



The Effect of Retained Primitive Reflexes on Academic Success in Middle School Children- A Pilot Study

Payal Mehta¹, Neeta Vyas², Ashish Kakkad³

¹MPT Neurological Science, PhD Scholar, PP Savani University, Surat, Gujarat, India; ²Emeritus Professor, P P Savani University, Surat, Gujarat, India;

³Professor, Faculty of Physiotherapy, Marwadi University, Rajkot, Gujarat, India.

ABSTRACT

Introduction: Every child has the potential to excel academically, but sometimes there are underlying factors that can hinder their progress. One such factor that often goes unnoticed is the presence of retained primitive reflexes. These reflexes, which are normally present in infancy but should disappear as a child grows, can affect a child's ability to learn and thrive in an educational setting.

Aim/Objectives: The pilot study aimed to research the relationship between the occurrence and level of intensity of primitive reflexes in middle school children and its effects on their education, and academic achievements.

Materials and Methods: A group of 40 children (18 girls and 22 boys) who attended middle school were examined. Participants were assessed for the presence of three Primitive Reflexes (PR): the Asymmetrical Tonic Neck Reflex (ATNR), Symmetrical Tonic Neck Reflex (STNR), and Tonic Labyrinthine Reflex (TLR). Romberg's test was employed to identify signs of difficulties with control of balance and/or proprioception. Then their school results were assessed including several domains like mathematics, science, and language. After summing up points obtained for all tests, a correlation coefficient was calculated from which the results were derived.

Results: There was a negative correlation between the academic results obtained from schools in several domains and the continued presence of Primitive Reflexes like STNR, ATNR, and TLR.

Conclusion: Neuromotor maturity status may be related to the ability to read written words and to calculate.

- It is necessary to conduct further research on laterality with a larger sample size.
- Additionally, introducing reflex integration therapy to children with learning difficulties may improve their reading and mathematical abilities.

Key Words: Academics, Academic Achievements, Dyscalculia, Dyslexia, Learning Difficulties, Primitive Reflexes

INTRODUCTION

Every child has the potential to excel academically, but sometimes there are underlying factors that can hinder their progress. One such factor that often goes unnoticed is the presence of retained primitive reflexes. These reflexes, which are normally present in infancy but should disappear as a child grows, can affect a child's ability to learn and thrive in an educational setting. ¹ This study correlates retained primitive reflexes and their effects on academic success in children. It explains the impact of these reflexes on motor skills, attention span, and cognitive development.

Understanding retained primitive reflexes is a crucial step in understanding the delays in learning potential of children.

Primitive reflexes are instinctive movements that infants are born with, which serve as building blocks for their motor and sensory development.^{2,3} These reflexes typically emerge during the prenatal and early postnatal stages and are eventually integrated into the central nervous system as a child grows. However, in some cases, these primitive reflexes may persist beyond the expected developmental timeline, leading to challenges in academic success.

Retained primitive reflexes can have a profound impact on a child's ability to learn and thrive in an educational setting. One such reflex is the Moro reflex, also known as the startle reflex, which is triggered by a sudden loud noise or a sensation of falling.^{4,5} If this reflex is retained, it can result in

Corresponding Author:

Payal Mehta, MPT Neurological Science, PhD Scholar, PP Savani University, Surat, Gujarat, India.

Phone: +0 07567926567; Email: mpayal1989@gmail.com

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heightened anxiety, difficulty focusing, and disrupted sleep patterns, all of which can hinder a child's ability to concentrate and absorb new information. Another commonly retained reflex is the Symmetrical Tonic Neck Reflex (STNR), which influences a child's ability to coordinate their upper and lower body movements. When this reflex is retained, it can lead to challenges in activities that require bilateral coordination, such as reading, writing, and participating in sports.

Understanding these retained primitive reflexes is essential in identifying the underlying causes of learning difficulties in children. By recognizing and addressing these reflexes through targeted interventions and therapy, parents and educators can help children overcome these challenges and unlock their full learning potential. It is important to note that identifying and addressing retained primitive reflexes should be done in collaboration with healthcare professionals, such as physiotherapists, occupational therapists or developmental specialists.^{1,3,4} These experts can provide a comprehensive evaluation and develop a tailored intervention plan to support a child's specific needs.^{17,18} By understanding the link between retained primitive reflexes and academic success, we can provide children with the support and tools they need to thrive in their educational journey. Through early identification, intervention, and a holistic approach to learning, we can unlock their true potential and pave the way for a brighter future.

MATERIALS AND METHODS

The study was approved by PP Savani University Ethical Committee. Written consent and assent from parents and children were taken prior to the study after explaining the procedure of the study. The study involved 40 participants aged 9-10 years healthy middle school children who consistently had poor academic achievement (poor results). The study tools were: primitive reflexes tests by Sally Goddard for children and School results (GSEB). Exclusion criteria: Children diagnosed with Learning Disability, children taking remedial education classes, children with physical disabilities.

Table 1: Participant's characteristics with Mean and Standard Deviation for Height, Weight and BMI

Characteristics	Value	
Age(years)	9	10
No of subjects	20	20
Boys	10	12
Girls	10	8
Height, mean+-SD(m)	1.25+-0.7	1.31+-0.6
Weight, mean+-SD(kg)	26+-4	32.9+-6
BMI, mean+-SD(kg/m ²)	14.9+-2.2	14.8+-2.5

(SD-Standard Deviation, BMI- Body Mass Index)

Each child was assessed individually by Primitive Reflex Tests(ATNR, STNR and TLR).

Measurement of primitive reflexes

The child had to assume a quadruped position with shoulders and hips flexed to 90°, elbows extended, hands flat, fingers extended and head in a neutral position to test ATNR.

The child's head was gently rotated passively to the right laterally and held for 5 seconds and again rotated back to the midline by the examiner. The procedure was repeated to the other side. This sequence was repeated four times.

The ATNR was measured for both the sides.

Left (ATNR L) and Right (ATNR R).

ATNR was assessed using a five-point rating scale by Goddard:¹²⁻¹⁴

0. No movement of the opposite arm, shoulder or hip (no reflex occurs);
1. Slight deflection of the opposite arm or movement of shoulder or hip (reflex present in 25%);
2. Clear deflection of the opposite arm with or without involving the shoulder or hip (reflex present in 50%);
3. Significant deflection of the opposite arm with or without involving the shoulder or hip (reflex present in 50%);
4. Descent of the opposite arm as a result of rotation of the head. Uncontrolled hip movement can also occur (reflex survived in 100% on the facial side).

The Symmetrical Tonic Neck Reflex Test was done with a child in a quadruped position with the head passively bent and extended. The STNR was measured for flexion (STNR FLX) and extension (STNR EXT).

The five-point rating scale for STNR was as follows (Goddard):¹²⁻¹⁴

0. No reaction;
1. Shaking of one or two arms or minimal movement of the trunk;
2. Elbow movement and/or hips or bending of the spine;
3. Deflection of the arms when lowering the head and spontaneous straightening of the hands when lifting the head;
4. Bending arms or going back to sitting on the heels.

Standing position had to be assumed to test the Tonic Labyrinthine Reflex. In a standing position, the child had to place their feet together and their hands along their trunk. They had to then tilt their head back, as if looking at the ceiling, and close their eyes. The examiner had to make sure to support the child. After 10 seconds the child was asked to bend the head slowly "as if looking at the toes" and stand in the position for 10 seconds. Then the same movement sequence was repeated four times. The TLR was measured for flexion

(TLR FLX) and extension (TLR EXT).

The five-point rating scale for TLR was as follows (Godard):

0. No reaction;
1. Minimal balance disturbances whilst changing head position;
2. Balance disturbances during the test and/or muscle tone change;
3. The child almost loses balance and/or shows disorientation after the task;
4. Loss of balance and/or significant muscle tone change whilst attempting balance stabilization. Dizziness and nausea may occur.

The higher the children scored on the primitive reflex test, the lower the integration they represented.

Table 2: The degree of Primitive Reflex Integration Scale.

Final score in the APR examination	Reflex Activity Level
1 to 2	0- no activity
2 to 8	1- low activity
9 to 14	2- medium activity
15 to 21	3- high activity
21 to 24	4- maximum activity

Statistical Analysis

The statistical analysis was carried out using SPSS version 20.0. Descriptive statistics were computed for all variables. The results were expressed as Means $\pm$ Standard Deviations. Differences between girls and boys and their body parameters were tested by Student's t-test. The statistical evaluation was performed using Pearson's correlation. All parameters were considered statistically significantly different if $p < 0.05$.

RESULTS

The correlation coefficient between the activity level of the reflex test findings and the academic performance at school was examined. The results of the PR test and the school record are negatively correlated. Accordingly, children with retained primitive reflexes (lower neuromaturation) were more common among those who scored lower on scholastic tests. Examining the relationship between the school outcome and each reflex and determining which has the greatest influence, we find that the STNR reflex significantly ($p < 0.01$) negatively correlates with academic test performance. This implies that a child's performance on the academic test will decrease with increasing STNR reflex activity. Tests for the

ATNR, Palmar grasp reflex and Romberg's sign also showed a statistically significant negative correlation with performance on the academic test ($p < 0.05$). The Spinal Galant reflex and TLR showed a low negative correlation with performance on the academic tests.

DISCUSSION

Retained primitive reflexes can have a significant impact on a child's motor skills, which in turn can affect their academic success. These reflexes are automatic movements that are present in infants, but should ideally be integrated as the child grows older.³ However, in some cases, these reflexes may persist beyond the typical developmental timeline. One example of a retained primitive reflex is the Moro reflex, also known as the startle reflex. This reflex involves the sudden extension of the arms and legs in response to a loud noise or a sudden movement. If this reflex is still active in a school-aged child, it can interfere with their ability to sit still and concentrate in the classroom.⁷ They may exhibit fidgeting, restlessness, and difficulty maintaining proper posture, making it challenging to engage in writing, drawing, or other fine motor activities. Another common reflex is the tonic neck reflex, which involves the turning of the head to one side while extending the arm and leg on that same side. If this reflex persists, it can impact a child's ability to coordinate movements on both sides of the body. They may struggle with activities such as tying shoelaces, catching a ball, or using scissors effectively. The retention of these primitive reflexes can lead to delays in the development of gross and fine motor skills, negatively affecting a child's overall physical coordination⁸. This can make it difficult for them to participate fully in physical education classes, sports, and other activities that require precise movement control. It is important to note that every child is unique, and the impact of retained primitive reflexes on motor skills may vary. However, addressing these reflexes through targeted exercises and interventions can help children overcome these challenges and improve their motor skills.^{9,10} Physiotherapists and other professionals specializing in child development can provide guidance and support in this process.^{20,21,22} By recognizing and addressing the impact of retained primitive reflexes on motor skills, parents, educators, and healthcare professionals can unlock a child's full learning potential.

Another reflex that can affect attention span is the Symmetrical Tonic Neck Reflex (STNR). This reflex plays a crucial role in the development of crawling and the coordination of eye movements. When it persists, it can interfere with a child's ability to sit still and maintain focus, as their body may constantly be seeking movement. The presence of these retained primitive reflexes can create challenges for children in the classroom, making it harder for them to concentrate on lessons, complete tasks, and absorb information. They

may appear restless, fidgety, or easily distracted, which can impact their academic performance and overall learning potential.

Primitive reflexes are automatic movements that infants exhibit in response to certain stimuli. Most of these reflexes disappear as a child matures, allowing for the development of more complex motor skills. However, in some cases, these reflexes may persist beyond their expected timeframe, becoming “retained.” Research suggests that retained primitive reflexes can have a significant impact on cognitive development. These reflexes are believed to interfere with the development of higher-order cognitive functions, such as attention, concentration, memory, and problem-solving skills. When these reflexes are retained, they can disrupt the smooth integration of sensory information and hinder the child’s ability to process and organize information effectively. For example, the Moro reflex, which is typically present in newborns, involves extending the arms and legs and then bringing them back to the body when startled. If this reflex is retained, it may manifest as an exaggerated startle response or an overactive fight-or-flight response, leading to increased anxiety and difficulty focusing in the classroom. Similarly, the asymmetrical tonic neck reflex (ATNR) involves the extension of one arm and leg while the opposite arm and leg flex. If this reflex persists, it can interfere with fine motor skills and coordination, making tasks such as handwriting or tying shoelaces challenging for the child. Understanding the impact of retained primitive reflexes on cognitive development can provide valuable insights for educators and parents. By recognizing the signs of retained reflexes early on, interventions and targeted therapies can be implemented to help children overcome these challenges and unlock their learning potential. Through specific exercises and activities designed to integrate the reflexes, children can improve their cognitive abilities, enhance their academic performance, and develop the necessary skills to succeed in school and beyond.

CONCLUSION

Neuromotor maturity status may be related to the ability to read written words and to calculate.

- It is necessary to conduct further research on laterality with a larger sample size.
- Additionally, introducing reflex integration therapy to children with learning difficulties may improve their reading and mathematical abilities.

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Conflict of interest

None

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