

# The Effect of Colored Filters Method on Treating Dyslexia Among Learning Difficulty Students

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## Abstract

The purpose of this study was to identify the effect of colored filters on treating dyslexia among students with learning difficulty in Jarash. Participants were 30 male and female students and were assigned to experimental and control groups aging (6-12) years. Results revealed statistically significant differences in favor of the experimental group on the posttest regarding the effect of colored filters method on treating dyslexia. However, no statistically significant differences were found attributed to age and sex. The researchers recommend holding awareness raising workshop on the importance of colored filters method on treating reading difficulty.

**Keywords:** Colored Filters, Dyslexia, Learning Difficulties

## 1. Introduction

Reading is viewed as a psychomental process implying the ability to convert written into spoken symbols, and one of the basic psychological processes composing the cognitive aspect of individual, and requires a number of mental processes to develop in normal children, a basic objective of the elementary school, and a way to access knowledge (al Rousan, et al, 2004).

There are many studies that attempted to explore the neural causes underlying dyslexia, and found that a dysfunction in Magnocellular cells results in disruption of data transmitting speed between retina and the cortex in human brain; which is smaller in size and less systemized in dyslexia person compared with normal persons (Solan, et al, 2004).

Children, in order to be able to read, should have developed alphabetic comprehension and phonological awareness and such skills should be taught clearly and systematically in the first years of schooling taking into account assisting dyslexia readers in visual handling by getting insights about the cognitive processes (Elliot, et al, 2007).

Learning to read is not an easy task without direct teaching, which adds a burden on teachers to learn about basic principles of teaching correct reading skills, and to learn how to teach reading skills. Regarding effect of early teaching of reading, McGuinness (1997) demonstrated that early teaching of reading makes the first three years of child in school significant.

### 1.1 Dyslexia

Basically, reading is one of the most significant skills learned by children at school. Generally, poor readers are most often low achievers academically that they might have difficulties that impact one or more of the learning skills such as reading comprehension, writing, and spelling. Children with poor reading skills could have impairments in memory, visual and hearing perception, spoken language, mobility skills, and using alphabets and numbers (Potrus, 2009)

Despite efforts and interventions to improve reading comprehension, many individuals with dyslexia still struggling. To explain, Irlen (2005) demonstrated that such people are characterized with visual distortions known as Scotopic sensitivity syndrome. Person diagnosed with Irlen's Syndrome read uneasily, vibration of text, see white areas clearer than black text, and text blurs inside and outside. Sometimes, they would find it difficult to follow with the text and mostly misunderstand words, see varied lines, and develop physical symptoms like headache, Nausea, eye fatigue, lost a word or line, reread a line, frequent movement of lashes, close eyes more than necessary, move head closer to or far away page, read slowly, or word by word, use fingers to locate position on page, commit writing mistakes while they rewrite from a book, prefer reading with a dim light, and get annoyed with bright light (Boubert, 2000).

### 1.2 Colored Filters Method

Colored filters have been in use since 1980 to assist dyslexia children (Irlen, 2005). Dyslexia was firstly known as Scotopic sensitivity syndrome to describe symptoms that were explained by sensitivity to light leading to difficulty of learning (Joubert, 2000), which is caused by visual distortions (Irlen, 1991).

Initially, This syndrome was treated using the colored filters which developed into colored lenses and finally the Intuitive Colorimeter was developed to control colors, saturation and intensity enabling accurate identification of color for an individual.

Many studies attempted to identify effectiveness of colors in improving reading ability among dyslexia readers. The results mostly indicated that colored lenses are effective in reducing dyslexia symptoms, thereby

improving the reading ability. Latterly, colored lenses were developed into Chromagen colored lenses “contact lenses” (Harris & Susan, 1988).

There has been much debate regarding how to treat dyslexia problem using colored filters. Over years, color has been in use to enhance visual and reading abilities; for instance teachers transferred from using colored chalk to black ink used on colored paper. Color can also be used behind the text as background to enhance eye’s ability to optimize the color used (Evans, 1974). However, some colors work more effectively than others like beige, yellow, golden, pink, blue, purple, green and red which were found effective in reducing visual distortions, increasing reading ability for dyslexia children with Scotopic sensitivity syndrome (Irlen, 2005), helping students concentrate longer; thereby focusing on details and improving comprehension, reading faster without distortions when optimal color is used (Singleton, 2005).

Educators contributed with many studies to explore therapeutic solutions for dyslexia; for instance, Dento & Meindi (2016) aimed at identifying the effect of colored filters on reading fluency among persons with dyslexia and to mitigate reading difficulty rates. Results confirmed the effectiveness of using colored filters in treating dyslexia among participants excluding three of them.

Monger et al., (2015) sought to identify the impact of contrast and color using colored filters among persons with dyslexia. Participants were assigned to two groups (95, 58) and results indicated greater improvement and easier reading using most preferable colors.

A study conducted by Shephard & Beaumont (2013) aimed to assess usability of colors to mitigate visual perception impairment. A set of colors including black, white, purple, yellow, red and green with participants (n=28) who were assigned to experimental and control groups. Results confirmed the role of colors in treating visual impairments among dyslexia children.

Rogers et al. (2013) compared the impact of colored filters on treating reading difficulty among children (n=73) with visual fatigue. Results found that using filters colored in blue and yellow yielded perceivable improvement in the reading ability among dyslexia children.

Ritchie et al, (2012) a follow-up study of Irlen's colored filter's effect on dyslexia student in classroom. Participants were (18) students aging (7-12 yrs). Results revealed that following a year of using colored filters, the average of student reading abilities did not increase.

Similarly, Shin (2012) sought to identify the effects and benefits of colored filters on treating dyslexia among (8) children. Results indicated that blue and grey filters had the most impact in reducing reading difficulty, and increasing fluency and reading rate among dyslexia children.

Rhonda (2011) sought to identify the effect of colored filters on reading fluency of dyslexia students. Results indicated that using colored filters did not make any improvement in treating reading problems among participants.

Kriss et al, (2005) aimed at the relationship between dyslexia and colored filters to mitigate visual impairments. Participants (n=64; 7-12 yrs) were assigned to two groups based on age and sex inclusion criteria. Results showed no statistically significant differences between the groups attributed to age and sex. However, there was significant improvement in reading ability among the experimental groups used colored filters.

### *1.3 Statement of the Problem*

Reading is a significant skill that parents target from sending their children to school, and also to find suitable solutions to reading problems in their children. In turn, educators attempted to find out an appropriate method to overcome challenges facing dyslexia children. The colored filters method is used to assist dyslexia students to read. So, the problem addressed by the current study is represented by the answers to the following two questions:

- Are there statistically significant differences at ( $\alpha=0.05$ ) of the effect of colored filters method on dyslexia treatment among students with learning difficulties?
- Are there statistically significant differences at ( $\alpha=0.05$ ) of the effect of colored filters method on dyslexia treatment attributed to sex or age?

### *1.4 Significance of the Study*

This study addresses a significant topic for educators by casting light on the problem dealt with by the current study and assisting them set appropriate therapeutic plans to overcome dyslexia relying on the insightful conclusions about the application of colored filters method, and providing practical suggestions for future studies.

### *1.5 Terminology:*

Dyslexia: learning difficulty of neural genesis not resulting from environmental causes or other disabilities.  
Colored Filters: Special lenses used as glasses or contact lenses developed to mitigate dyslexia symptoms.

### *1.6 Limitations*

This study was conducted at Jarash District School, and results are limited to validity and reliability of the instruments used.

### *1.7 Methods and Procedures*

1. A written consent has been secured from Jarash Directorate of education to conduct the study at their schools.
2. Learning Difficulty Scale was administered to students attending Learning Resource Centers LRC to identify the sample size.
3. The researchers observed the reading by the sample individuals.
4. Children were subjected to eye test to neutralize any effect of eye impairment.
5. Wilkin's Reading Speed Test (Wilkins, 2005) was applied. The test consists of four items each of which with 50 words to measure reading ability, and counting the number of words read correctly or incorrectly by a child.
6. Trying with the colored lenses each fixed in a frame for five minute testing . The patient tries with the lenses put in frame and takes the reading test. Then, using each of the eight colored lenses interchangeably, words read are counted until discovering the pair of lenses that produced most improvement in reading. Patients, then, take a rest for 30 minute interval between every pair lenses tried out.
7. Providing training on reading using lenses

### *1.8 Dyslexia Diagnosis Instruments*

The instruments used include:

- Reading Difficulty among Students with Learning Difficulty Scale The scale was built depending on review of the prior studies and relevant literature.

#### *1.8.1 Validity Test*

For validation, the researchers sent the instrument to a number of Special Educators, Psychometrics Specialists, faculties and learning resource teachers to check for items in terms of intelligibility, wording and belongingness to domain they measure. Based on comments and suggestion from the judges, some items were reworded and delete others. The items that had general agreement by judges were accepted; thereby the final scale consisted of 20-items.

#### *1.8.2 Reliability Test*

To test for reliability, the researchers computed the internal consistency Cronbach's alpha (0.2), and retested alpha (0.83); thereby the scale was considered appropriate for the current study.

- A pilot study was conducted on a sample of eight students selected from without of the original sample.

- Standardized Visual/Hearing Perception Tests developed by Princes Sarvath College (1996).

- Test of Auditory Memory: aims at measuring child's ability to recall a sequence of gradually long words; and whether deficiency was in data processing, auditory memory or preparedness to learning.

- Spoken Word Recognition Test: used to measure individual's ability to recognize words phonologically.

- Test of Auditory Analysis Skills: used to evaluate child's ability to recognize phonemes in spoken words and readiness to learn reading, spelling and writing.

Test of Visual Analysis Skills: used to explore any difficulty in learning literacy skills maintained by children in the primary education stage.

Eye-Hand Coordination Test: measures follow of instructions, drawing figures, imitation and ranking things.

### *1.9 Population*

Population consisted of (400) students both males and females with learning difficulties attending Learning Resource Centers LRCs at Jarash District schools.

#### *1.9.1 Participants*

Applying a number of measures on Learning Recourse Centers LRCs students at Jarash District schools, the sample (n=30) was purposefully selected.

### *1.10 Methodology*

This study adopts the experimental approach assigning participants to experiential and control groups.

#### *1.10.1 Variables:*

Independent Variable: color filters method

Dependent variable: reading skills

#### *1.10.2 Adjustment of the Measurement*

For data analysis, Likert 5-point Scale was used to assess responses to instrument questions as shown in table (1).

Table (1)  
 Questionnaire scale

Agreement Level	1	2	3	4	5
	Always	Often	Sometimes	Rarely	Not Apply

As to the limits adopted in the present study to represent mean scores against study model variables, the researchers identified three levels of agreement (high, moderate, low) based on the following formula:

$$\text{Length of interval} = (\text{maximal choice} - \text{minimal choice}) / \text{number of levels} : [5-1] / 3 = 4/3 = 1.33$$

Table (2) shows the measurement for identifying appropriateness level to means which is helpful in comments on mean scores.

Table (2)

Measurement of identifying appropriateness to mean scores

M	Estimation
1 to less than 2.33	Low
2.33 to less than 3.67	Moderate
3.67 to less than 5	High

### 1.11 Results

This section presents the results from the current study that aimed at identifying the effect of Irlen's colored filters method in treating dyslexia among learning difficulty students in light of study questions as follows:

1.11.1 First, results related to question one: "Are there statistically significant differences at ( $\alpha=0.05$ ) of the effect of colored filters method on dyslexia treatment among students with learning difficulties?"

To answer this question, means and standard deviations of respondent estimates on the posttest regarding reading dyslexia; and to identify differences between the experimental and control groups, Mann-Whitney test was administered as posttest. Following is a discussion of the results.

Table (3)

Means and standard deviations on the posttest measures of experimental group responses regarding dyslexia. (Mann-Whitney Test) was applied to identify differences between the experimental and control groups

Group	M	SD	Estimation	Z	Significance $\alpha$
Control	3.98	0.19	High	2.739	0.00
Experimental	2.12	0.85	Low		

Table (3) shows statistically significant differences at ( $\alpha \leq 0.05$ ) in the posttest measures of reading difficulty, where  $Z=2.739$  which was statistically significant. Results show that the control group had mean score ( $M=3.98$ ) and estimation rating higher than the experiment group ( $M=2.12$ ) that had low estimation rating. This result indicates that the experimental group which taught using the colored filters improved in reading and dyslexia average reduced compared with the control group that were taught traditionally.

1.11.2 Second, results related to question two "Are there statistically significant differences at ( $\alpha=0.05$ ) of the effect of colored filters method on dyslexia treatment attributed to sex or age?"

To answer this question, means and standard deviations on the posttest measure were computed for the responses of the experimental group regarding dyslexia. Further, Mann-Whitney Test was applied to identify differences in the experimental group on the posttest measure by age and sex. Following is a discussion of the results:

Table (4)

Means and standard deviations on the posttest measures of experimental group responses regarding dyslexia. (Mann-Whitney Test) was applied to identify differences between male and female students

Sex	M	SD	Z	Significance $\alpha$
M	2.99	1.11	0.66	0.67
F	3.12	1.18		

Table (4) shows no statistically significant differences at ( $\alpha \leq 0.05$ ) among posttest estimates of dyslexia by sex variable, where z-value was statistically insignificant at (0.66).

Table (5)

Means and standard deviations on the posttest measures of experimental group responses regarding dyslexia. (Mann-Whitney Test) was applied to identify differences among age groups

Age	M	SD	Z	Significance $\alpha$
6<	2.79	1.14	0.86	0.40
6>	3.25	1.10		

Table (5) shows no statistically significant differences at ( $\alpha < 0.05$ ) among posttest estimates of dyslexia by age variable, where z-value was statistically insignificant at (0.86).

### 1.12 Discussion of the Results

To answer question one: “Are there statistically significant differences at ( $\alpha = 0.05$ ) of the effect of colored filters method on treatment of dyslexia among learning difficulty students?”

Means and standard deviations of posttest measures of respondent’s estimates regarding dyslexia were computed; and to identify differences between the experimental and the control groups on the posttest measure, Mann-Whitney Test was applied. Table (3) shows statistically significant differences at ( $\alpha = 0.05$ ) between the posttest measures of dyslexia where Z-value (2.739) was statistically significant (M=2.12) and estimated low. This indicates that the mean score for the control group was higher than that for the experimental group; meaning that the use of colored filters reduced the average of dyslexia and improved reading among the experimental group. This result is consistent with related studies (Monger, et al, 2015; Dento & Meindi, 2016; Shephard & Beaumont, 2013; Roger, 2013; Shin, 2012; Kriss, et al, 2005) but inconsistent with (Ritchie et al, 2012; and Rhonda, 2011)

To account for this result, the researchers argue that visual distortions vary among children in terms of intensity and nature, and everyone responds differently to color stimuli. Generally, colors help children concentrate, improve visual ability, paying attention to details, increase comprehension and readability of texts faster and easier without distortion. Also, colors enhance the visual ability and reduce visual distortion, improve cognitive processing, and affect one’s behavior, thinking, and attention. On the other hand, individuals respond differently to color stimuli, possibly due to variation of visual distortion from one child to another. Similarly, colors reduce anxiety, tension, and have positive effect on children in terms of enhancing stay on task, improve vision and attention.

To answer question two “Are there statistically significant differences at ( $\alpha = 0.05$ ) regarding the effect of colored filters on treating dyslexia students attributed to age and sex?”

Means and standard deviations of posttest measures regarding experimental respondents’ estimates of dyslexia were computed. To identify differences in the experimental group on the posttest measure by sex (Z=0.66) and age (Z=0.86) variables, Mann-Whitney Test was applied and the resulting values were statistically insignificant. Results from this study agrees with Kriss, et al (2005).

To explain this result, the researchers argue that sex and age variables make no difference regarding visual distortions (Scotopic sensitivity syndrome) among dyslexia children as the symptoms commonly noticed among patients are similar irrespective their sex or age.

### 1.13 Recommendations

- 1- To organize awareness raising workshops for the local community regarding importance of colored filters to overcome dyslexia.
- 2- To conduct experimental studies to ensure effectiveness of colored filters method in treating learning difficulty.

### 1.14 References

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- Dyslexia Scale

No.	Item	Always	Often	Sometimes	Rarely	Not Apply
1	Seems nervous, irritant, frowned on reading					
2	Reads with high sharp voice and stressed articulation					
3	Averts from reading, cries, disrupts words and units					
4	Misses the place of reading and frequently repeats the reading					
5	Pronounces intermittently and fitfully while reading					
6	Seems confused, anxious, and reads close to eyes,					
7	Omits some words, and jumps from one place to other while reading					
8	Alternates some words with others not found in the text					
9	Inverses or replaces some letters and/or words					
10	Misspells words/ mispronounces letters					
11	Reads without comprehension of the reading					
12	Reads words disorderly					
13	Hesitates on words mispronounced					
14	Finds difficulty in recognition of letters, phonemes and words					
15	Finds difficulty in deducing facts and meanings in the text.					
16	Fails retell a story after reading it					
17	Unable to identify the topic sentence in the reading					
18	Reads intermittently: a letter by letter, a unit by unit, a word by word					
19	Reads with sharp, loud and disturbed voice					
20	Finds difficulty in using punctuation while reading					