

# Mask Design For Children Aged 7-12 Years Based On Children's Convenience and Interest

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## Abstract

The purpose of this study is to determine children's interest in colors and images of mask. The convenience of wearing a mask affects wearability in children. In a study, the N95 mask was a comfortable mask for children, but children's interest in wearing masks is influenced by colors, shapes and images, so children were still reluctant to wear masks. This study would test masks on children consisting of N95 Respirator and N95 Non-Respirator masks. The observations were carried out in a room with natural comfortable room temperature. Individual children were asked to answer questions about the children's perception of comfort and interest in masks, then assessed using a five-point Likert scale. N95 respirator mask was chosen by the children because it was suitable for convenience, not in pain, not hot, comfortable when breathing and children's interest in masks with images and attractive colors were the reasons for attracting children's interest in continuing wearing the mask. Therefore, the design of the mask must be in accordance with the parameters needed by the children so that the children's resistance when wearing the mask lasts a long time. The convenience of wearing a mask was one reason why children wore them for a long time, but the interest in visual images and attractive colors were also factors that drew children to continue wearing the mask.

## Keywords

Mask, children, and N95.

## 1. Introduction

Deaths due to COVID-19 in children and adolescents under the age of 20 account for 13 percent of reported COVID-19 cases and 32 percent of the population (Unicef 2021). Prevalence and serious cases of COVID-19 in children is lower than adult (Wu and McGoogan 2020, Livingston and Bucher 2020, Garg et al. 2020). However, the finding of a study in Indonesia, that the mortality rate of children with confirmed COVID-19 was 40%, indicated that children should be protected from that infection (Dewi et al. 2021). One way to overcome child deaths due to exposure to COVID is by wearing masks (Esposito and Principi 2020). Currently, there are medical masks that have been evaluated for safety, compatibility, and comfort. One of them is the N95 mask. N95 masks are designed and adapted for children. The results in the study stated that the N95 mask was a suitable, comfortable, and safe mask for use on children during rest and light activities. (Goh et al. 2019). The use of masks that last for a longer time in children is influenced by comfort parameters. These parameters consist of confidence when wearing, comfortable when wearing, child interest, not hurt, has good air circulation so it is not hot when worn, and comfort when breathing. Children who easily remove the mask can substantially affect the efficacy of the mask. In other words, children's perception of the use of medical masks is strongly influenced by the design of the mask, the air circulation when wearing it and the breathability felt when wearing a mask. By producing medical masks that can attract children's interest, provide breathing comfort when in use, have good air circulation so that masks are not hot when used, and increase their suitability to children's needs will make the duration of wearing masks in children can be increased (Naomi, 2020).

The standard for using an N95 mask is to tie it around the nose and mouth with a string around the ears or head or both. Its performance characteristics are tested according to a series of standardized test methods (ASTM F2100, EN 14683, or equivalent). Filtering facepiece respirators (FFR), or respirators, offer a balance of filtration and ease of breathing (WHO 2020). The testing in this study is important because, in this study, the test carried out was to compare children's interest in N95 respirator and non-respiratory N95 masks on the market. By knowing this, it can be assessed whether the child masks sold in the market are following the child's comfort parameters or not. These parameters consist of confidence when wearing a mask, comfort when used, interest in masks, does not hurt when worn, has good

circulation so that the mask is not hot when used, and ease of breathing. Tests on these parameters were carried out on N95 respirator and N95 non-respirator masks. The benefits are to increase comfort in using masks for children and increase children's interest in N95 respirator and N95 non-respirator masks.

### **1.1 Objectives**

The purpose of this study was to compare whether N95 respirator and non-respiratory N95 masks were following the comfort and interest of children in wearing masks. By knowing this, it is hoped that the duration of wearing masks on children can be longer so that efforts to reduce the risk of being exposed to Covid-19 are more effective.

## **2. Literature Review**

It is important to increase the use of masks among the public, especially during the current COVID-19 pandemic. The use of masks by the public during the COVID-19 pandemic is not encouraged enough, so it is necessary to publish the use of masks. (Nicholas 2020). Masks play an important role in reducing disease transmission, one of which is caused by viruses. Given the current pandemic, it is necessary to review the use of masks in children. This can be done by comparing and contrasting attitudes towards the use of masks. According to Mariella (2020) explains that the universal use of face masks seems necessary for people who carry out activities outside the home in their daily lives. In addition to the availability of masks of various sizes that can adapt perfectly (Esposito and Principi 2020), N95 masks are recommended for children because of their convenience (Greenhalgh et al. 2020). By making children's medical masks more attractive, providing comfort when breathing, have good air circulation, and increasing compatibility with children's needs, comfortable when used, it is hoped that the duration of wearing masks in children will be longer (Smart et al. 2020).

In Table 1 it shows that the characteristics of non-respirator N95 masks are masks that have a nose clip made of comfortable spunbond material and an N95 respirator mask with a nose clip on the mask can prevent bacterial and dust invasion. There is a respirator so that children do not feel hot when wearing it.

## **3. Methods**

### **3.1 Participants**

Participants in this study consisted of 6 boys and 7 girls aged 7-12 years. As a precaution, children with respiratory conditions due to cardiovascular problems and claustrophobia were excluded from this study.



### **3.2. Data source**

In this study, a method was used to measure the duration of use of children when using a KN95 respirator and KN95 non-respirator mask. The test was conducted on children aged 7-12 years where they were asked to wear a mask to assess their comfort and interest in wearing a mask.

### **3.3 Research Tools**

Data retrieval was done in video mode using Canon 550 D and Sony CX405 CX-405 camcorders. Details of taking video and cameras were used to see the details of participant responses while wearing KN95 Non-filtration and KN95 filtration masks.

Table 1. Characteristics of the three masks tested in the wearability study

Mask	Image	Protection Provided (As Stated by Manufacturer)	Nose Clip	Strap Type	Exhalation valve/respirator	Washable	Price
N95 mask		Effectively prevent the invasion of bacteria and dust and protect the body to breathe fresh air. - Made of good material Spunbond/Nonwoven, safe and healthy to use as a mask	Available	Unadjustable	Not available	No	IDR.8500
N95 Respirator Mask		Reusable disposable, children aged 2 to 12 years	Available	Unadjustable	Available	No	IDR.6000

#### 4. Data Analysis

Observations were made at home by implementing health protocols in the form of social distancing, washing hands, wearing masks, and not making crowds. Before the observation, the researcher was confirmed to be in good health. The study was conducted in a closed room with a comfortable room temperature. Observations were carried out in turns with a duration of approximately 20 minutes for each child. The children who were the sample of the study were those who were healthy and did not suffer from respiratory cardiovascular disease and claustrophobia. Camera devices were prepared in a room with a recording duration per child of approximately 20 minutes. To obtain detailed video footage, the camera was mounted with a mini tripod so that every movement and speech of the child can be captured properly. The camera in this case is hidden from the children so that the answers they give are honest and true answers. Children were welcome to sit in the room comfortably. The children were then given directions to wear masks and answer questions given by the researcher.

The children were individually asked to answer questions about their perception of comfort when wearing a mask. These perceptions include masks with good air circulation so the masks are not hot when worn, breathability when wearing masks, comfort when breathing, and medical masks that they may want to wear again. In the assessment, a five-point Likert Scale was used. If children removed their face masks during the study process, this provided an opportunity to evaluate the duration of wearing the mask. The children were also asked if they felt confident when wearing a mask, if they liked the look of the mask and if they took off the mask during activities. The children were also asked whether and when they would wear masks again as an open-ended question. After testing their final mask, a post-activity questionnaire was administered. In this stage, the children were asked to sort two masks which in this case depended on their perception, regarding comfort, ease of breathing, and which masks they might want to wear again.

Children are encouraged to wear a mask during all activities but are made aware that they can remove the face mask at any time, if they feel uncomfortable, too hot, feel their breathing is limited or the mask restricts their activities.

#### 5. Results and Discussion

##### 5.1 Graphical Result

The participant's description of the 20 children who were the study population are presented in Table 2. All 20 children were wearing masks. The results of this stage are used as the study population whose criteria are divided by gender and age 7-12 years.

Table 2. Participant description

		Total Number	%
Gender	Male	11	55
	Female	9	45
Age (Year)	7	6	30
	8	6	30
	9	2	10
	10	3	15
	11	2	10
	12	1	5

##### The convenience of masks

The convenience of masks when worn by children, namely non-respirator N95 masks for N95 masks. Table 3 describes the standard criteria for wearability masks by showing the criteria for comfort when breathing with an N95 respirator mask, which is 70% for non-respirator N95 masks, only 30% of children feel comfortable when breathing. On the criteria for lack of shame when wearing a mask, 60% on an N95 respirator mask and on a non-respirator N95 mask, 40% of children feel a lack of shame when wearing a mask. The criteria for comfort when wearing a mask are 80% on N95 Respirator masks and 20% of children feel comfortable when wearing masks. The criteria for not being hot when wearing a mask are 70% for N95 masks and on non-respirator N95, only 30% of children do not feel hot. Then there is no pain when wearing a mask, 80% on an N95 Respirator mask and 20% on a Non-Respirator N95 mask.

Figure 1 shows a diagram of mask convenience according to the criteria for mask convenience for children of 85% for N95 Respirator masks and 15% for Non-Respirator N95 masks.

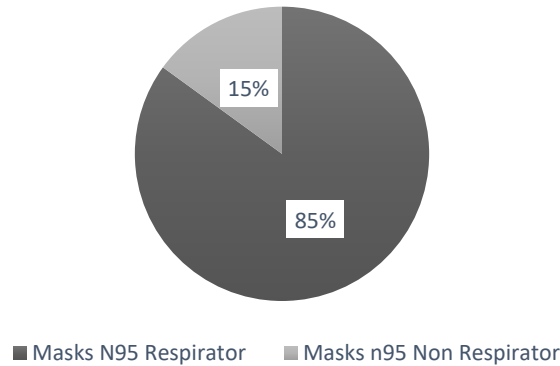


Figure 1. The diagram of mask convenience

The N95 Respirator mask is very appealing to children, according to this study, because of its comfort in accordance with the mask criteria, namely the children are comfortable when breathing, lack shame when wearing a mask, are comfortable when wearing a mask, are not hot when wearing it, and are not in pain when wearing it.

Table 3. Standard criteria for wearability masks

Wearability Criteria	Masker N95 Respirator	N95 non respirator
Comfortable when breathing	70%	30%
Lack of feeling shame when wearing a mask	60%	40%
Comfortable when wearing a mask	80%	20%
Not hot when wearing a mask	70%	30%
Not in pain when wearing a mask	80%	20%

### Children's interest in masks

The development of children's perceptual abilities of this form is taken from the results of experiments using the Terman-Merril Test and experiments conducted by Piaget and Vernon (1977). At the age of 6-7 years, the mastery of perceptual activities is growing. Their observations began to be systematic and they had a better sense of the relationship of form. Excessive imagination began to decrease. They observed the overall form and the details separately, and they could only observe the more prominent parts. At the age of 8-9 years, they could see the relationships of the parts of the form into a unified whole. There were still differences in individual abilities in children this age. They have not been able to see things concerning space, objects are only seen without seeing where the object is placed. At the age of 9-11 years, they already recognized real objects with the correct forms. The attention to objects is detailed, as is the ability to observe space. At the age of 11-12 years, children have begun to be able to feel the pictures like the real atmosphere. In this study, children's interests can be influenced by the development of children's ages, namely ages 7-12 years, so that children's interest in masks can be adjusted to the age of children, namely 7-12 years.

Figure 2 shows that the diagram of children's interest in pictorial and non-picture masks is 77% and non-picture masks are 23%. The result is that illustrated masks are interesting to children. In this study, children's interest in illustrated masks was 77%.

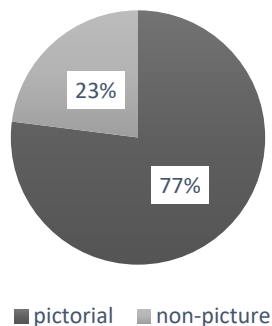


Figure 2. The diagram of children's interest in pictorial

### Children's interest in mask colors

Favorite colors at the age of 7-12 years are red, yellow, green, blue, black and pink. By choosing colors for children according to their age level, it can create harmony both in design and the mental development of children in shaping their character. According to Kartono (1997), the cheerful character is a characteristic of children aged 7 to 12 years.

Figure 3 shows that children's interest in the color of the mask is 75% and those who are not interested are 25%. The result is a colored mask is a mask that children are interested in.

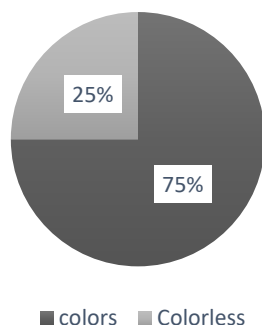


Figure 3. The diagram of children's interest in mask colors

### E. Conclusion

The children's interest in N95 respirator mask is higher than N95 non-respirator mask. This shows that there is a need for improvements in the design of children's masks, which are comfortable for children and in accordance with the child's character so that the durability of wearing masks is long and can reduce the risk of Covid-19's spreading.

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### **Biography**

**Diah Meisi Roudatul Jannah** is a graduate student majoring in fine arts with a research focus on human design at Sebelas Maret University. Diah has completed a bachelor's degree as a graduate of Telkom University majoring in product design before finally continuing her master's education at Sebelas Maret University.