

BSL PRO Lesson H30: The Stroop Effect

BLUE BLUE XXXXX
Examples of Stimuli Presentation

Abstract: Studies of interference in serial verbal reactions

The "**Stroop Effect**" is named after J. Ridley Stroop, who noticed that two functions could form an association with each other in a way that interferes with other related functions and that such inhibitory effects could be seen while reading. Stroop reported his findings in his Ph.D. thesis, published in 1935.

If the word "red" is printed in blue ink how will the interference of the ink-color "blue" upon reading the printed word "red" compare with the interference of the printed word "red" upon calling the name of the ink-color "blue?" The increase in time for reacting to words caused by the presence of conflicting color stimuli is taken as the measure of the interference of color stimuli upon reading words. The increase in the time for reacting to colors caused by the presence of conflicting word stimuli is taken as the measure of the interference of word stimuli upon naming colors. (p. 646-647)

—Stroop, J.R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18, 643-662.

Using this observation, Stroop proposed to study the strength of interference between two associative tasks: naming and reading. He proposed that this measure may correlate with the strength of the association between related functions. Stroop described the associations as follows:

RCNd Reading color names where the color of the print and the word are different

RCNb Reading color names printed in black

NC Naming colors

NCWd Naming color where the color of the print and the word are different

Although the original experiment used 70 subjects, the "Stroop Effect" is strong enough that it can be shown with only a single subject. For the purposes of computer presentation, some adaptations have been made to the original experiment.

Acknowledgements: Portions adapted with permission from Cedrus Corporation.

References: The following web site and publications offer further information about the **Stroop Effect**:

Classics in the History of Psychology (developed by Christopher Green, York University, Toronto, Ontario)
<http://psychclassics.yorku.ca/Stroop/>




Bower, B. (1992, May 9). Brother Stroop's enduring effect: A mental task devised nearly 60 years ago still intrigues psychologists. *Science News*, 141, 312-314.

MacLeod, Colin M. (1991). Half a century of research on the Stroop effect: An Integrative approach. *Psychological Bulletin*, 109:2, 163-203.

Objectives

1. To measure and compare strength of interference between two associative tasks: naming and reading.
 - a. To measure and compare reaction time for the effect of word and visual interference.
 - b. To measure, compare, and correlate the interference of color stimuli upon reading words.
 - c. To measure, compare, and correlate the interference of word stimuli upon naming colors.

Equipment

- Two computers (at least one must be a PC running Windows; see [Hardware Note](#) for details).
- BIOPAC [BSL System](#) with MP36/35/30 Data Acquisition Unit and Biopac Student Lab *PRO* software
 - MP35: Graph Template file [h30_mp35.gtl](#) or equivalent file settings defined in [h30_mp35_gtl settings](#) 
 - MP30: Graph Template file [h30.gtl](#) or equivalent file settings defined in [h30_gtl settings](#) 
 - [H30 Lab Report](#) 
- BIOPAC Hand Switch ([SS10L](#))
- Stimulus Presentation System
 - SuperLab™ System for BSL ([STP35W](#) for MP35 or [STP30W](#) for MP30)
 - If you have SuperLab™, use the isolated digital interface to BSL ([STP35](#) to MP35 or [STP30](#) to MP30)
- Visual Stimuli—use the SuperLab™ files included in the H30 downloads
 - For SuperLab 4 (.sl4 format): [h30_sl4](#)
 - For earlier versions of SuperLab (.xpt format): [h30_xpt.zip](#) for Windows, [h30.hqx](#) for Mac.
- Flat Head Screwdriver

Setup

Hardware

NOTE: Second computer required - The synchronization signal(s) coming from the STP35 can be directed to an MP System running on a Macintosh or PC, but it's not possible to run the STP35 on the same computer as the MP System. The STP35 requires that the SuperLab™ software and a Digital I/O card (PCI slot required) be placed on a second computer running Windows 95 or later.

MP35 Connections



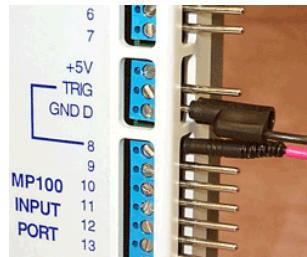
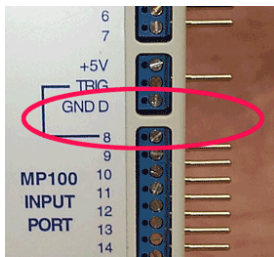
Connect STP35 to the I/O port



Hardware setup with the main computer

1. Connect **STP35** cable to the I/O port of the rear of the MP35 unit and connect the other side of the cable into the Digital I/O card on the second computer where SuperLab™ software is placed (vs. the computer that is running the BSL *PRO* software).
2. Plug the **Hand Switch** (SS10L) into "CH 1."

MP30 Connections



Loosen pins from GND D and 8

Plug the SS44L into the STP30

Hardware setup with the main computer

1. Use a flat head screwdriver to loosen the pins from **GND D** and **Input Port 8** on STP30.
2. Turn 1- 1½ times to loosen the screws. (You do not need to remove the screws.)
3. Plug the signal pins from the interface cable (SS44L) into the STP30:
Black - GND D
Red - Input Port 8
4. Make sure that the signal pins are well set and then tighten the screws.
5. Plug the **SS44L** Smart Sensor into "CH1" on the front of the MP30 unit.
6. Plug the **Hand Switch** (SS10L) into "CH 2."
7. Plug a ribbon cable into the **STP30** and connect the other side of the ribbon cable into the Digital I/O card on the second computer where SuperLab™ software is placed (vs. the computer that is running the BSL PRO software).

Software

BSL PRO:

1. Turn the **main computer on**.
2. Launch the **BSL PRO** software. (Record or analyze a lesson)
3. Choose the "BSL PRO Lessons" tab and select "H30 – Stroop Effect" from the menu. This will open the H30 graph template and Journal.

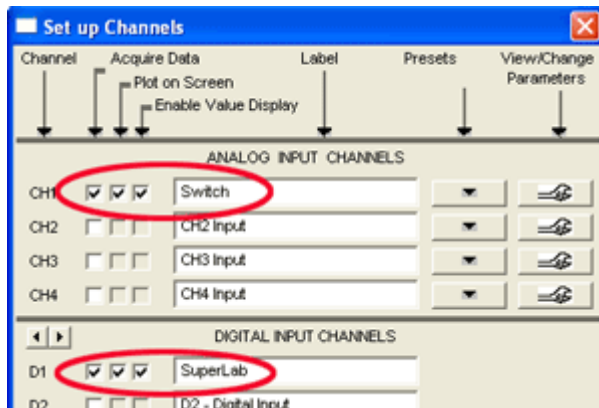
BSL 3.7x users: Open the Stroop Effect graph template file: Choose **File > Open** and set **Files of type:** **GraphTemplate (*.GTL)**.

- MP35 users: **h30_mp35.gtl**.

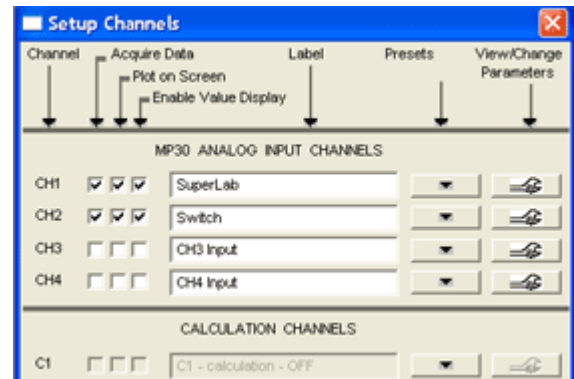
The template is set to display
 CH 1 Switch
 D1 SuperLab

- MP30 users: **h30.gtl**.

The template is set to display
 CH 1 SuperLab
 CH 2 Switch



Set up Channels from Stroop template for MP36/35



Set up Channels from Stroop template for MP30

SuperLab™:

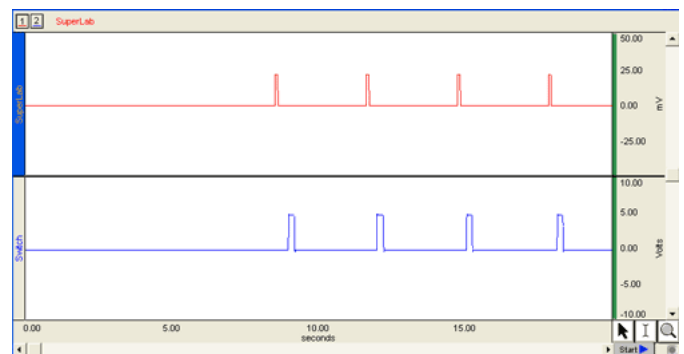
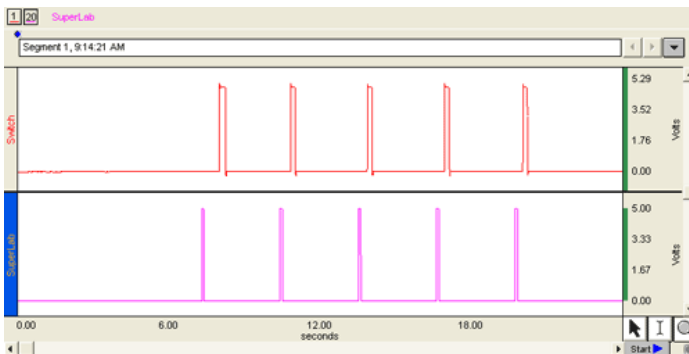
1. Turn the **second computer on**.

- Launch the SuperLab™ software.
- Open the test file: **H30 Test.sl4** or **Test.xpt** (included in the download folder).

Running the Experiment

Signal Check

- Position the subject approximately 2 feet directly in front of the computer monitor displaying SuperLab.
- Make sure the subject is relaxed.
- Choose "Run" from the "Experiment" menu (on the menu bar).
- In the "Run Experiment" window, click "Run"; you do not have to enter Subject's Name for the Signal Check.
 - H30 Test.sl4** will start displaying instructions.
 - Test.xpt.** will start displaying pictures.
- Click "Start" on the main computer to begin recording (this instruction is repeated on the first slide).
- Have the subject read the screen aloud and press the hand switch at the same time.
- When the slide show is complete, click "Stop" on the main computer to end recording.
- Review the data.
 - If you see signals on CH 1 and CH 20, as shown below, you are ready to run the experiment. If you do not see both signals, check all connections and repeat the Signal Check.



Signal Check (MP36/35, MP30) confirming that the switch was detected each time the screen changed

Experiment

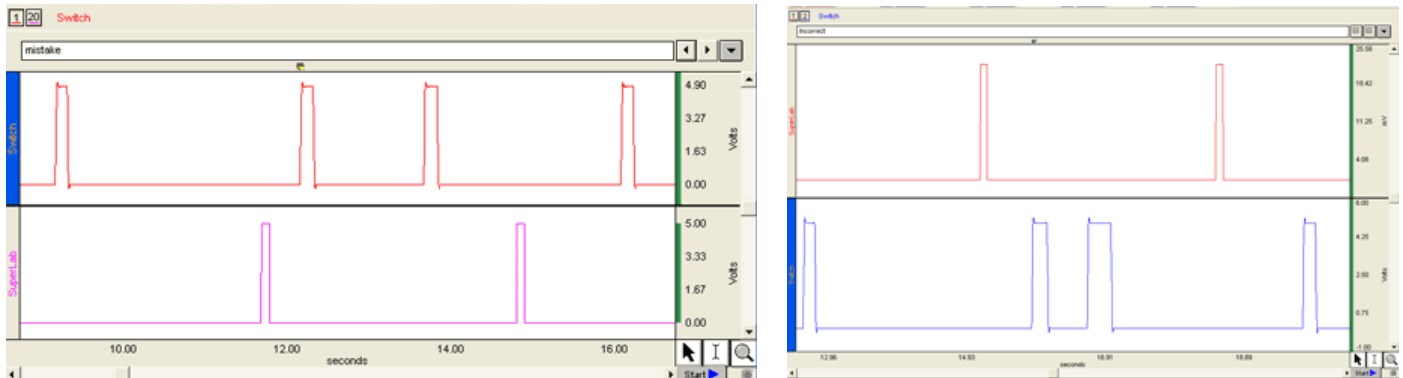
Overview & Hints for Good Data

- This experiment consists of two distinct trials, each with two segments.
 - SuperLab 4 uses one file with 4 segments** and users should manually insert a marker each time segment break instructions are displayed (instructions display for 5 seconds).
 - Previous SuperLab versions (.XPT format) use four separate files** as detailed in the following summary.

Experiment	XPT File	Sample	Principle	Subject must...
Trial 1-Segment 1	Word1.xpt	RED	RCNb color names printed in black ink	read the word
Trial 1-Segment 2	Word2.xpt	RED	RCNd color names printed in different colors	read the word
Trial 2-Segment 3	Color1.xpt	XXXXX	NC series of x's printed in different colors (removes the effect of word interference)	name the color
Trial 2-Segment 4	Color2.xpt	RED	NCWd color names printed in different colors	name the color

- The subject should read each word or name each color as quickly as possible and correct all errors before moving on.

- C. If the subject presses the switch with an incorrect answer, he/she should press the switch again when the answer is corrected.
- D. Recorder inserts markers to identify points where the subject presses the switch by mistake (i.e., if the subject reads the word instead of naming the color, insert a marker).



BSL Data with a marker inserted to indicate Subject's mistake—MP35, MP30

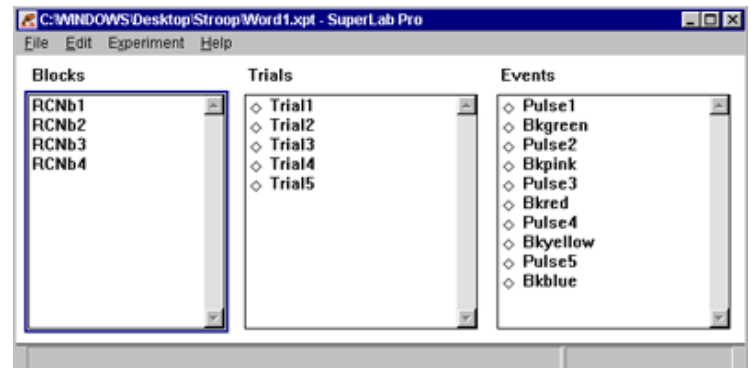
- E. Running a SuperLab™ presentation:
- o Each slide changes every 3 seconds and there are 20 slides in each trial.
 - o You can hit the "Esc" key to stop the presentation at any time.
 - o The presentation closes automatically at the end.

Procedure

1. Have the subject relax and sit in front of the computer monitor displaying SuperLab™.

2. Trial 1-Segment 1:

- a. Open the SuperLab presentation file.
 - SuperLab 4: open **Stroop Effect.sl4**
 - Previous versions: open **Word1.xpt**.
- b. Choose "Run" from the "Experiment" menu.
- c. Enter the subject's name.
- d. At the same time—click "Run" in SuperLab and click "Start" in BSL PRO.
- e. **The subject has to read the screen aloud and press the hand switch** at the same time.
- f. If using Word1.xpt: Click "Stop" to end the recording when SuperLab™ closes.



Opening Word1.xpt

3. Trial 1-Segment 2:

- a. SuperLab 4: insert a marker when the Segment 2 instructions are displayed.
 Previous versions: open **Word2.xpt**, then choose "Run" from the "Experiment" menu and enter the subject's name. Next, click "Run" and—at the same time—click "Start" in BSL PRO.
- b. **The subject has to read the screen aloud and press the hand switch** at the same time.
- c. If using Word2.xpt: Click "Stop" to end the recording when SuperLab™ closes.

4. Trial 2-Segment 3:

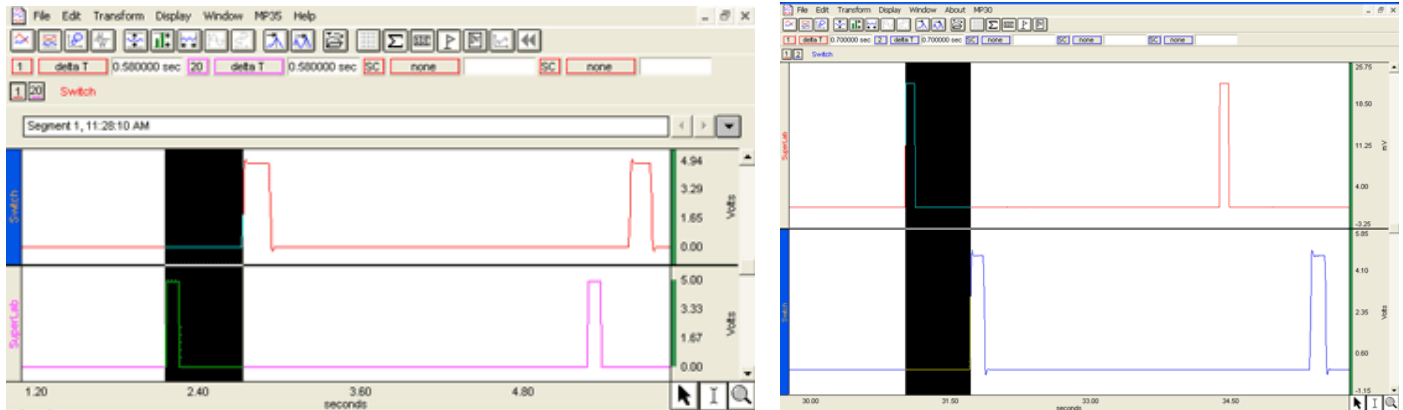
- a. SuperLab 4: insert a marker when the Segment 3 instructions are displayed.
 Previous versions: open **Color1xpt**, then choose "Run" from the "Experiment" menu and enter the subject's name. Next, click "Run" and—at the same time—click "Start" in BSL PRO.

- b. **The subject has to name the color aloud and press the hand switch** at the same time.
 - c. If using Color1.xpt: Click \ "Stop" to end the recording when SuperLab™ closes.
5. Trial 2-Segment 4:
- a. SuperLab 4: insert a marker when the Segment 4 instructions are displayed.

Previous versions: open **Color2xpt**, then choose "Run" from the "Experiment" menu and enter the subject's name. Next, click "Run" and—at the same time—click "Start" in BSL PRO.

- b. **The subject has to name the color aloud and press the hand switch** at the same time.
- c. If using Color2.xpt: Click "Stop" to end the recording when SuperLab™ closes.

Data Analysis



Standard Trial Stroop Effect data recorded with BSL PRO and MP35, MP30

- [H30 Lab Report](#)
1. Measure the reaction time for the responses by selecting "delta T" in one of the measurement boxes for CH 1 and selecting the area between the start of each SuperLab spike and the start of each Switch spike.
 2. Compare the reaction times within Trial 1 (Segments 1 & 2); use markers to identify segments.
 3. Compare the reaction times within Trial 2 (Segments 3 & 4).
 - You should see a significant interference effect when naming the color of a conflicting color-word (i.e., naming the color "blue" when the word "red" is printed in blue ink).

APPENDIX

Graph Template Settings

Click here to open [h30_mp35_gtl settings](#) or [h30_gtl settings](#) . The BSL PRO Graph Template file automatically establishes the settings shown in the table.