

Measuring the Magnitude of the Müller-Lyer Illusion

Subject's Task

You will see two horizontal lines. Your task is to adjust the length of one of the lines (the "Variable" or "Comparison" stimulus) until it *looks* the same length as the other line (the "Standard" stimulus).

"Null Matching" (aka "Method of Adjustment")

The task of adjusting one stimulus until it looks (tastes, sounds, etc.) identical to another stimulus is the *null matching* procedure. Measurements made using null matches are the "gold standard" of scientific research. Null matches are the fundamental measurement process in science. There is an additional reading and a Good Faith Effort Assignment on null matching.

POE and PSE

There are two different ways that the variable and standard stimuli can be the "same" length.

The length of the variable stimulus that is the same length as the standard stimulus--as measured by a ruler--is called the "Point of Objective Equality" or the POE.

The "Point of Subjective Equality" (PSE) is the length of the variable stimulus that *looks* the same length as the standard stimulus.

The Müller-Lyer illusion is an illusion because the PSE is not the same value as the POE. The magnitude of the illusion describes how different these two values are. It isn't unusual to find the PSE is 25% larger or smaller than the POE. Whether it is larger or smaller depends on which part of the illusion figure is set to be the variable and which is set to be the standard.

Training Trials

The first task is a training task where you learn how to adjust the length of the variable stimulus. The stimuli you are adjusting are plain lines with no ends.

You may be assigned to a condition where the variable stimulus can only be adjusted one way (made longer *or* made shorter). If so, be very careful not to "over shoot" the length that looks equal. You will not be able to correct the overshoot.

Because there is no illusion with plain lines, the PSE and the POE should be the same value. That is, we expect subjects to set the variable stimulus to the same length as the standard stimulus.

Each time you complete the Training Trials you will be told whether or not your mean setting (PSE) was close enough to the POE to be considered the same length (within what is known as sampling error which is similar to "margin of error").

You may be asked to repeat the training trials until your mean setting demonstrates you can set the two lines to be equally long.

Practice Trials

On practice trials the stimuli have ends that are vertical lines. Again you are to adjust the length of the variable stimulus until it *looks* the same length as the standard stimulus.

Illusion Trials

On these trials you are asked to set the lines to *look* equally long using the Müller-Lyer Illusion stimuli.

Reversed Illusion Trials

The stimulus conditions are the same except the standard and variable stimulus or switched. Now the variable stimulus has the "inward pointing" arrowheads and the standard stimulus has the "outward pointing".

Compensation Trials

Complete these trials using the illusion figure except try to ignore the effect of the illusion and set the variable stimulus so it is the same length as the standard stimulus. Your task on the compensate trials is to attempt to make your setting be the POE rather than the PSE.

Using the Software

- Launch the "Muller-Lyer" application.
- Click on the "Next" button to go to the "*Experimenter Controls*" card (aka "screen").
- Uncheck the "**Lock Controls**" box.
- The controls will set automatically when you use the "**Task**" popup menu. You can refer to Table 1 to double-check the settings for each kind of task.
- After you have chosen the task, click on the "**Collect Data**" button.
- After reading directions click on the "**Begin**" button to start.
- Click the "**Next Trial**" button to Start/End each trial.
- When all the trials are completed, click on the "**OK**" button. You will be returned to the "*Experimenter Controls*" card.

Table 1. Control Settings for each of the sets of trials.

| Parameter | Type of Trial | | | | |
|-------------------------|---|---|---|---|---|
| | Training | Practice | Illusion | Verticals | Compensate |
| Series | 1 | 2 | 3 | 4 | 5 |
| Task | "Training" | "Practice" | "Illusion" | "Verticals" | "Illusion" |
| Figure Ends | "None" --- vs --- | "Vertical" -- vs -- | "Illusion" < -- > vs > -- < | "Vertical" -- vs -- | "Illusion" < -- > vs > -- < |
| STD length | 130 Pixels |
| Side of VAR | Random | Random | Random | Random | Random |
| Number of Trials | 20 | 20 | 20 | 20 | 20 |
| Form of Illusion | <input type="checkbox"/> <input type="checkbox"/> Classic <input type="checkbox"/> <input type="checkbox"/> Reversed | <input type="checkbox"/> <input type="checkbox"/> Classic <input type="checkbox"/> <input type="checkbox"/> Reversed | <input type="checkbox"/> <input type="checkbox"/> Classic <input type="checkbox"/> <input type="checkbox"/> Reversed | <input type="checkbox"/> <input type="checkbox"/> Classic <input type="checkbox"/> <input type="checkbox"/> Reversed | <input type="checkbox"/> <input type="checkbox"/> Classic <input type="checkbox"/> <input type="checkbox"/> Reversed |
| Stimulus Configuration | <input type="checkbox"/> <input type="checkbox"/> Side by Side <input type="checkbox"/> <input type="checkbox"/> Parallel | <input type="checkbox"/> <input type="checkbox"/> Side by Side <input type="checkbox"/> <input type="checkbox"/> Parallel | <input type="checkbox"/> <input type="checkbox"/> Side by Side <input type="checkbox"/> <input type="checkbox"/> Parallel | <input type="checkbox"/> <input type="checkbox"/> Side by Side <input type="checkbox"/> <input type="checkbox"/> Parallel | <input type="checkbox"/> <input type="checkbox"/> Side by Side <input type="checkbox"/> <input type="checkbox"/> Parallel |
| ITI (Seconds) | 5 | 5 | 5 | 5 | 5 |
| Response Option | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unidirectional <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Bidirectional | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unidirectional <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Bidirectional | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unidirectional <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Bidirectional | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unidirectional <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Bidirectional | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Unidirectional <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Bidirectional |
| Training Task | Yes (Check Mark) | No (Unchecked) | No (Unchecked) | No (Unchecked) | No (Unchecked) |
| Present Instructions... | Yes (Check Mark) | No (Unchecked) | No (Unchecked) | No (Unchecked) | No (Unchecked) |
| Show Limits Fields | No (Unchecked) | No (Unchecked) | No (Unchecked) | No (Unchecked) | No (Unchecked) |

Working with the Results: Calculations, Printing, Saving as a file.

- Click on the "**Calculate**" button. Do **** NOT **** click the "**Clear**" Button.
- Enter your first and last names. Click "**OK**"
- A new screen appears: "*Müller-Lyer Illusion*" Task Results. It may be hidden behind the "*Experimenter Controls*" screen.
- Click on the "**print**" button to print the results.
- Click on the "**Copy**" icon (a paperclip) if you want to paste the data into another document.
- Click "**Save Data to File**" in you want to save the results. A complete listing of the conditions and results are saved to a text file (can be opened by any word processor).

Your Name: _____

Lab Date: _____

Summary Table for the Results of the Müller-Lyer Illusion Task

Record the PSE, estimate of sigma, number of trials and value of t for each set of Training Trials you complete.

Table 1. Results of Training Trials (you may not be required to do extra training trials)

| Measure | Training 1 | Training 2 | Training 3 | Training 4 | Training 5 |
|---|------------|------------|------------|------------|------------|
| Value of PSE (Mean Setting) (2 decimals) | | | | | |
| Est. Sigma (4 decimals) | | | | | |
| Number of Trials | | | | | |
| t-value | | | | | |

Table 2. Results of the 5 tasks.

| Task | Practice | Illusion | Illusion | Compensate | Verticals |
|---|----------|----------|----------|------------|-----------|
| Value of POE (pixels) | | | | | |
| Value of PSE (Mean Setting) (2 decimals) | | | | | |
| Est. Sigma (4 decimals) | | | | | |
| Number of Trials | | | | | |
| t- value | | | | | |
| Statistical Decision | | | | | |
| What Is the Expected Mean Setting? | | | | | |
| PSE = POE? | | | | | |

Your Name: _____

Lab Date: _____

Interpret the Following Müller-Lyer Lab Results (Page 1 of 2)

With 20 trials there is evidence to reject the "No difference" statistical hypothesis whenever the t-value is more different from 0.00 than ± 2.093 for a Type-I error rate of 0.05. If you **reject** the "No difference" hypothesis you are concluding the mean setting of the comparison stimulus is reliably different from the length of the standard stimulus. If you **do not** reject the "No difference" hypothesis, you are concluding the difference in the lengths is not reliable.

Series 1: Training Task

If you are told to repeat the training task ("Statistical Decision: Reject Ho") then there is evidence the PSE and POE values are different from one another.

Give three reasons why this result might have occurred.

1. The measurement procedure is flawed in some manner.
2. There is a legitimate illusory effect even when "plain" lines are matched.
- 3.

When you successfully complete the training task ("Statistical Decision: Do Not Reject Ho") then there is **NO** evidence to conclude PSE and POE differ.

Series 2: Practice Task

1. Is there evidence the values of POE and PSE differ.

2. Compare the mean setting (PSE) of the Training & Practice Tasks. Do you believe, there is evidence the two mean PSEs differ? At the moment you do not have any objective means to reach a conclusion so it is your best guess.

Series 3: Illusion Task

1. Is there evidence the values of POE and PSE differ.

2. Compare the mean setting (PSE) of the Training & Illusion Tasks. Do you believe, there is evidence the two mean PSEs differ? At the moment you do not have any objective means to reach a conclusion so it is your best guess.

3. Compare the mean setting (PSE) of the Practice & Illusion Tasks. Again, there is no objective means to reach the conclusion at this point in the course.

Interpret the Following Müller-Lyer Lab Results (Page 2 of 2)

Series 4: Vertical-Ends Task

1. Is there evidence the values of POE and PSE differ.
2. Compare the mean setting (PSE) of the Training & Vertical-Ends Tasks. Do you believe, there is evidence the two mean PSEs differ? At the moment you do not have any objective means to reach a conclusion so it is your best guess.
3. Compare the mean setting (PSE) of the Practice & Vertical_Ends Tasks. Again, there is no objective means to reach the conclusion at this point in the course.

Series 5: Compensate Task

1. Is there evidence the values of POE and PSE differ.
2. Compare the mean setting (PSE) of the Compensate & Illusion Tasks. Do you believe, there is evidence the two mean PSEs differ? At the moment you do not have any objective means to reach a conclusion so it is your best guess.