



**THE OHIO STATE
UNIVERSITY**

Language Sciences Research Lab



STROOP DEMONSTRATION

1-Line Summary

This demo is about the automaticity of reading: For experienced readers, we can't help but read words in front of us.

Background:

For experienced readers, reading is something that often happens without any conscious thought: we automatically read words and understand their meaning (if we know the words). The Stroop task asks people to ignore the meaning of the words and focus instead on the color of the ink they are written in. The task is hard to do when the word itself refers to a different color than the ink it is written in (when the word "blue" is written in yellow ink) because your automatic access to the meaning of the word (blue) interferes with your goal in the task (to identify yellow).

Introductory Reading: http://en.wikipedia.org/wiki/Stroop_effect

Advanced Readings:

MacLeod, C. M. (1991). Half a Century of Research on the Stroop Effect: An Integrative Review. *Psychological Bulletin*, 109 (2), 163 – 203.

Bialystok, E. (2009). Bilingualism: The good, the bad, and the indifferent. *Bilingualism: Language and Cognition* 12, 3 – 11.

Materials:

- In our lab we use an old app called "The Stroop Game". You may still be able to find it on the iTunes App store (it costs around \$1) but it won't work on more up-to-date operating systems. If you do find it, the LIGHT interference level is the basic Stroop condition.
- There are a variety of other apps that use the Stroop effect available for little or no money. The exact way that you would use those apps will likely differ slightly, but all of them allow you to experience the effect.
- It is also possible to show off the Stroop effect with a piece of paper and a few colored markers! In fact, we have found it effective to ask people to create their own Stroop test (it is harder than you think 😊).



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The Interaction:

The pitch – Do you want to get your brain tricked?

Using the materials – For the iPad game, the key level to focus on is the LIGHT interference level: That's the one that uses the classic Stroop effect. Once people experience the effect (you can often tell by their behavior!) you can ask them about it. Most people will be pretty aware about the fact that they're working to overcome a trick.

Once people have experienced the effect, you should try to get them to think through what happened. Here are some questions that will generate good discussions and allow you to help the visitor engage in some hypothesis testing:

- What do you think made the game hard?
- Who do you think would find this game easier?
- What could you do to make the game easier?
- (If people feel like they did well) What did you do during the game to make it easy?

People often have good answers to these questions, but you can also prompt them to try out different things – try not to start out by giving people the answers and instead see if they can generate some of their own. More generally, listen to what the visitors tell you! Often they have good ideas and a good sense of what to do – build off of what they say whenever possible.

Messages:

Critical take home: You can't stop yourself from reading the meaning of the words, even when you want to. If you're a good reader, that just happens automatically.

But wait, there's more: One cool element of this phenomenon is that it depends on being a good reader. If you're NOT a good reader, then you take longer to get the meanings of the words and it is easier to accomplish your conscious goals (focus on the ink color). Young children who are still learning or solidifying their reading knowledge show weaker (and sometimes no) interference effects. People who don't know the language as well also show weaker effects (e.g. some L2 speakers).

One key component to being able to read fluently involves being able to focus on the words. So it's possible to make yourself into a worse reader by making the visual task harder – removing your glasses if you wear them, holding the iPad upside down, focusing to the side of the iPad (so you use your peripheral vision). These are also all things you can suggest that people try for themselves!

And still more: The Stroop Test is used by psychologists to assess a person's *inhibitory control*, the ability to suppress an automatic response. For good readers, accessing the meaning of the words is done without much thought but naming the color of the ink is something we have



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less experience doing and takes more cognitive effort to do. Good readers need to inhibit (or stop) themselves from doing the easy task in favor of the less familiar task. And, since the two tasks give different answers, we can really tell which one a person is doing!

People differ in their inhibitory control, and an individual's inhibitory control may change if s/he is tired or has drunk alcohol or has been doing a task like the Stroop Test for a while. In fact, psychologists (even those who don't care about language or reading), use the Stroop Test to tire people out to test what happens to our willpower when our brains are tired. It turns out that it's a bit harder to resist temptation after doing the Stroop Test for a while!

And one more thing: One group of people who seem to be particularly good at the Stroop Task control are bilingual individuals. These individuals get lots of practice at inhibitory control as part of switching between their languages – they need to stop accessing one language in order to access a second one. Some research suggests that this kind of lifetime of practice may make you better at all kinds of tasks requiring cognitive control (like Stroop!). So in addition to getting to speak to more people in their native language, bilingual individuals also benefit cognitively from having multiple languages.

And still one more thing: Oral language is something that every typically developing child acquires but Reading is something that is culturally specific and not everyone learns how (at times in the past, and in some cultures today, relatively few people in society could read). Even so, this task shows that once reading is a well-practiced skill, it becomes as automatic as any other linguistic skill you've got.

Homework:

Ask people to look at any sign around them and tell them to look at it but NOT read it. Since reading is automatic, this is virtually impossible to do. You can note that advertisers make good use of this fact (think about billboards on the highway).

Target Audience:

This works well with groups and is especially effective if you can get a group with people of different ages (since younger children often do better with interference).



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Tips From the Field:

- It is useful to have multiple ways to describe the basic rules of the game! Telling people to give them the color of the “word” is not a very useful instruction: the meaning of the word is a reasonable answer! The classic instructions asked people to label the color of the “ink” but that’s a bit awkward on the computer since there’s no real ink involved. One solution is to ask people for the color of the “letters”. Another solution is to demonstrate how to play and then just re-start the game.

- If you’re doing this activity in any kind of game-like way, part of the appeal is the competitive aspect – people like to play against each other. It’s fine to have multiple people play, but try not to lose sight of the message! The scores people get on the game aren’t really meaningful (this is NOT a proper cognitive test!) so it is totally fine if you want to talk to people while they are playing the game.

- People may ask why this is called the Stroop game. It is in fact named after John Ridley Stroop, who was from a small town in Tennessee. You can read more about him here: <http://www.arts.uwaterloo.ca/~cmacleod/Research/Stroopbiog.htm>

- The Stroop task is pretty famous and you may run into people who have seen it or other versions of it before. That shouldn’t be a problem – reading is so automatic that even if you’re aware that it will interfere in the task, you still have problems.