

# The Effect of Color on Children with Neurodevelopmental Conditions

I. Elaraby, Ossama A. Abdou

**Abstract**— This article aims to demonstrate the effect of colors on children with neurodevelopmental conditions in particular, especially the blue color, in order to improve their skills. We have shown from studies the positive effect of blue color. Then, we confirmed this result. We exposed the participants to the blue color. Exposing ranged from zero hour per week for six months to 25 hours per week for the same period. Intelligence tests were administered for each participant, before starting and six months after the first test. The studies showed that exposure to blue color led to an increase in the average percentage of participants intelligence quotient (IQ). The increase doubled with increasing exposure time to blue color.

**Index Terms**—Bleu, Children, Color, Exposure, Intelligent, Improve, Neurodevelopmental Conditions, Skills.

## I. INTRODUCTION

Throughout history and up to the present day, color plays an important and major role in human life [4]. This importance is associated with traditions, customs, cultures, ceremonies and psychotherapy [2] - [9]. Color is an essential element in the design, and it has a special importance that does not share or match any other element of architectural design, because each element needs color to be recognized [7], [8]. Color affects the human psyche, and activates various emotions in their depths, such as sadness, calmness and turmoil (Elaraby & Aly, 2018). Intellectual disability affects about 2% - 3% of the general population [12] means about 170 million people. One of the reasons and significance of choosing this topic is the fact that many building designers (architects as well as interior designers) may not give enough scientific thoughts and attention when selecting colors for interior building spaces, especially in neurodevelopmental cases. Since the colors of the spaces affect humans [6], and it has a clear effect in helping patients [10] - [11]. Hence, this article serves as a guide and incentive to recommendations for selecting proper colors for interior spaces, given certain circumstances facing building designers that relate to specific human needs. The effect of blue on the IQ score of neurodevelopmental conditions was evaluated. Where intelligence is defined as the

sum of mental abilities, and the IQ score reflects good performance in intelligence tests [1]. A field studies was conducted for patients with low and medium IQs. This article assesses the problem of how to help people with mental problems using blue. The aim is to determine the possibility of improving the level of IQ of people with neurodevelopmental conditions.

## II. RELATIVE EFFECT OF COLORS ON CHILDREN

As shown in Fig. 1, Indigo with 6 score and green color with 5.75 score, had the highest average scores of positive responses with 15%. Red color score, has average score 5.7. Cyan color had 4.28 score, average score of responses. Black had 4.1. Orange had 4.05. White had 4.00. Violet had 3.85 score. Finally, yellow color has 2 score.

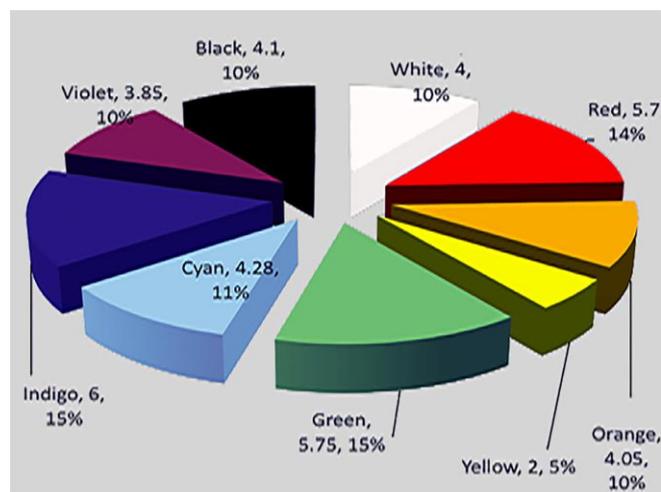


Fig. 1. Relative effect of colors on children.

## III. EXPOSING CHILDREN TO BLUE COLOR

Figure 2 shows four different pictures of the children. The activity room was provided with blue curtains to create the desired effect of the color, so that the results express the color effect.

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Fig. 2. Pictures of children while they were in the skills development center.

#### IV. THE RELATIONSHIP OF AGE TO THE INCREASE IN IQ SCORES

Figure 3 shows the relationship between age and the increase in IQ scores for all participants.

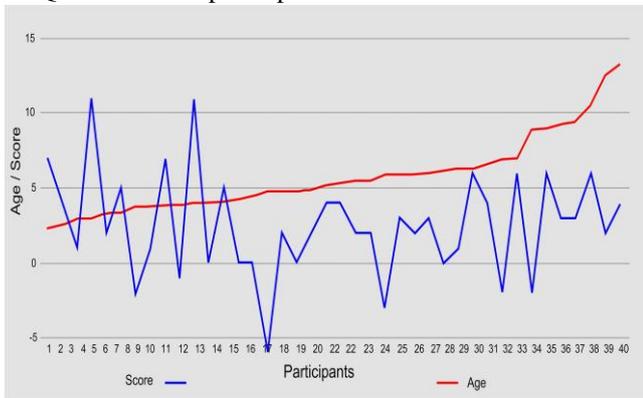


Fig. 3. The relationship between age and increase in IQ scores.

Age of each participant was determined when doing the pretest, and then we studied the relationship of age to the change in IQ, compared to the posttest. The figure shows that the increase in IQ scores was mostly greater with younger, and less with older, which means that younger are more responsive and benefit.

#### V. THE RELATIONSHIP OF INCREASED EXPOSURE TO BLUE COLOR AND INCREASED IQ SCORES

Figure 4 shows the pretest and posttest scores for participants who were not exposed to blue where the increasing degree was -0.2 (average). Figure 5 shows the scores for participants who were those where exposed to blue for 3 hours per week where the increasing degree was 1.65 (average). Figure 6 shows the scores for participants who were those where exposed to blue for 4 hours per week where the increasing degree was 2 (average). Figure 7 shows the scores for participants who were those where exposed to blue for 25 hours per week where the increasing degree was 3.85 (average), [5]. The effect of increasing the duration of exposure to blue color on increasing IQ scores is very clear.

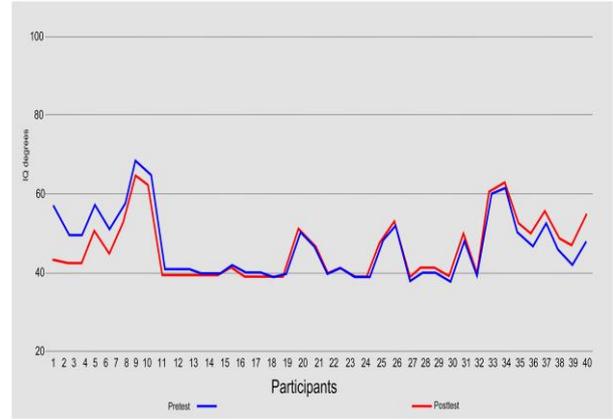


Fig. 4. Degrees for who were exposed 0 hours a week.

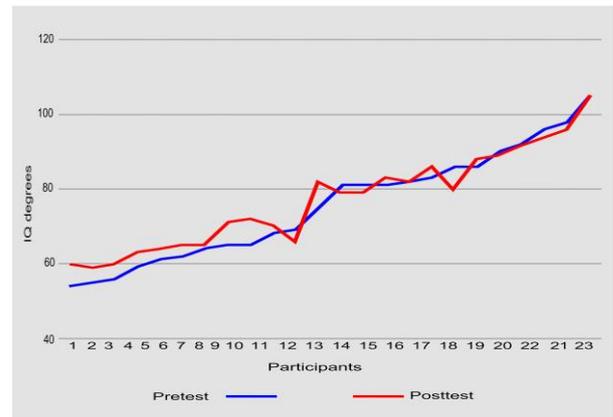


Fig. 5. Scores for whom were exposed 3 hours a week

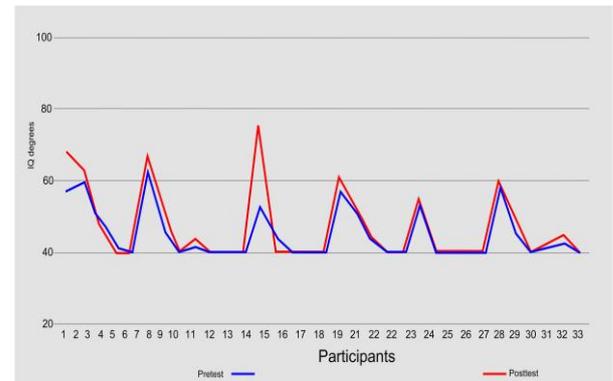


Fig. 6. Degrees for who were exposed 4 hours a week.

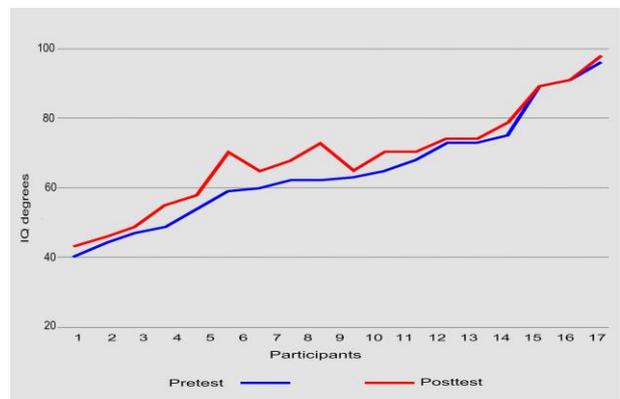


Fig. 7. Scores for who were exposed 25 hours a week.

## VI. CONCLUSION

The studies were conducted on participants with neurodevelopmental conditions, who had IQs ranging between 40 and 105 degrees. They were exposed to nine colors (white, black and seven spectrum colors). Blue had the highest degree of positive effect on them. Then many participants were exposed to blue for six months. IQ tests were conducted to them, at the beginning of trial and after six months. The average rates of rising were -0.2 for those whom did not exposed to blue, 1.65 for those whom exposed to blue for 3 hours a week, 2 for those whom exposed to blue for 4 hours a week and 3.85 for those whom ex-posed to blue for 25 hours a week. These results confirm that the increase in the period of exposure to blue is directly proportional to the increase of IQ scores. Given the interval between pretest and posttest (six months), it is expected that the child can improve from the level of IQ (40) to the level of an IQ (70) within an approximately period of less than four years.

## VII. RECOMMENDATIONS

- 1) For future studies
  - Continuing studies in the same direction to help these children improving their performance.
  - For individual cases, a color test can be done for each case before starting the application.
  - Conducting studies on each clinical case, if possible.
- 2) For interior architects and designers
  - Paying attention to the colors of architectural spaces because of their effect on users.
- 3) For children parents and teachers
  - Paying attention for helping youngers, whom seem to be most responsive.

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