The ability to store, retain, and later recall information is termed memory. Memories fall into two different classes. **Explicit**, or declarative, memory encompasses the information that an individual can verbally communicate to themselves and others. **Implicit** memory is the retention and reproduction of motor skills. In the first part of this lab you will test an Implicit motor skill by tracing stars while looking in a mirror. You would expect to get better as you practice a new skill. What you might not expect is that the skill you learn with one hand can transfer to the other hand. This phenomenon is called Transfer of Learning. This ‘transfer of learning’ can occur even though one hand has not practiced the skill. In the second set of exercises you will determine if males or females excel in two different Explicit memory tasks. One task particularly addresses a part of your brain responsible for remembering facial characteristics. The other test involves the activation of your visual language abilities in a different portion of the brain.

As you answer questions for this lab use terms and concepts learned in this unit.

**Research Question**

Can learning be transferred through the brain from one region to another?

Is there a gender difference in explicit memory abilities?

**Protocol**

Read through the entire protocol and then make a flow chart of the lab. Have the flow chart checked before you begin any part of the lab. Add extra paper if needed.

**Activity 1 - Implicit Memory**

**Part 1) Motor Memory and Transfer**

1. Place a star trace blank on the mirror trace stand beneath the ‘blind’. Position the star so that you can see the reflection in the mirror but not the actual star sheet on the base of the apparatus.
2. Use your dominant hand. Place your pen on the dot at the end of one of the star’s arms. Have your partner start the stopwatch and time you for one minute.
3. As soon as your partner starts timing move your pen between the two outlines of the star. Go back to where you left the outline if your pen goes outside of the outline. Do not lift your pen from the surface of the paper at any time during the trial.
4. At the end of one minute put your pen down.
5. Score errors each trial as follows:
   - 1 error each time your pen tracing touches a line
   - 1 error each time your pen crosses over a line (both out and back into the figure)
   - 1 error each time your line is broken (you lifted the pen)
6. Count up your errors and record on the star sheet along with the fraction of the star completed during the one minute (each side of an arm is 1/10 of the total star).
7. Calculate your score for a trial by taking the number of errors multiplied by the inverse of the fraction of the star completed. (Ex.: You count up 25 errors and completed 7/10 of the star, your score is 25 x 10/7 = 33.2 (round to the nearest tenth). Record your score.
8. Do another trial with the opposite (non-dominant, or ‘off’) hand and score.
Lab 1-2

9) Do three more trials with the dominant hand. (five stars total for the first day) Score and plot results. Use LoggerPro for graphing.
10) Do four trials each day for the next three days with your dominant hand (total of 12 trials). Record and graph each day’s trial.
11) On the last day do one trial with your ‘off” (non-dominant) hand score, record and plot results. (18 total stars are required)

Answer Stop questions #1-3 before continuing

Activity 2 - Explicit Memory

Part 2) Short Term Memory
Go to the following URL’s and take the memory tests. Record your results on the data sheet and on the class data at the front of the room. (Do this one at home.)
http://faculty.washington.edu/chudler/stm0.html (short term letter memory test)
http://faculty.washington.edu/chudler/java/facemem.html (short term face memory test)

Answer Stop questions #4-7 before continuing

Flow Chart
Lab 1-2 Memory
Data

Name __________________
Trial Date ______________
Errors ____ Complete __/__
Score ______

Name __________________
Trial Date ______________
Errors ____ Complete __/__
Score ______

Name __________________
Trial Date ______________
Errors ____ Complete __/__
Score ______

Name __________________
Trial Date ______________
Errors ____ Complete __/__
Score ______

Name __________________
Trial Date ______________
Errors ____ Complete __/__
Score ______

Name __________________
Trial Date ______________
Errors ____ Complete __/__
Score ______

Name __________________
Trial Date ______________
Errors ____ Complete __/__
Score ______

Name __________________
Trial Date ______________
Errors ____ Complete __/__
Score ______

Name __________________
Trial Date ______________
Errors ____ Complete __/__
Score ______
Lab 1-2

Name __________________  
Trial Date ______________  
Errors ____ Complete __/__  
Score _______  

Name __________________  
Trial Date ______________  
Errors ____ Complete __/__  
Score _______  

Name __________________  
Trial Date ______________  
Errors ____ Complete __/__  
Score _______  

Name __________________  
Trial Date ______________  
Errors ____ Complete __/__  
Score _______  

Name __________________  
Trial Date ______________  
Errors ____ Complete __/__  
Score _______  

Name __________________  
Trial Date ______________  
Errors ____ Complete __/__  
Score _______  

Name __________________  
Trial Date ______________  
Errors ____ Complete __/__  
Score _______  

Name __________________  
Trial Date ______________  
Errors ____ Complete __/__  
Score _______
## Data Table 1-2.1 Motor Memory

<table>
<thead>
<tr>
<th>Day</th>
<th>Dominant Hand Score</th>
<th>Non-dominant Hand Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>1 2 3 4 average</td>
<td>1</td>
</tr>
<tr>
<td>Two</td>
<td>1 2 3 4 average</td>
<td>No data</td>
</tr>
<tr>
<td>Three</td>
<td>1 2 3 4 average</td>
<td>No data</td>
</tr>
<tr>
<td>Four</td>
<td>1 2 3 4 average</td>
<td>1</td>
</tr>
</tbody>
</table>

Star Trace Data Graph (from LoggerPro)
### Short Term Letter Memory

<table>
<thead>
<tr>
<th>Trial #</th>
<th>The letters I remember are:</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average # remembered:

### Short Term Face Memory

<table>
<thead>
<tr>
<th>Trial #</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Average

### Explicit Memory Class Data

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Letter Memory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(average)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Face Memory</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(average)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Explicit Memory Gender Comparison Histogram

# of students

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Letter Memory</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Face Memory</strong></td>
<td></td>
</tr>
</tbody>
</table>
Stop Questions

1) Define: implicit memory

2) Why didn't we do trials with your 'off' hand on days two and three?

3) What is meant by memory transfer?

4) Define: explicit memory

5) How long do short term memories typically last?

6) How many 'registers' hold short term memory?

7) Why would a person have different scores on the two types of explicit memory tests? (Use what you have learned in this unit about brain function to answer this question)

Analysis Questions

1) Which day of the implicit memory exercise showed the greatest rate of change from one trial to the next? Which day showed the most improvement over the previous day?

2) Which hand had the best initial score (dominant or ‘off’)? Why do you think this is the case?

3) Did your ‘off’ hand performance improve by the end of the experiment even though you did not practice with it?

4) Does there appear to be a gender difference in explicit memory tasks? Why do you think this occurred?
Conclusion

Memory is closely associated with learning. Outline a process by which you could improve explicit memory. Then outline a process by which you could improve implicit memory. Be sure that you understand the difference between the two memory types before you design your process.

Explicit

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Implicit

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________