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Improving the Concentration of Children with Attention Deficit Hyperactivity Disorder through the Intensity of Lighting

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Abstract

Attention Deficit Hyperactivity Disorder (ADHD) is a severe disorder of attention concentration, hyperactivity and impulsivity in early childhood that interferes with the child's development and functioning in daily life. A characteristic of attention deficit disorder (concentration) in children with ADHD is that they often have difficulty focusing continuously on an activity. This will affect the quality of life of ADHD children in the future. Basically, human behavior can be controlled by controlling the stimuli in the environment (Widyastuti, 2022). One way is to modify the room lighting. Based on this, this research carried out a simple experimentl of lighting with different bright light strengths on ADHD child respondents. By knowing specifically what room lighting is appropriate to increase the learning concentration of ADHD children, it can help ADHD children to concentrate on studying at school and at home as well as therapy activities and other activities that require high concentration. This can help ADHD children to have a better life.

Keywords: *Consentration; ADHD; Lighting*

Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is a severe disorder of attention, hyperactivity and impulsivity in early childhood that interferes with the development and functioning of children in everyday life (Van Tiel, 2018). Attention Deficit Hyperactivity Disorder (ADHD) in Indonesia is quite high, reaching 26.4%. This is reinforced by data from the Badan Pusat Statistik in 2007 that there were 82 million children in Indonesia, one in five children and adolescents under the age of 18 experienced mental health problems, at least 16 million children experienced mental health problems including ADHD. Hyperactivity disorder can be found in everyday life in school-age children to adolescents, even if not treated immediately it will affect a person's future (Barkley, 1981 in Prasaja, 2022). Children with ADHD need adjustments in the classroom such as arranging seating positions, placing students with ADHD away from windows and doors, placing students with ADHD in front of the teacher's desk or chairs in rows near the teacher, keeping the classroom environment calm during exams and while studying, considering the impact of lighting, heat and other possible distractions (Mirnawati, 2019).

Children with ADHD need therapy to adapt to the social environment. One of the therapies is behavioral therapy. Behavioral therapy is useful for controlling hyperactivity and impulsive behavior in children with ADHD. Laurens (2004) stated that architecture creates an atmosphere, forms an activity space, which becomes a facilitator or barrier to behavior. Basically, human behavior can be controlled by controlling the stimuli in the environment. Therefore, environmental modification is needed to support the activities of children with ADHD.

Previous research generally focuses on the application of behavioral architecture in therapy centers for children with special needs autism and ADHD (Widyastuti, 2022). Application of color and light in the interior of basic therapy rooms with a visual approach to autistic children (Indina, 2014). Only a few studies have been directed at the context of improving the learning concentration of ADHD children through specific lighting. In fact, autistic and ADHD children tend to be sensitive to light. To reduce extreme light changes during therapy sessions, window openings are reduced. In the therapy room, the lighting used is artificial lighting with a light intensity of 200 lux (Widyastuti, 2022).

A specific understanding of optimal room lighting can significantly contribute to improving the concentration abilities of children with ADHD, both in the context of learning at school and at home, as well as in supporting the effectiveness of therapy and various other activities that require a high level of focus. Everything is learned or done will help improve the quality of life of ADHD children in the future. This study uses a qualitative method through a experiment approach to measure the level of concentration endurance of ADHD children by being given a certain bright light treatment. Researchers carefully examine programs, events, activities, processes or groups of individuals. Cases are limited by time and activity, and researchers collect complete information using various data collection procedures based on predetermined time (Stake, 1995 in Cresswell 2009). The results of the study can be applied to study rooms at home, therapy rooms or classrooms at school.

Literature Review

Van Tiel (2015) stated that concentration is a child's ability to maintain attention and focus attention. This ability is related to a system called consciousness regulation which is localized in the middle of the brain. This consciousness regulation system plays an important role so that humans can make contact with the world outside themselves. Concentration is how individuals concentrate or focus their attention in doing or doing something so that the work can be completed. In children with ADHD, concentration can be observed through sitting behavior with concentration and calm. Children's ability to concentrate varies according to their age. Children's attention span in receiving information through any activity is also different (Sandrawati, 2019). According to the American Psychiatric Association (2004), difficulty concentrating in children with ADHD is careless or failing to pay attention to details, often making mistakes because they are not careful, often having difficulty concentrating continuously in an activity, often appearing not to listen when spoken to, often not following instructions or failing to complete tasks, often avoiding, not liking or being reluctant to do tasks that require long thinking, often easily distracted by external stimuli, and often forgetting to do daily activities. ADHD can be concluded as a disorder of activity and attention (hyperkinetic disorder) is a psychiatric disorder that is quite commonly found with the main symptoms of inattention (lack of attention), hyperactivity and impulsivity (acting without thinking) which are inconsistent with the level of development of children, adolescents or adults (Mirnawati, 2019).

General characteristics of people with ADHD are not being able to pay special attention to details, often having difficulty maintaining focus, often not following instructions and directions, often avoiding and not liking activities that require concentration, often and easily switching attention, often forgetting daily activities. having difficulty socializing with others. These characteristics are complemented by Hildayani. According to Hildayani (2012, in Faridy, 2021) the characteristics of

children with ADHD are as follows: Hyperactivity - Seems like they are always enthusiastic and moving from one activity to another. So it seems like they get bored easily with just one activity and need self-stimulation by muttering, making loud noises or talking continuously while doing activities -, disorganization in placing objects, impulsively displaying inappropriate social behavior, aggressive behavior such as attacking others physically or verbally, daydreaming when activities are considered boring, having difficulty with tasks involving fine motor skills, short-term memory, obsessive thought patterns.

Mirnawati (2019) explains the need for adjustments in the classroom for children with ADHD such as adjusting seating positions, placing students with ADHD away from windows and doors, placing ADHD students in front of the teacher's desk or chairs in rows near the teacher, keeping the classroom environment calm during exams and while studying, consider the impact of lighting, heat and other possible distractions. Widyastuti (2022) states that autistic and ADHD children tend to be sensitive to light. To reduce extreme changes in light during therapy sessions, window openings are reduced. In the therapy room, the lighting used is artificial lighting with a light intensity of 200 lux. Flynn found that lighting has several effects on behavior and sensations of comfort. Flynn also found significant differences in preferences at different lighting levels. People rated the room as having higher clarity with higher lighting levels, and rated the room as more calming with lower lighting. (Flynn, 1973 in Gamelli, 2013)

Research Methods

The method used in this study is a qualitative method with a lighting experiment approach. Qualitative research is a method to explore and understand the meaning that -by a number of individuals or groups of people- is considered to come from social or humanitarian problems. (Creswell, 2007) This study uses a case study approach where researchers carefully investigate a program, event, activity, and researchers collect complete information using various data collection procedures based on a predetermined time (Stake, 1995 in Creswell, 2009).

Data collection methods with lighting experiments, observations, and interviews. In this study, environmental modifications were carried out in the form of simple lighting experiments on a child respondent with ADHD. This experiment used a study table with a study lamp with adjustable lighting. The collected data were analyzed to obtain appropriate results, namely an increase in learning concentration with lighting modifications. The respondent of this study was a 7-year-old ADHD child with a combination of ADHD types. Respondent data were taken and observations during the experiment and interviews with the respondent's parents and therapists from the Autis Center Yogyakarta which is the respondent's therapy place.

Analysis and presentation of data through a case study approach, namely with a detailed description of an individual program. As stated by Wolcoff (1994b, in Cresswell, 2013), namely sketching ideas by highlighting certain information in the description, reducing codes to themes by identifying patterned regularities, connecting categories with analytical frameworks in the literature by contextualizing with frameworks from the literature, and displaying findings in tables and figures, comparing cases with standard cases. The data analysis technique in this study uses a qualitative method. The following are the stages of analysis:

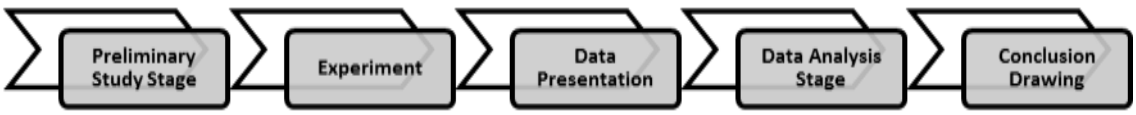

Diagram 1. Data Analysis Process
Source: Researcher, 2023

Discussion

Symptoms of disorders experienced by ADHD children result in difficulty concentrating in various activities, especially studying. Studying is a very important activity to support life in the future. If this is difficult to do, it will hinder the life of children with ADHD. One way to overcome or suppress ADHD symptoms is by doing therapy. Therapy for ADHD children requires a special room with room modifications according to the needs of ADHD children such as room lighting.

The respondent of this study was an 8-year-old child named Nino. Based on the results of interviews with parents, he has a combination of ADHD (Impulsive and Hyperactive). The respondent was diagnosed with Combined ADHD since March 2023. He has undergone therapy at the Autism Center Yogyakarta for 6 months from April to October 2023. The respondent also took medication to suppress the symptoms of ADHD that appeared. The characteristics of ADHD that appeared in the respondent were often mumbling or talking without a specific purpose, often avoiding and not liking activities that require concentration, often and easily switching attention, often forgetting daily activities. difficulty socializing with other people, difficulty doing activities that use fine motor skills, difficulty writing and having a speech delay disorder until the age of 7 years. The respondent attended a private elementary school with normal children and was able to follow lessons even though he tended to be slow in grasping the material.

In this study, lighting modifications were carried out with light intensity of 50 lux, 100 lux, 150 lux, 200 lux, and 300 lux. Lighting uses a table lamp with a dimmer to adjust the light intensity. The lamp is placed on the study table at a position of 30-45 degrees to the left of the respondent. The activities carried out for this lighting experiment are solving simple math problems. The following are the results of the lighting experiment on respondents on December 12, 2023.

Table 1. Lighting Test Result

Date : Tuesday, December 12, 2023
Location : Respondent's House
Activity : Doing Math

No.	Light Intencity (*Lux*)	Time (Hour.Minute.Second)	Description
1.	50 *Lux*	00.00.25 00.03.53	Stop while mumbling Completing the task
2.	100 *Lux*	00.03.03 00.04.05	Stop Completing the task
3.	150 *Lux*	00.01.59 00.02.45 00.03.37 00.04.58	Pause Speaking Speaking and pausing Completing the task
4.	200 *Lux*	00.00.53 00.02.26 00.03.19 00.04.05 00.04.44	Moving feet Stop. Rubbing the book. Pause. Hands moving. Pause. Completing the task
5.	300 *Lux*	00.00.50 00.04.30 00.05.50	Stop Stop. Erasing the wrong writing. Completing the task

Source: Researcher, 2023

From the table above, the results of the lighting test with the activity of working on math problems at a light intensity of 50 lux, the respondents started working but at the 25th second, the respondents stopped for a moment and completed the task in 3 minutes 53 seconds. At a light intensity of 100 lux, at 3 minutes 3 seconds, the respondents stopped for a moment to erase the wrong writing and then completed the task in 4 minutes 5 seconds. When the brightness of the light was increased to 150 lu, at 1 minute 59 seconds the respondent paused and then continued working on the questions. After that, at 2 minutes 45 seconds the respondent spoke and continued at 3 minutes 37 seconds starting to speak and pausing. The respondent finished at 4 minutes 58 seconds. At a light intensity of 200 lux at 57 seconds, the respondent began to move his feet. At 2 minutes 31 seconds the respondent stopped and rubbed the book. After that at 3 minutes 19 seconds, the respondent paused and moved his hands. At 4 minutes 21 seconds, the respondent stopped again and continued working on and completing the problem at 4 minutes 44 seconds. Then the light intensity was increased to 300 lux, the respondent stopped working on the question at 57 seconds, then stopped and erased the wrong writing at 4 minutes 30 seconds. The respondent finished working on the question in 5 minutes 50 seconds.

Based on the above experiments, at light intensity of 50 lux and 100 lux, only a few symptoms of concentration disorders appeared and could complete tasks quickly. However, at light intensity of 150 lux and 200 lux, symptoms of concentration disorders began to appear quite often. However, respondents continued to work on the task until it was finished. Meanwhile, at light intensity of 300 lux, the intensity of the symptoms of concentration disorders that appeared began to decrease and respondents completed the task well. The inconsistency of the results in the experiment was due to repetitive activities with similar math problems, so that respondents felt bored. However, respondents still experienced a significant decrease in symptoms of concentration disorders after being given light intensity treatment above 200 lux. This is in accordance with Widyastuti's research (2022) which states that autistic and ADHD children tend to be sensitive to light, the lighting used is artificial lighting with a light intensity of 200 lux.

Conclusion

Based on this study, the increase in learning concentration is quite significant even though the results obtained are still inconsistent. This is because the activities carried out repeatedly and continuously, resulting in ADHD child respondents still showing symptoms of quite high concentration disorders. There is no significant effect of light intensity of 50 lux, 100 lux, 150 lux, and 200 lux. However, a significant change is in the light intensity of 300 lux.

There are still many shortcomings in this study. In further research, more specific lighting modifications can be carried out using a stopwatch to be more detailed in recording learning concentration time. Further research can increase the number of respondents and use various other simpler activities and apply direct lighting to the room so as to obtain more specific and accurate results. It is hoped that with further research, it can help ADHD children to get a better life.

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