Female/Wrong/Confident 38

Histogram #9: Male/Wrong/Educated Guess 39

Histogram #10: Female/Wrong/Educated Guess 40

Histogram #11: Male/Wrong/Guess 41

Histogram #12: Female/Wrong/Guess 42

## Numerical Summaries

Analysis #1: Right 29

Analysis #2: Wrong 30

**List of Figures**

#### **I. Introduction**

The debate between the equality of the sexes has raged since the beginning of civilization. In the natural world, the female dominates while the males compete for the attention of the females, yet in the human society this tread seems to have been reversed. In Africa and Indian cultures the family is matrilineal and centered around the females, yet in the modern Western world the males are considered superior. In our contemporary time period, the equality of the sexes is strongly advocated, but is there actually a difference between the two, especially in thought processes? The purpose of our experiment is to investigate whether or not the female mind is better able to recall information from the subconscious than males.

Problem:

Does gender affect the ability of the mind to recall minute details?

Hypothesis:

Gender does affect the recalling of the mind, especially the subconscious. Since there are anatomical differences between the structure of the mind of the two sexes, we hypothesis that females are better able to recall information not stored in the conscious mind.

Prediction:

If we distribute a survey to the two differing sexes, then there will be a statistically significant difference between the numbers of questions answered correctly by females, when guessing.

**II. Review of the Literature**

The debate of sex differences due to gender has a timeless history. Countless studies have been carried out to find out how different women and men really are, or if there are differences at all. It is such a popular and applicable topic in everyday life, yet its discussion also brings to light about issues of morality, gender equality and societal norms. Clearly there are anatomical differences between these two biological groups, however these differences extend not only behavior but also mental processes. The infinite fascination surrounding the human mind crosses even compasses the gender differences between species.

Through years of experimentation and research, scientists have concluded that the brain is in fact separated into different parts and each has its only specific function. Storage and recalling of memory is not limited to one part of the brain, but actually involves several regions of the brain. The parietal lobe controls temporary containment of auditory information. Similarly, the upper temporal lobes momentarily store visual images. The last component of short memory storage is the occipital lobes, which retains kinesthetic impulses. Long-term memory is stored in the hippocampus and in the cortex of the frontal lobes. In addition, the cortex of the temporal lobes is crucial to abstract memory [5]. In order for all memory to be retained the information that resides within the short-term memory components of the brain must be transferred to the long-term memory storage portions of the brain.

The brain has trillions of connections joining billions of neurons and each junction has the potential to be part of a memory. The memory capacity of a human brain is effectively infinite, providing it is store in the right way. The human memory is selective. Items of interest are retained better than those that are not; personal and meaningful memories can be held in billions while dry facts learnt at school may soon fade away [3]. A memory is created as the waves of neuron impulses are sent through the mind and leaves impressions upon the brain. Theoretically the more areas the neuron is able to reach the better chance that the thought will be remembered.

Many of these thoughts remain unconscious, which also dictates a large part of our behavior. Unconscious memories permeate the decisions that we make everyday. According to social psychologist Robert Zajonc “people generally prefer things they have seen before, even if they do not remember seeing them” [2]. Misinformation has the potential for invading memories when we talk to other people, when we are suggestively interrogated or when we read or view media coverage about some event that we may have experienced ourselves. After more than two decades of exploring the power of misinformation, researchers have learned a great deal about the conditions that make people susceptible to memory modification. Memories are more easily modified, for instance, when the passage of time allows the original memory to fade [5].

The mind is an intricate and complicated organ that has interested many scientists and researchers. One of the most interesting details about the brain consists of two hemispheres, however the two halves are connected by the corpus callosum, a band of tissue through which the two hemispheres communicate. In an actual experimentation it is proven that the corpus callosum is relatively large in women than in men. The anterior commissure, a more primitive connection between the two hemispheres that links the unconscious areas of the hemispheres is also thicker for females [3]. Some scientists have found that the right hemisphere cortex is thicker in male babies than in female babies, however the corpus collasum is undoubtedly larger in females than males. The corpus collasum is even smaller in individuals with autism, which could explain their superiority in verbal fluency [3]. The thickness of the corpus collasum may also be an integral part of memory.

The animal kingdom is full of examples of female leadership and dominance. They were the desired, respected, and the ones most sought after. They are superior. Contrastingly in the history of mankind, women have been deemed inferior. Many believed that women lacked the region of the brain in which “the intellect” was said to be located by citing the statistic that the men’s brains weigh 10%more. Craniologist G. LeBon claimed in 1879 that “the intelligence of women recognized today [is] that they represent the most inferior forms of human evolution and that they are closer to children and savages than to an adult, civilized man.” In fact the father of evolution, Charles Darwin also concluded that “at least some of the mental traits in which women excel are traits characteristic of lower races” [1]. Both scientists based their assumptions on the notion that the female brain was smaller in size, however this was disproved in the 20th century by Franklin Mall, who demonstrated that there is no difference between the relative sizes of the female and male brains. Since then devices such as the IQ test, which historically favors, ideas such as the vulnerability of females due to their excessive emotions have been used to shed a negative light on the female population [1]. However the validity and usefulness of the IQ test is debatable and in addition it has been proven in other trials that emotions may even enhance memory and recall. These ideas of inferiority have been fiercely condemned in the modern 20th century and were the subject of much experimentation.

The new technological advances of the late 20th century, enabled many to oppose previous notions of female inferiority. New techniques originally designed to better understand the functions of the brain, has also enabled others to study sex differences in brain activity, structure and chemistry. For example, Richard Haier of the University of California of Irvine and his colleague Camilla Benbow have used brain-scanning technology to obtain results showing sex difference in brain function. In the ended they have concluded that “Women and men with similar high-performance scores were using different regions of their brains to perform the tasks” [1]. This suggests that women and men use different part of the brain for memory and computations, but it also implies that the manners in which the two sexes use their brains also differ. The two sexes use different means to achieve the same goals, an idea supported by numerous other studies. The difference in ways of thinking can also be related to the different subjects each prefers. It is believed that women have superior verbal and linguistic skills, while the males have better spatial ability and reasoning than women on average [3]. The specializations between female and male brains places different selection pressures upon the two sexes. Sex differences suggest that men and women may have different occupational interests and capabilities, independent of societal influences [2].

Many studies have been conducted regarding the behavioral differences between men and women due to their anatomical dissimilarities. In very few of these experiments have significant and reliable results been produced. Although there has been few instances of concrete results, there has been traces of evidence that support the hypothesis that there is actually differences between the minds of the sexes. With environmental factors and lurking variables influencing the mind, it is hard to isolate the mind and study it. The greater conductivity between the female brain, due to the thicker corpus collasum, lends evidence to the premise that females may have an advantage in storing information. This may be just one of the numerous differences between the female and male mind.

Different sexes have specialties toward different subjects. Females are more advanced at linguistic and artistic areas, therefore girls should have an advantage over guys on subjects such as English and Art. Guys are better at spatial and reasoning areas, therefore males should be more successful on subjects such as Math and Science. However, primary preferences become compromised as the subject grows and matures due to their environmental conditions and influences, especially education. Therefore, it is hard to distinguish these preferences since the differences diminishes with age. In addition, studies show that females are more emotional than males, and humans are better at remembering and recalling information under stressful conditions. Therefore, girls should recall their memory more easily.

Gender differences of the brain affect many real life situations, not just in careers and professions but also in academics. If there is a difference between the brains of two sexes, then it would seem inappropriate to have the uniform education. The same teaching techniques and standard testing would be unfairly biased toward a certain gender. If through experimentation concrete evidence supporting an actual difference is found, then modifications regarding the education system should be implemented. This is just one aspect of society would be better benefited if more information concerning brain differences is acquired.

The sexes are different because their brains are different. The brain, the chief administrative and emotional organ of life, is differently constructed in men and in women; it processes information in a different way, which results in different perceptions, behavior, and thought processes.

**III. Procedures**

1. Formulating a Topic

We made a list of the possible topics for our project, listing all areas that were of interest to us. One of the ideas we were intrigued by was the topic of instinct. After finding out that instinct had little scientific basis we decided to pursue the topic of the subconscious. This idea was brought to light by our history teacher, Mrs. Wohlgemuth. After conferring with Mr. Thiel we decided on this topic.

1. Designing the Survey

For the Survey we needed to find information that everyone had been exposed to, so we found old study guides, homework, and notes from several subjects. We then separated a list of possible questions by subject and categorized them into history, science, math, and literature. We chose the questions that we knew had been taught but weren’t the focus of any classes. We also chose an equal number of questions for each subject area, to eliminate any bias due to the question type. The order of the questions were arranged by alternating subjects, but was modified after conducting the experimental survey.

1. Designing the Experiment (Eliminating Bias)

We calculated the number of students necessary to obtain a trustworthy sample, however after considering our limited circumstances, we had to give up on conducting an actual simple random sample (SRS). In order to compensate for this setback, we decided to survey the entire senior class, by giving out our surveys in every Civics/Economy class, which is a required course for seniors. Although there was not an even number of senior history classes for every period, we believe the extremely large sample size and the fairly balanced number of classes for each period of the day compensated for this inequality. We needed to test out the difficulty of the test on an experimental class and we picked a period with a greater number of classes and a class with a smaller size and more conscientious students.

1. Contacting the Teacher and Distributing Permission Slips

After establishing the setup of the experiment, we contacted and conferred with our biology teacher in order to confirm some of our procedures and elimination of bias, which is very important in an experiment. After attaining approval, we proceeded to contact the individual teachers that we needed assistance from. WE also printed out enough permission slips for every student and entrusted the teachers to pass them out. We did not mention the object of our project on the permission slip to control another source of bias. After conferring with most of the teachers we were able to set a fairly accommodating date for both the teachers and us.

1. Conducting the Survey (Bias cont.)

Before administering the survey to all of the classes, we presented the preliminary survey to an experimental class. Based on their feedback we eliminated some questions and added others. We also rearranged the order of the questions based on difficulty to curb excessive discouragement. During the actual day of the experimentation, we prepared a written speech, so that we would administer the same set of instructions to all students (see Oral Speech). We also wore dull clothing to not detract from the seriousness of the survey. We also tried to eliminate the devaluing of the survey by reminding all participants to not disclose information contained within the survey to peers. As with the prepared speech the surveys themselves was also identical to one another.

1. Analyzing the Data

After obtaining hundreds of completed surveys we had to design a chart to tally the data. We proceeded to separate the papers by period and then by gender. The next separation was based on the correctness of the answers and then the confidence of the student. Each answer was tallied and then imputed into Minitab. After learning the usage of the statistical program, Minitab, and realizing all of its advantages, we were able to analyze most of our data on that program. The data was entered by periods combined and according to whether or not the answer was correct and the confidence level of individual questions. We checked the histograms for approximate normality and possible outliers. We also conducted the Chi-Square Test, which compares quantitative variables, to obtain a P-value and judge the significance of our data. The P-values were obtained with the use of TI-83 calculators. We also tested to see if the subject tested affected the correctness.

1. Formalizing Our Conclusions

After obtaining our data and reaching some conclusions we typed up a written report of our findings.

**Oral Speech**

Instructions:

(Wait till everyone is quite..)

Fan: I am Fan Liu. This is Sibo Zhao. We are two AP Biology students. For our project, we need to conduct a survey. Please take out a piece of binder paper and a pen or pencil.

(Sibo passing out survey...)

Fan: Please do not turn them over until everyone has received a copy of the survey. Do not write your name on your papers and do not write on our surveys. Please take it seriously.

Sibo: Now if you would turn them over. Notice the first question and please answer that now! It is very important. Also note that the rest of the questions have even numbers in front of them, this is because after answering each question, you must answer the question at the top of the first page.

Fan: Mark answer A if you definitely knew the answer to the question. Mark answer B if you kind of knew the answer or had an educated guess. Mark answer C if you had no idea and guessed. Does anybody have questions?

(Answer questions if there is any..)

Sibo: Answer each question to the best of your ability. We will collect the survey from you at the end of 20 minutes, please begin now.

(20 min later...)

Fan: Has everyone turned in his or her survey? Please do not discuss the questions with students from other classes because that would ruin our results. Thank you for taking our survey. Bye!

**Chart of Periods**

Table #1 : Class Period and Teachers

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Teacher/Period | 2 | 3 | 4 | 5 | 6 |
| Blanton | √ |  |  |  | √ |
| Bull |  |  |  |  | √ |
| Campbell | √ |  |  | (Experimental) | √ |
| Cohn | √ | √ | √ | √ |  |
| Elewski |  |  |  | √ |  |
| Ladd |  | √ | √ | √ |  |

**IV. Findings**

The data was categorized by the correctness of the answer and the confidence of the individual. There was not many cases of significant differences, however in a few cases there was significant differences between the two genders, although it was different from what we first predicted.

Table#2: Right and Knew the Answer

Chi-Squared #1: Right and Knew the Answer

MTB > chis C11, C12

Expected counts are printed below observed counts

mrat frat Total

1 62 31 93

58.11 34.89

2 35 33 68

42.49 25.51

3 40 20 60

37.49 22.51

4 10 2 12

7.50 4.50

5 6 4 10

6.25 3.75

6 39 14 53

33.12 19.88

7 44 12 56

34.99 21.01

8 12 3 15

9.37 5.63

9 20 8 28

17.50 10.50

10 50 47 97

60.61 36.39

11 34 18 52

32.49 19.51

12 37 36 73

45.61 27.39

13 25 17 42

26.24 15.76

14 7 4 11

6.87 4.13

15 7 3 10

6.25 3.75

16 9 3 12

7.50 4.50

17 9 4 13

8.12 4.88

18 4 2 6

3.75 2.25

19 17 6 23

14.37 8.63

20 61 50 111

69.36 41.64

Total 528 317 845

ChiSq = 0.260 + 0.433 +

1.320 + 2.199 +

0.168 + 0.280 +

0.835 + 1.390 +

0.010 + 0.016 +

1.045 + 1.741 +

2.319 + 3.863 +

0.736 + 1.227 +

0.358 + 0.597 +

1.858 + 3.094 +

0.070 + 0.117 +

1.627 + 2.710 +

0.059 + 0.098 +

0.002 + 0.004 +

0.090 + 0.151 +

0.301 + 0.501 +

0.095 + 0.158 +

0.017 + 0.028 +

0.481 + 0.801 +

1.007 + 1.678 = 33.742

df = 19

8 cells with expected counts less than 5.0

p-value=.0197

Assuming that the actual difference between the likelihood of obtaining an answer right and being confident of the two sexes is zero we would only obtain a sample with a difference as extreme as this 1.97% of the time. Therefore there is some evidence to support that there is an actual difference between the obtaining a right answer and being confident and being female or male.

Table#3: :Right and Educated Guess

Chi-Squared #2: Right and Educated Guess

MTB > chis C11,c12

Expected counts are printed below observed counts

mrbt frbt Total

1 45 65 110

50.70 59.30

2 23 26 49

22.58 26.42

3 55 46 101

46.55 54.45

4 21 16 37

17.05 19.95

5 21 22 43

19.82 23.18

6 31 36 67

30.88 36.12

7 22 27 49

22.58 26.42

8 6 10 16

7.37 8.63

9 17 15 32

14.75 17.25

10 17 21 38

17.51 20.49

11 18 19 37

17.05 19.95

12 19 30 49

22.58 26.42

13 14 28 42

19.36 22.64

14 11 8 19

8.76 10.24

15 15 15 30

13.83 16.17

16 31 22 53

24.43 28.57

17 3 3 6

2.77 3.23

18 18 26 44

20.28 23.72

19 21 21 42

19.36 22.64

20 16 40 56

25.81 30.19

Total 424 496 920

ChiSq = 0.640 + 0.547 +

0.008 + 0.007 +

1.535 + 1.312 +

0.914 + 0.781 +

0.071 + 0.060 +

0.000 + 0.000 +

0.015 + 0.013 +

0.256 + 0.219 +

0.344 + 0.294 +

0.015 + 0.013 +

0.053 + 0.045 +

0.568 + 0.486 +

1.482 + 1.267 +

0.575 + 0.491 +

0.100 + 0.085 +

1.769 + 1.512 +

0.020 + 0.017 +

0.256 + 0.219 +

0.140 + 0.119 +

3.728 + 3.187 = 23.163

df = 19

2 cells with expected counts less than 5.0

P-value=.2302493978

Assuming that the actual difference between the likelihood of obtaining an answer right and having an educated guess of the two sexes is zero we would only obtain a sample with a difference as extreme as this 23% of the time. Therefore there is not sufficient evidence to disprove the equal likelihood of both sexes to obtain an answer right and with an educated guess.

Table#4:: Right and Guessed

Chi-Squared #3: Right and Guessed

MTB > chis C11,C12

Expected counts are printed below observed counts

mrct frct Total

1 20 35 55

24.83 30.17

2 22 20 42

18.96 23.04

3 36 50 86

38.83 47.17

4 27 34 61

27.54 33.46

5 13 15 28

12.64 15.36

6 15 18 33

14.90 18.10

7 32 32 64

28.90 35.10

8 19 13 32

14.45 17.55

9 31 29 60

27.09 32.91

10 6 8 14

6.32 7.68

11 19 26 45

20.32 24.68

12 12 12 24

10.84 13.16

13 16 23 39

17.61 21.39

14 39 31 70

31.61 38.39

15 22 39 61

27.54 33.46

16 10 23 33

14.90 18.10

17 4 12 16

7.22 8.78

18 32 28 60

27.09 32.91

19 19 30 49

22.12 26.88

20 11 14 25

11.29 13.71

Total 405 492 897

ChiSq = 0.941 + 0.774 +

0.486 + 0.400 +

0.206 + 0.170 +

0.011 + 0.009 +

0.010 + 0.008 +

0.001 + 0.001 +

0.333 + 0.274 +

1.434 + 1.180 +

0.564 + 0.464 +

0.016 + 0.013 +

0.085 + 0.070 +

0.125 + 0.103 +

0.147 + 0.121 +

1.730 + 1.424 +

1.115 + 0.918 +

1.611 + 1.326 +

1.439 + 1.184 +

0.890 + 0.732 +

0.441 + 0.363 +

0.007 + 0.006 = 21.137

df = 19

P-value=.3292955673

Assuming that the actual difference between the likelihood of obtaining an answer right and guessing of the two sexes is zero we would only obtain a sample with a difference as extreme as this 33% of the time. Therefore there is not sufficient evidence to disprove the equal likelihood of both sexes to obtain an answer right and with a guess.

Table#5: Wrong and Knew the Answer

Chi-Squared #4: Wrong but Confident

MTB > chis C11,C12

Expected counts are printed below observed counts

mwat fwat Total

1 7 1 8

5.04 2.96

2 10 9 19

11.96 7.04

3 1 2 3

1.89 1.11

4 8 2 10

6.29 3.71

5 24 7 31

19.51 11.49

6 17 15 32

20.14 11.86

7 4 1 5

3.15 1.85

8 11 8 19

11.96 7.04

9 11 9 20

12.59 7.41

10 36 34 70

44.06 25.94

11 9 5 14

8.81 5.19

12 24 11 35

22.03 12.97

13 27 26 53

33.36 19.64

14 5 2 7

4.41 2.59

15 18 11 29

18.25 10.75

16 34 16 50

31.47 18.53

17 12 2 14

8.81 5.19

18 10 2 12

7.55 4.45

19 27 14 41

25.81 15.19

20 21 9 30

18.88 11.12

Total 316 186 502

ChiSq = 0.766 + 1.302 +

0.321 + 0.546 +

0.418 + 0.710 +

0.462 + 0.785 +

1.031 + 1.752 +

0.491 + 0.833 +

0.231 + 0.392 +

0.077 + 0.131 +

0.201 + 0.341 +

1.476 + 2.507 +

0.004 + 0.007 +

0.176 + 0.299 +

1.213 + 2.061 +

0.080 + 0.136 +

0.004 + 0.006 +

0.203 + 0.344 +

1.153 + 1.958 +

0.792 + 1.346 +

0.055 + 0.093 +

0.237 + 0.403 = 25.342

df = 19

9 cells with expected counts less than 5.0

P-value= .1495788791

Assuming that the actual difference between the likelihood of obtaining an answer wrong and being confident of the two sexes is zero we would only obtain a sample with a difference as extreme as this 15% of the time. Therefore there is not sufficient evidence to disprove the equal likelihood of both sexes to obtain an answer wrong with confidence.

Table#6: Wrong but Educated Guess

Chi-Squared #5: Wrong but Educated Guess

MTB > chisC11,C12

Expected counts are printed below observed counts

mwbt fwbt Total

1 10 8 18

9.23 8.77

2 17 16 33

16.92 16.08

3 7 11 18

9.23 8.77

4 30 32 62

31.79 30.21

5 54 53 107

54.86 52.14

6 34 43 77

39.48 37.52

7 15 13 28

14.35 13.65

8 34 25 59

30.25 28.75

9 32 44 76

38.96 37.04

10 35 38 73

37.42 35.58

11 20 23 43

22.04 20.96

12 40 29 69

35.37 33.63

13 37 33 70

35.89 34.11

14 24 8 32

16.41 15.59

15 40 33 73

37.42 35.58

16 48 53 101

51.78 49.22

17 36 31 67

34.35 32.65

18 29 22 51

26.15 24.85

19 39 40 79

40.50 38.50

20 26 22 48

24.61 23.39

Total 607 577 1184

ChiSq = 0.065 + 0.068 +

0.000 + 0.000 +

0.538 + 0.566 +

0.100 + 0.106 +

0.013 + 0.014 +

0.759 + 0.799 +

0.029 + 0.031 +

0.466 + 0.490 +

1.244 + 1.309 +

0.157 + 0.165 +

0.190 + 0.200 +

0.605 + 0.636 +

0.035 + 0.036 +

3.516 + 3.699 +

0.177 + 0.186 +

0.276 + 0.290 +

0.079 + 0.084 +

0.312 + 0.328 +

0.056 + 0.059 +

0.079 + 0.083 = 17.842

df = 19

P-value=.53295

Assuming that the actual difference between the likelihood of obtaining an answer wrong and guessing of the two sexes is zero we would only obtain a sample with a difference as extreme as this 53.3% of the time. Therefore there is not sufficient evidence to disprove the equal likelihood of both sexes to obtain an answer right and by guessing.

Table#7: Wrong and Guessed

Chi-Squared #6: Wrong and Guessed

MTB > chis C11, C12

Expected counts are printed below observed counts

mwct fwct Total

1 22 16 38

17.56 20.44

2 54 54 108

49.89 58.11

3 24 26 50

23.10 26.90

4 64 71 135

62.37 72.63

5 45 53 98

45.27 52.73

6 22 33 55

25.41 29.59

7 47 84 131

60.52 70.48

8 71 110 181

83.62 97.38

9 51 49 100

46.20 53.80

10 14 12 26

12.01 13.99

11 61 65 126

58.21 67.79

12 34 31 65

30.03 34.97

13 43 31 74

34.19 39.81

14 73 110 183

84.54 98.46

15 60 53 113

52.20 60.80

16 25 41 66

30.49 35.51

17 108 107 215

99.33 115.67

18 69 77 146

67.45 78.55

19 35 55 90

41.58 48.42

20 26 26 52

24.02 27.98

Total 948 1104 2052

ChiSq = 1.125 + 0.966 +

0.338 + 0.290 +

0.035 + 0.030 +

0.043 + 0.037 +

0.002 + 0.001 +

0.457 + 0.393 +

3.021 + 2.594 +

1.905 + 1.635 +

0.499 + 0.428 +

0.329 + 0.283 +

0.134 + 0.115 +

0.525 + 0.451 +

2.272 + 1.951 +

1.576 + 1.354 +

1.164 + 1.000 +

0.989 + 0.849 +

0.757 + 0.650 +

0.036 + 0.031 +

1.041 + 0.894 +

0.163 + 0.140 = 30.500

df = 19

P-value=.0457736686

Assuming that the actual difference between the likelihood of obtaining an answer wrong and guessing of the two sexes is zero we would only obtain a sample with a difference as extreme as this 4.587% of the time. Therefore there is some evidence to support that there is an actual difference between the obtaining a wrong answer and guessing and being female or male.

Key

**In the tables, the first letter refers to the gender. The second letter refers to the correctness of the answer(r for right, w for wrong). The third refers to the confidence level (a for knew the answer, b for educated guess, c for guess). The last refers to the class period or the total number of students.V. Conclusions**

The outcome of our experiment does not support our hypothesis, which states that females are better able to recall information not stored in the conscious mind.

There is no data shown in the experiment significant enough to prove that females are better able to recall information subliminally. However, it did prove that females have the capability to perform as well as the male population on recalling the subconscious memory.

But, our data proved that males are better at recalling the learned information and are more confident in their answers than females since there are many more males had answers in the “right and knew the answer” category than females. Also, there are a significant amount of males believed that they had the right answer even though the result was the opposite. Females tend to doubt their answers more than males because even when their answers were correct, most of the answers would go under the “right and educated guess” or “right but guessed” categories.

Also, females tend to guess the wrong answers more often than males do. This is supported by the data in our “wrong and guessed” category. The result may mislead many individuals to believe that the male population is superior over the female population. However, that is not the case. According to our data, guys do have an advantage on guessing the right answer over the female population.

Overall, from this experiment the following conclusions can be made:

* Both sexes have the capability to perform as well as the other on materials they have encountered at least once in their high school career.
* Males are more confident in their performance than females.
* Males have the advantage to guess the correct answers more frequently than females.

Even though the outcome of this experiment were not what we have expected, the results did open up more opportunities for future experimentation for related fields such as studying memory, behavior or confidence between different sexes.

**VI. Recommendations**

* Plan out every step of the experiment and remember to stay on time and do not procrastinate.
* Consider all factors that may produce bias within the results including the sample size, time of day, and even the wording of the questions.
* Conduct an extensive research to ensure a plausible experiment with likely significance.
* Contact teachers early if a survey and the cooperation of teachers and students are required. Make sure to pick a day in which all teachers can agree to, so that the surveys will be done within a day.
* Always have experimental classes and leave more time between the experimental class and the actual day of testing all classes, to have sufficient time to confer with other teachers and to revise the survey.

**Literature Sited**

1. Rogers, Lesley. Sexing the Brain. Columbia University Press: New York, 2001.
2. Scientific American. Book of the Brain. The Lyons Press: New York, 1999.
3. Carter, Rita. Mapping the Mind. University of California Press: Berkeley and Los Angeles, California, 1998.
4. Campbell, Dr. Anne. The Opposite Sex. Salem House Publishers: Massachusetts, 1989.

5. A Perigee Book. The Brain, A User’s Manual. G.P. Putnam’s Sons: New York. 1982.

**References**

Chadwick, Peter, Schizophrenia – the Positive Perspective. Routledge: London, 1997.

Connell, R.W. Gender and Power: Society, the Person, and Sexual Politics. Sanford University Press: CA, 1987.

Gazzaniga, Michael S. Nature’s Mind: The biological Roots of Thinking, Emotions, Sexuality, Language and Intelligence. Penguin Books: Harmondsworth, 1992.

Hutt, C. Males and Females. Penguin: Harmondsworth, Eng, 1972.

Kimura, D. Sex Differences in the Brain. Scientific American 267: Sept 1992.

LeDoux, Joseph, The Emotional Brain. Simon and Schuster, New York, 1996.

Lloyd, B. and Archer, J. Exploring Sex Differences. Academic Press: London, 1976.

Moir, A. and Jessel, D. Brainsex: The Real Difference Between Men and Women. Dell Books: New York, 1993.

Nisbett, Richard, and Wilson, Thimothy, ‘Telling more than we can know – verbal reports on mental processes’, Psychological Review, 1977.

Pinker, S. How the Mind Works. Norton: New York, 1997.

Restack, Richard, Brainscapes: An Introduction to What Neuroscience Has Learned About the Structure, Function and Ability. Hyperion: New York, 1995.

Ridley, M, The Red Queen: Sex and the Evolution of Human Nature. Penguin: New York, 1994.

Rose, Steven. The making of Memory: From Molecules to Mind. Bantam Press: London, 1993.

Sayers, J. Biological Politics: Feminist and Anti-Feminist Perspectives. Tavistock: London, 1982.

Springer, Sally P and Deutsch, Deorg. Left Brain/Right Brain. W.H. Freeman: New York, 1993.

**Appendices**

1. Statistical Analysis

Analysis #1: Right

MTB > Describe 'mrat' 'frat' 'mrbt' 'frbt' 'mrct' 'frct'.

N MEAN MEDIAN TRMEAN STDEV SEMEAN

mrat 20 26.40 22.50 25.67 18.92 4.23

frat 20 15.85 10.00 14.72 15.50 3.47

mrbt 20 21.20 18.50 20.33 12.03 2.69

frbt 20 24.80 22.00 23.78 14.13 3.16

mrct 20 20.25 19.00 20.11 9.93 2.22

frct 20 24.60 24.50 24.11 10.78 2.41

MIN MAX Q1 Q3

mrat 4.00 62.00 9.00 39.75

frat 2.00 50.00 3.25 28.25

mrbt 3.00 55.00 15.25 22.75

frbt 3.00 65.00 15.25 29.50

mrct 4.00 39.00 12.25 30.00

frct 8.00 50.00 14.25 31.75

Analysis #2: Wrong

MTB > Describe 'mwat' 'fwat' 'mwbt' 'fwbt' 'mwct' 'fwct'.

N MEAN MEDIAN TRMEAN STDEV SEMEAN

mwat 20 15.80 11.50 15.50 10.12 2.26

fwat 20 9.30 8.50 8.39 8.66 1.94

mwbt 20 30.35 33.00 30.33 12.14 2.71

fwbt 20 28.85 30.00 28.67 13.77 3.08

mwct 20 47.40 46.00 45.89 23.28 5.21

fwct 20 55.20 53.00 54.56 30.23 6.76

MIN MAX Q1 Q3

mwat 1.00 36.00 8.25 24.00

fwat 1.00 34.00 2.00 13.25

mwbt 7.00 54.00 21.00 38.50

fwbt 8.00 53.00 17.50 39.50

mwct 14.00 108.00 25.25 63.25

fwct 12.00 110.00 31.00 75.50III. Daily Log

Sept & Oct:  
Mr. Thiel introduced the project requirements for AP Biology class to the students.

We brainstormed ideas for a possible topic.

Oct 23

We looked through lists of old projects online and made a list of interests, which also included our own ideas, one of which was brought up by our AP US History teacher Mrs. Wohlgemuth. Mrs. Wohlgemuth’s story of girls’ first guesses are usually right led to question of “Does gender affect instinct?”

Oct 24

We talked to Mr. Thiel about the topic of our project and changed it from instinct to subconsciousness. We talked about other factors that can influence our data and learned a few techniques to eliminate bias in our experiment.

Oct 26

We confirmed with Mr. Thiel the topic of concern for our project.

We also talked to Mrs. Nash and Ms. Ochsenfeld, both of whom suggested the use of the Minitab program.

Nov. 9

During the morning we searched the web for any library books or sites of use. We went to the library from 2:00p.m. ---5:00p.m. We research numerous books and websites to come up with our hypothesis and prediction. Later, we checked out several books related to brains and memory.

Nov. 20

We confirmed with Mr. Thiel our hypothesis and prediction.

Dec. 3

We thought of possible needed material and discovered we needed only willing subjects and a unbiased survey. We also developed our experimental design.

Dec. 29-30

We went over old materials such as homework, notes, and tests from previous years at Fan’s house from 10:00a.m. —5:00p.m. and designed a rough draft for our survey.

Jan. 7

We showed our survey to Mr. Thiel and received additional suggestions

Jan 12-13

We revised the survey and went online to conduct more research for our topic

Feb.2-3

We obtained TVSEF forms from the internet and read the instructions and requirements. WE also printed our permission slips and filled out eh required forms.

Feb. 4

Mr. Thiel signed our field trip permission slips in order to get out of our classes so that we could conduct our survey. We also talked to Mrs. Cohn and Mr. Campbell concerning the survey and both teachers cooperated and agreed.

Feb.5-7

We contacted the rest of the teachers: Mrs. Elewski, Mr. Bull, Mr. Ladd, and Mr. Blanton about the survey. Fortunately we were about to reach all teachers and obtain approval by all except Mr. Blanton who we were unable to contact.

Feb. 12

We distributed permission slips to the teachers for them t pass out to the students.

Feb. 25

WE printed out a class size of our preliminary surveys

Feb. 26

We collected permission slops from the experimental class and distributed the preliminary surveys to that class. Afterwards we also talked to the students and received some feedback. We also visited Mr. Thiel and Mrs. Nash to see if they had anymore input. We revised the survey that night and printed enough copies for the next day.

Feb. 27

We collected the rest of the permission slips from the students and conducted the actual survey. We gave the same speech to each class and took care to wear dull clothing to avoid distractions.

March 4

We conducted the survey for Blanton’s class on the only day available to us. WE also conferred with Mrs. Nash and Ms. Ochsenfeld about Minitab and ways to analyze our data.

March 5-10

We corrected the papers and produced tallies for our data.

March. 8

We went online and checked the requirements for packets and the display board and we also analyzed our data with Minitab.

March 17-18

Typed up the write up packet and bought he board

March19

Completed both the written work and the display board.

II Selected Graphs, Etc (attachments)