The effect of combining vision training with reflex movement patterns and related postures on the development of primary visual skills in children with dyslexia

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Visual and motor reflex patterns in babies serve as the neurophysiological basis for future academic skills in schoolchildren. Visual skills such as eye tracking, head-righting, focusing, focus recovery, convergence/divergence, figure-ground discrimination and staring build on the integration of overall neuro-sensory-motor development with balance, stability, grounding and the vestibular system. Timely maturation and integration of these systems enable children to avoid both delays in sensory and motor skills and lags in academic achievement.

Observers have consistently found a correlation between primary visual skills and reflex patterns among children participating in Masgutova Neuro-sensory-motor Reflex Integration (MNRI™) Programs. Initial research by Masgutova Method practitioners resulted in quantification of these correlations in a group of 370 seven to ten year old children diagnosed with dyslexia. A further project measured the response among 240 of those children with the poorest visual skills to Masgutova Neuro-sensory-motor Integration™ exercises. The purpose was to determine whether combining vision training with reflex patterns and related developmental postures, as practiced in the MNRI™ Program, would influence the development of visual skills in these children. This report describes and comments on findings from those two investigations.

Correlation between primary visual skills and developmental postures among children with dyslexia

The following reactions and reflex patterns associated with primary visual skills were assessed:

1) Eye tracking (smooth pursuit movements used to track a slow moving object):
   a) On horizontal plane
   b) On vertical plane
   c) In a circle
   d) Coordination of eye tracking with breathing
2) Oculovestibular reflex pattern (head righting, eyes open)
3) Optokinetic reflex pattern (head righting, eyes closed)
4) Convergence-divergence
5) Focusing
6) Visual figure-ground discrimination
7) Staring (freezing)

Each reaction or reflex pattern was evaluated according to the following primary parameters:

1) Pattern (correspondence to appropriate motor response for the specific sensory or sensory-proprioceptive stimuli).
2) Direction of the motion or sequence of the reactions/postures.
3) Stability of the reaction/response.

4) Timing (In tracking, the ability to maintain a slow moving object in the center of the field of view with the eyes neither lagging behind nor moving ahead. In oculovestibular and optokinetic reflexes, speed of head righting adjustment.
5) Symmetry of the reaction/response in both eyes.

The following additional parameters of the reaction or the reflex pattern were also evaluated:
1) Efficiency of eye movements in terms of completion, range of visual field, and ability to maintain binocularity in the mid-field.
2) Stability (smoothness of eye movements, no saccadic motions).
3) Muscle tone (easy tracking, no tension, appropriate blinking reflex, no staring reflex, easy breathing).

The initial research group consisted of 370 children (7-10 years old) diagnosed with dyslexia. Researchers measured their performance of the visual skills described above and correlated them with developmental postures in the following way. The children performed visual tasks in each of three postures: **Posture 1**, seated in a chair; **Posture 2**, lying down prone supported by their elbows; and **Posture 3**, sitting on their heels with head up, arms extended and hands flat on the floor slightly in front of the knees. **Posture 2** represents a very early developmental stage in which an infant first becomes able to overcome gravity by raising his head and maintaining it in a vertical position. **Posture 3** is one of the basic Symmetrical Tonic Neck Reflex (STNR) patterns.

The testing results showed that the level of development of their primary visual skills correlated with the three body positions. All the children demonstrated variations in visual skills depending on their body position, with poorer results in the two developmental postures. Eye tracking on the horizontal plane, for example, was less controlled and more difficult in **Postures 2** and **3**, which represent earlier developmental stages. This sensitivity of visual skill to body position became the basis for further research.

Table 1. Level of primary visual skill development demonstrated by 370 children with dyslexia in three different postures.

Table 1. LEVEL OF PRIMARY VISUAL SKILLS DEVELOPMENT
IN DIFFERENT POSTURES OF DYSLEXIA CHILDREN (370 individuals)

LEVEL	POSTURE-1				POSTURE-2				POSTURE-3 (STNR)			
	No	%	No	%	No	%	No	%	No	%	No	%
Good	39	10.54	118	31.89	17	4.59	77	20.81	23	6.22	91	24.59
Average	79	21.35			60	16.22			68	18.38		
Poor	156	42.16	252	68.10	169	45.68	293	79.19	164	44.32	279	75.40
Very poor	96	25.95			124	33.51			115	31.08		

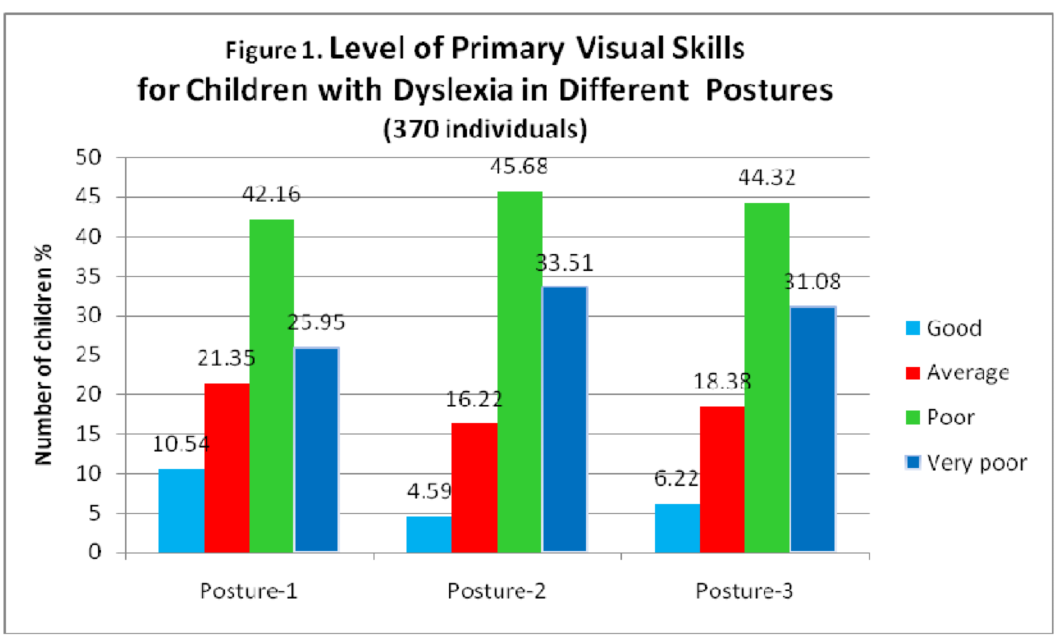
The group of 370 children with dyslexia demonstrated the following (see **Table 1** above):

- Overall inadequate primary visual skill development: 68.10% showed poor or very poor results in **Posture 1** (sitting); 79.19% in **Posture 2** (prone on elbows); and 75.40 % in **Posture 3** (STNR pattern).
- The children tended to achieve worse results when they performed visual tasks in postures associated with reflex patterns from earlier stages of development. Whereas 68.10% demonstrated poor or very poor skill levels in **Posture 1** (sitting), that percentage grew to 79.19% in **Posture 2** (prone on elbows) and 75.40% in **Posture 3** (STNR pattern).

Based on long-term clinical observations, MNRI™ practitioners interpreted these results as follows:

1) Visual skills in children with dyslexia are unstable and poorly developed. Deficiencies in different visual reflex patterns cause major difficulties in their reading and writing (reading speed, silent reading, reading comprehension, spelling, hand writing, composition) and the deficiencies become worse depending on the position of their bodies. The children demonstrated better results in **Posture 1** (sitting). This can be due to the growth of ability to control visual skills with increasing age due to training of the visual system in their daily lives (conscious control, learned skills).
2) The increase of poor and very poor results in **Postures 2** (prone) and **3** (STNR) can indicate the lack of sufficient development of visual skills at earlier stages of neuro-sensory-motor development. Children with dyslexia seem to use their visual skills better when they can control them (often with considerable effort), but cannot use these skills automatically and spontaneously. Using more controlled than spontaneous eye activity indicates poor neurological maturation of visual function. This behavior, requiring more effort, can cause overloading of the visual system, visual inhibition, poor coordination of visual activity, and fatigue. The visual skills of such children are too unstable, too poorly developed, and require too much conscious control to adequately support their learning process. **Fig. 1** below presents the data from **Table 1** in chart form.

Figure 1. Level of Primary Visual Skills for Children with Dyslexia in Different Postures: 1) sitting, 2) prone supported on elbows, and 3) STNR.



Results shown in Table became the baseline (initial results) for the next stage of research.

Response of control and research groups to special vision training exercises

This stage of research involved 240 children: 150 with poor and 90 with very poor results on the primary visual skills assessment shown in Table 1. They were divided into the following four groups of 60 children each:

1) **Control group**: received no intervention.
2) **Research group A**: performed vision exercises in **Posture 1** (sitting) with no use of the postural reflex patterns.
3) **Research group B**: performed vision exercises in **Posture 2** (prone supported on elbows) as practiced in our MNRI™ Program.
4) **Research group C**: performed vision in **Posture 3** (STNR) as practiced in the MNRI™ Program.

Posture 2:

Posture 2 (prone supported on elbows) represents a stage of motor development that infants must achieve. The main task of this pattern is development of antigravity mechanisms that enable the baby to raise his head and keep its vertical alignment. This position in turn develops the important skills of head righting, eye leveling, binocular vision, eye tracking, convergence, focusing, near-far accommodation, and visual evaluation of the horizontal and vertical planes. Eye tracking is one of the main automatic responses that trigger the RAS system in the brain stem to organize the protection strategy for visual information processing. All of these crucial skills should be developed by the end of the second month. Later on they will affect the development of the baby's and early child's ability to use visual skills when they sit on their heels in the Symmetrical Tonic Neck Reflex (STNR) position in extension.

Posture 3:

Posture 3 (STNR) is the sitting-on-the-heels posture in which head extension causes arm extension and the tendency for leg flexion. The gravity center shifts toward the lower core and lower limbs as the child quiets motor activity to engage vision and audition. It is active from the age of six months. At about the seventh to ninth month, the baby begins to crawl on his/her stomach using an asymmetrical style of motion. The STNR then integrates into the whole body movement system at about the tenth month. The task of this STNR position in extension is to bring the above visual skills together with posture to enable visual function to become automatic. This integration of vision and posture is necessary for creation of the code for future automatic postural control in response to information coming from the vestibular, oculovestibular, and optokinetic systems.

During this stage of the research **Groups A, B and C** were given vision training. **Group A** performed vision exercises in a normal sitting position. **Groups B and C** performed the same exercises in the developmental postures described above, **Posture 2** (**Group B**) and **Posture 3** (**Group C**). The control group experienced no further intervention. All four groups were given post-assessments after one and four months. All of the children had initially demonstrated poor or very poor results in the assessment of their visual skills.

Control group. This group was given neither visual nor postural exercises. In pre-tests 61.67% of these children performed at a poor level and 38.33% at a very poor level. In post-tests after one month they did not demonstrate significant changes (60.0% poor and 36.67% very poor, with an average change of 3.33%). Results in four months again did not show significant change (53.33% poor and 40.0% very poor, with an average change of 6.67%). See **Table 2** below.

Table 2. CONTROL GROUP
(60 individuals, 7-10 years old)

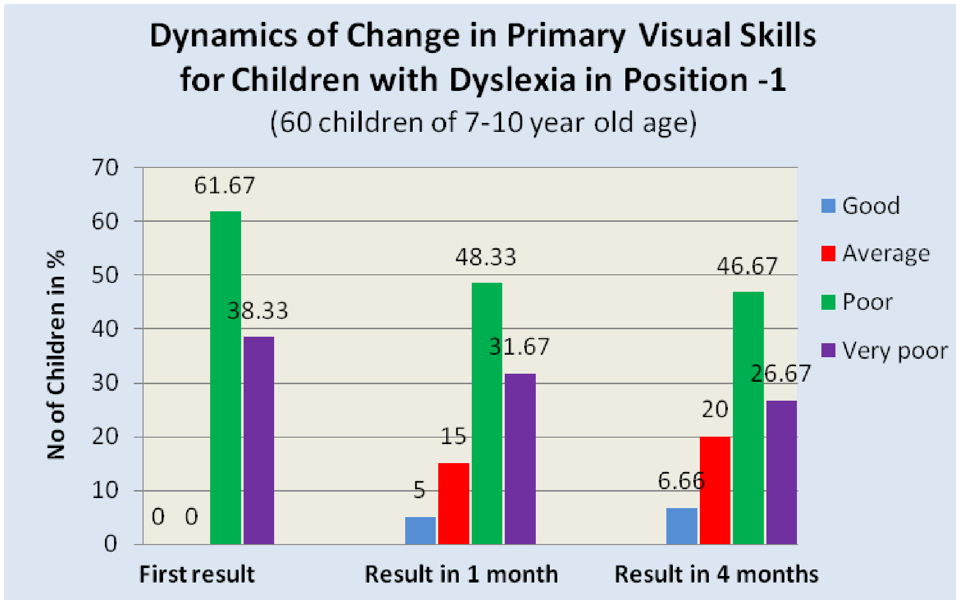
Level of visual skills	Initial results				Results in one month				Results in four months			
	No	%	No	%	No	%	No	%	No	%	No	%
Good	0	0	0	0	0	0	2	3.33	0	0	4	6.67
Average	0	0			2	3.33			4	6.67		
Poor	37	61.67	60	100	36	60	58	96.67	32	53.33	56	93.33
Very poor	23	38.33			22	36.67			24	40.0		

Research group A (Posture 1: Sitting). Children in this group were given visual exercises to do while in a normal sitting position. They were not given any postural exercises. Their performance in post-tests given one month later showed that 20% of them moved to good or average levels and 80% still demonstrated poor or very poor levels; in four months the number of children achieving good or average levels grew to 26.67 % and the number remaining at poor or very poor levels was 73.33 %. These results did not show any significant change in visual skills after four months in comparison with results after one month (See **Table 3** below).

Table 3. RESEARCH GROUP A: POSTURE 1 – Sitting down
(60 individuals, 7-10 year old age)

Level of visual skills	Initial results				Results in one month				Results in four months			
	No	%	No	%	No	%	No	%	No	%	No	%
Good	0	0	0	0	3	5	12	20	4	6.66	16	26.67
Average	0	0			9	15.0			12	20.0		
Poor	37	61.67	60	100	29	48.33	48	80.0	28	46.67	44	73.33
Very poor	23	38.33			19	31.67			16	22.67		

Figure 2 (below). Dynamic of the change in primary visual skills of 60 children with dyslexia in **Posture 1** (sitting): initial results, results in one month after doing visual exercises, and results in 4 months with homework/visual exercises given two times a week.

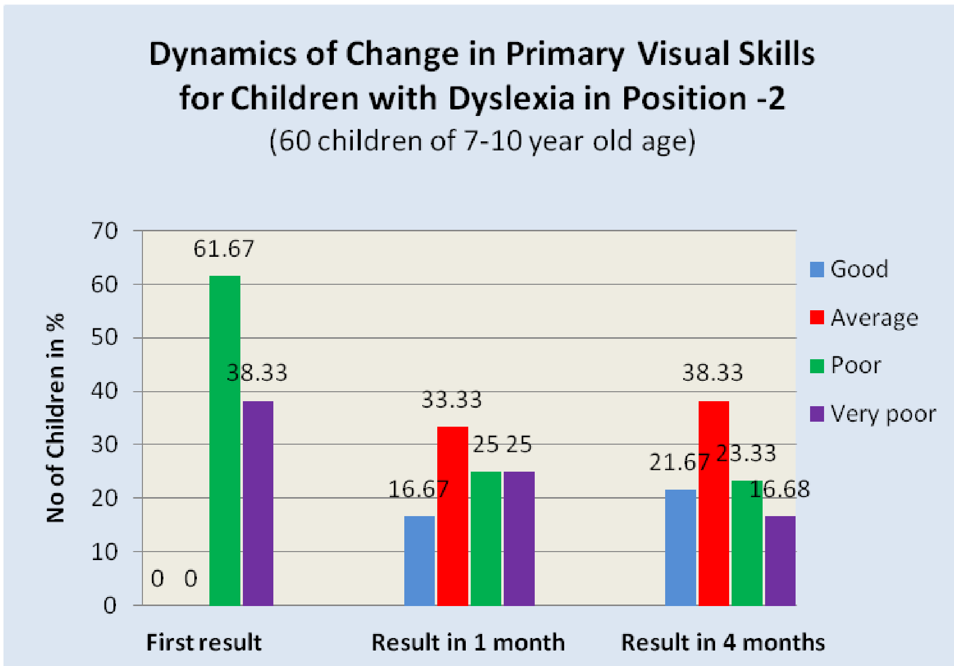


Research group B (Posture 2 - Prone supported on elbows). Children in this group were given the vision exercises in the developmental posture, prone supported on elbows. The number of children demonstrating good and average results increased from 0% in the pre-test to 50.0 % in one month and to 60.0% in four months (See **Table 4** below.) The number of children with poor and very poor results decreased from 100% in the pre-test to 50.0 % in one month and to 40.0% in four months. These results show significant change after one month of visual training in **Posture 2** (prone). The data demonstrate that the developmental position prone on elbows can serve as a resource and support for optimal functioning of visual skills. MNRI™ combines vision training with the developmental position as a way to activate genetic motor memory and remind the body-brain system of its ability to integrate vision and body posture during infancy. Results of the post-test in four months showed that optimized visual skills remained stable and in fact tended to improve further. The results also suggest that body position can be used as a key for future development of visual skills. The combination of visual work and developmental posture can be a valuable corrective tool for children with visual challenges and learning difficulties.

Level of visual skills	**Table 4. RESEARCH GROUP B: Posture 2 - Prone supporting on elbows** (60 individuals, 7-10 years old)											
	First results				**Results in one month**				**Results in four months**			
	No	%	No	%	No	%	No	%	No	%	No	%
Good	0	0	0	0	10	16.67	30.0	50.0	13	21.67	36.0	60.0

Average	0	0			20	33.33			23	38.33		
Poor	37	61.67	60	100	15	25.0	30.0	50.0	14	23.33	24.0	40.0
Very poor	23	38.33			15	25.0			10	16.67		

Figure 3. (Below) Dynamic of the development of primary visual skills of 60 children with dyslexia in **Posture 2** (prone): initial results, results in one month after doing visual exercises, and results after 4 months with homework/visual exercises given two times a week.



group C (Posture 3 – STNR). Children in this group were given the vision exercises in **Posture 3** (STNR). The number of children demonstrating good and average results increased from 0% in the pre-test to 60.0 % in one month and to 68.33% in four months. The number of children with poor and very poor results decreased from 100% in the pre-test to 40% in one month and to 31.67% in four months. These results show significant change after one and four months of visual training in the STNR position. The data demonstrate that the STNR developmental position can also serve as a resource and support for optimal functioning of visual skills. MNRI™ combines vision training with the STNR position as another way to activate genetic motor memory and remind the body-brain system of its ability to integrate vision and body posture during infancy. Results of the post-test in four months showed that here too optimized visual skills remained stable and in fact tended to improve. These results again suggest that body position can be used as a key for future development of visual skills. The combination of visual work and developmental posture can be a valuable corrective tool for children with visual challenges and learning difficulties.

Table 5. RESEARCH GROUP C: Posture -3 – STNR (60 individuals, 7-10 year old age)

Level of visual skills	First results				Results in one month				Results in four months			
	No	%	No	%	No	%	No	%	No	%	No	%
Good	0	0	0	0	12	20.0	36	60.0	15	25.0	41	68.33
Average	0	0			24	40.0			26	43.33		
Poor	37	61.67	60	100	13	21.67	24	40.0	11	18.33	19	31.67
Very poor	23	38.33			11	18.33			8	13.33		

Figure 4. (Below) Dynamic of the development of primary visual skills of 60 children with dyslexia in **Posture 3**, STNR: initial results, results in one month after doing visual exercises, and results after 4 months with homework/visual exercises given two times a week.

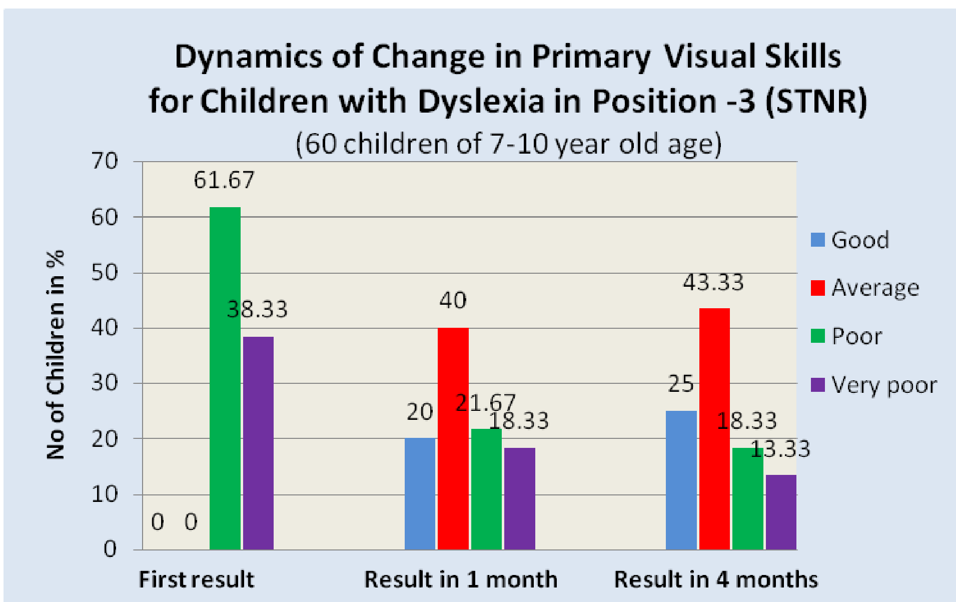
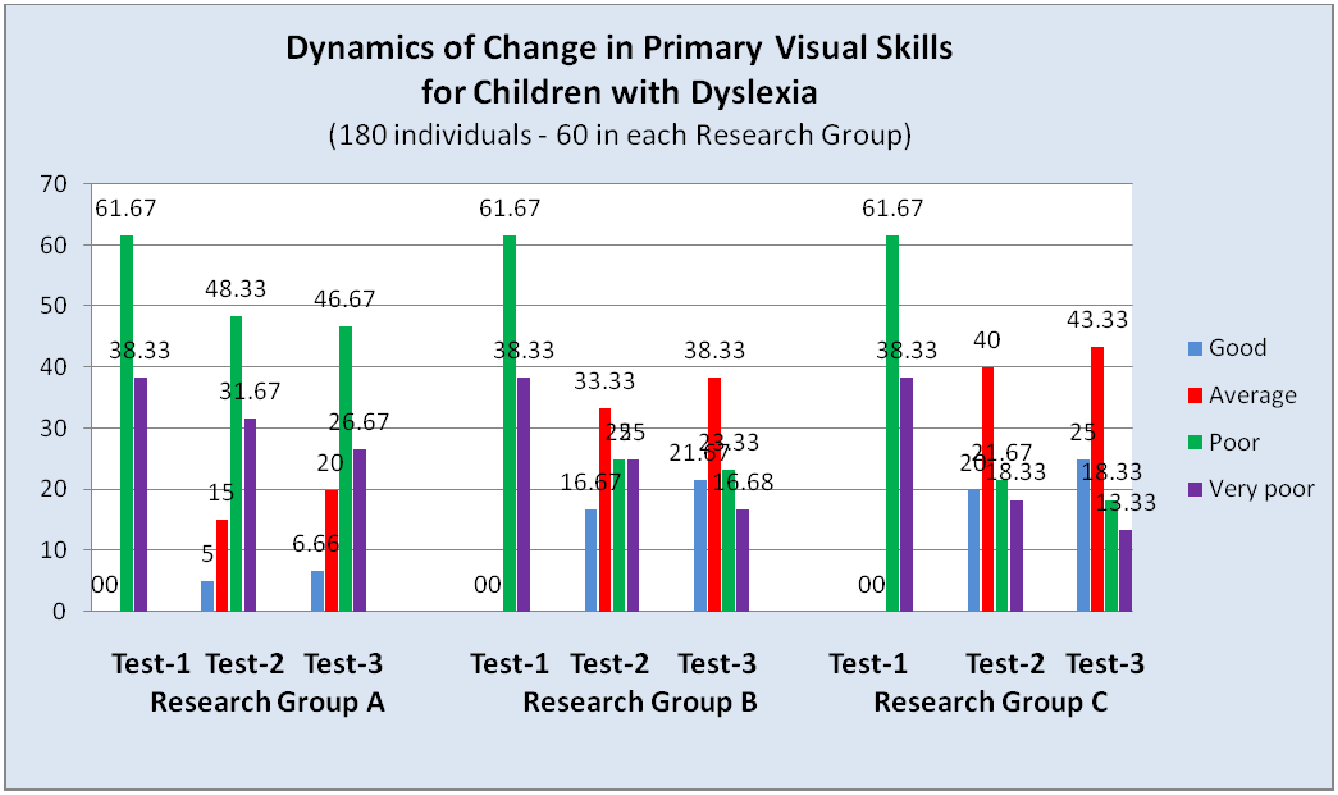


Figure 5. Summary of Research Group Findings. Dynamic of the development of primary visual skills of 180 children with dyslexia in Research Groups: A (sitting); B (prone); and C (STNR); as demonstrated in: Test 1, initial results; Test 2, one month after doing visual exercises; and Test 3, after four months with homework/visual exercises given two times a week.



Conclusion:

Comparative analyses of the change in primary visual skills in 180 children with dyslexia showed significant improvement when they performed visual exercises in **Postures 2** (prone) and **3** (STNR). Children training in **Posture 1** (sitting) showed lower results than those in the other two groups after both one and four months. Children with dyslexia may need a much longer time for visual training in the usual sitting position. Post-testing showed improvement in 120 children with dyslexia in less time, with less effort and stable results thanks to the use of the developmental resources of postural reflex patterns inherent in **Postures 2** (prone) and **3** (STNR). The researchers understand this improvement as resulting from activation of the "tasks" of the reflex patterns. Developmentally these positions provide for the formation of the visual skill of estimation of horizontal and vertical planes and lines in the surroundings, and for awakening and strengthening the mechanisms linking vision with balance, stability, grounding and the vestibular system. At the ages of two and four months, these reflexes support the formation of the visual-vestibular-proprioceptive code, which then supports the development of visual skills: binocular vision, tracking along the horizontal and vertical lines/planes, perception of two-dimensional planes and three-dimensional perspective with easy visual transition from one to the other, near-far accommodation, and figure/ground discrimination (important for future attention span). The results of this investigation suggest that combining vision training with reflex patterns and related developmental postures, as practiced in the MNRI™ Program reactivate the developmental potentials of visual, oculovestibular, and optokinetic reflex patterns that become the neurophysiological basis for academic achievement.

S. Masgutova, 2009.