Logbook

November 25, 2025

- We chose color psychology as the topic for our research project after talking about several possible options.
- We agreed that color psychology was interesting, useful, and suitable for a survey-based project.
- We discussed how colors are often linked to emotions in everyday life, such as in advertising, design, and art.
- We began thinking about how people of different ages might react to colors in different ways.

November 26, 2025

- We discussed why color psychology is often used in advertising, design, and media.
- We talked about how colors can affect emotions and influence people's choices.
- We agreed that emotions would be easier to study than behavior for this project.

November 29, 2025

- We created an early research question about the connection between colors and emotions.
- We discussed narrowing the topic so it could be finished within the time given.
- We decided that collecting our own data would make the project stronger.

Ideas:
Emotional reactions to color may change as people get older.
Some emotional connections to color may be learned instead of natural.

December 2, 2025

- We researched background information about color psychology using reliable sources.

- We learned about common emotions linked to warm, cool, and neutral colors.
- We wrote down important information to help support our hypothesis and survey.
- We discussed how surveys are often used in studies to measure emotions.

December 4, 2025

- We continued researching how specific colors are connected to emotions.
- We compared information from different sources to find similarities.
- We discussed how research can support or disagree with common beliefs about color.

Ideas:
Some common color-emotion ideas may not be scientifically proven.
Personal experiences may strongly affect how people feel about colors.

December 6, 2025

- We decided that a survey would be our main method of collecting data.
- We discussed the benefits of surveys, such as saving time and allowing easy comparison.
- We talked about ethical concerns, including keeping responses anonymous.

Ideas:
Anonymous answers may help people respond more honestly.
Showing colors clearly may help participants give more accurate answers.

December 8, 2025

- We planned the overall layout of the survey.
- We discussed how many questions to include so participants would not feel overwhelmed.
- We decided to use both multiple-choice and short-answer questions.

- We discussed how participants would be grouped by age.

December 12, 2025

- We created a draft list of colors for the survey.
- We made sure to include warm, cool, and neutral colors for fair comparison.
- We discussed how brightness and shade might affect emotional reactions.

Ideas:
Different shades of the same color may cause different emotions.
Very bright or very dark colors may cause stronger emotional reactions.

December 14, 2025

- We checked our progress to make sure we were meeting deadlines.
- We discussed any problems we were having with the survey design.
- We made small changes to improve organization and clarity.

December 18, 2025

- We improved our research question to make it clearer and more focused.
- We confirmed that the study would compare colors, emotions, and age groups.
- We reviewed our background research to make sure it matched our topic.

December 20, 2025

- We wrote the first complete draft of the survey questions.
- We focused on using simple and clear language for all age groups.
- We checked that each question was connected to the research question.

December 22, 2025

- We finalized the colors that would be included in the survey.
- We organized the colors in a clear and logical order.
- We made sure all participants would see the same colors.

January 3, 2026

- We reviewed the finished survey and made changes to improve clarity.
- We improved the instructions so participants would understand the task.
- We discussed how survey answers would be collected and organized.

January 6, 2026

- We prepared the final version of the survey for distribution.
- We reviewed our plan for collecting data so results could be compared easily.
- We discussed ways to analyze the data, such as grouping responses by age.
- We confirmed that the project was ready for the data collection stage.

Survey

Survey

Color Shown: _____

1. How does this color make you feel?

(Choose the one that fits best)

☐ Happy
☐ Calm
☐ Excited
☐ Relaxed
☐ Anxious
☐ Angry
☐ Sad
☐ Focused
☐ Confused
☐ No strong feeling

---

2. Rate how strong this feeling is:

☐ Very weak
☐ Weak
☐ Neutral
☐ Strong
☐ Very strong

3. Does this color make you feel more positive or negative overall?

☐ Very negative
☐ Slightly negative
☐ Neutral
☐ Slightly positive
☐ Very positive

4. One word to describe how this color makes you feel:

_____

5. Does this color remind you of anything?

☐ Yes ☐ No

If yes, what? _____

Research

Emotions in Color; A Study on Color-Driven Emotions

Introduction

- In our everyday lives, colors are everywhere and often influence our emotions without us realizing it. The brain processes color quickly, which can affect how we feel, think, and react to our surroundings.
- According to color theory, different colors are commonly linked to specific emotions and moods. Warm colors like red and yellow are associated with energy and alertness, while cool colors like blue and green are linked to calmness and focus.
- This science fair research investigates color psychology to understand how and why colors impact people's emotions and moods. By studying this topic, the project explains how the brain responds to color and why color is used to influence behavior in everyday life.

Objective

This science fair project aims to investigate how different colors influence human emotions and overall mood. The research also explores whether certain colors are consistently associated with specific emotional responses, helping to explain the connection between color, the brain, and human behavior.

Hypothesis

Individuals are expected to experience similar emotional reactions when shown different colors: for example, warm colors may help people feel relaxed and comfortable, while cool colors may create feelings of energy and activeness.

Method

A survey will be distributed to participants from various age groups. After being shown a variety of colors, participants will be asked to select or describe the emotions they associate with each color. The responses will then be collected, compared, and analyzed to identify patterns and trends between colors, emotions, and different age groups.

Variables

- The independent variable: The color displayed to participants
- The dependent variable: The participants' reported thoughts or emotions
- Variables under control: Everyone is shown the same set of colors. The same poll questions. View each color for the same amount of time. The same display conditions (screen or paper) and illumination.

Research & Theories

What Is Color in Psychology: A study of how different colors can affect human emotions, thoughts, behavior, and mood. Scientists and psychologists believe that when we see a color, our brain reacts to it based on a mix of biology, personal experience, and culture.

Color psychology is often used in:

- Marketing and advertising (logos, packaging)
- Interior design (schools, hospitals, bedrooms)
- Art and media
- Mental health spaces

Colors do not affect everyone in exactly the same way, but many people have similar emotional responses to certain colors. This is why colors are carefully chosen in places like classrooms, restaurants, and websites.

How Are Colors Believed to Influence Moods: Colors influence moods by affecting the brain and nervous system. When light enters our eyes, it sends signals to the brain, which can trigger emotional and physical responses such as feeling calm, excited, stressed, or focused.

Red: Emotions/Associations: Anxious, powerful, energetic, angry. Why: Red increases heart rate and draws attention. It can signal danger, passion, and strong emotion.

Orange: Emotions/Associations: Excited, courageous, comfortable. Why: A blend of red (energy) and yellow (joy), orange often sparks enthusiasm and sociability.

Yellow: Emotions/Associations: Happy, energetic, intellectual, joyful. Why: Bright yellow stimulates mental activity and is linked to sunlight, which boosts energy and mood.

Green: Emotions/Associations: Natural, hopeful, soothing, tender. Why: Green represents nature, growth, and balance. It is known to reduce stress and create harmony.

Blue: Emotions/Associations: Calm, somber, peaceful, tender.Why: Blue is connected to the sky and water, promoting relaxation and stability. Often used in calming or professional settings.

Purple: Emotions/Associations: Luxurious, high quality, authentic, spiritual. Why: Historically linked to royalty and rarity (purple dyes were expensive). Also associated with creativity and introspection.

Color, Memory, Perception and Behaviour: Research shows that color doesn't just affect mood—it can also influence memory, attention, and how we think and behave. Studies have found that people remember colored objects, words, or images more accurately than black-and-white ones. Colors make information stand out, which helps the brain encode it more strongly. High-contrast color combinations, like white on red or black on yellow, are especially effective for improving memory. In educational settings, using color to highlight vocabulary or important information has been shown to help students recall the information better.

Color also interacts with perception. The brain often relies on memory and expectations when processing colors. For example, people expect bananas to be yellow, so even a gray banana may appear slightly yellow. This shows that our past experiences with colors influence how we perceive new information, which can affect both attention and memory. Research in classrooms and virtual reality settings has found that cool colors like blue and green can help people focus better, supporting learning and cognitive tasks.

Color can even influence thinking and task performance. Certain colors are linked with different emotional or cognitive responses.

Major Parts of the Brain Involved in Psychology:

1. Occipital Lobe – Visual Processing

The occipital lobe is located at the back of the brain and is mainly responsible for vision. Example: When you look at a bright red sign, the occipital lobe helps you recognize that the color is red.

- It helps identify colors, shapes, and movement.
- Without the occipital lobe, the brain cannot properly process color.
- This is the first major brain area involved when we see color.

2. Limbic System – Emotions and Feelings

The limbic system controls emotions, mood, and emotional memories. It is one of the most important systems involved in color psychology. Colors can trigger emotional responses because the limbic system connects color with past experiences.

Main parts include:

- Amygdala (emotions like fear and excitement)
- Hippocampus (memory and learning)

3. Prefrontal Cortex – Thinking and Decision-Making

The prefrontal cortex, located at the front of the brain, is responsible for:

- Decision-making
- Focus and attention

Certain colors can improve or reduce concentration. Example: Cool colors like blue and green can help the prefrontal cortex stay calm and focused, which is why they are often used in classrooms and offices.

4. Hypothalamus – Body Reactions

The hypothalamus controls automatic body responses such as:

- Heart rate
- Body temperature

Strong colors can cause physical reactions. Example: Red can increase heart rate and alertness because it activates the hypothalamus.

Long-Term Scientific Review: A systematic review of 132 peer-reviewed studies involving more than 42,000 participants across 64 countries found consistent links between color and emotion.

- Colors were reliably associated with emotional dimensions like valence (positive/negative), arousal (calm/excited), and power.
- Warm colors (like red and orange) tended to be linked to high arousal and strong emotions, while cool colors (like blue and green) were linked to calm, positive emotions.
- Light and highly saturated colors were generally associated with more positive feelings, and darker/less saturated colors with more negative feelings.
  This research shows color-emotion associations are widespread and systematic, not just casual observations.

Blue Light and Circadian System: The eye also contains special cells called intrinsically photosensitive retinal ganglion cells (ipRGCs). These cells are especially sensitive to blue light.

- They help regulate the circadian rhythm (sleep-wake cycle).
- Blue light can reduce melatonin, making people feel more awake and alert.
- This explains why blue light affects mood, focus, and sleep.

This biological response helps explain why blue is often associated with alert calmness and focus in color psychology.

Laboratory Studies on Color and Emotional Responses: Controlled laboratory experiments have studied how hue, saturation (intensity), and brightness affect how people feel when they see colors:

- In one psychological experiment using standardized color chips, researchers found that brightness and saturation had strong effects on emotions. For example, some blue and purple hues were rated as pleasant, while some yellow shades caused higher arousal.
- Another study compared how colors influence judgments of emotional facial expressions. It found that a yellow background helped people recognize happiness faster, though effects for sadness and certain colors like blue were smaller.

These kinds of experiments show that color perception can influence how we interpret other emotional information.

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Eye Structure and Color Perception: Light first enters through the cornea, which helps focus light. It then passes through the pupil, which controls how much light enters the eye. The lens further focuses light onto the retina.

- In bright light, the pupil becomes smaller to protect the eye.
- In dim light, the pupil widens to let in more light.
- Bright, intense colors can cause the pupil to react, which is linked to arousal and attention.

This is why strong colors like red or bright yellow can feel more stimulating—they physically affect how the eye responds to light.

The retina is the most important part for color vision. It contains two types of photoreceptor cells:

- Rods
    - Detect light and dark
    - Work best in low light
    - Do not detect color

- Cones
    - Detect color and fine detail
    - Work best in bright light
    - There are three types of cones:
        - Red-sensitive (long wavelengths)
        - Green-sensitive (medium wavelengths)
        - Blue-sensitive (short wavelengths)

Different colors activate these cones in different amounts. For example, red light strongly activates red-sensitive cones, while blue light activates blue-sensitive cones. This helps explain why different colors create different physical and emotional reactions.

How the Eye and Brain Work Together to Acknowledge Color and Emotion:

<u>Step 1: Light and Color Detection in the Eye</u>

Color starts as light energy. Different colors are different wavelengths of light. Bright or intense colors can cause the pupil to slightly change size, which already affects alertness and attention. When light enters the eye, it passes through several parts:

- Cornea – bends (refracts) incoming light
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<u>Step 2: Retina – Where Color Is First Recognized</u>

The retina is a thin layer of cells at the back of the eye. It contains photoreceptors that convert light into electrical signals. Each color we see is created by a combination of cone activity. For example, yellow activates both red and green cones.

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Once cones detect color, the information is sent as electrical signals through the optic nerve. The optic nerve acts like a data cable, carrying visual information from the eye to the brain.

At this point, color information is still raw data — it does not yet have emotional meaning.

Step 4: Thalamus (LGN) – Organizing Color Signals

The signals reach the thalamus, specifically a part called the Lateral Geniculate Nucleus (LGN).

The LGN:

- Sorts visual information (color, brightness, movement)
- Prioritizes important signals
- Sends organized information to the visual cortex

This step helps the brain decide what to pay attention to, which is important because attention influences emotional reaction.

Step 5: Visual Cortex – Conscious Color Recognition

Next, signals arrive at the visual cortex in the occipital lobe at the back of the brain.

- V1 processes basic visual features (edges, brightness)
- V4 is especially important for color perception

This is where the brain becomes aware of color (for example, recognizing something as “blue” instead of just light). Damage to area V4 can cause color blindness, even if the eyes are working normally. This shows that color is constructed by the brain, not just the eyes.

Step 6: Emotional Brain Areas Become Involved

After color is identified, the information spreads to other brain areas that connect color with emotion and meaning.

Amygdala (Emotion Center)

- Processes emotional reactions like fear, excitement, calmness
- Reacts quickly to visual stimuli, including color

Hippocampus (Memory Center)

- Connects color with past experiences and memories
- A color linked to a happy memory may cause positive emotions

Hypothalamus (Body Response Control)

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- Receives visual input, especially related to brightness and blue light

Trifold

Introduction

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Hypothesis

We hypothesise that participants exposed to **red** will report feeling more energetic or alert, participants exposed to **blue** will report feeling calmer or more relaxed, and participants exposed to **green** will report feeling balanced or comfortable, showing that color influences emotional responses.

Method

A survey will be distributed to participants from various age groups. After being shown a variety of colors, participants will be asked to select or describe the emotions they associate with each color. The responses will then be collected, compared, and analyzed to identify patterns and trends between colors, emotions, and different age groups.

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Conclusion

The results of this study demonstrate that color does affect emotional reactions, although not always in the way that was initially anticipated. The idea that blue has a soothing effect is supported by the fact that those who were exposed to it most frequently reported feeling at ease and comfortable. This hypothesis is further supported by the fact that green mostly evoked feelings of calm, relaxation, and happiness, indicating that it produces feelings of harmony, comfort, and positive outlook. The idea was not entirely supported by the red results, though. The majority of individuals experienced neutral, weak, or moderate emotions, including peace or relaxation, rather than feeling attentive or motivated. Few people reported feeling more energized or excited.
Overall, there was some support for the idea. As anticipated, blue and green had an emotional impact by encouraging serenity and comfort. Red, however, failed to provoke the expected enthusiastic reaction. This illustrates how color may affect feelings, yet individual responses may differ based on perception, experience, or circumstance.

Acknowledgements and References

We would like to thank all students and staff members who participated in this survey and shared their emotional responses. Their cooperation made this research possible. We also acknowledge our teacher for guidance and support throughout the research process, as well as for providing feedback that helped improve the quality of this study.

For future research, a larger and more diverse group of participants could be surveyed to increase the reliability of the results. It may also be useful to control environmental factors such as lighting, screen brightness, or time spent viewing each color. Additionally, future studies could examine how colors affect emotions over longer periods of exposure or explore how cultural background, age, or personal experiences influence emotional reactions to color. Comparing emotional responses with physical reactions, such as heart rate or focus level, could also provide deeper insight into how color impacts the human mind.

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Color Psychology in Media and Advertising: Color psychology plays a major role in media and advertising because colors can influence how people feel, think, and react, often without them realizing it. When someone sees an advertisement, movie scene, or social media post, the brain processes color before reading text or fully understanding the message. Because the visual system is closely connected to emotional areas of the brain, color can quickly create feelings such as excitement, calmness, trust, or urgency.

- Advertisers carefully choose colors to match the emotion they want the audience to feel. Red is often used to create excitement, urgency, and energy, which is why it appears in fast-food logos, sale signs, and advertisements meant to encourage quick decisions. For example blue is commonly used to communicate calmness, trust, and reliability, making it popular among technology companies, banks, and social media platforms.

- Color psychology is also important in branding. Companies use consistent colors in their logos, packaging, and advertisements so people begin to associate those colors with the brand itself. Over time, this creates emotional connections and helps with brand recognition.

- Research also shows that color can affect consumer behavior and memory. People choose whether they like an advertisement or product within seconds, and color plays a major role in that decision. Color can increase attention, improve memory of a brand or message, and influence trust. However, reactions to color are not exactly the same for everyone.

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Step 4: Thalamus (LGN) – Organizing Color Signals

The signals reach the thalamus, specifically a part called the Lateral Geniculate Nucleus (LGN).

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- This step helps the brain decide what to pay attention to, which is important because attention influences emotional reaction.

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Step 6: Emotional Brain Areas Become Involved

After color is identified, the information spreads to other brain areas that connect color with emotion and meaning.

Amygdala (Emotion Center)

- Processes emotional reactions like fear, excitement, calmness
- Reacts quickly to visual stimuli, including color

Hippocampus (Memory Center)

- Connects color with past experiences and memories
- A color linked to a happy memory may cause positive emotions

Hypothalamus (Body Response Control)

- Regulates heart rate, stress hormones, alertness
- Receives visual input, especially related to brightness and blue light

Hypothesis

We hypothesise that participants exposed to **red** will report feeling more energetic or alert, participants exposed to **blue** will report feeling calmer or more relaxed, and participants exposed to **green** will report feeling balanced or comfortable, showing that color influences emotional responses.

Data: Blue

This graph displays the participants' emotional reactions to the color. The majority of respondents said they felt calm or relaxed, suggesting that the color had a calming impact. While fewer reported feeling nervous, confused, or feeling nothing at all, some participants also reported feeling happy. Few people experience unpleasant feelings like sadness or anger. In general, the color produced feelings of serenity and optimism.

Data: Red

From what we gathered from our participants' answers, rather than their emotions being extremely weak or extremely strong, the majority of participants described their emotions as neutral, weak, or strong. This implies that the color had a mild emotional impact. The findings show that most participants were emotionally affected by the hue in a visible but mild way. Most participants felt emotions such as relaxation and calmness, while none felt any feeling of excitement nor energy.

Data: Green

People selected mainly calm, relaxed, and happy feelings, indicating that the color elicited a nice and calming emotional reaction. Few respondents indicated no strong feeling, whereas a small percentage selected emotions like confusion or anxiety. Rarely were negative feelings like sadness or anger selected. Overall, the chosen emotions demonstrate that the color primarily inspired sentiments of tranquility and positivity.

Data: Red

From what we gathered from our participants' answers, rather than their emotions being extremely weak or extremely strong, the majority of participants described their emotions as neutral, weak, or strong. This implies that the color had a mild emotional impact. The findings show that most participants were emotionally affected by the hue in a visible but mild way. Most participants felt emotions such as relaxation and calmness, while none felt any feeling of excitement nor energy.