

5 Psychology Studies That Tell Us How People Perceive Visual Information

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“ Ever wondered how we see things? How do we take in all the visuals in an environment filled with strong sensory stimuli? And how do we interpret what we see?

The phenomenon is called *visual information processing* or *visual perception*.

What is visual information processing?

Visual information processing is the **visual reasoning skill** that enable us (or even animals) to process and **interpret meaning from visual information** that we gain through our eyesight.

Visual perception plays a big role in our everyday life. It helps us in learning and interacting with others. Perception happens so effortlessly. The ease of which we rely on such effortless perception, we tend to overlook the complexity behind it. Understanding how we interpret what we see will help us design our visual information.

A **well-balanced infographic** is designed with proper use of visual representation (like charts, graphs, icons, images), appropriate application of colors and typeface, suitable layout and flow, and many others. And let's not forget the data, data source and topic, which are as important too. But we will not be talking about these now. We'll focus on visual information design, instead.

Let's take a look at five psychological studies that reveal some remarkable insights on how people perceive visual information.

1. Gregory's Visual Assumption Theory

Psychologist Richard Gregory (1970) strongly believed that the visual perception relies on top-down processing.

What is top-down processing?

Top-down processing, also known as *conceptual-driven processing*, happens when we form our perceptions from the big picture to the tiny details. We make the best guess of what we see based on expectations, beliefs, prior knowledge and past experiences. In other words, we make calculated assumptions. According to Gregory, we are usually right in our assumptions.

The Hollow Face Experiment

Gregory's theory is backed by a lot of evidence and experimentations. One of the famous examples is the hollow mask effect.



You must watch the YouTube of this effect at https://www.youtube.com/watch?v=G_Qwp2GdB1M

Do you see a normal face when the mask rotated to the hollow section?

He used the rotation of a Charlie Chaplin mask to explain how we perceive the hollow surface of the mask as protruding based on our expectation of the world. Our prior knowledge of a normal face is that the nose protrudes. So, we subconsciously reconstructed the hollow face into a normal face.

How we perceive visual information based on Gregory's theory?

- Almost 90% of what we see is lost by the time it reaches the brain. Therefore, the brain has

to make the best guess based on past experiences or prior knowledge.

- Visual information we see is combined with previously stored information about the world, which we have built up as a result of experience.
- Also perceived from his various examples on the top-down processing theory are that the meaning of surroundings provides context to aid understanding.

Visual Information Design Takeaway #1 based on Gregory's Visual Assumption Theory



2. Sanocki and Sulman's Color Relations Experiment

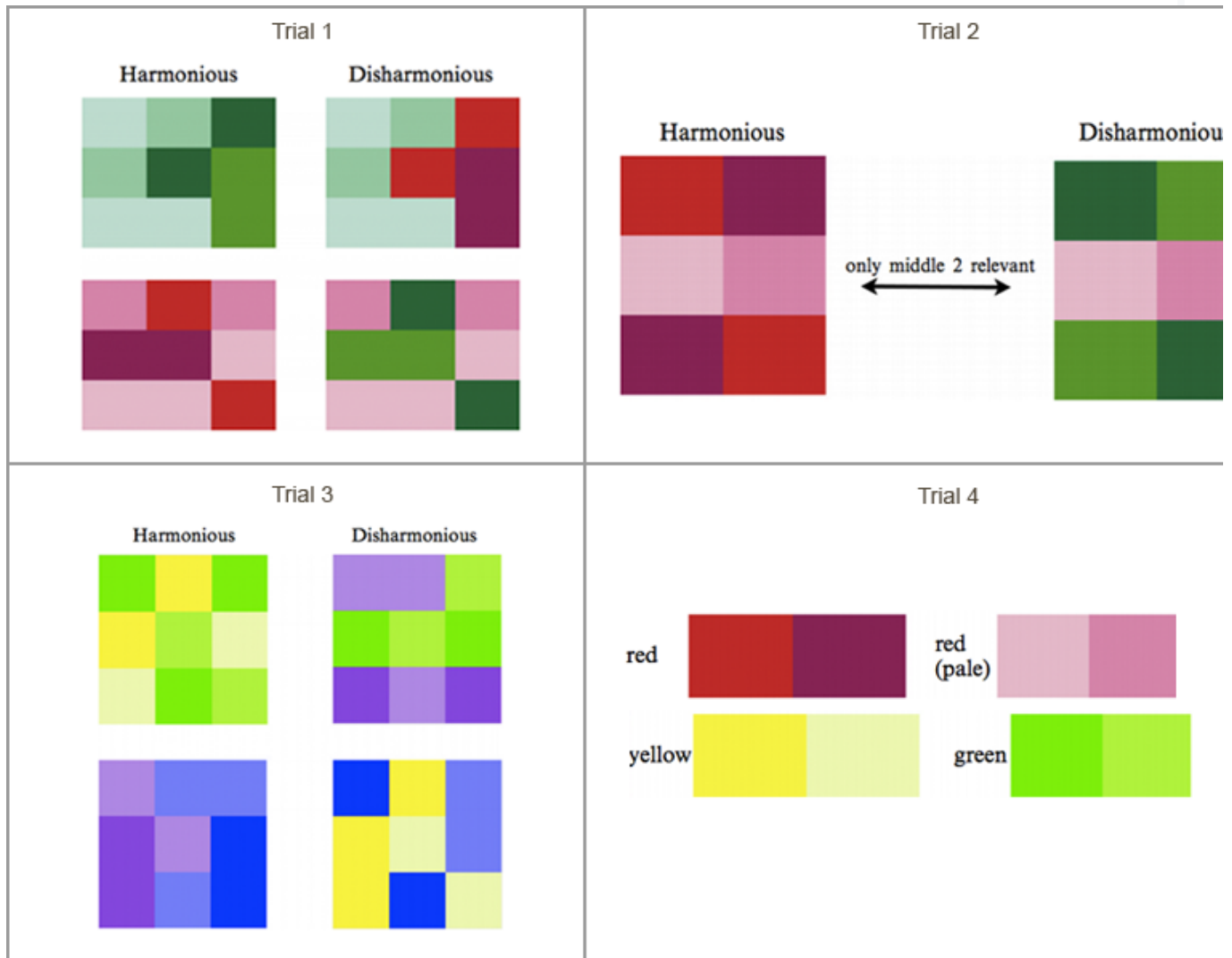
According to numerous psychological studies, in general, a group of similar colors are deemed more harmonious and pleasant. While, contrasting colors are usually associated with chaos or boldness.

In 2011, Thomas Sanocki and Noah Sulman (professors of University of South Florida) conducted an experiment on color relations and the impact on the visual short-term memory—our ability to remember what we just saw.

Four different sets of trials were carried out using harmonious and disharmonious color

palettes. In each trial, In each trial, observers were presented with a set of color pattern and another set for them to compare. The patterns were presented in a predefined interval and in number of times in random planned patterns. Observers were to rate whether the patterns shown were 'same' or 'different'. Observers were also expected to rate whether the pattern is harmonious—a pleasing relation between colors.

The following are the examples of 4 types of color pattern set used for each trial.



Sanocki and Sulman's findings on how colors impact our visual perception?

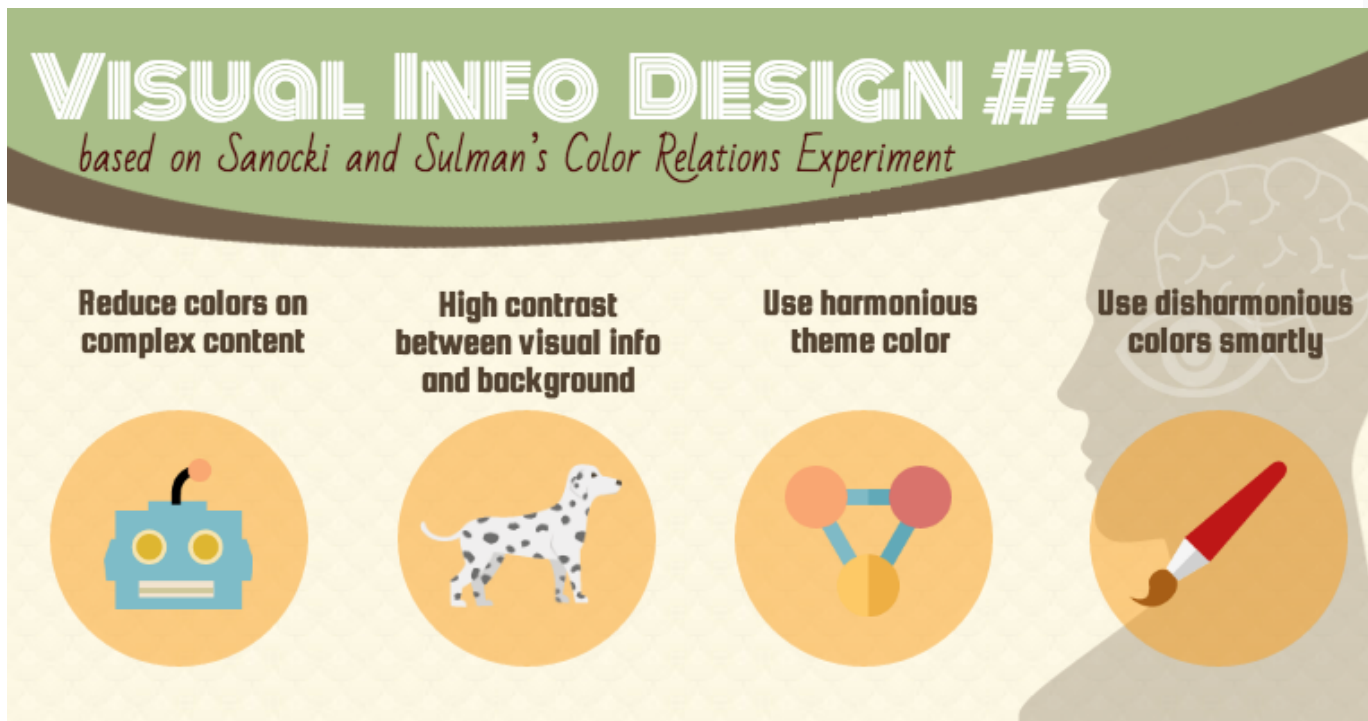
- People remember color pattern better when the color palette is harmonious.
- People remember the patterns with lesser colors (2-color palettes) better than patterns

with more colors (4-color palettes).

- The contrast of surrounding color impacted how well we remember the color pattern. In other words, **this implies that color differences between the context and the background may enhance our ability to focus our attention on context.**
- We can remember fairly high number of patterns at one time.

In summary, the results of the experiment imply that people can assimilate and retain more information with similar colors and even more with lesser combination of colors.

Visual Information Design Takeaway #2 based on Sanocki and Sulman's Color Relations Experiment



3. Binocular Rivalry Phenomenon

What is Binocular Rivalry?

It occurs when our eyes see two different images at the same location. One image dominates, while the other is suppressed. The dominance alternates periodically. So, rather than seeing a single combination of both visuals at all times, we experience the alternation of the images over time as the two visuals compete for visual dominance.

The Binocular Rivalry Experiment

In 1998, Frank Tong, Ken Nakayama, J. Thomas Vaughan and Nancy Kanwisher, in their experiment, deduced that over time two different images presented to the eyes observed the binocular rivalry phenomenon.

Four experienced observers participated in the experiment. They were shown, through red-green filter glasses, an image of a face and a house in an organized set to experiment on similar and dissimilar visuals presented to the eyes. Each eye sees one specific image at a time. The visual-selective responses of observers were monitored using functional magnetic resonance imaging (fMRI).



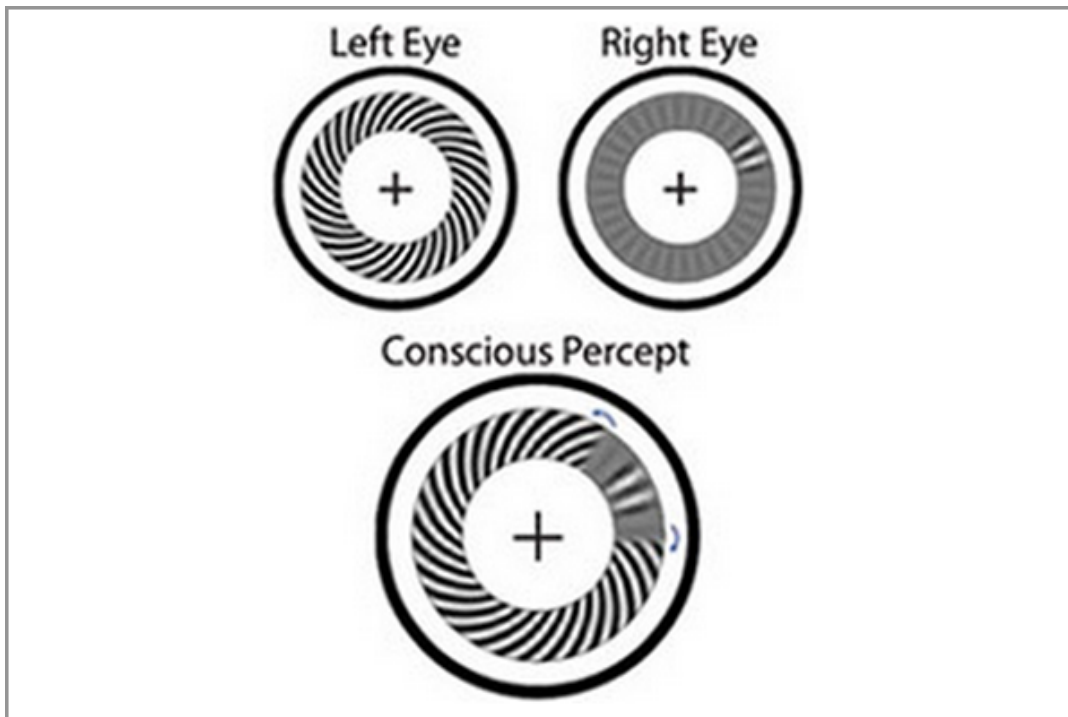
How we perceive visual information based on Tong's experiment?

- All observers monitored on the fMRI indicated vigorous binocular rivalry when dissimilar visuals were presented.
- In our visual system, binocular rivalry happens during the visual processing stage. In other words, during the short period of time when our eyes rest upon two dissimilar images that are close together, we will not be able to determine what we actually see.

Binocular Rivalry Instigation With Contrast

On a separate experiment, conducted by David Carmel, Michael Arcaro, Sabine Kastner and Uri Hasson. They have demonstrated that the binocular rivalry can be initiated by visual differences like color, luminance, contrast polarity, form, size or velocity between the eyes.

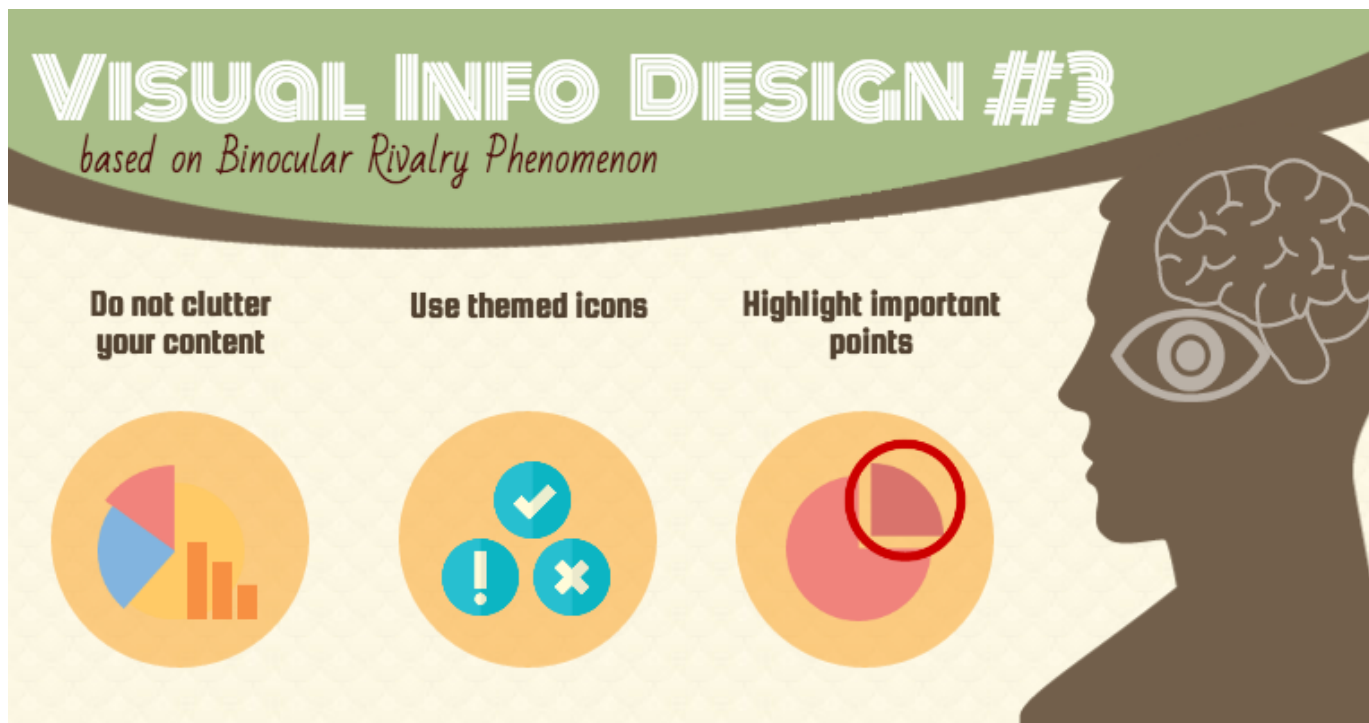
The left eye is presented with the dominant image, while the right eye is presented with a suppressed image. A contrast was introduced to the suppressed image.



How contrast impacts our visual perception based on the experiment?

- Dominance can be initiated on the image by creating contrast.
- We will see a convergence of dominant images (and part of a dominant image) once the binocular rivalry occurrence is resolved.

Visual Information Design Takeaway #3 based on Binocular Rivalry Phenomenon



4. Influence of Typography and Aesthetics of Reading

Do you know that typography can affect your mood and your ability to solve problems?

What is typography?

Typography is the design and use of typefaces as a means of visual communication. Typography has evolved from printing to digital typography. Underlying all sorts of definitions is the purpose of typography—to effectively create visual communication.

The Experiment on the Influence of Typography on Readers Mood and Cognitive Performance

In an experiment conducted by Kevin Larson (Microsoft) and Rosalind Picard (MIT), they presented their findings on the effects of typography on reader mood and cognitive performance.

They conducted two studies, each involving 20 people. The participants were divided to two groups evenly and were given 20 minutes to read the typeset issue of a magazine (The New Yorker) on a table device. One of the groups, got badly typeset version, while the other got properly typeset one (examples shown below).

Good Typography

AN APPENDECTOMY ON THE BAKERLOO LINE

BY GRAHAM CHAPMAN

Dear Sirs,
I've had letter after letter after letter since you published one particular query that asked, "What should I do about my appendix on the Bakerloo Line?" Well, "Miss N.," I can



and ask for one. Remember, the stations marked with an "O" are interchange stations. Stations marked with a star are closed on Sundays, and also remember to pick up a plastic bucket for the guts.

Then study your map and find the brown line clearly marked "Bakerloo" in the key. Select a station appropriate to the severity of the inflammation. For mild or grumbling appendicitis, you could start at Lambeth North—being careful not to change at Waterloo—and have comfortably incised your abdomen and exposed the inflamed organ by the time you are between Marylebone and Kilburn Park. You will then have the time it takes you to reach Willesden Junction to complete the excision. And the six minutes between there and Wembley Central give you plenty of time to be

Bad Typography

AN APPENDECTOMY ON THE BAKERLOO LINE

BY GRAHAM CHAPMAN

Dear Sirs,
I've had letter after letter after letter since you published one particular query that asked, "What should I do about my appendix on the Bakerloo Line?" Well, "Miss N.," I can



later on. I have set out some details that may help you in this sometimes irksome chore. First, find yourself your nearest Underground station and ask for one. Remember, the stations marked with an "O" are interchange stations. Stations marked with a star are closed on Sundays, and also remember to pick up a plastic bucket for the guts.

Then study your map and find the brown line clearly marked "Bakerloo" in the key. Select a station appropriate to the severity of the inflammation. For mild or grum-

During the experiment, participants were interrupted and asked to estimate the amount of time they thought has passed since experiment began. A psychological study (Weybrew 1984) found: **People who find their task enjoyable and are in a positive mood, experience a faster flow of time and so are likely to underestimate the amount of time that has passed.**

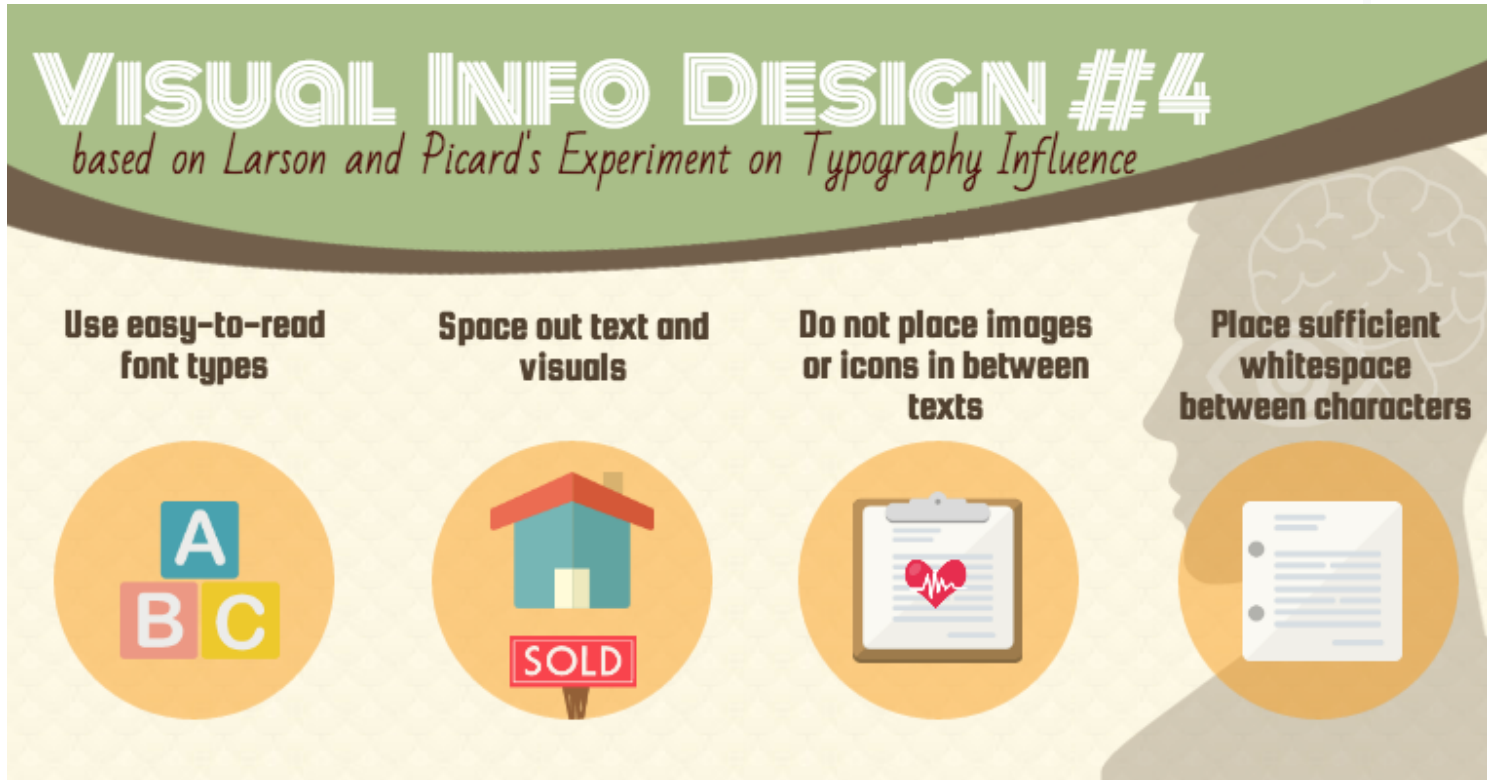
The participants were then asked to solve the candle problem after their reading. They had to attach a candle to the wall with a box of thumbtacks in a way that the candle doesn't drip all over the place.

How we perceive good typography and the impact?

- Participants from both bad and good typography condition underestimated their reading time. **This implies that reading is an engaging task.**
- Participants with good typography condition greatly underestimated their reading time compared to participants with bad typography. **This implies reading with good typography is even more engaging.**
- No participants from the badly typography were able to solve the candle problem. While, less than half of the group with good typography correctly solved the problem. **Good**

typography has some impact on our ability to solve problems.

Visual Information Design Takeaway #4 based on Larson and Picard's Experiment on Typography Influence



5. Castelhana and Henderson's Perception of Scene Gist

Ever wondered what does "a picture speaks a thousands word" really mean? Or why are we able to understand visual better than text?

It's not that the picture tells us something, and everything. It is, in fact, our human ability to visually form imagery of what we see. When we fix our eyes on object(s), we have the visual ability to form an understanding of the environment and recognize the meaning of a scene.

What is Perception of Scene Gist?

According to Ronald A. Rensink, a research scientist from Nissan Research & Development, Inc.:

Perception of scene gist or scene perception is the visual perception of an environment as viewed by an observer at any given time. It includes not only the perception of individual objects, but also such things as their relative locations, and expectations about what other kinds of objects might be encountered.

Let's take a look at our jungle trekking example. We see the *objects*, which are two signboards with symbols, and the layout, which is the forked paths and positioning of the signboards at each path. We will, rather instantaneously, recognize the *scene*—we are in the middle of a jungle with a forked path and each path leads to a different destination. Based on this scene, we know it is expected that a decision have to be made to proceed.

The Study on the Influence of Color on Scene Perception

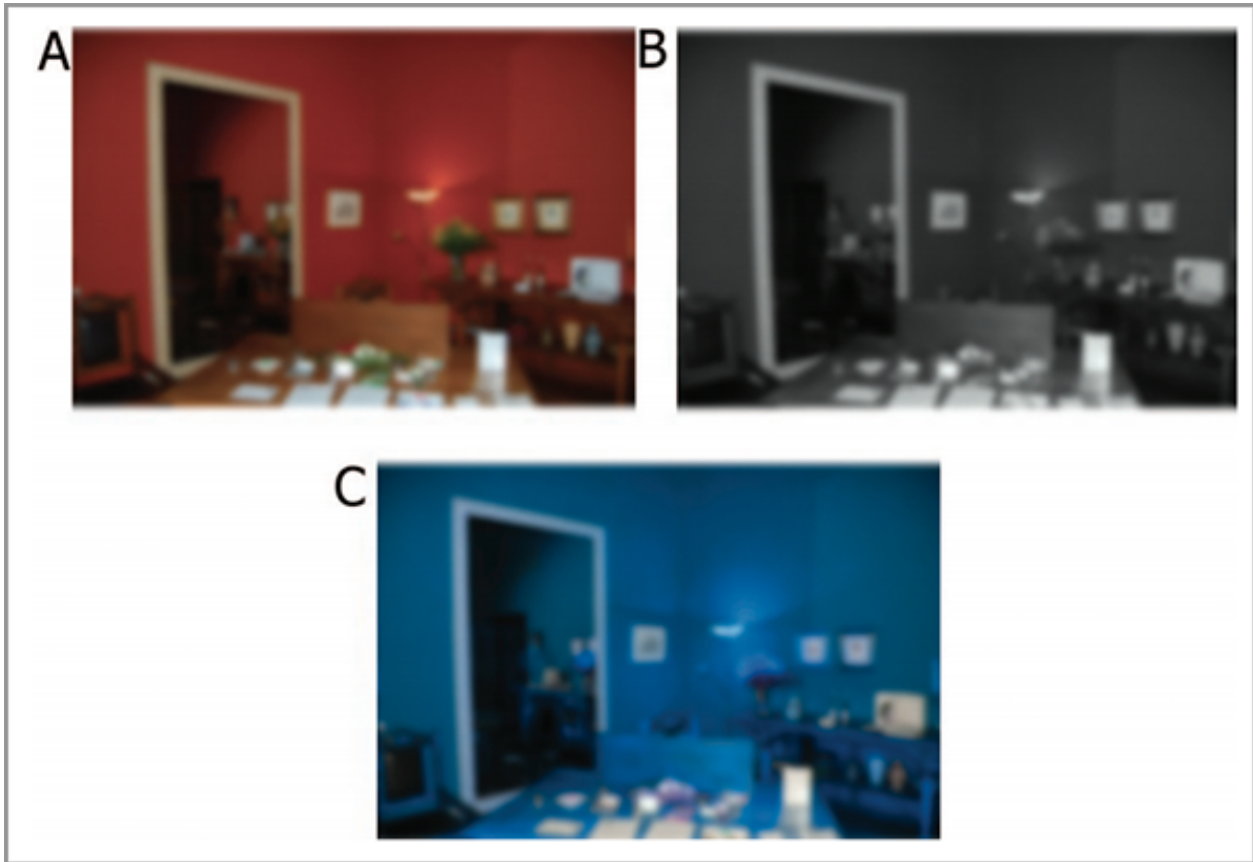
In 2008, Monica S. Castelhana from University of Massachusetts at Amherst, and John M. Henderson from University of Edinburgh conducted an experiment on the influence of color in activating a scene gist.

The experiment was conducted in three different trials. Undergraduates were exposed to a few hundreds of photographs (nature or man-made objects) in various conditions for each trial. Each photograph was shown in a specific sequence and timing. Participants were to respond either “yes” or “no” when they were given the target object to match the scene they see.

Normal and blurred photographs with colors and monochrome sample photographs were presented respectively.

A**B****C****D**

To determine the role of colors in our scene perception, the following sample photographs were used—abnormal colors on the same photograph.



They have also studied the range of abnormality with the following samples.



Reminds me of the infamous "the dress" controversy with regard to color compensation.

How we perceive visual information based on Castelhana and Henderson's findings?

- Observers were able to match the scenes and target object within a second. **This implies people can quickly get the meaning of a normal scene.**
- Observers were able to match the scenes quicker with color as compared to black and white. **This means colors help us understand scenes better.**
- Overall, colors define the structure of objects. So, as long as the colors are not too far from what we normally perceive the world as, we'll be able to understand the meaning of an image easily.

Visual Information Design Takeaway #5 based on Castelhana and Henderson's Scene Perception Study

VISUAL INFO DESIGN #5

based on Castelhana and Henderson's Scene Perception Study

Use proper icon or image to represent data



Layout content in proper sequence



Use standard colors on important objects



Conclusion

Understanding how people perceive visual information reveals a lot about how we should design our infographics. Based on the findings, listed below is the summary of the key visual information design tips.

1. Layout & Designs

- Theme and designs to compliment your data.
- Do not clutter your infographics.
- Use themed icons.
- Layout your content in proper sequence.
- Headline to set the key expectations.

2. Visuals

- Text to go with visuals.
- Highlight important numbers on charts and graph.
- Use the right image or icon to represent your data.

3. Colors

- Reduce the number of colors for complex content.
- Use high contrast between important visual info and background.
- Use harmonious theme colors.
- Use disharmonious color smartly.
- Use normal color on important objects.

4. Typography

- Use easy-to-read font types.
- Place ample white space in between headline and the descriptive text or images.
- Do not obtrude line of connected words with images or icons.
- Provide ample whitespace in between characters.

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