

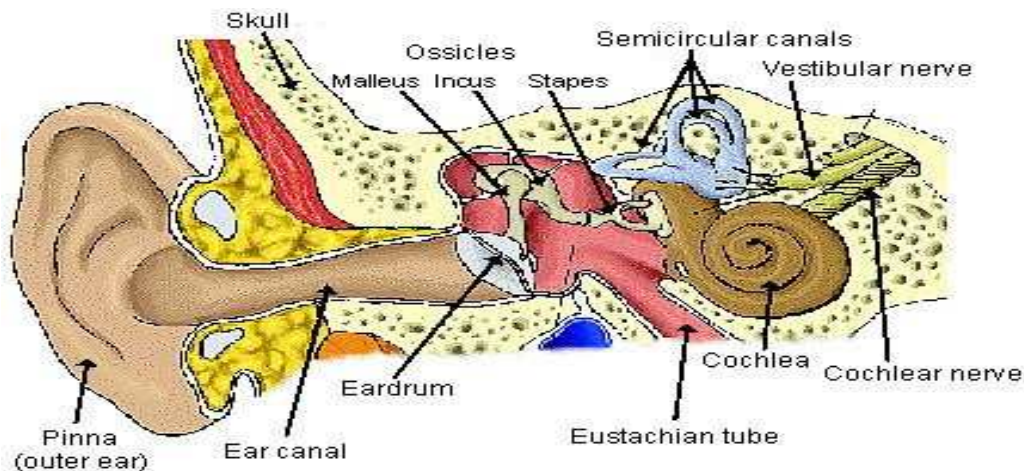
A Neurological Look at Writing in the Classroom

Writing Difficulties

There can be lots of reasons why a child may have difficulty writing in the classroom. From a physical perspective, it can be in some cases due to an immature **Vestibular System** and retention of early infant **Primitive Reflexes**. These systems control the neurological pathways and are specifically involved in the coordination of the head, arm, hand and eye movements.

The Vestibular System (Balance)

- The vestibular system is located in the Inner ear.



- It allows us to stand upright, maintain balance and move through space.
- It also coordinates information from the vestibular organs in the inner ear, the eyes, muscles and joints, gravity receptors, muscle tone, limb position, and immune responses.



The Vestibular System (Balance)

- It functions automatically at the brainstem and is stimulated through dynamic movement.
- It is the *bony* labyrinth located in the Inner ear.
- The vestibular transmits signals to the neural structures that control the movement of our eyes and also to the muscles in the body that help keep us upright. It helps us to know the difference between *Up & Down, Right from Left, and the shapes of letters – i.e. “p” & “b” and “d” and “q”*.
- It sends information to the **Central Nervous System** for processing in order to produce muscle tone to help us move our bodies in an even and well-organized way.

Why is Balance important for Writing?

A well integrated Balance system is important for not only writing but also reading. It provides a stable platform not only for eye movements but it assists with good posture. Beyond the early years of learning to form letters, after the age of eight most of learning requires the ability to sit on the chair, hold the pencil correctly, listen and remember what the teacher has said and then put pencil/pen to paper.

What are Primitive Reflexes & what is their impact on Writing?

Primitive Reflexes are reflex actions originating in the central nervous system. They are exhibited by normal infants but not neurologically intact adults.

These primitive reflexes within the first year are gradually taken over by actions known as postural reflexes or postural control. Developmental milestones such as crawling, sitting, standing, walking etc. play a big role in the brain's interconnections. For example Motor development is reliant on Neuro development. As the baby adapts to its new environment these reflexes become integrated into the advanced brain. Primitive reflexes should be inhibited by six to twelve months and if one or more are retained they can result in behavioral problems, learning difficulties and poor posture.

Retained primitive reflexes are inhibited through movement and sensory integration enabling the child to build a stable foundation in which to learn.



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Effects of an immature Balance system

Under sensitive:

- ❖ Children that have a dysfunctional vestibular can either be under sensitive (high threshold) or oversensitive (low threshold) with their response.
- ❖ A child who is under sensitive seeks out sensation to stimulate the vestibular.
- ❖ They are usually daredevil's, can't sit still, fidget, bump and crash into things around them.
- ❖ The vestibular as a result is firing too little and the child will seek out different kinds of movement in their daily routine to stimulate their vestibular.
- ❖ They will most likely seek out intense and fast movement activities such as **being whirled, merry-go-rounds, playground equipment** and enjoy being **upside down**. The child will seek out **rocking** movement in a desk/chair/on the floor and may **twirl/spin** self frequently and not get dizzy.
- ❖ A child who has an **under sensitive** vestibular will also present as having low muscle tone, poor postural control, have poor body awareness and be uncoordinated at sporting activities. They will usually have poor balance, frequently fall, bump into things, trip over their feet and have a poor ability to control the movement of the eyes. This poor ability to control the movement of the eyes interferes with the child's learning and movement.

Over sensitive:

- ❖ They also don't like it if their head is upside down e.g. somersaults and feel extremely dizzy or nauseous from swinging or spinning.
- ❖ The **oversensitive** child may also get motion sickness and be very tense and rigid in their body so as to avoid moving the position of their head.
- ❖ They may also display low muscle tone, poor postural control and prefer to do activities sitting still such as reading a book.
- ❖ Children that have an **oversensitive** vestibular will usually avoid seeking out stimulation as their vestibular is firing "**too little**".
- ❖ They dislike seeing or doing spinning activities and can feel very anxious or frightened if their feet leave the ground.
- ❖ An **oversensitive** child tends to move slowly, avoids playgrounds and is very cautious.



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Effects of an immature Balance system

Static Balance:

- ❖ Static balance is the ability to remain in one position.
- ❖ Children with poor static balance may find it difficult to sit still, may be restless and fidgety when sitting to write or read. i.e. attending and learning in the classroom requires the ability to:
 - ❖ Sit still
 - ❖ Listen to the teacher
 - ❖ Hold the pencil
 - ❖ Process what the teacher has said
 - ❖ Block out background noise in the classroom
 - ❖ WHAT DID THE TEACHER SAY?



Dynamic Balance:

- ❖ Dynamic balance is the body's ability to perform efficient and controlled movements.
- ❖ Children who tend to withdraw from Physical activities that require you to move your body in space and rapidly change direction may have a poorly developed control of dynamic balance. They may prefer to sit and read a book.



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Effects of retained Primitive Reflexes

- poor muscle tone, balance, fine motor, gross motor and posture
- midlines are often not integrated
- child may be mixed dominant
- difficulties with reading, writing, maths
- child often finds ways to compensate for difficulties they are experiencing
- easily startled
- over sensitive
- low self esteem

All Primitive Reflexes link into the Vestibular (Balance) System and one which is significantly associated with writing difficulties is the ***Asymmetrical Tonic Neck Reflex (ATNR)***.

The ***ATNR*** plays a very active role from 18 weeks in utero until approximately 6 months of age. It stimulates the vestibular and helps develop muscle tone, balance and facilitates movement.

If the ATNR is retained beyond 6 months it can result in the following symptoms:

- Poor eye tracking
- Difficulty copying from the blackboard
- Dyslexia
- Reading, listening, hand writing, written expression and spelling
- Difficulty with maths
- May use fingers when eating
- Poor hand eye co-ordination
- Poor balance - imbalance of tension in the muscles when the head is turning
- Difficulty crossing the midline - may not display a cross pattern movement when walking, marching or skipping



In older children, a residual ATNR makes writing difficult because when the head turns to follow the direction of the writing hand, the arm and hand want to extend. This makes it difficult to hold the pen correctly, bend the arm and bring the hand back to write on the left hand side of the page.

In most cases children learn to “accommodate” the problem and will do this in a number of ways:

- adjust posture by pushing the chair back
- leaning into the chair so that the arm can be straight while writing
- twisted posture
- rotating the page by as much as 90 degrees
- awkward or very tight pen grip



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As a result of compensation, the physical action of writing does not become **automatic** and the ability to think and carry out the physical task at the same time becomes very hard.

A child who is physically struggling to write can have difficulties irrespective of intelligence. Sometimes these children are accused of being “lazy” because they are very good telling a story orally but “get stuck” when they have to get their ideas down on the paper.

If the **ATNR** is the only residual primitive reflex, the child can usually learn to read. Reading requires the control of eye movements (oculo-motor functioning), but **writing** needs the eyes and hand to work together (visual-motor integration).

Movement Programs To Improve Learning (Reading, Spelling & Writing)

There are many movement programs such as Brain Gym and PMP in schools which work more on the Postural Reflexes, Balance System and Cerebellum. Two movement programs which address the Primitive Reflexes and Balance system are INPP and Move to Learn.

Both programs are designed to assist children and adolescents with their:

- | | |
|---------------------------------|-------------------------------|
| * Balance & Co-ordination | * Fine and Gross motor skills |
| * Primitive & Postural Reflexes | * Spatial Awareness |
| * Reading & Writing | * Memory |
| * Maths | * Muscle Tone |
| * Behaviour | * Concentration |
| * Short Attention Span | * Visual Perception |

INPP Program

- ❖ The INPP program has been very successful at addressing children who have difficulties in **writing** together with other individuals who have a range of Learning and Behavioral challenges.
- ❖ Treatment comprises of a series of physical exercises based on early movements made by the developing child in the first year(s) of life. The exercises are designed to retrain the **reflex pathways** and thereby improve the control of balance, posture, voluntary movement, visual functioning and perceptual abilities.
- ❖ A typical programme will take about 5-10 minutes a day over a period of 12 months. Progress is reviewed at 8 weekly intervals and exercises are changed when appropriate.
- ❖ It can be offered as a group exercise programme within a school setting or for children who have more challenging difficulties as an individual programme.



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The Move to Learn Program

- ❖ Move to Learn is a sequenced daily movement program which is a simple, flexible movement intervention.
- ❖ It is based on the natural movements of babies and toddlers comprising of 10 simple movement activities covering all the essential movement patterns.
- ❖ The developmental movements are followed in sequence.
- ❖ It also addresses the underlying functional deficits that children with various Learning Difficulties have shown.
- ❖ As the movements are working on changing brain patterns and building new neural pathways, it is important to do them consistently and regularly 5 days a week.
- ❖ They can be done as a task to help your child prepare for concentrated learning. Alternatively, if your child is becoming restless during homework, it can be used during this time as a calming activity.

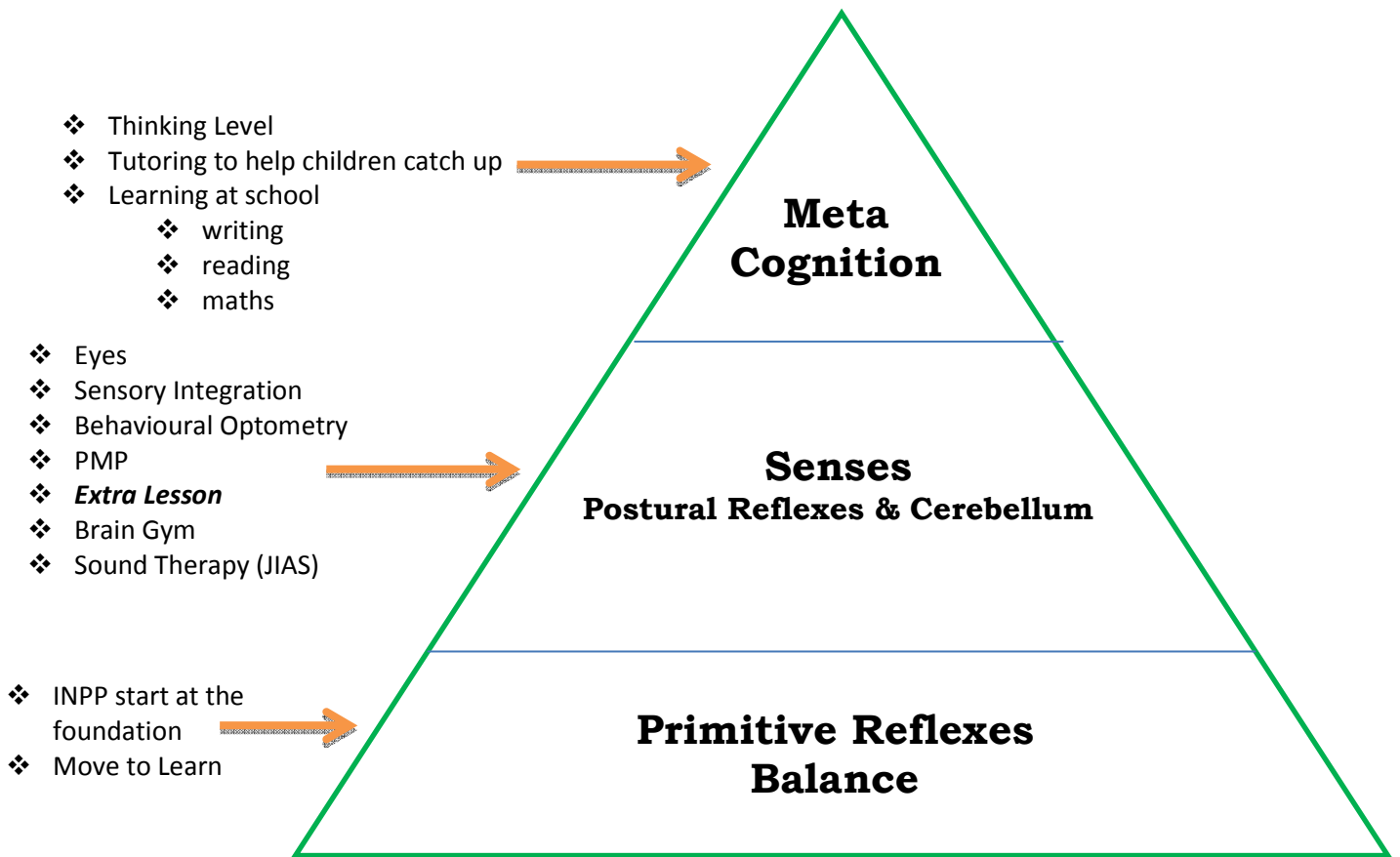


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