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The Psychological Impact of Color and Light in Interior Design on Teenagers

Anushka Shorewala[1] and Andrew Ardito[#]

[1]The Wheatley School, Old Westbury, NY, USA
[#]Advisor

ABSTRACT

Interior design is a wide profession that can drastically influence how people feel and use a room. Marco Costa's research on the effect of color in a room and Markus Canazei's study on the effect of natural light in a room both focused on how adults were influenced by light and color in rooms. This ultimately led to both studies in this research process focused on teenagers because there isn't a great amount of research on how light and color can affect teenagers in a room. The results showed that teenagers have a preference towards neutral and cool tones as opposed to adults who prefer warm tones. Teenagers also have a preference towards natural light similar to adults. More research can be done on understanding how light and color can affect teenagers in other environments such as school settings. Further research is necessary to obtain more information on the psychological impact of interior design on teenagers.

Introduction

Have you ever walked into a room and instantly felt safe? Or comfortable? Or overwhelmed? According to the Council of Qualification for Interior Design, interior design is "a distinct profession with specialized knowledge applied to the planning and design of interior environments that promote health, safety, and welfare while supporting and enhancing the human experience." Interior design is a profession largely overlooked by the general population, however, interior design plays a key role in every room a person will ever walk into. The way an office, or bedroom, or hospital is designed can change the way a person feels and acts in a space. Interior designers use information from psychological studies to make choices which subconsciously alter human perception to increase the functionality of a room.

Modern interior design is rooted in an early form of science originated in India known as Vastu Shastra or simply Vastu. The literal meaning of Vastu Shastra is "science of architecture." In simple terms, the structure and organization of an environment that a person works or lives in influences all aspects of their life. Vastu is a science of maintaining a balance in the structure of a room, building, house, etc. with the five elements that compose humans, Prithvi (earth), Apa (water), Agni (fire), Vayu (air), and Akasha (sky or space). Every element has its own place and the placement of that element is the most beneficial (Rajgopal, 2002). Feng Shui is a branch of Vastu Shatra, where the designers focus on the balance of the elements "wind and water" (Mack, 1997). Both ideologies use the balance and harmony of energy in different roomsd to help the room achieve its full potential. Using inspiration from Vastu Shastra and Feng Shi, modern interior designers create a unique feel for an environment by balancing several different elements.

Literature Review

Seven Elements of Interior Design

In James Howard's book, Atmosphere: the seven elements of great design (2019), he discusses the seven main components of modern interior design: color, form, light, line, pattern, texture, and space. Although interior designers use all seven aspects of design to create a cohesive space, most interior designers agree that color and light are the two most influential elements, changing how people feel in a room and the purpose of it. Color refers to the walls, objects, and furniture in a room. Light refers to the use of artificial light versus natural light. Both aspects can transform the purpose of an area in a house, office, school, etc. Although pre-existing research exists on how color and light can be manipulated to influence human's psychology, it primarily focuses outside the scope of interior design and specifically towards adults.

The Impact of Color in Interior Design

Color has a very strong psychological impact, many studies have been performed to test the effect of color on humans and their emotions, and how color interacts with the space it is present in. Researchers Sutton and Altarriba performed a study where participants were asked to rate colors with words which were then categorized as negative or positive. The most common color subjects responded with a negative emotion was red (57.1%), followed by blue (20%), and then by green (5.7%). The most common color response for positive words were yellow (40.0%), followed by red (33.3%), and then blue (20%). Based on these findings, researchers concluded the dislike towards red was due to the association of the color red with many different negative experiences such as a teacher using a red ink to mark incorrect responses on a test or the face of a cartoon character turning red when they are angry. Researchers have found a strong correlation in the association of an emotional appeal of a color related to objects or events individuals experience (Kayy & Epps, 2004). This could signify that people of different cultures, genders, and age emotionally judge the same colors differently. Although not discussed by Sutton and Altarriba, other research has found that red can also have the opposite effect on humans, the color has a long red's long wavelength which can evoke exiting effects that can be characterized as stimulation, strength, and activity (Labrecque & Milne, 2012).

When applied to interior design, however, participants had a different preference. In his study, Marco Costa used a virtual program to detect which color is best suited for university residential rooms and areas. He found that participants disliked studying in rooms that were painted warm tones, Costa and his colleagues associated this dislike with the high arousal characteristics associated with the long wavelengths for the color red and orange. However, participants had a higher preference towards blue and green (Costa et al., 2018). Similar to the phenomenon described previously, the two genders in the study had different opinions on their preference towards university residence hall colors. Males had an extreme preference towards blue and green shades, female participant's preferences varied as it also included red-purple and violet tones.

Color can also be used to enhance the utility and functioning of the purpose of a room. Travelodge, a hotel chain company with franchises all around the world, studied the effect of a bedroom color and how it can influence the amount and quality of sleep a person receives in hotel rooms in the United Kingdom. People slept in specific rooms, each painted a different color. At the end of the study, subjects were asked to rate their sleep and participants in the blue rooms claimed they got the most hours and best quality of sleep in the blue room (The Secret, 2013). Various reasons could suggest why blue provides sleepers with the best sleep such as the color blue being associated with calming and peaceful properties like the sky, water, and loyalty. Compared to red, blue has a shorter wavelength triggering emotions that display calming and trusting characteristics (Labrecque & Milne, 2012). The color of the room can greatly impact other areas such as classrooms for young children. Children ages 8 to 9 benefit from purple walls in order to promote and strengthen student's test scores and concentration. A statistical analysis showed that students performed better and had higher concentration levels in purple classrooms compared to any other colored room (Duyan & Ünver, 2016).

The Impact of Light in Interior Design

Similar to color, natural light and artificial light can be used to enhance the utility of a room. Natural light has many known benefits such as boosting Vitamin D and keeping the human circadian sleep cycle on track, however, natural light used in interior design presents different psychological benefits. Natural light has a great impact in a classroom setting. Students who were in the classroom with the most daylight progressed 20% faster on math tests and 26% faster on reading tests compared to students who were in the classroom with the least natural light. More natural light also resulted in significantly high test scores (Loisos, 1999).

Not only does natural light have psychological benefits for students in a classroom, but also for individuals in hospitals. Hospital patients, nurses, and doctors can benefit from natural light. Natural light can give hospital patients and workers hope and a feeling of freedom. Additional sunlight in hospitals can promote recovery and decrease the chance of developing diseases such as Alzihemiers (Torcellini & Edwards, 2002, pp. 32-35). Markus Canazei's study on depressed geratic patients showed a correlation between increased natural light and decreased depression rates (Canazei et al., 2017). Knowing that natural light can present various psychological benefits in classrooms and hospitals, natural light should have many psychological benefits in other settings such as bedrooms.

Addressing the Gap & The Research Question

The initial research question focused on the technical aspects of interior design. However, since interior design is an artistic field, there was no one way to correctly design a room. Different interior designers suggest different methods to designing rooms. Additionally, different rooms are meant to be designed differently. For example, a bedroom would be designed to create a calm and relaxing environment while an office would be created to promote productivity. Another consideration would be that interior designers create rooms based on their customers' needs. This meant the technical aspects would differ based on the designer, the type of room being created, and the customer's needs and wants for their rooms.

The majority of the studies I previously mentioned were conducted to find the impact of color and light on adults, little to none focused on the impact color and light have on children or adsolendences. This directed me towards the psychological aspect of interior design, specifically if interior design has a significantly different impact on teenagers since age can influence how people perceive colors because of what they associate certain colors with. If there was a difference, how could interior designers use that information to benefit teenagers? This targeted research can help not only interior designers design rooms, but also allow teenagers to create rooms they would benefit from.

Teenagers spend a majority of their time in their rooms doing work or relaxing, especially because of the pandemic, teenagers have been spending more time in their rooms than ever before. Because those two are the main purposes of a bedroom for a teenager, I decided to focus on two factors: how to create rooms which promote productivity and create a place where teenagers feel space to relax.

The final version of my research question is the following: How can color and light be used in interior design to influence the emotions of teenagers and how they utilize a room?

Methods

To answer my research question I decided to create two separate studies, both studying two major aspects of interior design: color and light. Both studies were performed in bedroom settings using a questionnaire. The color and light study focused on quantitative data because qualitative data would focus on the subject's personal opinions and not represent the opinion of the population.

Study #1: The Psychological Impact of Color on Interior Design

The color surveys were based on the studies performed by researcher Sutton and Costa in their studies. Using a virtual program, similar to the one used by Costa, I created rooms on a virtual program, all of which were different colors. To address the first part of my research question, I created a questionnaire similar to Sutton's questionnaire where participants were given a list of words to select the word they felt best described their emotions towards a particular room. Finally, I included four supplemental questions to answer the second part of my research question (reference appendix C). This method proved to be the easiest and most feasible because of the time and budgetary constraints. Unlike the study performed by Travlodge, I did not have resources available to create physical rooms on a lifesize scale.

First, I created a sketch of the general format on paper (reference appendix A). I used inspiration from other interior designers to design the room that would reflect one of an average teenager. The dimensions were 15 feet by 16 feet with a total of 240 square feet. Some furniture pieces, such as the bed, desk, dresser, nightstands, and closets, remained constant throughout all nine rooms. However, other furniture pieces such as the rug, bed, night lamp, and wall changed based on the room. For instance, room #1 is testing the psychological effect of a blue room which therefore the walls and furniture pieces are blue (reference appendix B). This pattern would be continued throughout all nine rooms testing nine different colors: blue, red, yellow, purple, pink, orange, green, grey, and brown. These nine colors were specifically chosen because it gave a variation of cool, warm, and neutral tones. Blue, purple, and green were classified as cool tones, whereas yellow, pink, orange, and red were classified as warm tones. Grey and brown were both classified as neutral tones.

After finalizing the details on the paper version, I started creating the rooms on a virtual program known as FloorPlanner. This website is used by many interior designers and architects to design model architecture. I first created a "blue" room with and then made eight copies of that room on the program and changed the color of the wall and furniture of the room according to each room.

Once all nine rooms were created, I started to create the survey on google forms. The form consisted of two sections; the first section contained preliminary questions. Participants were asked to state their age and gender, this gave me data on the demographics of my sample. Then there was a series of questions regarding all nine rooms. I took overhead pictures of each of the rooms on FloorPlanner and inserted them into the form. The rooms were labeled Room #1-Room #9, I used numbers instead of color to prevent any sort of bias from the subjects. Below each picture was a question that asked participants: what emotion that room made them feel. Their choices were happy, sad, energized, panicked, irritated, mad and relaxed, or safe. I specifically chose these eight emotions because there was an equal number of "positive emotions" (happy, energized, relaxed, and safe) and "negative emotions" (sad, panicked, irritated, and mad).

The second section of this survey contained four questions in regards to all nine rooms. The first and second questions asked participants to identify which room they felt the most productive in and the most energetic in. The purpose of these questions was to provide interior designers and teenagers information on how to create rooms that would create an ideal workspace for teenagers. This was because teenagers spend a great deal of time in their rooms studying, doing homework, or writing essays. The third and fourth questions asked participants were about which rooms participants think they would feel the happiest and calmest in. The results from these two questions would allow us to understand how to create rooms where teenagers would feel safe and comfortable as teenagers use their room as a place to destress from their stressful lives. Once the survey was approved by the IRB at high school X, the form was sent out to the students.

Study #2: The Psychological Impact of Light on Interior Design

This second study focused on light, specially the effect of natural light. Participants were sent forms to fill out at specific times of the day. Participants were allowed to participate at their convenience. The study was done over an

eight-hour period to ensure that participants would be able to give answers that accounted for various intensities of sunlight. The first form was to be filled out at 11 am, the next at 1 pm, the third one at 4 pm, and the final one at 7 pm. Originally I created one form for all four times, however, I later realized that it would be easier for participants to fill out four separate forms compared to one long form (reference appendix E).

All our forms were identical except for the 11 am form. The 11 am form has two sections; the first part of this form included preliminary questions and the second section included the same questions as the ones in the 1 pm, 4 pm, and 7 pm forms. The 11 preliminary questions asked participants to state their gender, age, location, and information on the natural light and artificial light present in the room. The second section of the 11 am form and the only section of the remaining three forms first asked participants to rate the amount of sunlight present in the room on a scale of 1 to 5, 1 being no sunlight. The second question asked the participants how many forms of artificial lights they were using at the moment. Then participants were asked supplemental questions, the same questions as the ones at the end of the color survey. I did this in order to be able to compare and combine the data of the two questionnaires. For this survey participants were asked to rate their productivity level, energy level, happiness level, and calmness level on a scale of one to five (1 being not productive, not energetic, not happy, and not calm at all).

Results & Data

Survey 1: The Psychological Impact of Color on Interior Design

Survey 1 received a total of 154 responses. The surveys were sent through email to a suburban high school in Long Island. Participants were able to complete the survey at their convenience. The form indicated that the survey would take between 5 to 10 minutes to complete. Participants were also told that their responses would remain anonymous and their emails would not be collected unless they wanted to participate in the light study. If participants were interested in the second study they were required to give their emails so additional information could be sent to them.

Figure 1.1 through figure 1.9 display the results of the first section of survey #1. The left side of the figure displays the room being referred to and the right side of the figure shows the emotions selected by participants for each room. For example, on the left side of figure 1.1 there is an image of the blue room because “room #1” is the blue room. The right side of figure 1.1 is a graph of the emotions of all 154 participants selected for the blue room.

Figure 1:

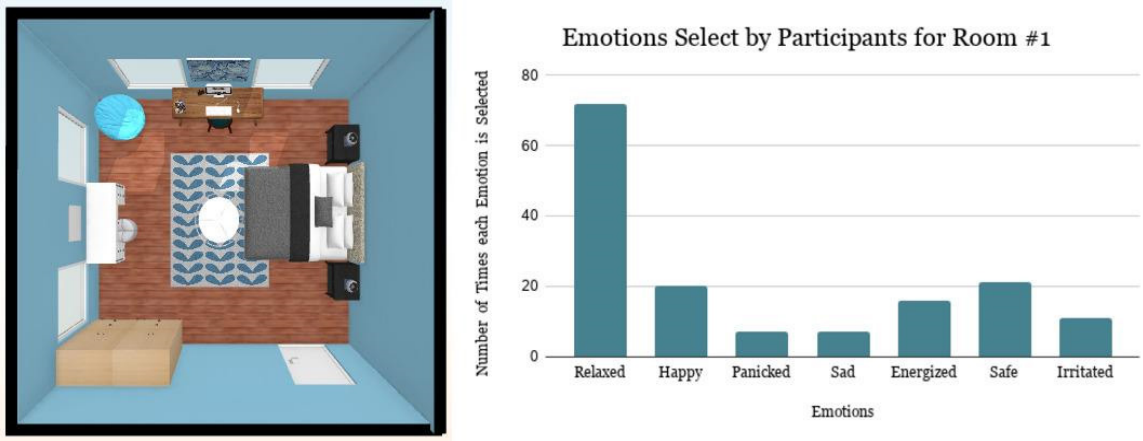
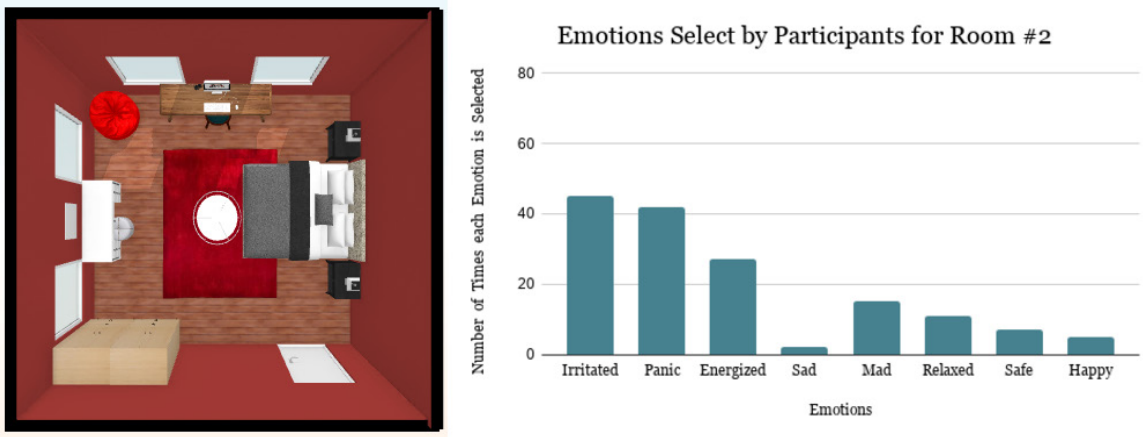


Figure 2:



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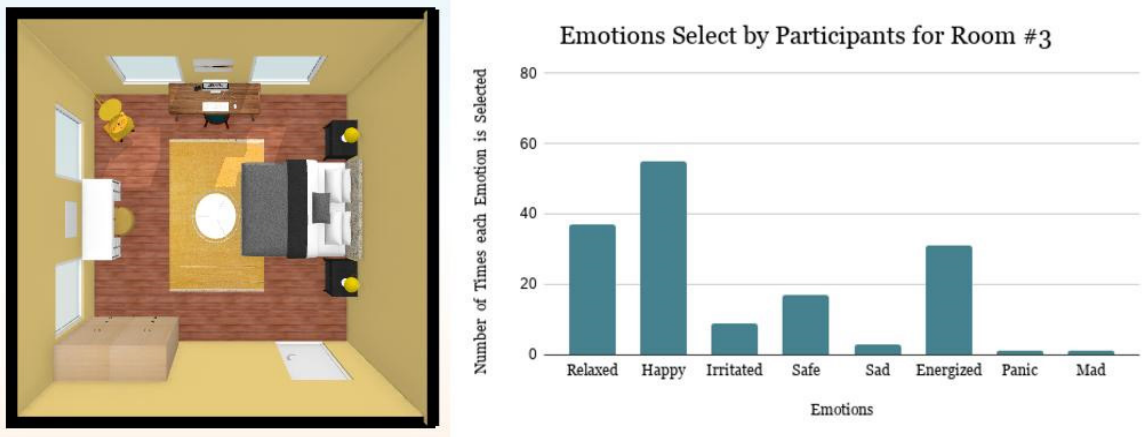

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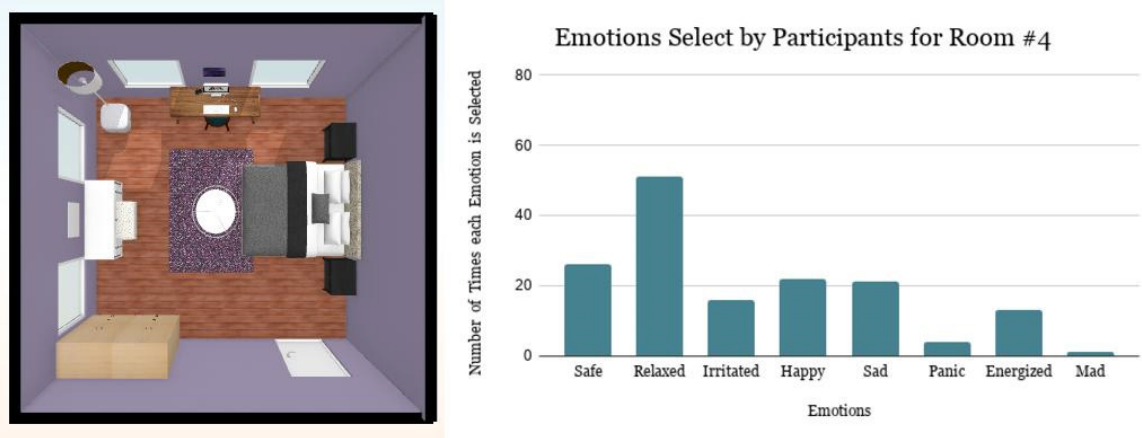
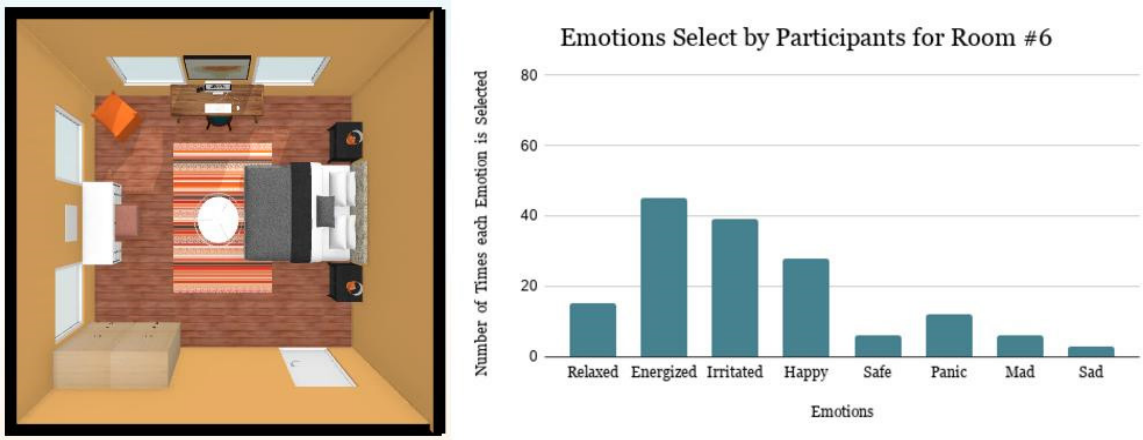


Figure 5:

Figure 6:



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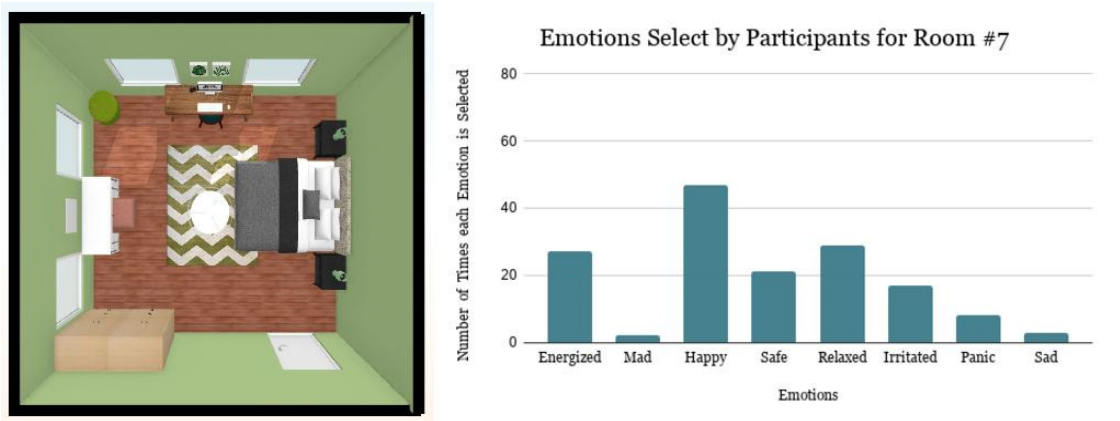
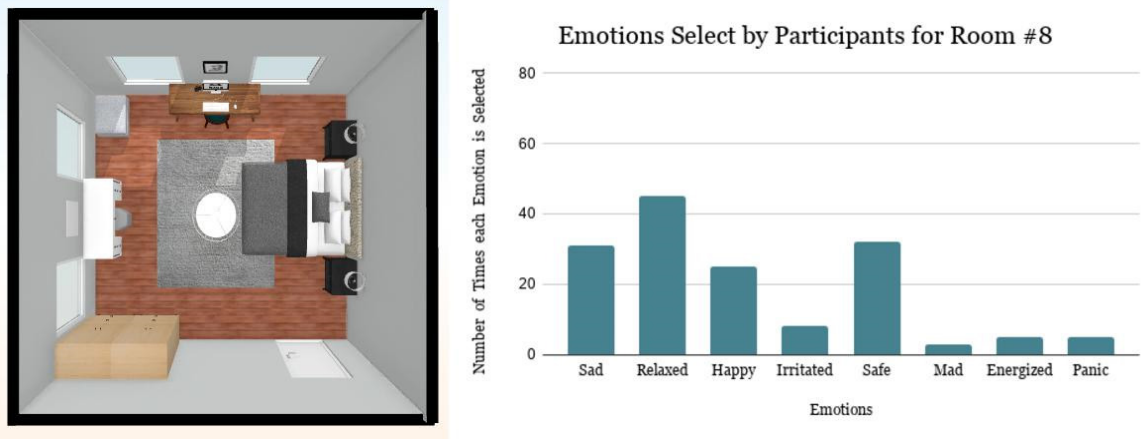


Figure 8



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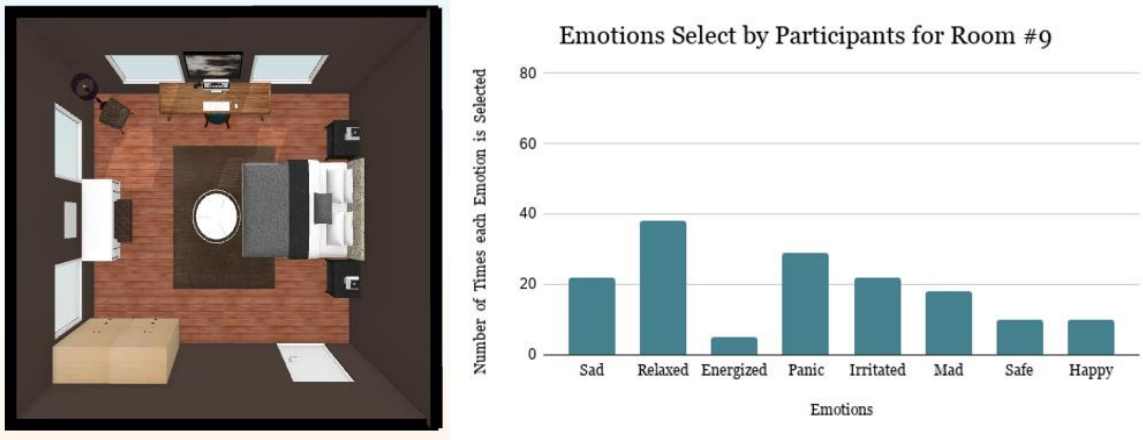
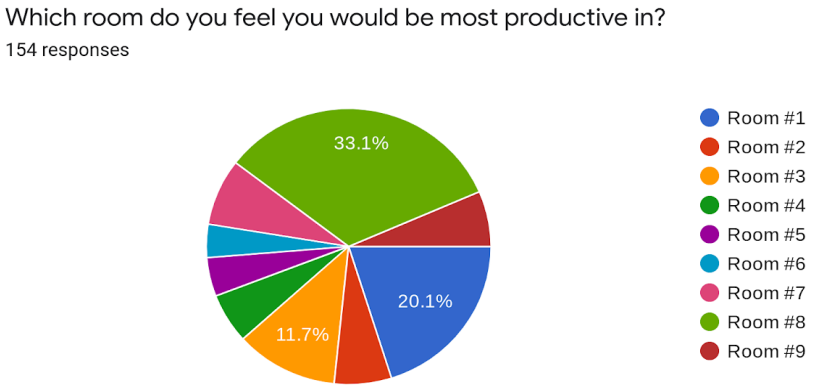


Figure 10:



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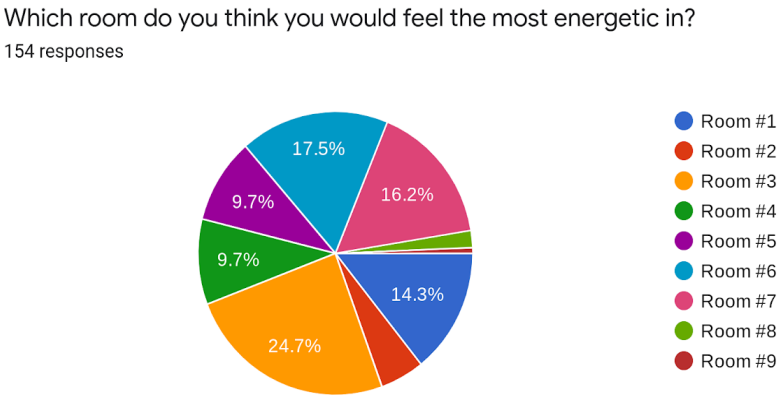

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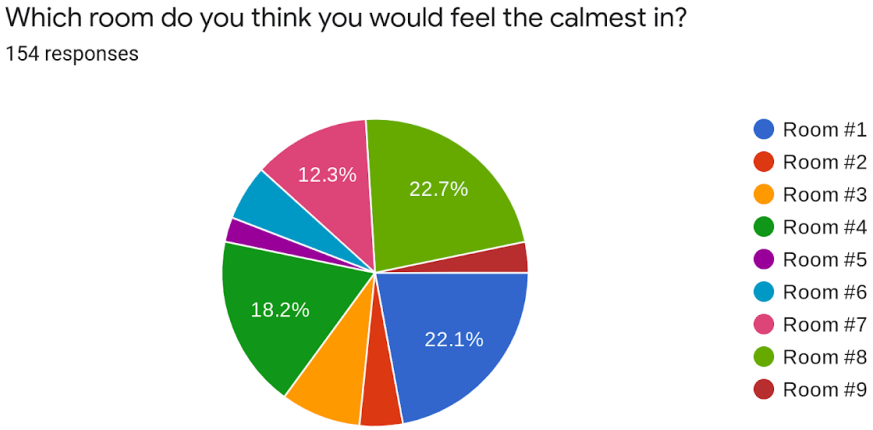
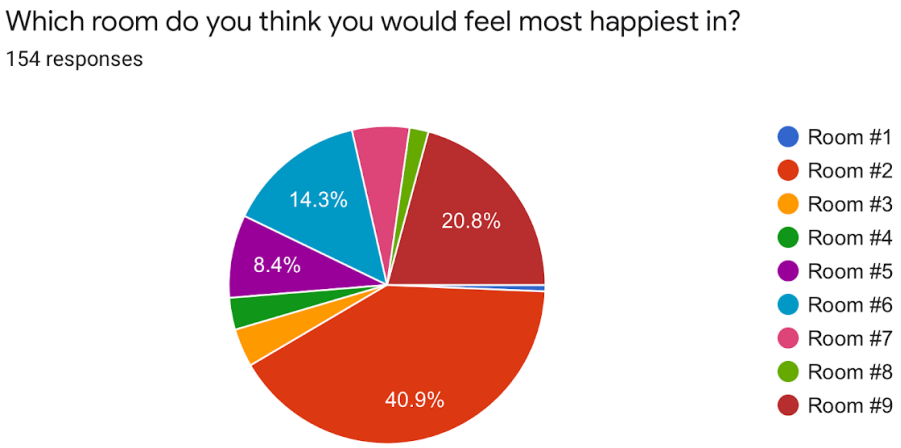


Figure 13:



Survey 2: The Psychological Impact of Light on Interior Design

A smaller group of people volunteered to participate in this study because it required more effort than survey #1. A total of 32 people were sent information about the light study. The 11 am, 1 pm, and 4 pm forms received 21 responses, however, only 20 responses were received for 7 pm. Participants were sent reminder emails throughout the day reminding them to fill out the forms. All 4 forms were emailed to the participants with detailed instructions in the middle of february. Participants were told that their emails would be collected for the purpose of cross referencing the data across all 4 forms, however, their responses would remain anonymous.

The four graphs below include data from all four forms. The x-axis represents the five different intensities of natural light participants could select, each bar above the levels of intensity representing the number of responses for the level of one of the factors. The y-axis represents the data collected for the number of responses collected for that specific variable at a specific intensity of sunlight. For example, in figure 2.1, the first green bar shows that two participants felt a level one of productivity at a level 1 intensity of sunlight.

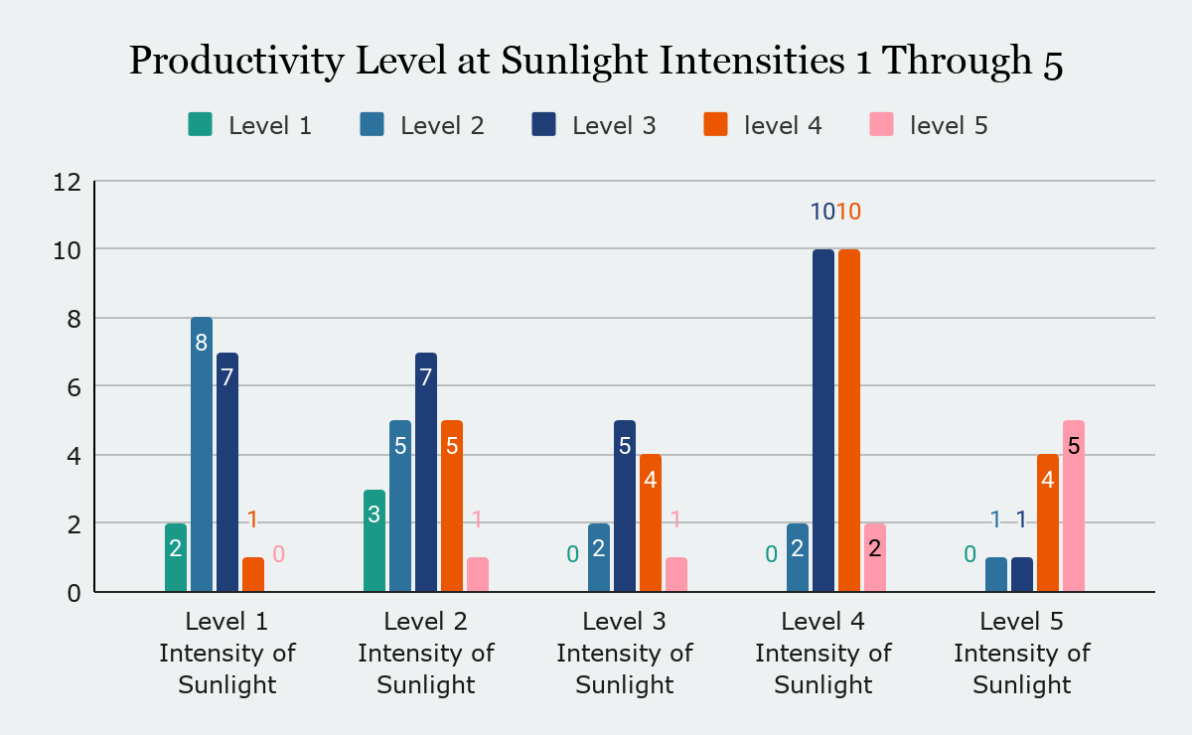


Figure 14: Depicts the relationship between the amount of natural sunlight and how productive respondents felt on a scale of 1 to 5 at different intensities of sunlight. The purpose of this question was to understand how light could be used in room's of teenagers to create a productive environment.

Figure 14 shows that participants felt most productive (level 5) at a level 5 intensity of sunlight. On the other hand, most participants felt the least productive (level 1) at a level 2 intensity of sunlight. At a level one intensity of sunlight most participants felt a level 2 of productivity, however, for a level 2 and 3 of sunlight intensity the productivity level increased to 3. At a sunlight intensity of 4 there were an equal number of participants who felt a level 3 and 4 of productivity. The productivity level increased to a level 5 productivity at a level 5 intensity of sunlight.

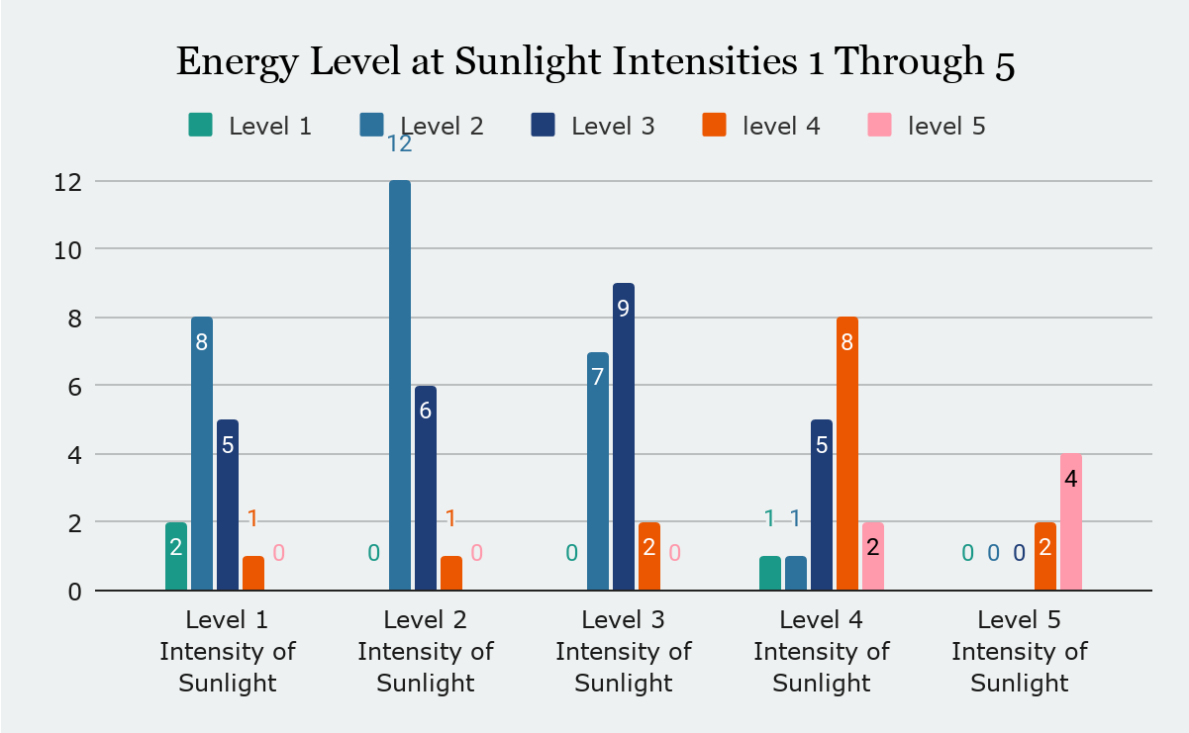


Figure 15: Depicts the relationship between the amount of natural sunlight and how energized respondents felt on a scale of 1 to 5 at different intensities of sunlight. The purpose of this question was to understand how light could be used in room's of teenagers to create an energetic environment.

As shown in figure 15 above, most people had the highest level of energy (level 5) at a level 5 of intensity of sunlight. However, most respondents felt least energetic (level 1) at a level 1 intensity of sunlight. At a level 1 and 2 intensity most participants' energy levels were at level 2. However, as the sunlight intensity went up, participants' energy level went up.

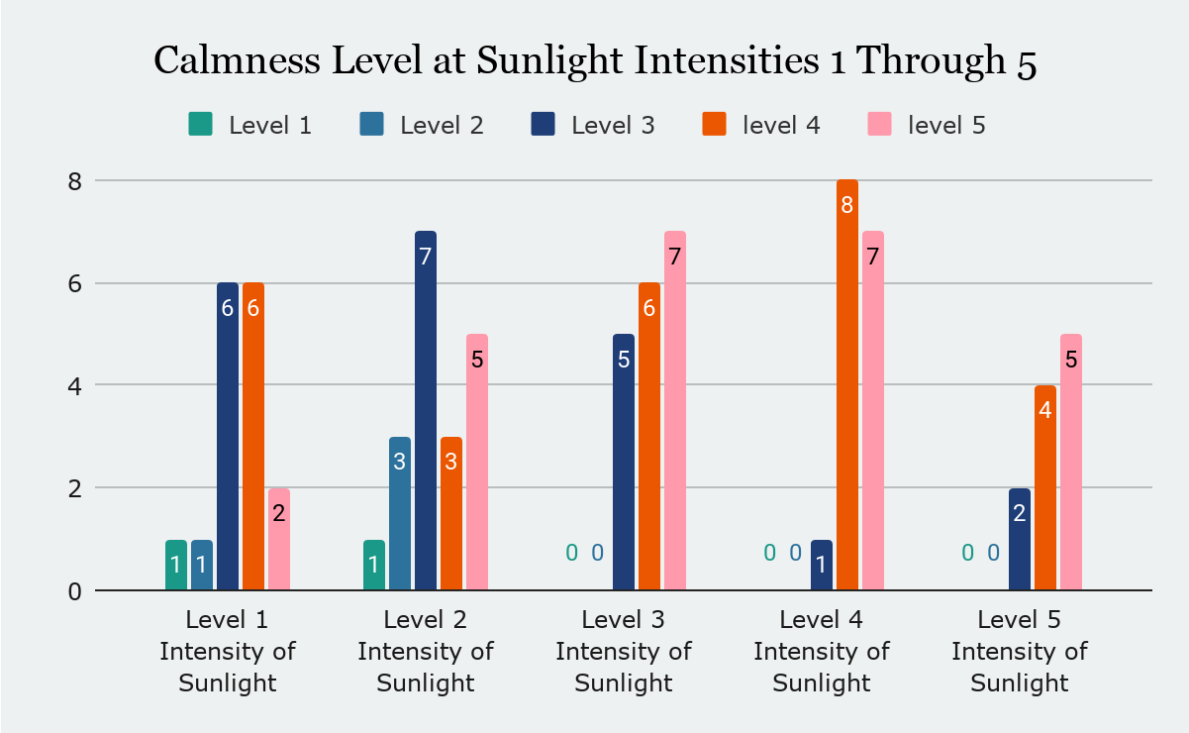


Figure 16: Depicts the relationship between the amount of natural sunlight and how calm respondents felt on a scale of 1 to 5 at different intensities of sunlight. The purpose of this question was to understand how light could be used in room's of teenagers to create a calm environment.

Figure 16 shows that most participants felt the calmest (level 5) at two levels of sunlight intensity: level 3 and level 4. However, most respondents felt the least calmest (level 1) at a level 1 intensity of sunlight. At a level 1 Intensity of sunlight participants equally felt a level 2 and 3 of calmness. As sunlight intensity increased to level 3, calmness level also increased to a level 4. However, at a sunlight intensity level of 4 the calmness level selected by most participants dipped down to a level 3 of calmness. But at a level 5 intensity of sunlight most participants chose a level 5 of calmness.

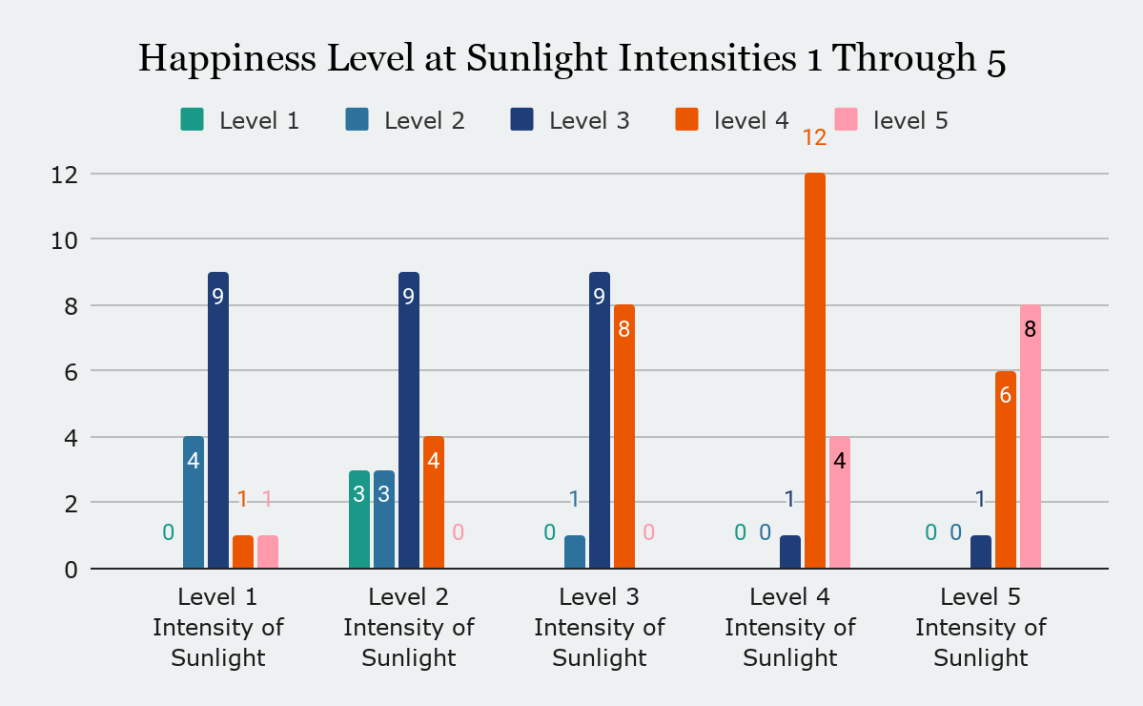


Figure 17: Depicts the relationship between the amount of natural sunlight and how happy respondents felt on a scale of 1 to 5 at different intensities of sunlight. The purpose of this question was to understand how light could be used in room's of teenagers to create a happy environment.

Figure 17 shows that most of the participants were the happiest (level 5) at a level 5 intensity of sunlight, while most participants were the least happiest (level 1) at a level 2 intensity of sunlight. Most participants constantly selected a level 3 of happiness for sunlight intensities 1 through 3. However, at the level 4 sunlight intensity most participants choose a level 4 of happiness. Furthermore, at a level 5 intensity of sunlight most participants choose a level 8 of happiness.

Discussion

There were two main purposes of these two studies: how teenagers and interior designers could design bedrooms to create (1) optimal workspaces and (2) a refuge for tired and overworked teenagers. To answer my research question I created two separate studies, both of which focused on the same final goals mentioned previously. Although previous studies have been conducted on the psychological impact of light and color, there is a very limited amount of research done on how those elements influence teenagers. Even then, researchers did not study how these elements worked when applied to interior design.

The first section study #1 asked participants what emotion each room made them feel. When participants were asked which emotion in cool tone rooms (blue, purple, and green) made them feel, the emotions selected are as follows: relaxed, relaxed, and happy respectively. This data reflected the findings of researcher Costa, where he found that adult participants favored cool tones over warm tones in residential settings. For the warm toned rooms, red, orange, pink and yellow, the word selected for most rooms was irritated, happy, happy, and energized respectively. The red room was the only room that received the most emotions as a negative word. Finally, for the neutral tones (grey and brown) both rooms got the most responses as relaxed. Overall, the color chosen by most for each room was

positive except for the red room. In this section, participants showed no clear preference between the nine colors. However, they did show a dislike towards the red room.

The first variable in the second section of the survey focused on understanding what sort of room teenagers would work best in, the two questions regarding this variable in both studies were about productivity and energy level. When asked about productivity level participants said that they think they would feel the most productive in the grey room (reference figure 1.10). Then when asked about energy level, a little less than a quarter of participants selected the yellow room as the room they think they would feel the most energetic in. The second most selected room for this question was the orange room (reference figure 1.11). This indicated that participants felt the most energetic in the rooms that had warm tones. These findings differed from the results found by Costa where adults in his research did not like studying in warm toned rooms.

The second variable of the study focused on obtaining data to create rooms where teenagers would feel safe and relaxed, therefore they were asked about happiness and calmness levels. Most participants would decide that they would feel the calmest in the grey room, the second most selected room for this question was the blue room (reference figure 1.12). This finding supports the previous research done by Travevelodge as participants slept the best in the blue room because blue expresses calming sensations. Surprisingly, at the end of the survey when participants were asked which room they would feel the happiest, most participants responded with the red room (reference figure 1.13). The red room was the only room that revealed the most responses as negative responses in the first section of the study. Although surprising, these findings were similar to the ones found in Sutton's study where red was selected the most for negative and positive words. A possible explanation for this difference could be that participants grew more comfortable with the red room towards the end of the survey or as the survey progressed participants associated the room with different experiences through the course of the study.

The grey room was the room selected for the room where teenagers think they feel the most productive and the calmest. This data shows that a grey room would be extremely beneficial to teenagers. Blue was a popular color for creating a safe and comfortable environment. The first section of the survey received about 70 responses for the emotion relaxed when participants asked how the room made them feel. Blue was also the second most chosen room when asked about productivity, making blue another color which would be beneficial for teenagers. The second section of the survey shows a clear preference towards neutral and cool tones as opposed to warm tones.

After the survey #2 was concluded, I was able to merge the data across the four surveys. Overall, participants preferred higher levels of natural light compared to lower levels. These results support the research done by Lossis and Canazei supporting the findings of this study as the light study shows that more natural light promotes productivity and energy level. It can also work to increase happiness and calmness levels. The only variable that did not have the most responses for a level 5 intensity of sunlight was the calmness level. Most participants equally felt the calmest at a level 3 or level 4 intensity of sunlight. This could be due to preference or other confounding variables. As the day goes on and the sun goes down, teenagers are able to complete more work. Resulting them to feel calmer at lower levels of sunlight.

Limitations

The first major limitation in the data collection stage was the sample population, specially the gender of the sample. The first study received a total of 154 responses, however, 81% of them were from females. My second study on the effect of natural light received a total of 21 responses, all of which were females. The uneven distribution in the sample could have been due to enthusiasm in the topic. Although, in the additional comments section many participants said they enjoyed the study or found it interesting, this can not be generalized to genders of high school students. Another major consideration in the sample population was cultural differences. High school X is located in a suburban school on Long Island, magnifying the ideology of one group in the data. The difference in gender and cultural similarity would impact how teenagers perceive colors and led to a bias in the studies' responses by reflecting responses of

suburban teenage females rather than representing all teenage male and females. Because of the distribution of my sample, replication of the color study in different locations could result in different outcomes.

Another major limitation for both studies were confounding factors. For example, the second study asked participants about their productivity level at a given time. The productivity level of participants could be influenced by how much or well participants slept the night before participating in the study. Researchers could solve this issue by performing these studies in a controlled environment where researchers are able to limit the effect of extraneous variables on the results and ensure that all subjects receive the same treatment.

A final major limitation was time, space, and budgetary constraints. Because the rooms were created on a virtual program instead of a physical room participants were not able to experience the rooms to their full extent. I believe creating physical rooms, like the ones created in the study done by Travelodge, could possibly give more accurate results because participants would be able to fully experience each room.

Although these limitations influenced the data from both studies, the responses received from them are reliable. The results were efficient to provide a sufficient response to the research question.

Further Research

Interior design is a wide profession with many different details that could be investigated. Based on the topics of the color and light surveys, researchers could study how color and light work in different areas or how the five other elements of interior design can influence teenagers.

The psychology of interior design is a science that can be applied in any building from hospitals to classrooms. Understanding how interior designers could use psychology to influence the way teenagers feel and think in a room can evolve how effectively a room could be used. In the future, researchers could study the effect of color in other settings than bedrooms such as classrooms, libraries, or hospitals. This information can be used by schools to create environments which promote productivity. Or create hospital rooms that enhance teenager's recovery rates from surgery or disease.

Another factor researchers could investigate is understanding how the five elements of interior design that were not used in these two studies - light, form, pattern, texture, and space- can alter teenager's emotions. These elements are equally as important as color and light in yielding a certain emotion to a room and data on these five elements can give researchers a broader range of information to use when designing a teenager's room.

Conclusion

The purpose of this research was to find if color and light in interior design can affect teenagers differently than it does adults, and if so, how was it different. Based on the results, to create a productive and safe environment, interior designers should use more neutral tones like grey and incorporate more sunlight in their designs. The information produced by these studies can not only be used by interior designers, but also teenagers themselves can use the information by this research to create rooms that would create an ideal work space or a space for them to relax. Future research on the psychology of interior design can add more information to a field that has little to no research, allowing interior designers and teenagers to produce a room in which they could feel productive in. Or creating a safe haven for themselves to get away from their hectic lives.

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References

Canazei, M., Pohl, W., Bauernhofer, K., Papousek, I., Lackner, H. K., Bliem, H. R., Marksteiner, J., & Weiss, E. M. (2017). Psychophysiological Effects of a Single, Short, and Moderately Bright Room Light Exposure on Mildly Depressed Geriatric Inpatients: A Pilot Study. Gerontology, 63(4), 308-317. https://doi.org/10.1159/000455231

Costa, M., Frumento, S., Nese, M., & Predieri, I. (2018). Interior color and psychological functioning in a university residence hall. Frontiers in Psychology, 9. https://doi.org/10.3389/fpsyg.2018.01580

Council for Interior Design Qualification. (2019). Definition of interior design. Council for Interior Design Qualification. Retrieved May 10, 2021, from https://www.cidq.org/definition-of-interior-design

Duyan, F., & Ünver, R. (2016, July). A research on the effect of classroom wall colours on student's attention. https://jag.journalagent.com/itujfa/pdfs/ITUJFA-57441-DOSSIER_ARTICLES-DUYAN.pdf

Howard, J. (2019). Atmosphere: The seven elements of great design. Abrams.

KAYA, Naz & EPPS, Helen. (2004). Color-emotion Associations: Past Experience and Personal Preference. AIC 2004 Color and Paints, Interim Meeting of the International Color Association, Proceedings. 5.

Labrecque, L. I., & Milne, G. R. (2012). Exciting red and competent blue: The importance of color in marketing. Journal of the Academy of Marketing Science, 40(5). http://dx.doi.org/10.1007/s11747-010-0245-y

Loisos, G. (1999, August 20). An investigation into the relationship between daylight and human performance. http://h-m-g.com/downloads/Daylighting/schoolc.pdf

Mack, D. (1997, December 22). Feng shui: Ancient chinese art is cutting edge design. Nation's Restaurant News.

RAJGOPAL, S. S. (2002, February). The Resurgence of Vastu Shastra - India's Traditional Science of Architecture. World and I, 17(2), 38. https://link.gale.com/apps/doc/A82780971/GPS?u=nysl_li_wheat&sid=GPS&xid=8cb77b70

The secret to a good night's slumber is to sleep in a blue bedroom. (2013, May 17). Travelodge. Retrieved December 3, 2020, from https://www.travelodge.co.uk/press-centre/press-releases/SECRET-GOOD-NIGHT%E2%80%99S-SLUMBER-SLEEP-BLUE-BEDROOM

Sutton, T. M., & Altarriba, J. (2016). Color associations to emotion and emotion-laden words: A collection of norms for stimulus construction and selection. In Behavior Research Methods. https://doi.org/10.3758/s13428-015-0598-8 (Excerpted from Behavior Research Methods, 686-728)

Torcellini, P., & Edwards, L. (2002, July). A literature review of the effects of natural light on building occupants (NREL/TP-550-30769). https://www.nrel.gov/docs/fy02osti/30769.pdf