

## The Implementation of Color in the Interior Design of the Pharmaceutical Laboratory through a Total Ergonomics Approach Provides Comfort and Increases Focus at Work

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### ABSTRACT

Furniture facilities and equipment in pharmaceutical laboratories have been standardized. The method used is the Descriptive Analysis method. Color psychology is a theory of color related to human psychology. In addition, to improve the function of the space, it must be thought of the appropriate colors to be implemented in the interior design to achieve balance and harmony in the room. Designing a pharmaceutical laboratory iteration is not just about implementing the colors we like, but it must have enough meaning so that it can have an impact on behavior, mood, focus, and general associations. For this reason, it is considered important to learn the total ergonomics approach in order to get optimal repair solutions.

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## **INTRODUCTION**

In interior design, it is based on the demands of activities and the community. This is very necessary in providing comfort and increasing the focus of the community in doing work. By providing comfort and focus, it can improve performance and productivity, so that the interior design of the pharmaceutical oratory laboratory with the concept of Good Laboratory Oratory Practice (GLP) is achieved.

Good Laboratory Oratory Practice (GLP) is a concept that can be used to test the feasibility of an oratory laboratory. With the achievement of the GLP concept, more valid and accurate work results can be achieved so that laboratory results can be more accountable. One of the principles of the GLP concept is that laboratory facilities meet cleanliness, safe and comfortable standards, for which one of them is the implementation of the right color in the interior design of the laboratory. Such as the implementation of the elements that form the space (floor, wall and ceiling), the complementary elements of the space (doors, windows and ventilation) and the choice of the color of the facility (furniture and laboratory equipment) must be carefully considered. The implementation of the right colors can provide comfort and improve focus at work.

By providing comfort and increasing the focus of work in the pharmaceutical laboratory room, it can, among other things: 1. Minimize the error rate in the drug mixing phase, resulting in a more valid and accountable data evaluation; 2 Approval of the application for drug distribution permits to regulatory bodies (BPOM) is easier because the results are more accurate and valid; 4. Increase consumer trust in drug manufacturers. For this reason, it is considered important to study the total ergonomics approach to get optimal repair solutions, related to color psychology to be implemented in the interior of the pharmaceutical laboratory.

The total ergonomics approach is the best effort in improvement to improve working conditions (humans, tools and environment) to be more optimal in doing work with the minimum possible work complaints. The minimal impact of work can be done with a systemic, holistic, interdisciplinary and participatory approach. The approach is known as the SHIP or SHIP Approach (Sucipta, I. N., Nada, M., & Wulan, W. C, 2016). The SHIP approach is a comprehensive improvement of all aspects of ergonomics in the design process from upstream to downstream in a continuous and integrated manner. One of them is creating a pharmaceutical laboratory interior design by implementing appropriate colors to create safe and comfortable environmental conditions.

## LITERATURE REVIEW

### *Pharmaceutical Laboratory Interior Design*

A pharmaceutical laboratory is a high-precision workspace that demands precision, concentration, and adherence to safety standards. According to WHO (2010) and ISO 15189, laboratory interior design must support work efficiency, user safety, and physical and psychological comfort.

### *Color in Interior Design*

Color is a visual element that has a great influence on the perception of space, emotions, and human behavior. Birren (2013) states that color can affect psychological conditions such as calmness, alertness, and focus. In the context of interiors, color also serves to clarify the zoning of the space, improve visual comfort, and support the function of activities in it.

### *Color Psychology in the Work Environment*

Color psychology discusses the relationship between color and human cognitive and emotional responses. In high-risk work environments such as pharmaceutical labs, color plays a role in maintaining emotional stability and work focus. Elliot & Maier (2014) explained that cool colors such as blue and green are related to calmness, trust, and concentration, while neutral colors such as white and gray support visual cleanliness and sterile perception.

## METHODOLOGY

The method used in this writing is the Descriptive Analysis method. Descriptive analysis is a research method by collecting data related to the implementation of appropriate colors for the planning of a safe and comfortable pharmaceutical laboratory space. Furthermore, it is compiled, processed and analyzed to be able to provide an overview of the existing problems (Haryoko, Bahartiar, and Arwadi, 2020).

## RESEARCH RESULT AND DISCUSSION

Interior design is not only limited to designing a room to look attractive. However, in designing interiors, there are many aspects that we must think about, one of which is choosing the right color so that it can provide a good mood to the user of the space. Besides that, we are aware that every decision in designing a room has a certain purpose. For this we must know some of the main functions of interior design:

1. **Creating a Harmonious Room**

Creating a harmonious room by arranging the elements in the room to harmonize with each other, so as to create balance and harmony in the room. That balance includes choosing the right color.

## 2. Giving Aesthetic Value to the Space

Providing aesthetic value by maximizing the elements of the beauty of the room, One of the things that can support aesthetic value is by choosing the right color to be implemented in an interior design. The application of the right color can present a comfortable and pleasant room. In addition, a well-designed interior design can increase work morale. For this reason, it can be concluded that humans and the environment are one unit that cannot be separated because the two interact with each other (Altaman, 1987).

Wise and coherent color selection in interior design can support the concept and function of the room. Besides that, color also plays a role in directing attention and distinguishing the function of indoor areas.

Color in Interior Design has a central role to create a good mood. For example, soft colors such as pastel or neutral colors tend to give a calm, peaceful, and relaxed impression, while bright colors such as red, and yellow can create energy and add enthusiasm.

Remembering the importance of color in interior design, an interior designer must master the science of color psychology before designing interior spaces. Next, we will discuss the right color studies to be implemented in the interior design of pharmaceutical laboratories.

### a. Color Studies

According to the laws of Pthagoras (around 580-500 BC) it was concluded that every object has a particle radiation. The particles will be visible in color when there is light.

### b. The Influence of Color Psychology on the Community in the Pharmaceutical Laboratory Space

Implementing color in the iterative design of pharmaceutical laboratories should have enough meaning so that it can have a positive impact on behavior, mood, cognition, focus, and general associations (Anonymous, 2014).

The Influence of Color on the Psychology of the Space Community according to color psychologists is as follows: (Made Ida Mulyati, and Levi Anatolia S.M. Exposto, 2023)

### *The Psychology of White and Light Gray as Neutral Colors*

White and light gray are categorized into neutral colors. White has a character that seems pure, innocent, clean. While light gray has a character that seems strong, harsh and emotionally dampening. White and light gray colors are very suitable when implemented in the elements that form the space (on the walls, floors, ceiling), on the complementary elements of the formation (doors, windows, ventilation), and furniture to create the impression of space so that it seems more spacious. However, the color of ash can seem cold, empty, and isolated if it is implemented too much. However, this impression will not appear if we combine it with colors such as white heron, crystalline, windmill wings, golden straw, thunder which are suitable for implementation in the interior of pharmaceutical laboratories.



***Green Color (Crystalline or Sage Green)***

The green color as a symbol of the leaves, gives a cooling impression. Paul Brunton said that green is the color of leaves related to nature can provide a sense of comfort, calm, soothing, and stress relief. For this reason, green is very suitable to be implemented in the interior design of pharmaceutical laboratories, but it must be combined with white, *white hiron* and other colors to not seem monotonous.

***Light Yellow Color Psychology (White Cream)***

Light yellow (white cream) is classified as a warm color that has a bright character. The effect of using white cream color in interior design can evoke mood, energize, and give a clean impression. The color of white cream is very suitable to be implemented in the interior design of pharmaceutical laboratories because it can provide enthusiasm for the community so that the work results are maximized. For a clean impression, it serves to always remind the working laboratory community to be skilled, minimizing materials that fall.



**Figure 1. Implementation of a Combination of White, Light Gray, and White Cream in Pharmaceutical Laboratories and Accompanied by a Little Black as an Agent**

***Psychology of the Blue Color (Windmill wings)***

Based on color psychology, blue has a calm, peaceful, orderly, and stable character. If applied too excessively, it can have a sad, lonely, and chaotic effect. The implementation of blue (Windmill wings) with a sufficient portion can have a positive effect on the psychology of the community in the pharmaceutical laboratory room, namely being able to work more comfortably and more focused.



**Figure 2. White Wall Color, Combined with Thander Frame Color, A Combination Door Between**

***Thander And Windmill Wings Colors***



**Figure 3. Combination of Wall Color with Thander Color, the Floor was Chosen by Windmill Wings and white Furniture**

### ***Psychology of Brown (Golden Straw)***

Based on color psychology, cream brown color is classified as a natural color that has a strong and warm character. If implemented too excessively, it can bring negative effects such as loneliness, sadness, isolation, and emptiness.



**Figure 4. The Implementation of a Combination of Golden Straw Colors, White, Light Gray and Black Accents on the Ceiling Makes the Interior Appearance of the Pharmaceutical Laboratory More Attractive**

### ***Psychology of Orange (Leading to Yellow)***

Based on *color psychology*, the color Orange gives an impression of emotional energy such as passion for work and warmth. With this impression, it can improve the quality and productivity of work. However, if Orange is applied too much, it can result in excessive fatigue and ultimately can lead to decreased performance (Susihono et al., 2017).



**Figure 5. The Implementation of a Combination of White, Light Gray, and white Cream in the Pharmaceutical Laboratory and Accompanied by a Little Orange Color as an Accent Gives a Warm Impression**

Considering that the effect of implementing colors that are in accordance with their portion in the pharmaceutical laboratory space can have a positive effect on comfort and focus on work, it is better to think about the suitability of the colors to be implemented in designing the interior design of the pharmaceutical laboratory and other laboratories.

The habit of working in a comfortable and safe environment must be conditioned from an early age in using the laboratory space of the pharmacy oratorium. For this reason, it is necessary to standardize the interior design of the pharmaceutical laboratory which must later be used as a reference in the interior design planning of the pharmaceutical laboratory oratorium. One of them includes color standardization that must be implemented.

In addition to the implementation of colors that are appropriate for the interior of the pharmaceutical oratorium laboratory, it is also no less important to think about the suitability of colors for the information and safety signs needed in the design of the pharmaceutical oratorium laboratory. The signs should be clear, and easy to understand. Writing should be in a language that is easy for workers to understand quickly. The writing must be in a clear font and must use the right color scheme to make it easy to read, in accordance with the Regulation of the Minister of Manpower number 15 of 2008 concerning First Aid in Accidents.

#### ***Application of Color on Laboratory Signs***

The application of color on laboratory signs follows regulations that are already a requirement of an emergency procedure. Such as color: (The Sherwin-Williams, 2018).

1. Orange is usually used to mark parts on machinery or equipment that are dangerous, such as having high temperatures, sharp objects that can cause scratches, cuts, electrocutions that can result in injured workers. In addition, orange is also used in the background of a K3 warning sign, on the engine door and the sharp tip on the work tool used as a warning of danger signs.
2. The yellow color is used for danger signs to be careful (caution),
3. It is usually used on stairs, and storage for acidic substances.
4. The color blue is used to mark equipment that cannot be used. For example, on command signs, electrical controllers, and others.
5. The Green color is used to indicate the location of safety equipment such as first aid equipment in an accident (P3K). The use of green color is also used in eyewash, eyeshower, and emergency exit routes.
6. Black and white: a combination of these 2 colors is used for traffic and signs for housekeeping. The lines of both colors are usually often seen on steps, or signs.



**Figure 6. Fire Extinguishers and Hydrants**



**Figure 7. Emergency Eyewash Green Color**

## **CONCLUSIONS AND RECOMMENDATIONS**

From the results of the analysis, it was obtained that the appropriate colors were applied to the interior of the pharmaceutical laboratory, including neutral colors of white, light gray, and it is possible to apply black as an accent a little. Besides there are several companion colors to be combined with neutral colors, including white heron, crystalline, windmill wings, golden straw, thunder. By implementing these colors, it can provide comfort and focus for the laboratory community to improve performance and productivity.

## **ADVANCED RESEARCH**

Further studies are still needed to examine the impact on objective performance aspects and potential work errors in the pharmaceutical laboratory environment.

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