

KISS 2024

Development: movement, posture
and the visual process

The logo consists of a large cyan circle with a dark blue horizontal oval inside it. The text 'OP SIS' is written in white capital letters within the dark blue oval.

OP SIS

Development

- Vision, movement and posture are all learned at the same time, indivisible.
- In the womb, the baby makes voluntary and reflexive movements, building the pathways for vision and for visually directed movements.



Development

- In utero, the baby has the advantage of being able to make movements in the fluid - cushioned womb, without the full effects of gravity.
- But the baby is making movement preparations for life outside the womb, when full gravity will act.



Development

- Once the baby has been born then he will be developing the postural control to make movements as visually directed actions.
- In utero the baby has low tone to help with birth, so will need to build core strength once he has been born.
- He remains in a tucked-up position and this is helped by the action of the forward Tonic Labyrinthine Reflex (TLR).



Development

- The backwards TLR emerges in the first month after birth to help the baby straighten out, and voluntary movement learning after the TLR response starts to build core strength.
- The baby, in that first month, is already learning to lift his head and look – key for visual process development.



Development

- In utero the baby is already making voluntary movements.
- Once born these 'general movements' appear sporadic, and can be called 'fidgety', as the baby does not yet have the development of core strength to make movements seem more meaningful.
- With increasing core strength, and learning, these voluntary movements appear more defined.



Development

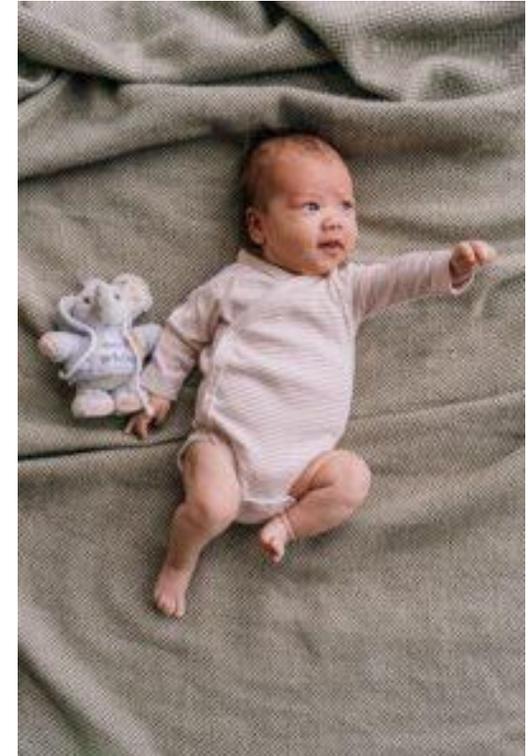
- There are hundreds of primitive reflexes.
- Each primitive reflex has a different purpose, and many are a starting point for some postural and voluntary movement learning to take place.
- The movements from the primitive reflex responses are accompanied by changes in muscle tone. This allows the baby to progress towards more complicated movement patterns, gaining appropriate postural development.



Development

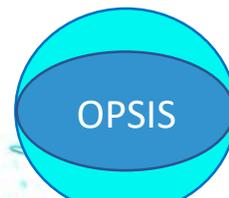
- 'The appearance of every function is usually preceded by a stage during which primitive reflexes prepare the basic patterns for the future action.'
- This is followed by a prolonged period of exercising this particular activity until smooth and skilful performance is accomplished'.

Dekeban A. Neurology of Infancy



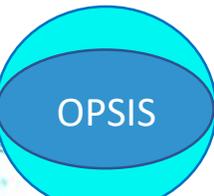
Development

- The stimulus for a primitive reflex response is often movement of the head, it could be to look at a light or object of interest.
- From the reflexive movement there is a postural change in the limbs moving the baby to a new posture. This allows the baby to learn to make the volitional movements needed to bring the baby back to their normal posture.
- As the baby learns, eventually these voluntary movements can be made without the need for the initial reflex response.



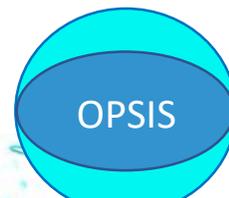
Development

- The reflexive movement response predisposes the baby to learn and practise voluntary movement skill.
- This includes gaining core strength to lift the head to direct action with voluntary, visually directed movements.
- The baby may, or may not, make the voluntary movement learning.



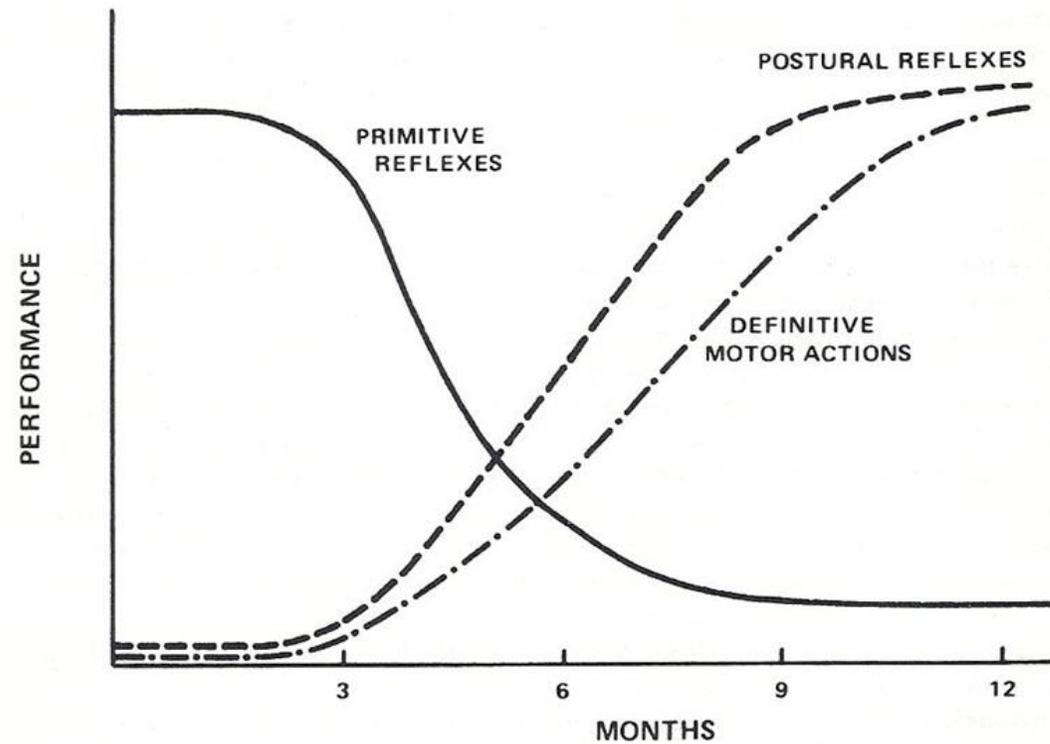
Development

- Primitive reflexes are called 'primitive' because they are present from such an early time, ie in utero, rather than being something to be discarded. These are 'survival reflexes'.
- Several of these reflexes have 'tonic' in their name which means the reflex responses will continue to act while the trigger is in place, eg turned head. Once the head has returned to the normal posture of straight ahead, and level, the reflex response stops.



Capute A. 1978

Investigations using electromyography have demonstrated the universal persistence of the primitive reflexes into normal adulthood.

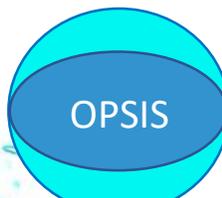


Development

Primitive reflexes are meant to be retained, as the voluntary movement learning after the primitive reflex response is needed all through life -

- in the maintenance of posture and muscle tone;
- to restart movement pattern learning if it has been lost;
- as the basis of fight and flight.

Consider it as a spectrum, with less and more reflexive response, depending on the state of the person, and the voluntary movement learning they have made.

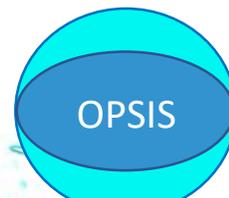


Development

Movements, posture to make those movements, and the visual process continue to develop as the baby grows.

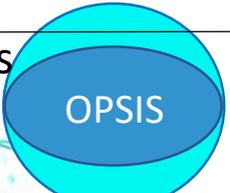
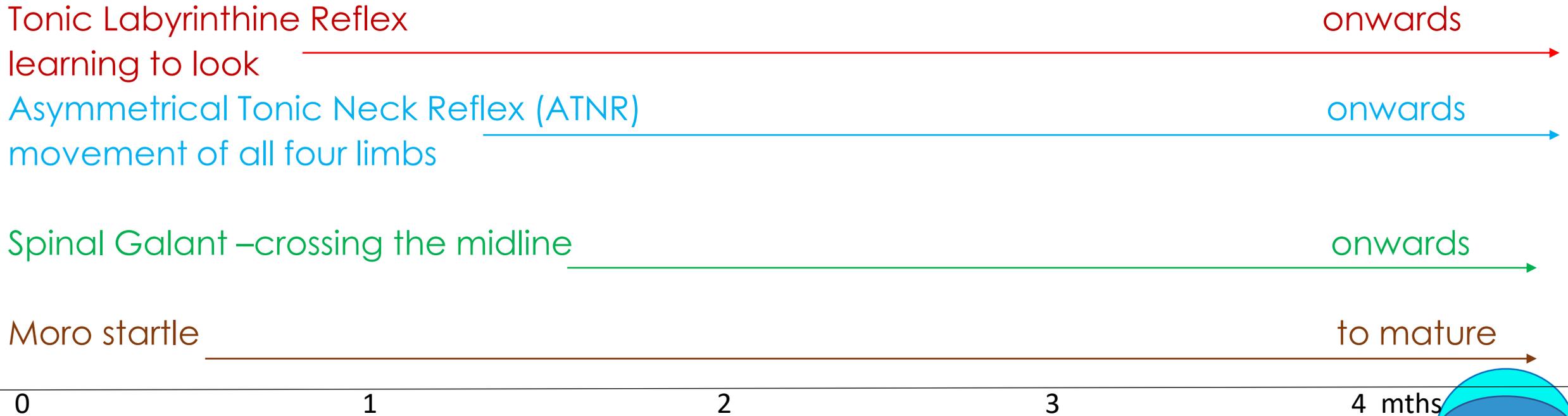
The baby's movements develop from being reflexive with sporadic voluntary movements, to having a CNS that includes

- primitive reflexes,
- postural reflexes,
- defined voluntary movements, and
- mature movements that are automatic, with reflex like, control of movement patterns.



Development: first four months

Head Control		Rolling			Tummy Crawling	Reach and grasp
Learning to look	Fixation	Looking at near				Stereopsis
	Developing EM					Refixation



Development: First 4 months

- During this time the baby begins to stretch out from the tucked-up position in the womb from the TLR forwards, by learning voluntary movements from the outwards TLR.
- Following the TLR responses the baby begins to learn voluntary movements to gain core strength in the body and neck, learn heading control and how to look. He needs to develop fixation and eye movements.



Development: First 4 months

- Gaining core strength, the baby's voluntary movements become more goal directed rather than appearing random.
- From the ATNR response initiated by a head turn to the side he starts to look at his hand gaining an understanding of pointing his eyes at near.



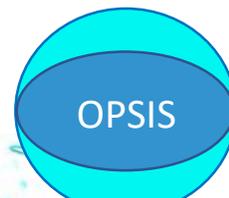
Development: First 4 months

- The response of the Spinal Galant adds to the responses of the TLR and ATNR, so that, with increasing core strength, the baby can learn to turn/roll in his own axis.
- That allows the baby move from the Moro startle response to the mature Moro response by rolling, by around 4 months old.



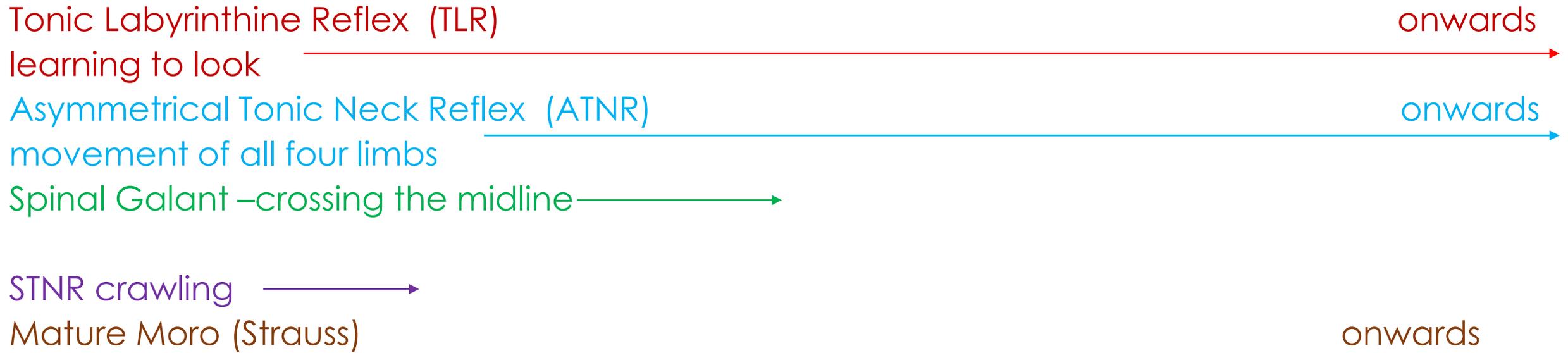
Development: 4-8 months

- The baby becomes very practised at reaching and grasping, and exploring anything, and everything, with his mouth.
- At this time the baby is learning to look from his hands into the distance, across the room, and becomes aware of things/people beyond arm's length from him.
- The baby is gaining core strength and learning to sit – first aided and then unaided. He continues to practice tummy crawling and rolling, learning about the space around him.
- Around 6 months old the STNR emerges to help the baby learn to crawl, and to gain strength in the shoulder girdle.



Development: 9-12 months

Standing aided		Standing unaided			Walking aided	Walking unaided
Localisation in space		Fixation on a near target	specific		Attention to	small details



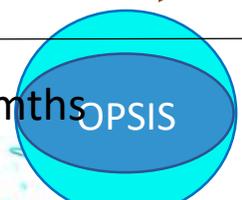
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12mths



Development: 9-12 months

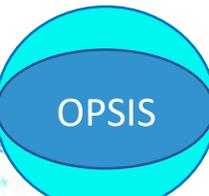
- In this time the baby is gaining increasing awareness and knowledge of space.
- He is learning how to move through space with his eyes and his body so his movements are visually directed.
- Eventually he learns how to walk and his world expands enormously!



Development: 12/13 months

By the time the baby is walking we hope he has, to use day to day,

- a robust motor and postural base, with good core strength, from which to direct action;
- a range of voluntary, visually directed movements, from gentle and delicate, through fluent and graceful, to strong and sharp.
- Efficient voluntary movements that are not affected by reflexive actions.



VT

Why is this important to us?

- We view the patient's directed action as a view of their visual process, and we observe their spatial understanding and the success of their directed actions.
- We can then decide if the patient will benefit from VT to enhance their visual process.



VT

Why is this important to us?

- If we see weaknesses in the visual process, particularly eye movements, there is likely to have been a lack of learning of voluntary movements as a baby.
- We can give VT activities to encourage the learning needed, and give movement activities to give experience to that learning.



VT

Example

If there is a TLR response on testing it suggests a lack of voluntary movement learning from that posture. The child has a reflex response as that is all he has developed so far.

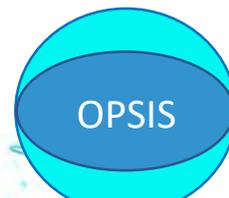
We can give an activity to help the voluntary movement learning from the TLR posture that the baby should have made,

- and activities for core strength eg hopping and skipping,
- also activities to help learning to look eg Eye control and Marsden Ball.

VT

Example

- If there is an ATNR response on testing we can give activities to develop the ability to voluntarily move one limb at a time, rather than the reflex response of moving all four limbs at the same time.
- It's also a good time to add in crawling, both ipsilateral and contralateral, as that requires an ability to move through space, as well as sequencing and timing.
- This encourages the natural emergence of rhythm and timing.



VT

But the reflexes themselves don't need to have therapy, they continue to work just as they should.

What is missing is the voluntary movement learning that follows the reflexive response, and we can help that with VT.



Thank you, any questions?



KISS questions

Which behaviours might you observe in the exam room, and in the VT room, that would suggest a lack of learning of voluntary movement skill as a baby?