Assessment of Reading and Writing Skills Using Coloured Overlays in Special Population

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ABSTRACT

Purpose: To assess the reading and writing skills using colored overlays among special population.

Methods: Cross-sectional, descriptive study in which 45 children from special population were recruited. Basic comprehensive eye examination and reading and writing skill, that has been carried by dynamic reader software test for writing skill and Yellow tint to check the reading speed with and without using coloured overlays. In other hand, test for the perceptual skills, a small questionnaire survey was carried out from the Teacher which was noted according to dyslexia conditions normal value (10-12), border line (13-24) & defective line (more than 24). Pre-validated & pre-designed questionnaire which was taken from college of optometrists in vision development

Results: Total 45 participants were screened who was already diagnosed with dyslexia, dysgraphia etc. The mean age of the participants was 12 ± 4.205 years, out of which 22 (48.9%) were male and 23 (51.1%) were female. For the perceptual skills (TPS);it has been found that had average good visual perceptual skills, [08(17.8%)],[27(60%)] had poor visual perceptual skills and [10(22.2%)] had very poor visual perceptual skills.

During the initial comparison, using coloured overlay the child was able to read maximum 95 words per minutes (WPM) with an average of [33.09 ± 22.595] words per minutes and without coloured overlays the child able to read maximum 45 words per minutes with an average of(14.93 ± 11.628) words per minutes. From the questionnaire assessment of dyslexia, it has been found, out of 45 children [43 (95.6%)] had dyslexia& [2 (4.4%)] had at border line dyslexia.

Conclusion: We conclude from this study that the deficit in visual perceptual skills is present among special population. There is association between conditions like dyslexia and refractive error, squint, near point of convergence and stereopsis. Coloured overlays found to be effective in the elimination of reading difficulties that are associated with learning disabilities including dyslexia.

Key Words: Visual Dyslexia, Dysgraphia, ADHD, reading disorders/disabilities, Coloured overlay, TPS including (visual memory, visual discrimination, visual closure, visual concentration), Visual perception, Reading fluency, Coloured filter, orthoptic evaluation

INTRODUCTION

Special population including dyslexia is types of learning disability which is caused by abnormal development of their visual "magnocellular" (M) nerve cells (Stein, 2001; Stein and Waish, 1997) [1]. Reading which is certainly one of the most complex oculomotor activities that modern persons use day-to-day. The processing involved is split separately to the level lower and higher. The first relates to various steps involved in the capture of the ocular image, the first of which is a cerebral analysis in the occipital cortex. The second represents different cognitive phenomena that allow identification and represent and give meaning to the newly learned word. The constant dependence between these materials, especially during the oculomotor study, makes this distinction a masterpiece. [2]

Reading draws heavily on the use of visuals; it is obvious that the letters must be identified and identified and then placed in the correct order for proper reading. About 5% of all children & nearly half of all children with disabilities cry out for visual problems when trying to read: the letters appear dimmed, moving around & letters become double, so children cannot see well, which often gives them an eyestrain and headache. Clearly, such symptoms interfere with learning to read. [3]

Difficulties with handwriting skills ability have been cited as one of the most common reasons for the referral of older children to pediatric services worldwide. Regarding handwriting tests, tests of visual perception and motor-visual integration has been reported as the most widely used tests among pediatricians worldwide. Developing Visual Motor Integration Testing and Visual Perceptual Skill test are two commonly used measures for children with handwriting difficulties. Visual Perceptual Skill test, on the other hand, does not require a motor component but measures seven visual aspects Perceptions of extinction include visual discrimination, visual memory, spatial relationships, positioning, sequential memory, visual land closure, and visual closure. [4]

In the British Dyslexia Association, developmental dyslexia are: Certain learning difficulties that mainly affect the development of literacy and language, characterized by difficulty with proficiency, rapid naming, working memory, working speed, and automatic development of imbalances and other human skills. Approximately 10% of school-age children lack access to fluids, and automatic reading skill due to their physical fitness. [2]

Visual depression affects approximately 37.5% of children with dyslexia and 25% of non-dyslexic children. Frequency of symptoms will be, blurry (24%), duplication (16%), jump (12%), structural variation (6%), and fainting (3.5%) of visual stimulation. Initially, in fact, visual pressure was considered as low-level dyslexia, and it has recently been shown that visual stress syndrome is independent of dyslexia. [5]

Dyslexia is generally considered as a linguistic root, and there is strong consensus among investigators that dyslexic learners are involved in processing phonetic information. The relative importance of phonetics in learning nevertheless extends to the depth of the language, and people may show satisfactory performance in phonetic tests or may not be able to read well. Factors other than phonetic processing may also contribute to dyslexia. [6]

Better thought of as a neurological syndrome involves more than just learning. Physically, a clear pattern of signs and symptoms indicates dyslexia, including severe genetic background, brain differences and visual and auditory processing combined with difficulty concentrating attention, poor sequencing, poor timing, confusion and short-term memory. This method is so different from other causes of illiteracy that it is easily detected. [3]

The large body of dyslexia activity has explored the role of visual deficits arising from the activation of the magnocellular-dorsal (MD) visual pathway. This may refer to the visual deficits arise anywhere between the retina and the posterior parietal cortex as the visual dorsal tunnel which extends to the posterior parietal cortex, strongly dependent (but not exclusively) on large contributions. [6]

The processes of attention and attention depend largely on the properties of the multicellular system. Retinal “ganglion” cells are neurons that send information from one eye to the other side of the brain - in particular, to the visual cortex, to the back of the occipital cortex back to the brain. They collect signals from light receptors behind the eyes and transmit them back to the brain. [3] Thus, the visible magnocellular system plays an important role in the directing attention, preventing the blurring of small eye movements and locking of the target. All of this is important for learning, so the accumulating evidence that the M system is not well-developed in many dyslexics has special significance. [3]

The diagnosis and treatment of learning disorders have become a major social issue in which medical and legal entities are currently organizing. Kidney specialists can remain complacent when they consider the important role of learning theory and their major role in other types of dyslexia. [2]

The colored overlays, one type of molded filter, are plastic reading sheets that are colored and placed on top of the text to eliminate or alleviate major reading difficulties such as low reading ability, accuracy and comprehension.[7]

The role of colors in reading have a few decades of history, which took place back in 1958, when Jansky (1958) reported the case of a student with reading errors who could not recognize words written on white paper but was able to see the words printed on yellow paper. [6]

Color filters are used in classrooms and homes to reduce learning difficulties associated with learning disabilities including dyslexia. [7]

According to Evans et al. (1999) Color filters determine that they have gained about 80% of the people they use. Adoption of color shows / filters in school is on the rise when it comes to the fact that visual ailment - which is a symptom that should be reduced - is often seen in non-traumatized students. Color overload can help people who suffer from a variety of difficulties such as low-grade reading disorder with dyslexia, unusual visual acuity in autism, and problems with deep comprehension caused by traumatic brain injury. [7] Thus, the result of the color-coded approach is that if visual pressure impairs readability, then the use of colored clothing can enhance the learning and reading performance. [5]

The colored overlaps are most common associated with scotopic Sensitivity Syndrome (SSS), also known as Meares-Irlen Syndrome or Irlen Syndrome This disease has been diagnosed as a sympathetic sensitivity to the brightness of a mirror that creates visual pressure. The theory supported by the overlay of color as a treatment is that most cases of dyslexia are caused by scotopic sensitivity syndrome. People diagnosed with SSS may have difficulty reading the text carefully or may become tired quickly while reading. Color filters are designed to reduce these barriers and improve reading performance. [7] These effects occur because the yellow filters actually stimulate the magnocellular system. This is because the even though the cells of the M ganglion group are not sufficient in the color spectrum, they are mainly absorbed in the wavelengths (red) and wavelengths (green) that are most commonly used in yellow light. [3] Yellow filtering reduces the total amount of light entering the eye; thus, they cause papillary dilation and increase the amount of yellow light that hits the retina. Thus, deep-coated filters designed to activate M cells may be more effective in improving M cell function and learning in children with visual reading difficulties. [3] It has been shown that when dyslexic children are able to read at a color choice of their own, they learn at a 25% speed (Wilkins, 2002): [7] moreover, even though non-problematic children benefit from the use of color overlay, the benefit from the use of color wear is -dyslexic is higher than that is seen by non-lonely children (Singleton and Henderson, 2007). With respect to adults, it seems that only people with dyslexia and visual impairment. The syndrome benefits from the use of color overlay compared to dyslexics without visual pressure, non-dyslexics with visual pressure, and non-dyslexics without visual pressure. Wilkins et al. (2001) found that with a 5% threshold increase in reading speed due to colored overlays. [5]

This processing involved classically separated into two levels that is lower and higher. The first resembles involved in the ocular capture of the word's image, which is the start of cerebral analysis in the occipital cortex to the different steps

Attention Deficit/Hyperactivity Disorder (ADHD) is one of the most frequently encountered neurodevelopment disorders of childhood. Children with ADHD have difficulty to maintaining focus and controlling their behaviour, some exhibit hyperactivity. There is no single known cause for ADHD; both genetic and environmental factors are supposed to play a role. [10]
Dysgraphia is closely related to the developmental dyslexia is a disorder categorised by difficulties in the acquisition of writing skills, with writing performance below that probable based on children's class level., and like developmental dysgraphia, despite adequate visas, schooling, and other reasoning abilities. [9]

METHODOLOGY

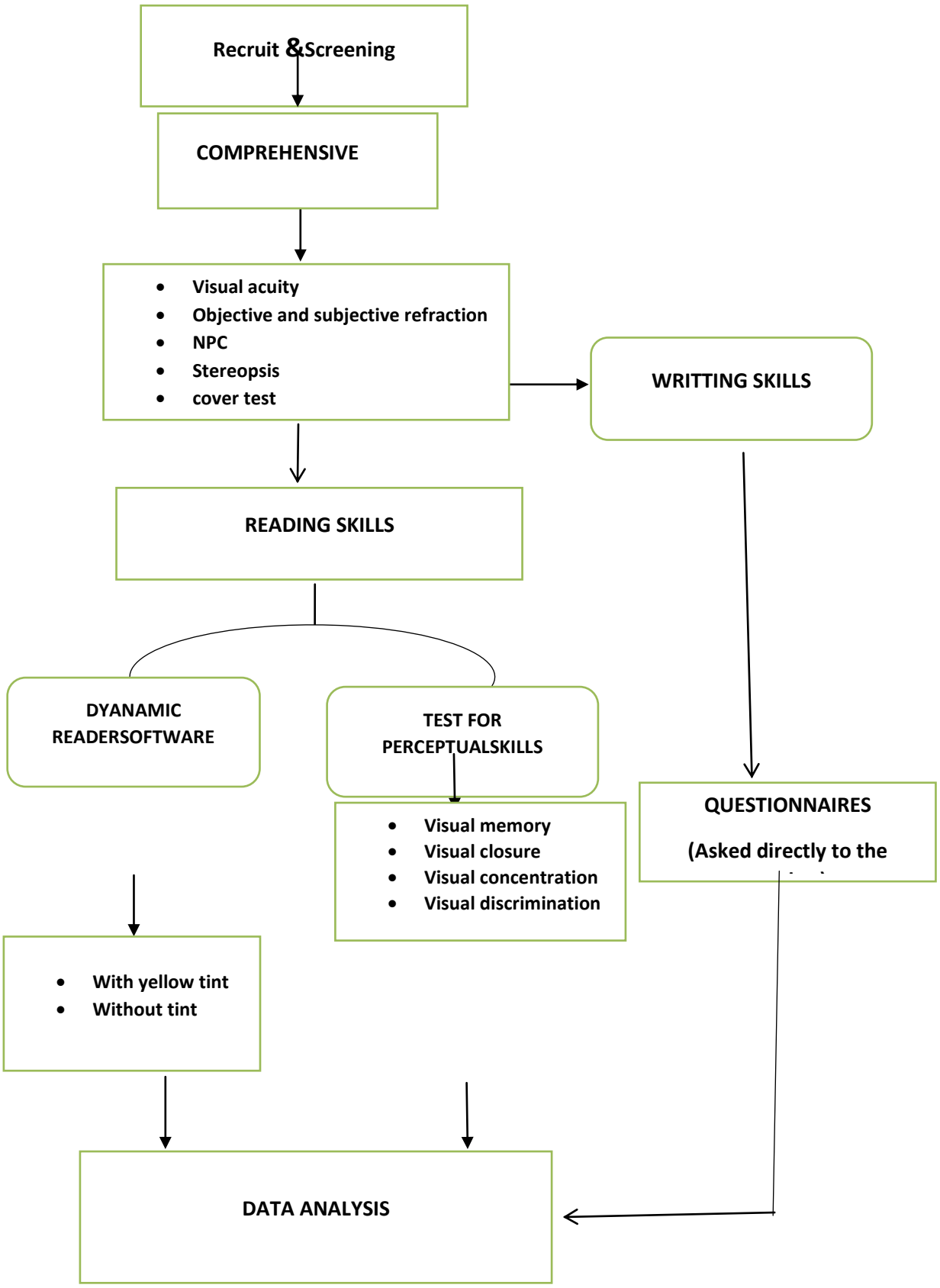
In this cross-sectional study, participants were 49 children with a prior diagnosis (including dyslexia, dysgraphia & ADHD), four were immediately resampled; two because of colour blindness & two because of speechless so total 45 children (22male & 23female) were recruited from the special school in Delhi, NCR. Basic comprehensive eye examination which include assessment of vision with the help of Snellen's chart, objective refraction with the help of dynamic and static retinoscopy to evaluate the best corrected visual acuity (BCVA), cover test to rule out squint, near point of convergence with the help of RAF rule in which 5-10cm was taken as normal value and >10cm as convergence insufficiency and stereopsis with the help of TITMUS FLY test in which 40sec of arc was taken as normal values was carried out. Monocular estimate method (MEM) retinoscopy was used to assess the accommodative response and a normal lag was considered between +0.25 to +0.75D.

Reading and writing skills were assessed with the help of dynamic reader software and Yellow tint was used as coloured overlay to check the difference in reading speed. In the other hand, test for the perceptual skills include Visual memory, Visual closure, Visual concentration, Visual discrimination was carried out with the help TVPS-3 in which plates >9 taken as good, 8 or <8 as poor and <3 as very poor. A small questionnaire survey was carried out from the Teacher which was noted according to dyslexic condition in normal value (10-12), border line (13-24) & defective line (more than 24). Pre-validated and pre-designed questionnaire which was taken from college of optometrists in vision development. In this study, refractive errors were defined based on the spherical equivalent (SE). An SE -0.5D or more was defined as myopia and that of +0.50D or more was considered hyperopia. Informed written assent was obtained from the principal of special school.

Inclusion criteria included whether emmetropic or ametropic, 5 to 25 years of age and diagnosed with dyslexia, dysgraphia, attention-deficit/hyperactivity.

Exclusion criteria were diagnosed with colour blindness, deaf & dump subject & history of eye surgery, medical illness, those not willing to participate, or other ocular pathologic condition**.** Data was collected and entered the Microsoft excel sheet & statistical analysis was done by using SPSS 16.0 Software.

Flow Chart


Recruit &Screening
COMPREHENSIVE
Visual acuity
Objective and subjective refraction
NPC
Stereopsis
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Visual memory
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QUESTIONNAIRES
(Asked directly to the
With yellow tint
Without tint
DATA ANALYSIS

DATA ANALYSIS

In the present study the statistical data analysis was conducted using Microsoft excel and SPSS version 16. Student t-test was used to calculate the p-value. The mean and standard deviation was calculated for age. Data were presented as frequency and percentage for the objectives.

RESULTS

A total 45 participants were screened who was already diagnosed with dyslexia, dysgraphia and attention-deficit/hyperactivity disorders (ADHD). The mean age of the participants was [12 ± 4.205] years of age, out of which [22 (48.9%)] were male and [23 (51.1%)] were female (figure.1).

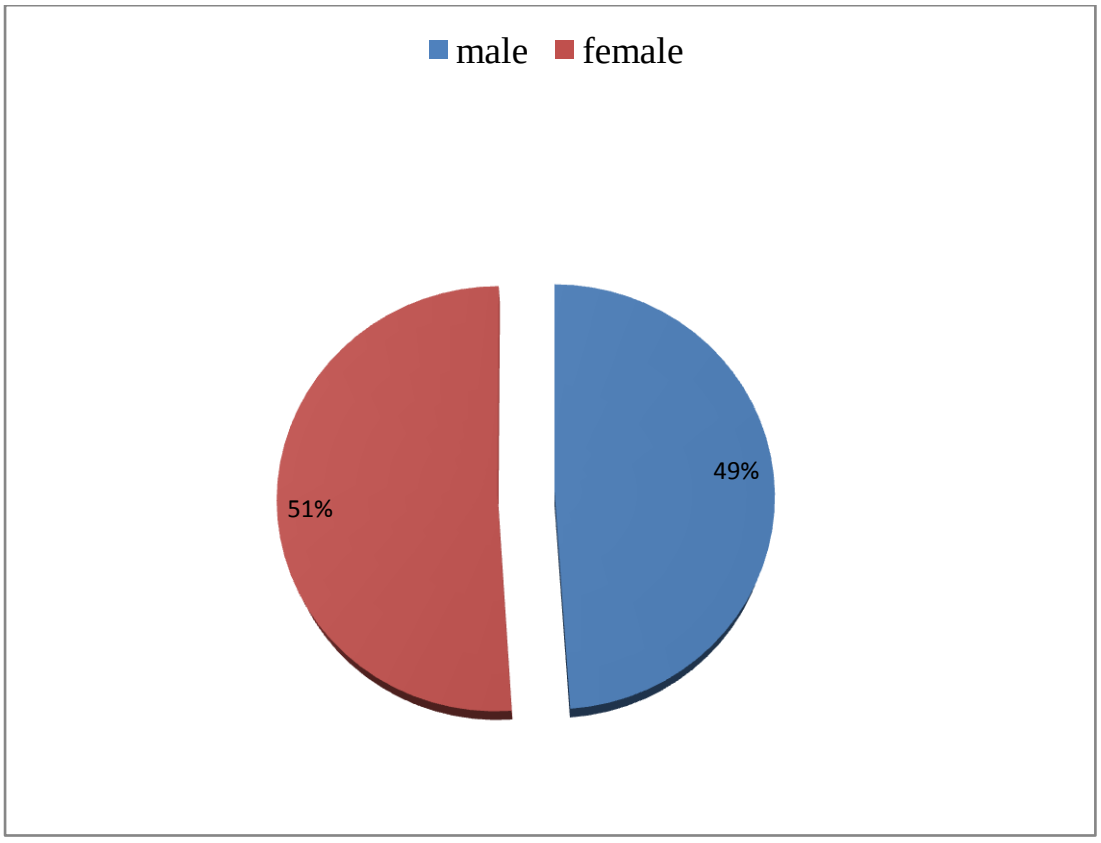

Figure.1: gender wise distribution of participants

Figure.2: In this study we found that out of 45 children from special population where a small questionnaire survey was carried out from the teacher which was noted value according to dyslexia condition where subdivided in to three groups including (normal, borderline and defective condition), after assessment of dyslexic readers reported a greater history of reading and writing problems through questionnaire we found [02(4%)] were at borderline and [43(96%)] were found to have a defective condition.

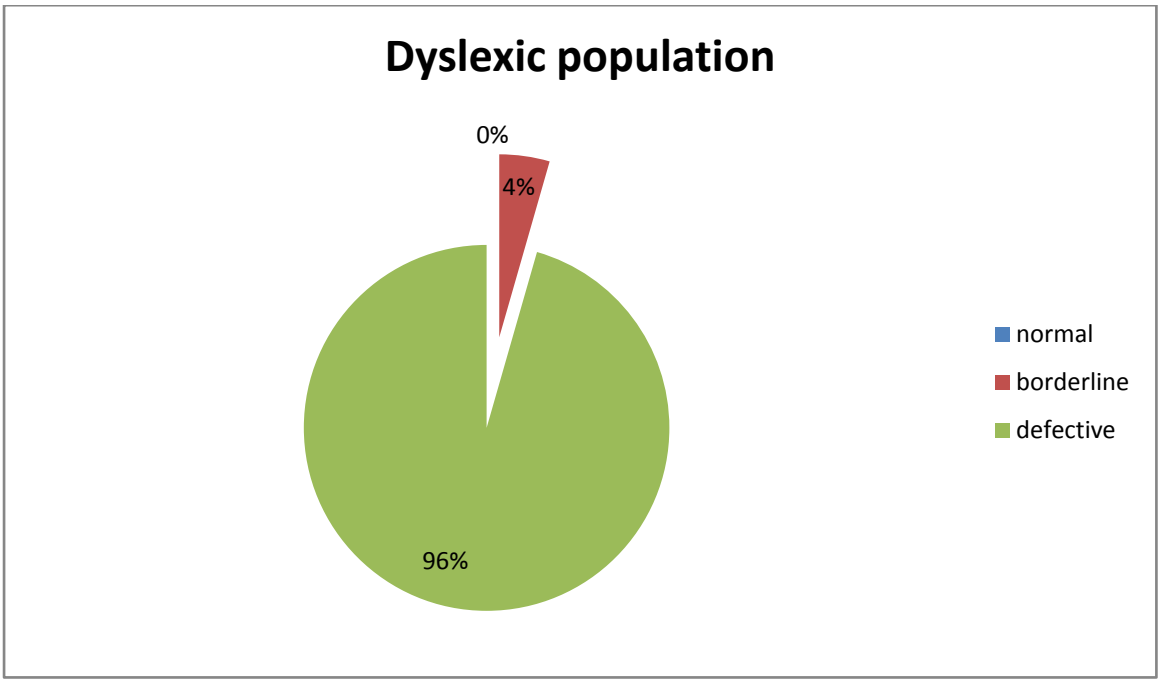

Figure.2: Classification of recruited population a/q to Dyslexia

For the test of the visual perceptual skills (TVPS), out of 45 participants only [8(17.7%)] children had good visual memory while [37(82.2%)] had disability of visual memory (figure.3), [9(20%)] children had good visual closure while 36(80%) had disability of visual closure (figure.4),[06(13.3%)] had good visual concentration while 39(86.7%) children had disability of visual concentration (figure.5) and [09(20%)]children had good visual discrimination while [36(80%)] had disability of visual discrimination.

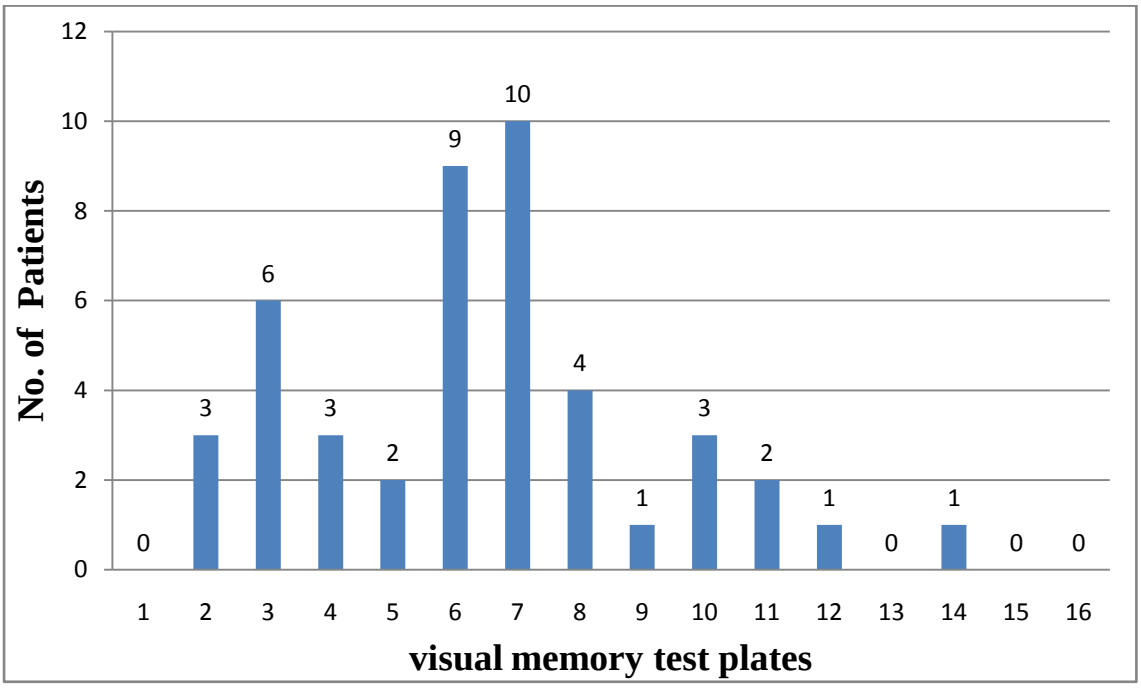

Figure.3visual memory scoring

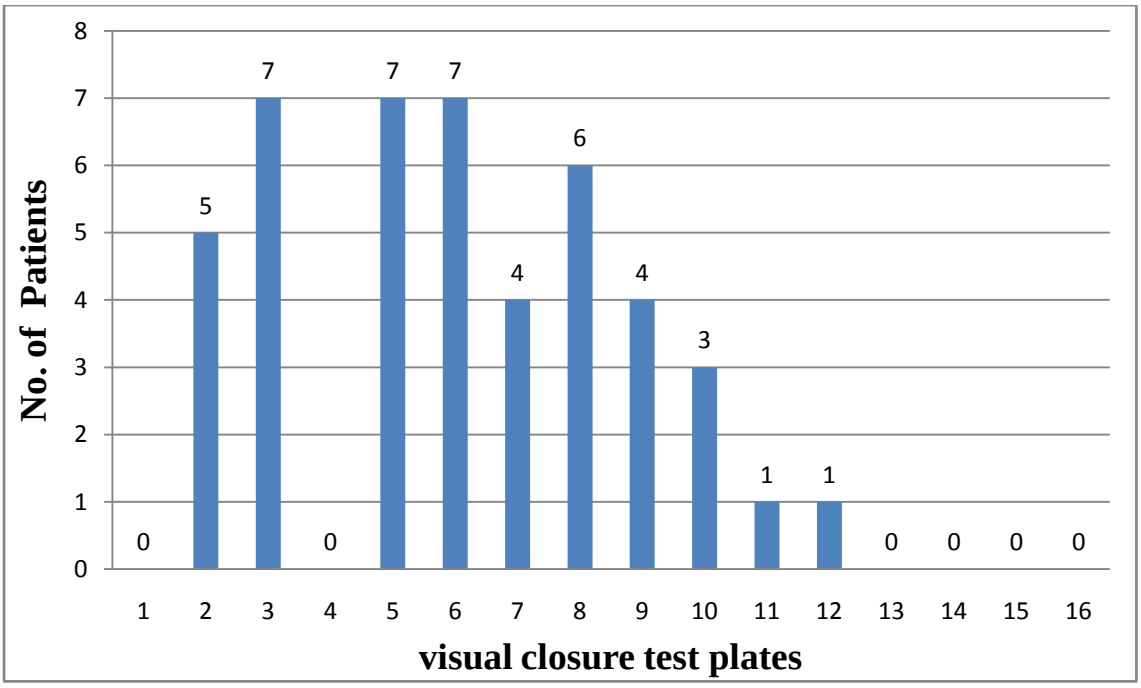

Figure.4 visual closure scoring

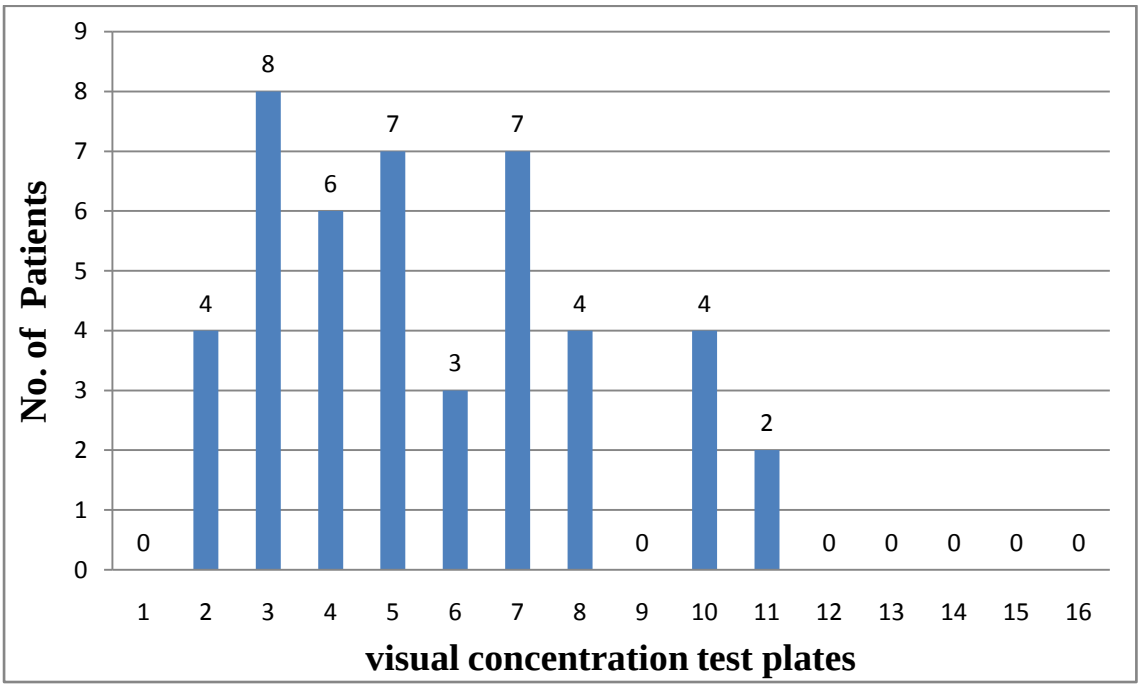

Figure.5 visual concentration scoring

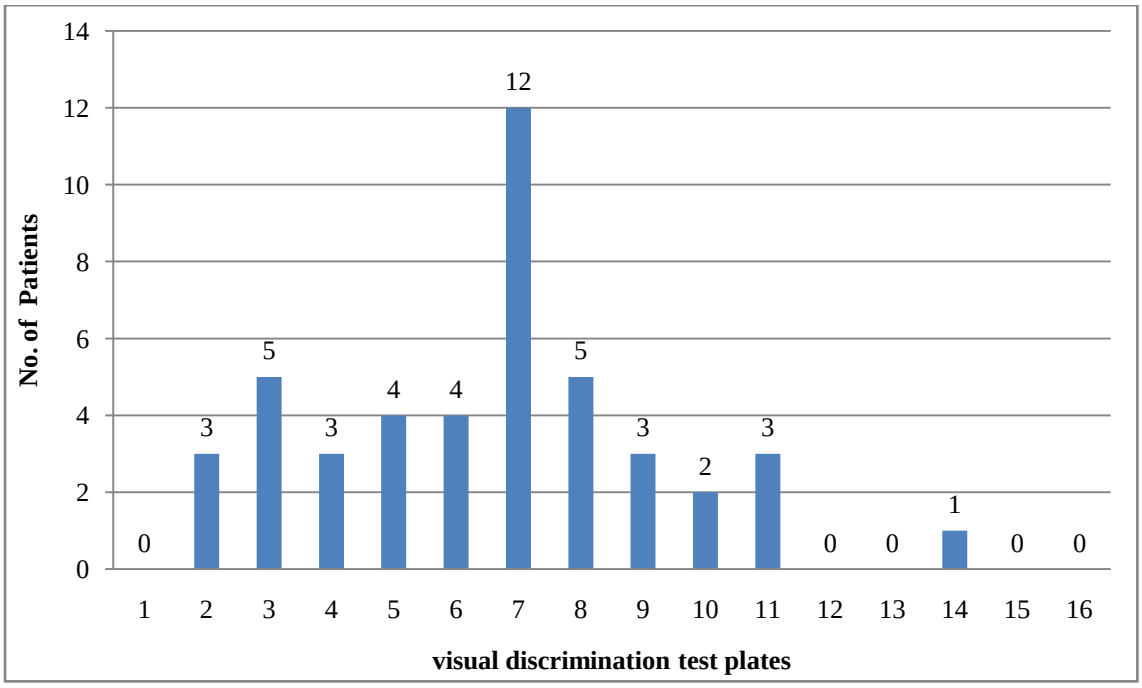

Figure.6 visual discrimination scoring

Table .1- Visual Perceptual Skills

Parameters	**Good**	**Poor**	**Very Poor**
Visual memory	08(17.8%)	28(62.2%)	09(20%)
Visual closure	09(20%)	24(53.3%)	12(26.7%)
Visual concentration	06(13.3%)	27(60%)	12(26.7%)
Visual discrimination	09(20%)	28(62.2%)	08(17.8%)
Average	08(17.8%)	27(60%)	10(22.2%)

This table shows that out of 45 participants only [8(17.7%)] children had good visual memory while [37(82.2%)] had disability of visual memory, [9(20%)] children had good visual closure while [36(80%)] had disability of visual closure,[06(13.3%)] had good visual concentration while [39(86.7%)] children had disability of visual concentration and [09(20%)]children had good visual discrimination while [36(80%)] had disability of visual discrimination. Overall, it has been found that average population that had good visual perceptual skills was 08(17.8%),27(60%) had poor visual perceptual skills and 10(22.2%) had very poor visual perceptual skills.

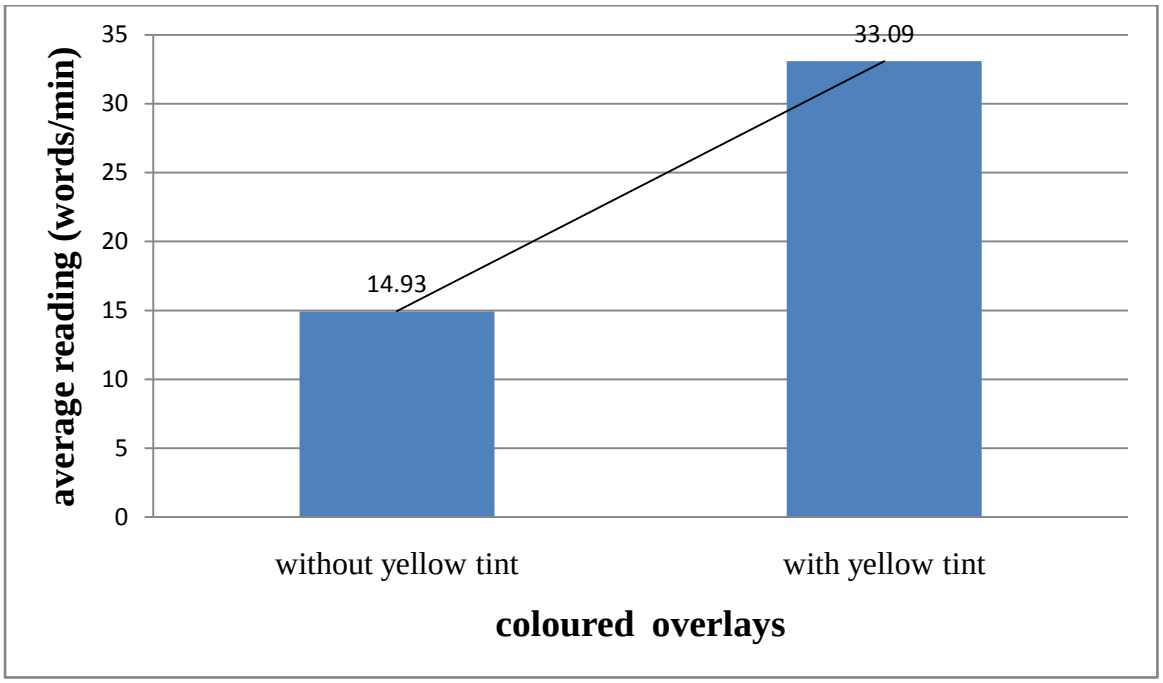

Figure.7- Effect of coloured overlay (yellow tint) on reading fluency

Table 2: Reading fluency with and without coloured overlays

Coloured Overlays	Mean (words per min)	Standard Deviation	Standard Error Differences	95%Confindence Interval of the Difference		P-value
				lower	Upper	
Without tint	14.93333	11.62755	3.788102	-25.6836	-10.6275	<0.001
With tint	33.08889	22.59507	3.788102	-25.7192	-10.5919	

For the dynamic reader software test (DRST), during the initial comparison between overlay and no overlay, which has been found that maximum number of words per minute (WPM) without using coloured overlays (yellow tint) was 45 words per minute with an average [14.93±11.62] and with coloured overlay (yellow tint) maximum number of words per minute was 95 words/min with an average [33.09±22.595] which shows the statistically significant ($p<0.001$) increase in reading fluency (figure.7 & table. 2)

Out of 45 participants, [36(80%)] children had higher frequency of refractive error. The average spherical equivalent in right eye was [-0.73±2.42] dioptre and in left eye was [-0.80±2.45] dioptre. Binocular vision anomalies were found after best possible correction,[38 (84.4%)] children were orthotropic while 8 (15.6%) children had squint.

It has been found that the average stereopsis was [255.11±246.87] sec of arc with minimum value 40sec of arc and maximum 800 sec of arc, [10(22.2%)] children had normal stereopsis and [35(77.8%)] children found to have decreased level of stereopsis (depth of perception).

This study shows that out of 45 children, [31(68.9%)] children had normal near point of convergence and [14(31.1%)] found to have convergence insufficiency.

DISCUSSION

This study suggests that colored overlays (yellow tint) helps to overcome reading difficulties in the special population by increasing their reading fluency as it been found that maximum number of words per minutes (wpm) without using colored overlays was 45 words per minutes average (14.93 ± 11.62) and with colored overlays (yellow tint) maximum number of words per minutes was 95 with an average (33.09 ± 22.595).

These results support previous research (Uccula et al, 2014) which has shown that colored overlays have been used extensively as a remedy for other learning difficulties experienced by dyslexic individuals, such as displaying speed and depth [5]. While this study (Tiffany Freeze Denton et al, 2016) suggests that the authors concluded that colored overlays, whether it is color-coded or not, did not help the reading rate compared to the color-free overlay. The colored overlays may have affected the words read correctly per minute or resulted in the reduction of well-read word per minute. [7]

Ritchie et al, 2011 found that there is no immediate benefit of colored overlays on learning difficulties. [11]

Volkmar et al. suggested that the differences in the subtest of the TVPS and found that the developmental coordination disorder (DCD) group were poorer on all subtests except for spatial relationships and form constancy. This contrast with (Tsai et al. 2008) where the DCD group performed below peers on all subtests of the TVPS. The TVPS was used to measure visual perception as defined by (Martin 2006). The TVPS utilizes black-and-white designs as stimuli for all the perceptual tasks [4]. But compare to the current study same methods & materials are used for the visual perception and after recruitment of 45 participants, found maximum average of 37(82.2%) had poorer visual perception in learning disabilities.

It has been found in this study that out of 45 children, 14 (31.1%) had convergence insufficiency and no one had convergence excess among recruited population which is supported by the previous study (Patrick Quercia et al, 2013) which showed that 64% of dyslexics demonstrated convergence insufficiency [2] and while in the study (Raghuram aparna et al, 2018) showed deficiencies in the visual function of children with dyslexia and the deficit could have included more likely to involve convergence excess than convergence insufficiency in dyslexia patients. [8]

Numerous scientific studies have also documented the presence of differences in eye movement anomalies in dyslexia and in our study, we found that even after the best possible refractive correction out of 45 children, 8 (15.6%) of children had squint.

There are various claims that colored overlays can help people who suffer from various range of disorders such as low reading fluency disorders and dyslexia (Wyman 2013), rare of poor eye contact autism spectrum disorders, and depth perception issues caused by deep cognitive impairment. [6] In this study we found that 35 children (77.8%) had decreased level of stereopsis.

LIMITATION OF THE STUDY

Relation of visual perceptual skills with the age was not assessed. During initial comparison between the reading skills of normal population and special population using colored overlays was not assessed. Comparison in the effectiveness of colored overlays of different tints (red, blue, etc.) was not assessed among special population. Relation of visual perceptual skills with the emmetropia and ametropia was not compared. It may also examine whether coloured overlays improve reading abilities over time through this mechanism, rather than through a direct effect on visual strain.

CONCLUSION

We conclude from this study that the deficit in visual perceptual skills is present among special population. There is association between conditions like dyslexia and refractive error, squint, near point of convergence and stereopsis. So, every child should undergo a routine detailed ocular examination so that timely interventions can be taken. Coloured overlays found to be effective in the elimination of reading difficulties that are associated with learning disabilities including dyslexia. In the result after using coloured overlays should increases the speed level or reading fluency in compare of without coloured overlays among special population. The test of the visual perceptual skills overall children was found disabilities (difficulty for visual perception) among special population. Children were found moderate frequency of binocular vision anomalies with specific learning disorders.

RECOMENDATION

Every special population like dyslexia patient should be prescribed with coloured overlays (yellow tint) as it effective in the elimination of reading and writing difficulties**.** If a child with reading difficulties desires to read with a coloured overlay, the overlay might increase inspiration to read which could prove useful for them.

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DECLARATIONS

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Conflict of interest: There are no conflicts of interest.

Ethical approval: Ethical approval was done by the ethical committee of ITM University, Gwalior,Madhya pradesh, India

REFERENCES

1. Giraldo-Chica, M., Hegarty, J. P., 2nd, & Schneider, K. A. (2015). Morphological differences in the lateral geniculate nucleus associated with dyslexia. *NeuroImage. Clinical*, *7*, 830–836. https://doi.org/10.1016/j.nicl.2015.03.011
2. Quercia, P., Feiss, L., & Michel, C. (2013). Developmental dyslexia and vision. *Clinical ophthalmology* (Auckland, N.Z.), 7, 869–881. doi.org/10.2147/OPTH.S41607
3. Stein J. (2014). Dyslexia: The Role of Vision and Visual Attention. *Current development disorders reports*, *1*, 267–280. https://doi.org/10.1007/s40474-014-0030-6
4. **Prunty, M., Barnett, A. L., Wilmut, K., & Plumb, M. (2016). Visual perceptual and handwriting skills in children with Developmental Coordination Disorder. *Human movement science, 49*, 54-65.**
5. Uccula, A., Enna, M., &Mulatti, C.(2014). Colors, colored overlays, and reading skills. *Frontiers in psychology*, 5, 833. https://doi.org/10.3389/fpsyg.2014.00833
6. Sigurdardottir, H. M., Danielsdottir, H.B, Gudmundsdottir, M., Hjartarson, K.H, Thorarinsdottir, E. A, &Kristjánsson, Á. (2017). Problems with visual statistical learning in developmental dyslexia. *Scientific reports*, 7(1), 1-12. https://doi.org/10.1038/s41598-017-00554-5
7. Denton, T. F., &Meindl, J. N. (2016). The Effect of Colored Overlays on Reading Fluency in Individuals with Dyslexia. *Behavior analysis in practice*, 9, 191–198. https://doi.org/10.1007/s40617-015-0079-7
8. Raghuram, A., Gowrisankaran, S., Swanson, E., Zurakowski, D., Hunter, D. G., &Waber, D. P. (2018). Frequency of Visual Deficits in Children with Developmental Dyslexia. *JAMA ophthalmology*, 136(10), 1089–1095. https://doi.org/10.1001/jamaophthalmol.2018.2797
9. Döhla, D., & Heim, S. (2016). Developmental Dyslexia and Dysgraphia: What can We Learn from the One about the Other? *Frontiers in psychology*, 6, 2045. https://doi.org/10.3389/fpsyg.2015.02045
10. DeCarlo, D. K., Swanson, M., McGwin, G., Visscher, K., & Owsley, C. (2016). ADHD and Vision Problems in the National Survey of Children's Health. *Optometry*

and vision science: official publication of the American Academy of Optometry, *93*(5), 459–465. https://doi.org/10.1097/OPX.0000000000000823

11. Ritchie, S. J., Della Sala, S., & McIntosh, R. D. (2011). Irlen colored overlays do not alleviate reading difficulties. *Pediatrics*, *128*(4), e932–e938. https://doi.org/10.1542/peds.2011-0314
12. Hussaindeen, J.R., Rakshit, A., Singh, N.K., Swaminathan, M., George, R., Kapur, S., Scheiman, M. and Ramani, K.K., 2017. Binocular vision anomalies and normative data (BAND) in Tamil Nadu: report 1. *Clinical and Experimental Optometry*, *100*(3), pp.278-284.
13. García-Muñoz, Á., Carbonell-Bonete, S. and Cacho-Martínez, P., 2014. Symptomatology associated with accommodative and binocular vision anomalies. *Journal of Optometry*, *7*(4),pp.178-192.
14. Porcar, E. and Martinez-Palomera, A., 1997. Prevalence of general binocular dysfunctions in a population of university students. *Optometry and Vision Science*, *74*(2), pp.111-113.
15. Montés-Micó, R., 2001. Prevalence of general dysfunctions in binocular vision. *Annalsofophthalmology*, *33*(3), pp.205-208.
16. Hussaindeen, J.R., George, R., Swaminathan, M., Kapur, S., Ramani, K.K. and Scheiman, M., 2015. Binocular vision anomalies and normative data (BAND) in Tamil Nadu–study designand methods. *Vision Dev & Rehab*, pp.260-270.
17. Brown, T., 2008. Factor Structure of the Test of Visual Perceptual Skills—Revised (TVPS-R). *Hong Kong Journal of Occupational Therapy*, *18*(1), pp.1-11.