

# The Stroop Effect WIP

Keywords: 2017, Computer Human Interaction, Computer Interaction, Computer science, Graphical User Interface, Human Brain, Psychology, Reaction Time, Science Busking, Science Communication, Science Festival, Stroop Effect

## Meta Description

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A demonstration which shows just how important the interaction between the human mind and a computer is by illustrating the Stroop Effect.

## Learning Objectives

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Learn how important the interaction between the computer and the human brain is.

Understand that, when creating graphical user interfaces, computer programmers must visualise the best way to present a program to a human.

## Key Terms

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### **Computer program**

A type of software that can be run on a computer to aid the user to complete different tasks.

### **Graphical user interface (GUI)**

This term concerns everything that is visible on the display of a computer, from the icons to the mouse pointer. It also encompasses how different graphical items can interact with each other.

### **Stroop effect**

A popular term in psychology which refers to the interference of human reaction time when carrying out a simple task.

## Method

### **Step 1**

Write the name of a colour on an A4 paper – the colour of the marker used does not necessarily need to match the name of the colour written down.

## Step 2

Hold up the A4 paper, but keep it turned away from the audience. Tell the audience that when you turn around the paper, you would like them to shout out the name of the colour of the marker used to write down the text.

## Step 3

Turn the paper around so that the audience can read the word.

## Precautions

1. Reuse and recycle materials when possible.

## Narrative

Ask the audience if their computers have ever given them any trouble, such as a program not working like it's supposed to or when the computer pops up windows filled with error messages that they don't understand. These are examples of interactions between the computer and the user which are not always as straightforward as they could be with better design of the program perfect. This activity starkly illustrates this problem by showing how easily the human mind can incorrectly extract information from a confusing (counter-intuitive) interface.

## Questions

**Why do the participants get confused about what they have to say?**

*The Stroop Effect.*

**Do you think developers who create software applications must keep psychology in mind whilst designing the application?**

*Yes, psychology is important because it affects user interaction with the interface.*

**How do developers make sure that their programs are easy to use?**

*Thoughtful design, feedback and quality analysis.*

**What is an example of the Stroop effect in a real computer interface ?**

*Having to press 'Start' then 'Shut Down' on a computer instead of just pressing 'Shut Down'. Basically, anything which is counter-intuitive and would require the user to think about and plan before taking action.*

**What kind of problems could the Stroop effect create in a practical situation?**

*Misjudgement of objects or situations in practical scenarios.*

## Brief Explanation

When the colour of the text is not a representation of the word on the paper, the brain receives two sets of information and extra time is required for it to decide which information must be used and which must be discarded. This is known as the **Stroop Effect**, which is a measure of the reaction time required for the brain to decide which information it needs to use.

The Stroop effect is an important concept in computer science. Sometimes, a computer can give a user two sets of information when in reality only one set of information is required. For example, when shutting down a computer running on a Windows operating system, it can be confusing for a user to first have to click 'Start' and then 'Shut Down', because this is a counter-intuitive process. Hence, it is important for the engineers designing these systems to understand how the human brain works and interprets information in order to give the best structure possible to the graphical user interface.

## Detailed Explanation

This Stroop experiment highlights the reaction time of the human brain when it is given two or more sets of information and must decide which it will use to complete the current task. Through this test it has been shown that the brain takes a longer time to think when given two sets of information. The original paper by **John Ridley Stroop** reported that when presented with a series of 100 cards with the names of colours printed on them, the average human takes approximately 74.3 % (or 47 seconds) longer to give an answer when the colour of the word printed does not match the colour of the font.

The original paper also gives **alternatives of how the test could be run** as well as how calculations can be made – by firstly running a blank (when the colour of the word printed is the same colour of the font) and then running the test with the font colour different to that of the printed word.

There are several theories which try to explain this effect. One of them states that the **brain processes the letters of the word faster than it processes the colour of the font**. Another theory suggests that the recognition of the colour of the font requires more attention and hence the brain takes more time to identify where exactly it should focus its effort.

This leads to the relation between the Stroop effect and computer science. Designing an application is always a tedious process for the developer, especially when they are unable to decide how to design a certain icon or function. They should not implement something stemming from personal preference since this introduces personal bias, but they should definitely take feedback from colleagues and other professionals, such as other designers and potential users. This helps to reduce issues of poor design which can exacerbate the Stroop effect.

For similar reasons, it is of utmost importance for software developers and designers to test their designs and applications using a user acceptance test (UAT) process. UAT is a process where users run an application in order to test its functionalities and provide feedback to the software developers. Thus, changes can be made in order to improve the product and make it more successful.

Recently, researchers have used this test to study disorders such as ADHD and Autism. Research by [Lansbergen et al](#) studied these disorders by relating the reaction time across different genders and age groups of people affected by these disorders and comparing the results to average human reaction times. They also investigated human reaction time and regions of the brain that involve decision making and planning.

## Applications and Research

### Applications

When designing graphical interfaces for computer applications, software engineers must keep the Stroop effect, as well as other aspects of psychology in mind. In order for a computer application to sell, it must be visually appealing to the user. Hence, the application undergoes a rigorous design process as well as a testing phase. The testing phase involves supplying potential users with the application to gather feedback and improve the overall product.

The following link gives some tips regarding [principles of UI design](#) in applications.

The Stroop effect is not only used in computer science. [Stroop experiments are carried out in order to investigate disorders](#) such as ADHD, sleeping disorders, schizophrenia and anorexia.

### Research

The test is being used on individuals of different ages to [investigate the how the brain behaves when reasoning, thinking and staying attentive](#), amongst other core skills. The study is also being used to investigate whether certain activities can have negative influences on the human mind.

[European Research](#) – A research project which ran from 2012-2017 had the goal of creating an easier way for humans to draw three dimensional shapes on a computer interface. These shapes could be static, meaning their shape never changes, or dynamic, meaning their shape can change. The project aimed to produce a digital dynamic tool which would enable the user to create and refine these shapes. The tool was designed to be more effective and expressive to use than a traditional pen. The design process of this tool involved viewing the project not merely from a computer graphics point of view, but also factoring in aspects of geometry, computer simulation and human-computer interaction. This ensured a level of user-friendliness which meant that the the tool could be easily used not only by scientists and engineers but by anyone interested in it.

## Investigation

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- If there are different age groups within the crowd, the demonstrator could divide the crowd according to age group. In turns, each group then takes on this challenge separately and the demonstrator can record how many correct and incorrect answers are given by the members of each group. Thus, an average score of correct and incorrect answers for each age group can be compared. It would also be interesting to compare how the reaction time of each group correlates with age group.

## Subjects

Computer Science

Psychology

## Education

Primary

Secondary

Informal

## Time Required

~20 minutes

Preparation: 10 minutes

Conducting: 5 minutes

Clean Up: 1 minute

## Cost

0 – 10 €

## Recommended Age

6 – 9

10 – 12

## Number of People

1 participant

## Supervision

Not Required

## Location

Indoors  
Outdoors  
Festivals  
Laboratory

## Materials

A4 papers

Coloured markers

## Contributors

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## Sources

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Colors, Colors  
Human Interference Design  
Seeing Science: Exploring Color Perception with the Stroop Effect

## Stroop Effect

The Stroop Effect

What is the Stroop Effect

## Additional Content

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Colors, Colors (Beginner)

The Stroop Effect – How it Works and Why (Beginner)

OCL Stroop Test (Beginner)

Stroop Effect (Intermediate)

User Acceptance Testing (UAT) (Intermediate)

The design development process in 6 steps (Intermediate)

Classics in the History of Psychology (Advanced)

Psychology In Software Testing (Advanced)

Relations between Cognitive Psychology and Computer System Design (Advanced)

## Cite this Experiment

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de Marco, A., & Padfield, N. (2017, December 08). The Stroop Effect. Retrieved from <http://steamexperiments.com/experiment/the-stroop-effect/>

First published: **December 8, 2017**

Last modified: **December 8, 2017**