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Measuring the impact of training of Visual Saccadic Competence on the Reading Ability of Youth with Oculomotor Dysfunction in Mainstreamed Regular Schools

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ABSTRACT

Accurate eye movements are needed for effective reading. Inefficient eye movements such as poor gaze fixation or saccadic skills indicate the oculomotor dysfunction. Oculomotor dysfunction is a key factor of poor reading skills among the youth. The training of saccadic skills of the children with oculomotor dysfunction ameliorates their reading capability. The present research measured the impact of training of visual saccadic competence on the reading ability of Youth with Oculomotor Dysfunction in mainstreamed regular schools at primary level. King Devick online test was administered on the children having poor reading skills. The below average accuracy on the test indicated the oculomotor dysfunction among the children. The NSUCO Oculomotor Test designed at Nova Southeastern University College of Optometry, Florida was applied to measure the level of visual saccadic ability among the youth before and after the intervention. The study sample of twenty children with oculomotor dysfunction was randomly selected. The sample was divided into two cohorts having 10 participants in experimental cohort and 10 in the control. The eye movement training in terms of saccadic exercises was presented to the participants of experimental cohort for consecutive 6 weeks with 50 minutes per day session on daily basis. Words Correct Per Minute Method was used to assess the reading ability of both groups before and after the intervention from selected paragraphs of the books of Punjab Textbook Board Lahore. Statistical analysis on the basis of scores of both the Experimental Group and Control group was made by using Analysis of Covariance (ANCOVA) to make a comparison between both of the groups. A highly significant difference was noted in the combined scores of both groups, $F(1, 17)=11.65$, $p=0.003$. The values of partial eta squared=0.407 showed that the effect size was large. The mean reading ability score of the experimental group ($M=64.0$, $SE= 1.16$) was greater than the Control Group ($M=58.3$, $SE=1.16$) which indicated a difference of 5.7 words per minute reading rate among the groups. The results of the study depicted that there was a significant effect ($p<0.05$) of the training of visual saccadic competence on the reading ability of Youth with Oculomotor Dysfunction.

Keywords: Visual Saccadic Competence, Youth with Oculomotor Dysfunction, Reading Ability

INTRODUCTION

Reading is a very complex neural process, which is imperative to access information. Good reading-ability assists people to learn variety of skills, facts, and information. Poor reading skills lessen the student's performance in the school. Students face reading

difficulties due to lack of specific skills essential for reading (Gagen, 2007). Generally students face reading problems due to language deficits but there are some non-language deficits which also cause reading problems (Bender & Larkin, 2009). Effective reading relies on rapidity in seeing (Bhardwaj, 2004), and it has strong correlation with the vision. Effective vision skills are very helpful in the reading. On the other hand visual inefficiency leads to cause poor reading performance. Students with visual impairment experience reading problems. Reading difficulty is the most usually reported problem of visually impaired people (Allegheny College, 2015; "Vision Problems," 2015).

The term "Oculomotor" is denoted as the movements of eyes (Oculomotor, n.d.). Accurate eye movements are needed for effective reading. Loss of eye fixation, or extra eye fixation and saccades in search tasks are the indications of oculomotor dysfunction (Scheiman & Rouse, 2006). Oculomotor skills involve fixation, saccades, and pursuits which function for visual tracking (Cooper, 1998). Inability of eyes to move rapidly, efficiently and correctly from one article to another is the sign of oculomotor dysfunction (Petrosyan, 2013). Oculomotor dysfunction is a key factor of poor reading skills of children. Slow eye movements reduce the reading speed (Lederman, 2012). Learning to read is a complicated phenomenon which involves visual processing and oculomotor functions. In the process of learning to read, the eyes should have ability to concentrate (form saccades) and make focus on letter-by-letter, word-by-word and line-by-line (Labor, 2010). Efficient oculomotor skills are very helpful in the process of reading, writing, and copying information. Inefficient visual tracking system results in poor reading comprehension, reversing, and skipping the reading words (Fortenbacher, 2010); slow reading pattern, and sometimes strong resistance to reading. The training through simple visual exercises helps to improve the eye tracking skills (Landau, 2013; Abdulmuhsin et al., 2021; Basheer et al., 2021). Fischer and Hartnegg (2000) concluded that daily visual training not only improved the perceptual ability of the dyslexic students but also enriched their saccadic eye control. Harris (2002) found key improvements of vision therapy on all mechanical aspects of reading including eye movements. Thiagarajan, Ciuffreda, Capo-Aponte, Ludlam and Kapoor (2014) found that oculomotor training improved reading-related oculomotor behavior. Oculomotor-based vision rehabilitation also enhanced control of eye movements, rate of reading and overall reading capacity.

A study carried out by Bucci, Nassibi, Gerad, Bui-Quoc and Seassau (2012) investigated the immaturity of visual saccade and vergence interaction in children with dyslexia against 2 groups of children without dyslexia with the age-matched reading/chronological. The visual motor abilities of dyslexic children and normal children were recorded. Normal children with age-matched chronological group revealed short duration and a small number of fixations in reading activities as compared to vision search activities. Moreover, saccadic abilities of this group in both tasks of visual search and reading were well yoked. The oculomotor patterns of the dyslexic children showed that they had deficit visual attentional processing and poor visual saccade and interaction of vergence system. The study of Seassau, Gerard, Bui-Quoc and Bucci (2014) examined the coordination in binocular saccade during visual search and reading among typical readers and dyslexic children. The typical readers had improved coordination of binocular saccades and reading skills with the age. Whereby poor visual saccade, visual attentional processing and vergence system interaction were noted in the dyslexic children. The second saccade target location

influences the first saccade trajectory and its landing position (McSorley, McCloy & Williams, 2016).

Saccadic eye movement is very vital for reading at near and seeing at distance. The findings of a study conducted by Fischer (2015) revealed that successful saccadic and fixation control training enhanced reading skills of dyslexic children. Leonge et al. (2014) also found significant effect of rigorous training of visual saccadic skills on the reading fluency of children at early age(; Yan et al., 2020; Nuseir et al., 2020; Asada et al., 2020: Shehzadi et al.,2020). The training of visual saccadic skills may assist to improve the involuntary movements of the eyes and thus contribute to enhance the level of reading fluency of the Children with Oculomotor Dysfunction (OMD). There was no study on the rehabilitation of saccadic skills particularly in relation to reading fluency of Children with Oculomotor Dysfunction in Pakistan. Keeping in view the magnitude of visual saccadic skill's rehabilitation in relation to reading performance, present study aimed to measure the impact of training of Visual Saccadic Competence on the Reading Ability of Youth with Oculomotor Dysfunction'. The research may help the teachers to improve the reading capacity of their students by giving special consideration to the vision related issues particularly mechanical problems of eye movements in terms of visual saccadic ability. Teachers can make adaptation in their teaching methodology involving numerous eye movement exercises to remediate the visual saccadic skills and thus improve the reading ability of their students.

Purpose of the Study

The research was basically designed to measure the impact of training visual saccadic competence on the reading ability of Youth with Oculomotor Dysfunction in mainstreamed regular schools. It also assessed the changes occurred in improving the visual saccadic competence among the Youth with Oculomotor Dysfunction as a result of training through visual saccadic exercises in mainstreamed regular schools.

Research Questions

Researcher intended to investigate the following research questions:

- What is the impact of training visual saccadic competence on the reading ability of Youth with Oculomotor Dysfunction in mainstreamed regular schools?

- What is the effect of training through visual saccadic exercises on the improvement of visual saccadic competence of Youth with Oculomotor Dysfunction in mainstreamed regular schools?

Subjects and Methods

Study Participants

The study was experimental and quantitative in nature. The experiment reported here was based on the data of reading assessment and measurement of oculomotor skills of the children of mainstreamed regular schools in district Toba Tek Singh, Pakistan during 2017. The present research measured the impact of training of visual saccadic competence on the reading ability of Youth with Oculomotor Dysfunction. All the Youth with Oculomotor problems of 10 mainstreamed regular schools having below fourteen years of age with poor reading skills were included in the study irrespective of their gender, class or race. Researcher located 204 poor readers with oculomotor problems. King Devick online test was administered by the researcher on the children having poor reading skills. The below average accuracy on the test indicated the poor

reading and oculomotor dysfunction among the children. The NSUCO Oculomotor Test designed at Nova Southeastern University College of Optometry, Florida was then applied to measure the level of visual saccadic and pursuit ability among the youth before and after the intervention. The level of gaze fixation of children was also determined. A block of 50 children was finally chosen who were having weak oculomotor skills (gaze fixation, saccades and pursuit eye movements). Thereafter, a study sample of twenty children with oculomotor dysfunction was randomly selected from the block of children having weak oculomotor skills. The sample was divided into two cohorts having 10 participants in experimental cohort and 10 in the control. The eye movement training in terms of saccadic exercises was presented to the participants of experimental cohort for consecutive 6 weeks with 50 minutes per day session on daily basis. Words Correct Per Minute Method was used to assess the reading ability of both groups before and after the intervention from selected paragraphs of the books of Punjab Textbook Board Lahore. Consequently, the results were inferred.

Instruments

Following instruments were applied to assess the level of oculomotor skills and reading ability of the Youth with Oculomotor Dysfunction:

King Devick (KD Test)

KD Test was applied on poor readers to diagnose the Children with Oculomotor Dysfunction. King Devick Test was initially designed by Alan King, O.D. and Steven Devick, O.D. in 1976. The online iPad version of KD Test 'King Devick Pro Reading' was used to diagnose the Youth with Oculomotor Dysfunction. Three test cards containing single digit numbering from left to right direction were used. There were five digits on total eight lines of each card. The test was run through internet connection after putting the login account. Child's age was entered in the test. After pressing the 'Run Button' KD Test automatically began after demonstration card. Poor readers were asked to read aloud the alphanumeric data with their maximum possible speed avoiding the errors. Only one error was recorded for the reversion of a word, word omission, or word addition (Mayo Clinic 2015). Total numbers of reading errors were put into the KD Test app which made its comparison with age-related normative values. The values of below 15 percentile rank and below average accuracy yielded a result of 54 Youth with Oculomotor Dysfunction. The reliability coefficient (r=0.87) of KD Test exhibits its suitability for the research (Oberlander, Olsen & Weidauer, 2017). More than 140 peer-reviewed researches have validated the King-Devick products for the reading problems and concussion management etc. (King Devick Technologies, 2019).

Nova Southeastern University College of Optometry (NSUCO) Oculomotor Test

NSUCO Oculomotor Test helps to assess the oculomotor skills. It takes two minutes for its completion. The test is easy to administer on the children with the age two years and above. The participants were standing at a distance not more 40 cm from the researcher. Firstly the visual saccade ability of the participants was assessed with the help of NSUCO Oculomotor Test. Researcher used two ballpoint targets for the saccade eye movement. One target of ballpoint had green spherical top and other target of ballpoint had red spherical top. The study participants had to follow the instructions of researcher to make saccade eye movement in five round trips in horizontal direction. The length of visual saccade was kept 20 cm. The participants had to look at red spherical top of the ballpoint when asked by the researcher and then look at the green spherical top of ball point in opposite direction. Researcher noted the saccade ability of

the children whether they complete five saccade round tips while keeping their attention under control, accurate fixation on the targets, movement of the body and head according to the scoring criteria of the test (Maples, 1995). The established reliability for the visual saccade areas has been presented as under:

- Saccade Ability of the children in completing five saccade 90%

round tips while keeping their attention under control

- Saccade Accuracy of the children in completing five saccade 62%

round tips by accurately fixating on target with minimum correction

- Movement of the Head of the children in completing five saccade 86%

round tips

- Movement of the Body of the children in completing five saccade 95%

round tips

Secondly the visual pursuit ability of the participants was determined with the help of NSUCO Oculomotor Test. Researcher used only one target ballpoint for the purpose. Participant was asked to fixate his/her eyes on the top of the target ballpoint as it goes around without pulling them off the ballpoint top. The target ballpoint was moved in 20 cm diameter. The target ballpoint was moved with two rotations clockwise and two rations anticlockwise. Researcher recorded the participant's pursuit ability to complete the four rotations (clockwise and anticlockwise) while keeping their attention under control, accurately tracking of target without re-fixation, movement of the body and head during pursuits according to the scoring criteria of the test. The established reliability for the visual pursuit areas has been presented below (Maples, 1995):

- Pursuit Ability of the children in completing four pursuit rotations 95%

while keeping their attention under control

- Pursuit Accuracy of the children in in tracking target without 90%

re-fixations

- Movement of the Head of the children in completing four pursuit76%

rotations

- Movement of the Body of the children in in completing four rotations 100%

round tips

The Visual Saccadic ability of the children was measured before and after the training, whereby Visual Pursuit ability was only measured before the treatment.

Gaze Fixation Duration

The Visual Fixation ability of the participants was assessed by calculating the gaze fixation duration during the reading. Total number of fixations made by the participants while reading a paragraph for minute was recorded. The gaze fixation time duration was obtained by dividing reading time in seconds over the number of fixations made while reading. The intra-class coefficient (ICC) for gaze fixation time duration was (r=0.89) on Visagraph II apparatus (Borsting, Rouse, Shin, & McClallen, 2007). Merely the gaze fixation time duration was calculated before the treatment.

Word Correct Per Minute (WCPM) Method

WCPM Method was applied to examine the reading capacity of the participants. Five passages from the Urdu Textbooks (Class 1 to 5) of Punjab Book Board Lahore were selected to test the reading ability of the children. WCPM Method assists the teacher to evaluate the rate of reading of their students (Hasbrouk, 2006). Total numbers of errors were subtracted from the total number of words read in one minute to calculate WPCM score (Shinn, 1989). The errors made by participants during the reaching process include: out of text word addition, self-corrected errors, mispronunciation, word distortion, word reading with 3-5 second pause, word substitution and word omission. Reliability of all the five selected paragraphs from Punjab Textbook Board was determined to analyze its applicability for the research. The Cronbach Alpha reliability coefficient for the Grade-2 was r=0.98, Grade-3 was r=0.97, Grade-4 was r=0.94 and Grade-5 was r=0.98.

Intervention

The participants of experimental group underwent the visual saccade skill training through visual saccadic exercises. The treatment lasted for 6 weeks with 42 sessions (45 minute per session). The reading ability of the children was ameliorated by exposing them with the seven manual and computer based visual saccadic exercises. Visual tracking exercises help to improve reading ability (Fischer, 2015). Visual Saccadic Exercises were selected from authentic resources (Heidi, 2011; Special Education Resource Center, 2013). Visual saccade exercises were administered on all the children one by one. Following saccade exercises were included in the experiment;

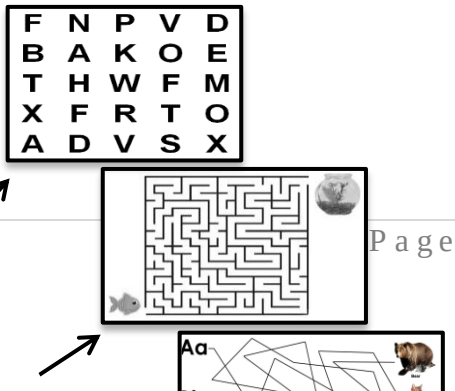

Figure 1: Representation of Visual Saccade Exercises

Data Analysis

Statistical analysis on the basis of scores of Experimental Group and Control group was made to analyze the effectiveness of training of Visual Saccadic Skills on Reading Ability of Youth with Oculomotor Dysfunction. Analysis of Variance (ANOVA) was applied to see the equality in age, in the level of reading ability, visual fixation ability, visual saccadic competence and visual pursuit ability before the intervention among the experimental group and control group. Analysis of Covariance (ANCOVA) was used to make comparison between the reading ability of both the groups.

Results

There were 20 participants (10 experimental group and 10 control group) selected for the study. No any significant difference ($p>0.05$) was noted in their age, level of reading ability and Visual Saccadic competence before the training.

The Levene's test F (1, 18)=0.410, p>0.05 verified the equality of variance among samples. The Shapiro-Wilk's test (10)=0.941, p>0.05 for Group A, (10)=0.923, p>0.05 for Group B showed that reading fluency data of both the groups was normally distributed. The ANCOVA values, F (1, 16)=0.004, p>0.05 verified the Homogeneity of Regression Slope and indicated that there was no interaction between the treatment and covariate. The visual inspection of Scatterplot showed that the scores of covariate and dependent variable were linearly related with each other. The above values showed that ANCOVA could be applied for the analysis of reading ability of Youth with Oculomotor Dysfunction. Partial eta-squared was explained using the values: 1) *Partial Eta Squared Value* 0.01=Small Size, *Partial Eta Squared Value* 0.06=Medium Size, and *Partial Eta Squared Value* 0.14=Large Size (Hanna & Dempster, 2012).

Table 1

Comparison of reading ability between the groups

Class	Group A					Group B					ANCOVA		
	n	Pre-test		Post-test		*N*	Pre-test		Post-test		*F*	*p*	η^2
		M	*SE*	*M*	*SE*		*M*	*SE*	*M*	*SE*	*Value*	*Value*	
2	2	43.5	10.5	53.3	3.20	2	42.5	7.50	46.2	3.20	2.496	.359	.714
3	2	61.5	20.5	70.2	1.02	3	65.3	11.1	65.2	.835	13.95	.065	.875
4	3	63.7	4.33	66.0	4.43	3	43.0	4.04	52.0	4.43	3.079	.178	.507
5	3	55.3	6.06	67.7	1.16	2	74.5	.500	65.0	1.57	1.487	.347	.426
All	10	56.7	4.64	64.0	1.16	10	55.9	5.54	58.3	1.16	11.65	.003	.407

A=Experimental Group, B=Control Group, WCPM = Word Count Per Minute Method

The influence of visual saccade exercises on the reading ability of youth with oculomotor dysfunction was recorded after the intervention. The pretest values of the reading of the participants were taken as a covariate, whereas posttest reading score of treatment group was compared with the control group using one way ANCOVA.

Pre-treatment adjustment was made before the comparison of posttest scores while applying the ANCOVA. Both the groups indicated no significant differences for the participants of class 2, F (1,1)=2.496, p=0.359. The partial η2 value was 0.714. Likewise, participants of class 3 F(1,2)=13.95, p=0.065, partial η2=0.875, in addition to class 4, F (1,3)=3.079, p=0.178, partial η2=0.507, and class 5, F (1,2)=1.487, p=0.347, partial η2 =0.426 also had no any significant difference between the groups. However, combined scores of both groups, F (1, 17)=11.65, p=0.003 reflected a highly significant different between the reading ability of the groups. Partial η2 =0.407

exhibited a large effect size. The mean reading score of experimental group (*M*=64.0, *SE*= 1.16) was greater than mean reading score of control group (*M*=58.3, *SE*=1.16). It indicated that there was significant impact ($p<0.05$) of training of Visual Saccadic Competence on the reading ability of Youth with Oculomotor Dysfunction.

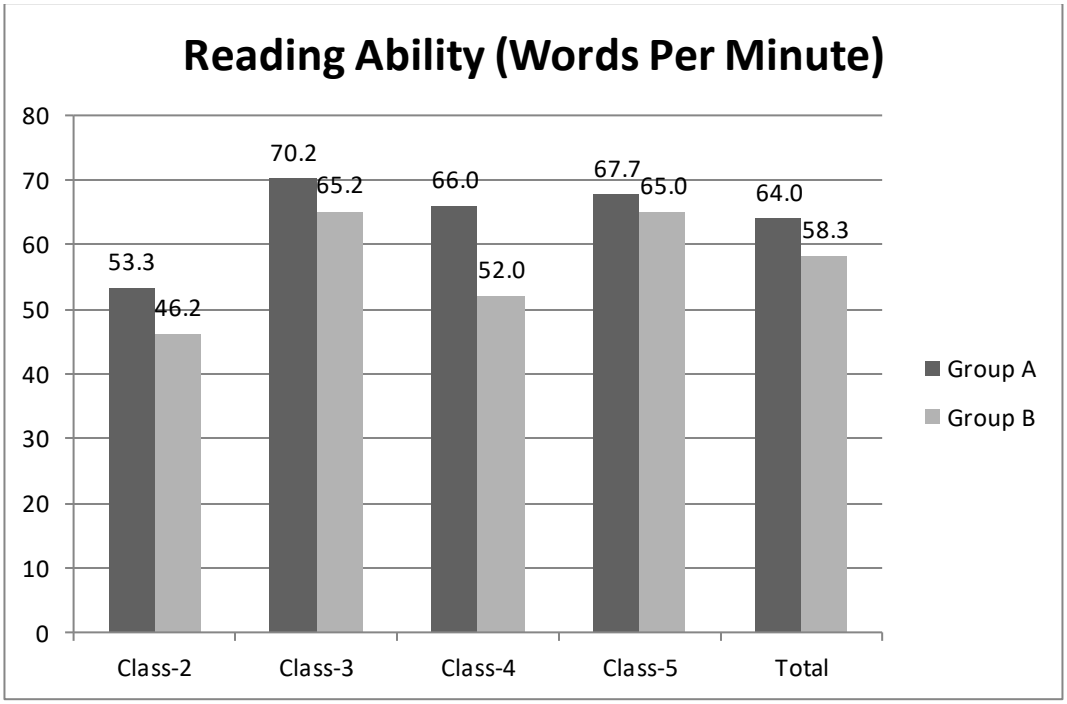

Figure 2: Representation of reading ability between the groups

Effects of training through Visual Saccadic Exercises in ameliorating the Visual Saccadic Competence among Youth with Oculomotor Dysfunction

The visual inspection of Scatterplot showed that the scores of covariate and dependent variable were linearly related with each other. The ANCOVA values, $F(1,16)=3.744$, $p>0.05$ verified the Homogeneity of Regression Slope and indicated that there was no interaction between the treatment and covariate. The equality of variance among the samples was verified by the Levene's test $F(1,18)=0.440$, $p>0.05$. The Shapiro-Wilk's test (10)=0.872, $p>0.05$ for Group A, (10)=0.930, $p>0.05$ for Group B showed that data regarding the level of Visual Saccadic Skills of both the groups was normally distributed. The above values showed that ANCOVA could be applied for the analysis of Visual Saccadic Competence of Youth with Oculomotor Dysfunction.

Table 2

Comparison of Visual Saccadic Competence between the groups

Class	Group	*n*		Ability		Accuracy		Head Movement		Body Movement		Total		ANCOVA		
				M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*	*F*	*P*	η^2
			Pre	2.0	.00	2.50	.50	1.50	.50	3.0	.00	9.0	1.0			

2	A	2	Post	3.75	.56	2.75	.43	2.50	.71	4.0	.35	13.1	1.4	2.59	.354	.721
	B	2	Pre	2.50	.50	1.50	.50	1.50	.50	3.0	.00	8.50	.50			
			Post	2.25	.56	2.75	.43	1.50	.71	3.50	.35	9.90	1.4			
3	A	2	Pre	3.0	.00	2.50	.50	2.00	1.0	3.5	.50	11.0	.00	.200	.698	.091
			Post	4.0	.20	2.96	.16	2.60	.00	3.97	.38	13.3	.84			
	B	3	Pre	3.0	.58	2.33	.67	3.0	.00	3.33	.33	11.7	.67			
			Post	3.70	.17	2.69	.13	2.60	.00	3.69	.31	12.8	.67			
4	A	3	Pre	2.33	.33	2.33	.33	3.00	.00	3.67	.33	11.3	.88	4.10	.136	.578
			Post	3.42	.38	2.58	.25	3.33	.47	4.0	.33	13.0	.60			
	B	3	Pre	3.0	.58	2.0	.00	1.67	.33	3.0	.00	9.7	.33			
			Post	3.25	.38	2.08	.25	2.0	.47	3.33	.33	11.0	.60			
5	A	3	Pre	3.0	.58	2.33	.33	2.33	.88	3.67	.33	11.3	.33	4.63	.164	.698
			Post	3.37	.43	3.20	.30	2.91	.31	4.34	.44	13.7	.65			
	B	2	Pre	3.50	.50	2.0	.00	2.0	.00	3.50	.50	11.0	1.0			
			Post	3.44	.53	2.70	.37	1.63	.38	3.5	.54	11.4	.80			
All	A	10	Pre	2.60	.22	2.40	.16	2.30	.33	3.50	.17	10.8	.42	9.66	.006	.362
			Post	3.58	.18	2.91	.18	2.73	.17	4.08	.14	13.2	.40			
	B	10	Pre	3.0	.26	2.0	.21	2.10	.23	3.20	.13	10.3	.47			
			Post	3.22	.18	2.49	.14	2.17	.17	3.52	.14	11.5	.40			

A=Experimental Group, B=Control Group, M=Mean, SE=Standard Error

The influence of training through visual saccade exercises on the eye saccade movement of youth with oculomotor dysfunction was recorded after the intervention. The pretest values of the reading of the participants were taken as a covariate, whereas posttest reading score of treatment group was compared with the control group using one way ANCOVA.

Pre-treatment adjustment was made before the comparison of posttest scores during the application of ANCOVA test. There were no significant differences in the visual saccade ability of class 2 participants, $F(1,1)=2.59$, $p=0.354$, partial $\eta 2=0.721$, and class 3, $F(1,2)=0.200$, $p=0.698$, partial $\eta 2=0.091$, in addition to class 4, $F(1,3)=4.10$, $p=0.136$, partial $\eta 2=0.578$, and class 5, $F(1,2)=4.63$, $p=0.164$, partial $\eta 2=0.698$. The comparison of combined scores of both groups for visual saccade competence revealed that there was significant difference between visual saccade ability of both the groups, $F(1,17)=9.657$, $p=0.006$. Partial $\eta 2=0.362$ depicted a large effect size. The overall mean score of control group ($M=11.5$, $SE=0.40$) was less than mean scores of experimental group ($M=13.2$, $SE=0.40$). It was concluded that Visual Saccadic Competence of experimental group was significantly ameliorated ($p<0.05$) than control group after the intervention in terms of training of Visual Saccadic competence through visual saccadic exercises.

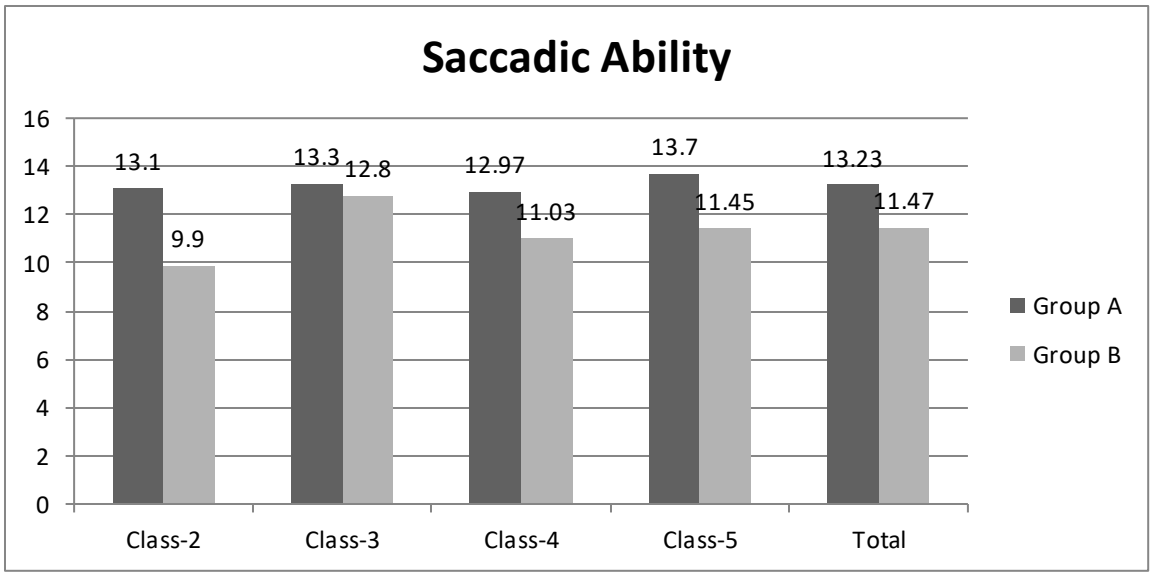

Figure 3: Representation of Visual Saccadic Competence between the groups

Discussion

The study measured the impact of training of visual saccadic competence on reading ability of Youth with Oculomotor Dysfunction in mainstreamed regular schools. The research also determined the effect of intervention (training through visual saccadic exercises) in ameliorating visual saccade competence of the participants.

Impact of Training on Reading Ability

The reading ability of treatment group was significantly better (64 Words Per Minute) after the treatment in terms of training through Visual Saccadic Exercises, than control group
(58 Words Per Minute). The reading ability score of control group (M=58.3, SE=1.16) was less than experimental group (M=64.0, SE=1.16). The data values $F(1,17)=11.65$, $p=0.003$. Partial eta squared=0.407 showed that Effect size was large. It indicated that there was significant effect ($p<0.05$) of Visual Saccadic Competence training on the reading ability of Youth with Oculomotor Dysfunction. A recent study of Wethe et al. (2015) observed the effects of oculomotor training on the reading fluency outcomes on the students at elementary level. After the training reading fluency scores were improved and it was statistically significant ($p=0.008$, Wilcoxon signed-rank). This research supported the idea that visual tracking skills training assists to improve the reading of students. This investigation showed greater improvement in the level of reading fluency with 25.1 words per minute which was result of training of eye movements, saccades and shifting visuospatial attention. Likewise Hellerstein (2014) analyzed the effect of training of visual saccadic skills on reading speed by using King-Devick Remediation Software in which she found significant improvement in the reading fluency of
the children as well. Leonge et al. (2014) also showed similar results and found significant
effect of visual saccadic training on the reading rate of treatment group ($p<0.005$) after the intervention.

Impact of training on Visual Saccade Competence

The post-intervention comparison revealed significant difference in the level of Visual Saccadic Competence between the experimental and control group, F (1,17)=9.657, p=0.006. Partial eta squared=0.362 depicted a large effect size. There was significant improvement (p<0.05) in the level of Visual Saccadic Competence of group A (M=13.2, SE=0.40) than group B (M=11.5, SE=0.40) on the basis of treatment through training of Visual Saccadic Exercises. A study conducted by Fischer and Hartnegg (2000) to evaluate the effects of visual training on saccade control in 85 dyslexic children having deficits in oculomotor control, revealed positive correlation between the visual training and saccade control of dyslexian. It was found that training not only improved the Visual Saccadic Skills but also perceptual ability in 3-8 weeks duration. A study conducted in Japan by Okumura, Laukkanen and Tamai (2008) also found significant effect of Computerized Eye Movement Training on the reading rate and Saccadic control of adult Japanese.

Conclusions

The study showed significant improvement in the level of reading ability in addition to Visual Saccadic competence of Youth with Oculomotor Dysfunction in the experimental group when provided the training through Visual Saccadic Exercises. The visual saccades ability plays very effective role in the learning process especially in reading activities, therefore current study may help to practice the visual saccade exercises to resolve the oculomtor problems of the children and subsequently ameliorate their reading capacity at home and the school as well.

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