



Infant Reflexes

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History

- Numerous authorities have talked of the reflex hierarchy, including Gesel, de Quiros, Getman, Holt, Ayres, Bobath, Blythe and others
- In recent years, much work on understanding the role of these reflexes on human development has come from Blythe and Goddard of INPP in Britain

What is a reflex?

- At its most basic, a reflex is a stereotyped, automatic response to a stimulus
 - e.g. simple muscle responses such as the movement away from pain.
- In the human, in addition to these basic 'arc' reflexes, there exist both **postural** and **primitive** reflexes, designed to help the helpless infant in a hapless world
- These are far more complex, involving motor control, midbrain and in some cases cortical involvement – but at a sub-conscious level.

The development of children and nerves

- Although at birth we are already programmed with many complex movements, we are still by and large helpless – we cannot move, find food or communicate
- None the less, we have already started to develop many complex skills in-utero that lay the foundations for the future

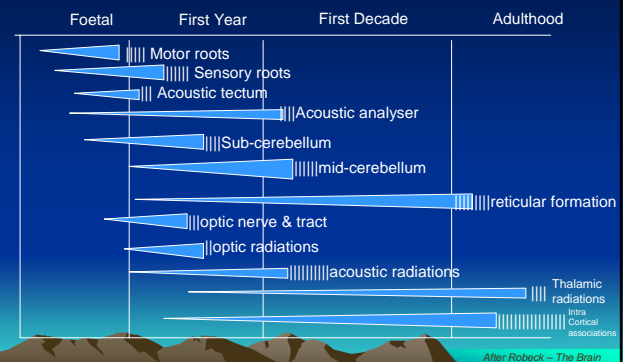
- This development is largely linked to the maturation of the central nervous system, and would appear to be pre-programmed from conception
- Development and need go hand-in-hand
 - We do not develop complex motor skills until simple ones are in place
 - Simple motor skills are there to fulfil simple needs

- We see from VT that development is along a broad front – one skill depends on another maturing, and on it's being needed by the body to achieve a purpose

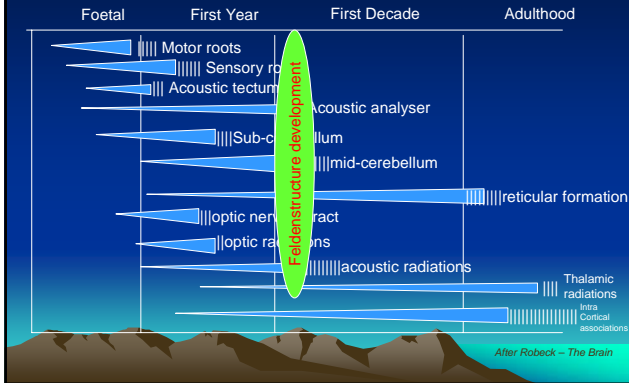
– We don't walk until we can crawl!

- This development follows a clear pattern across the human race, and seems to be inextricably linked to the presence of a series of reflexes that are similar and consistent in all races

Hierarchy of development



Hierarchy of development

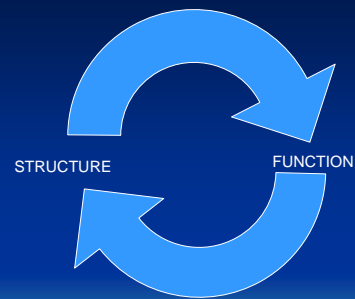


Primitive Reflexes

- These are automatic, stereotyped movements that are directed from the brain-stem and executed without cortical involvement
- Most are essential to survival
 - At least to effective survival
- Primitive reflexes should ideally clear, or transform into postural reflexes well before one year of age

Postural Reflexes

- These are higher order automated movements, controlled by the mid-brain, indicating cortical involvement that allows some voluntary inhibition of otherwise “automatic responses” to stimulus.
- They pave the way for the dependant infant to become an independent adult



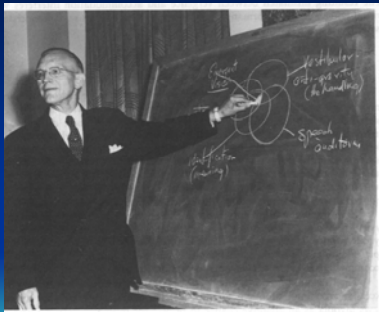
Adult Behaviour – beyond reflex action

- Classically, postural reflexes are seen as the upper layer of involuntary action and development
- I submit there is another, higher layer, as described by Peachey and others – those schema of action that allow automated responses to events that are sub-conscious, yet cortical in origin

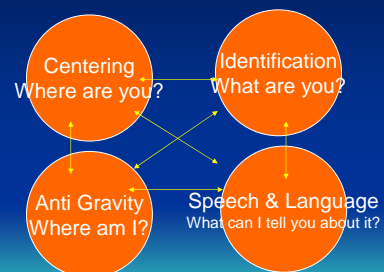
Beyond Reflexes

- Our heritage has been to develop and potentiate all three of these levels through vision therapy and lenses

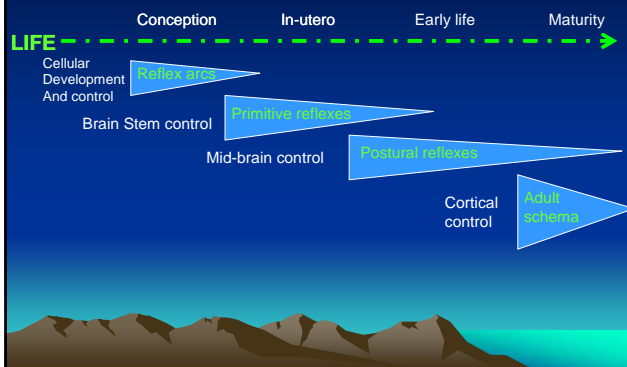
Let's we forget..



Four Circles Model of Vision



Summary



Key reflexes

- Key Reflexes that relate to our work
 - MORO
 - Asymmetrical tonic neck reflex
 - Tonic neck reflex
 - Spinal gallant
 - Postural reflexes
 - Fear Paralysis Reflex

Moro

- Possibly the most crucial device for kick starting life in air
- Any sudden stimulus causes instantaneous arousal of the organism
- There is a sudden expansion of the lungs
 - Followed by a momentary pause or “freeze”
 - And then explosive exhalation, often with a cry
 - Immediately following, there is a stimulation of the sympathetic nervous system

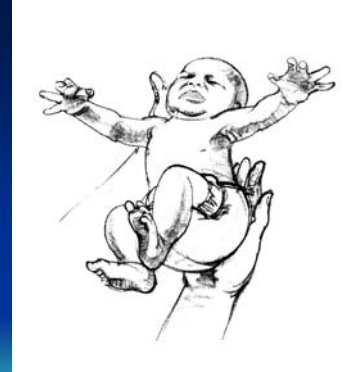
Moro

- That sympathetic system stimulation results in:
 - Release of adrenaline
 - Increased breathing rate (can cause hyperventilation)
 - Increased heart rate
 - Rise in blood pressure
- This can all be accompanied by aggression / anger / excessive emotional outburst

Moro

- The reflex movement itself involves the arms flying out, with the fingers open, allowing the lungs to expand
- The arms then pull in across the body, causing an exhalation, usually with a cry

Thus, we take our first breath of life...



Moro

- In early days, the Moro also acts as a means of summoning help to the helpless infant
- It is like a panic alarm
 - All or nothing, and very 'loud'
- It can be initiated by a number of stimuli
 - Loud noise Auditory
 - Bright light Visual
 - Sharp touch Tactile
 - Sharp change in balance Vestibular

Moro - in the longer term

- The moro is usually emerging at about 11 weeks in utero, and is fully developed at birth
- Ideally the Moro subsides by the third month
- If not, the child becomes hypersensitive to sudden stimuli
 - They over-react
 - They may be emotionally over-sensitive
 - The constant release of adrenalin leads to draining of cortisol supplies. In turn this lowers auto-immune defences, and leaves them prone to minor infections
 - Sore throats, asthma and eczema are particularly common

Moro – in the longer term

- Visual effects include dilated pupils and photosensitivity
- The child may be constantly drawn to bright or sudden visual stimuli, leading to figure-ground problems, and difficulty coping with detail
- Auditory issues mirror vision
 - They overact to noise
 - They have difficulty coping with auditory discrimination
 - There is a specific hearing loss at 6,000Hz

Moro – the positive side

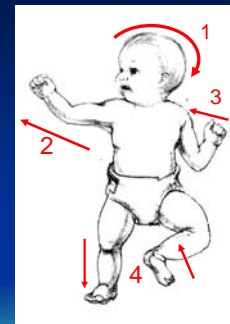
- Yes, there really is one!
- The Moro bound individual may be:-
 - Good at multi-tasking
 - Can go into 'hyper-drive' in emergencies
 - Can be good at 'explosive' type tasks, and may be an excellent athlete (but not at the marathon!)
 - May like 'living on the edge', and be good at extreme type sports, or enjoys danger

Asymmetric Tonic Neck Reflex (ATNR)

- If the moro helps us breathe: ATNR helps us get out!
- ATNR provides a corkscrewing action that helps the head engage, and the baby to pass down the birth canal, it is activated by maternal contractions

ATNR

- Head turn to the side
(1) causes limb on that side to extend (2), and opposite limb to pull in (3) – flexion
A similar effect occurs with the legs (4)



ATNR

- After birth, the ATNR helps ensure free air passage in the early weeks, and later helps prepare the body for turning over and crawling
 - 3 for 1 What an economy of action!

ATNR

- Vision: In those crucial early days, ATNR helps stimulate hand / eye correspondence, stimulating both vergence, version AND accommodation
 - 4 in 1!
 - (Remember the four circles?)
- ATNR should clear by six months as it is no longer needed
- Almost always very strong in Cerebral Palsy
- *The down side of retention...*

ATNR – negatives

- As we move to crawl, a retained ATNR blocks cross crawling
 - This blocks good bilateral integration development
 - In turn, this may block myelination of corpus callosum
- Later, can effect walking causing ipsilateral march and poor postural stability

ATNR – negatives

- ATNR and writing...
 - As head turns to right, so right hand pulls out to right
 - Tension increases, leading to pressure, and broken pencils



ATNR – negatives

- Some suggest affects development of dominance
- Visually, can 'tether' vergence to near (baby looks at hand all the time)
 - *NPS & Myopia development?*
- May affect lateral pursuits, and later impact on reading

ATNR – positives

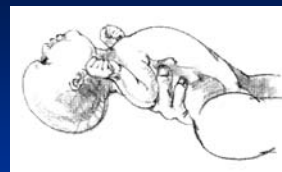
Only of use in
Australia
- And if you are a
Koala!



Tonic Neck Reflex (TLR)

- Closely linked to the Moro
- Controlled by vestibular system
- Bending forward of neck causes folding of arms & legs (forward TLR)
- Extension of neck causes extension of arms & legs (backward TLR)

TLR



Backward TLR



Forward TLR

TLR

- TLR should be fully present by birth
- Forward TLR should disappear by 4 months
- Backward TLR may take up to 3 years to inhibit

TLR

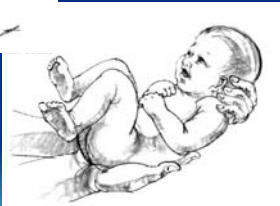
- Consider the forward TLR in terms of foetal position
 - And backwards TLR similar to Moro

TLR



Forward TLR
(foetal position)

Backward TLR
(Moro like)



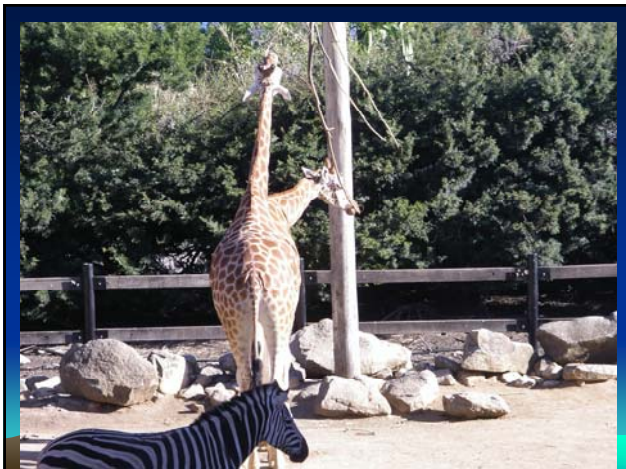
TLR – functions

- As head control starts to develop, TLR allows 'straightening out' of body, ready for movement
- Strengthens spinal control and muscle tone
- Crucial in developing 'anti-gravity' in the baby

TLR – retention effects

- If not inhibited, TLR leaves us over-sensitive to vestibular stimulation
- Head movement affects tone when standing
- Can block normal crawling / creeping (*don't miss the next talk!*)
- Head rotations, balance and general coordination are all affected
 - In turn affecting oculomotor functions
 - And auditory functions

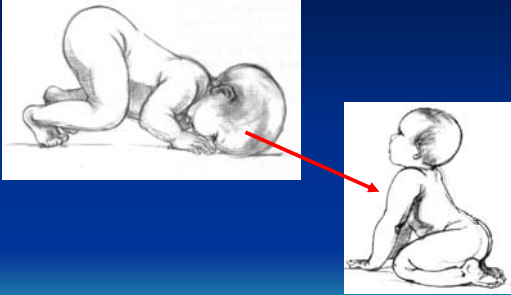
One person for whom a TLR would be disastrous!



Symmetrical Tonic Neck Reflex (STNR)

- Flexion of head causes arms to bend and legs to extend
- Only present for a very brief period
- Helps us get up – therefore crucial to locomotion

STNR



STNR

- Should appear at around 6-9 months of life
- Should be transformed by 9-11 months
- It is likely that STNR helps clear TLR through allowing head to stretch up, without legs flying out (counter effect to TLR)

STNR – effects on vision

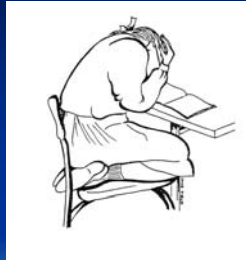
- Whilst ATNR helps establish vergence control at near
- ATNR clears at 6 months, leaving infant fixed at far for a while
- STNR then causes eyes to move back to near when arms bent
 - And to far when straightened
- Thus establishes near – far training

STNR

- Pavlides and others have noted how many children with poor reading skills did not crawl – and have poor near far skills
- *Have we been here before?*

STNR – effects on learning

- A retained STNR will:
 - Affect posture, causing slumping over the desk



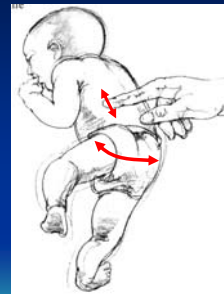
STNR – effects on learning

- A retained STNR may also –
 - Affect near / far switches
 - Affect ball control
 - Affect eating
- As the STNR inhibits, we can truly move the head independantly of the body and vestibular systems
 - We become free!

Spinal Gallant

- Present in-utero
- Clears by 3-9 months of life
- Stimulation to one side of lower spine causes rotation towards side of stimulus

Spinal Gallant



Spinal Gallant

- Function is rather obscure
 - May help birth process
- Retention affects ability to sit down!
 - The “ants in the pants” child
- Can affect bladder control (bed wetting)
 - Child may dislike tight waist bands & clothing
- In adults, has been linked with IBS
- Probably no *direct* effect on vision

Postural Reflexes

- As noted previously, each of the primitive reflexes should gradually mature and be replaced by the relevant postural (or adult) reflex.
- Generally this will occur between six months and eighteen months of age
- The postural reflexes themselves should reduce in the first three to four years - marking the maturation of the midbrain and higher cortical centres

Postural Reflexes

- They include
 - Strauss reflex (successor to Moro)
 - Landau reflex (successor to STNR)
 - Amphibian reflex (successor to ATNR)
 - Oculo-head righting reflex
 - Labarynthine head righting reflex
 - Segmental rolling reflexes

Visual system and reflexes

- So what affects vision?
- A recap..
 - Moro
 - ATNR
 - STNR
 - TLR

Effect on visual system

	Balance	Vergence	Accommodation	Head control	Eye Movements
MORO	YES	YES	YES		
ATNR	YES	YES	YES	YES	YES
STNR	YES	YES	YES	YES	YES
TLR	YES	YES	YES	YES	YES

?

- There is one other reflex to consider
- Even more basic than Moro
- Known as The Fear Paralysis Reflex

Fear Paralysis Reflex

- The earliest 'withdrawal' from stress
- An amoebic-like removal from danger
- Present at 5-7 weeks post conception
- Within days of initiation involves head pulling away & closure of eyes closely implicated in SIDS

Fear Paralysis Reflex

- In the older child
 - Leads to a breakdown in visual control
 - Panic
 - Overt stress responses
 - Total loss of focus and vergence control
 - Denial of spatial understanding
 - *I believe the FPR underpins Streff Syndrome*

Testing for reflexes

- A series of well established tests exist to identify the presence – and magnitude of specific reflexes
- These are well documented in a number of neurological texts
- Most of us show some retention – it is where a cluster of retained reflexes exist that the fun starts

Treatment of problems

- Blythe & McGowan in the 1970's and McPhillips and Sheehey in the 1990's, identified a series of repetitive movements made by infants at key points in their development
- These movements appeared to have specific purpose in that all infants studied made the same movements
- Following these movements, reflexes became inhibited

Treatment

- Several authorities have developed programmes to replicate these movements
- They involve daily repetitive activities over about twelve months
- Aim is to transform a cluster of primitive reflexes so they no longer pose a block to neurological maturity

Vision Therapy and reflexes

- BUT...
 - What do we do in V.T.?
 - How do our activities relate to the same repetitive movements
 - Consider
 - Head rotations
 - Thumb rotations
 - Cross marching
 - Angels in the snow
 - And numerous other activities

Other therapies

- A number of groups and individuals have proposed treatment programmes that help learning difficulties. All have some impact on reflexes
 - OT & Sensory Integration
 - DORE / DDAT
 - Levinson
 - Dolman / Delacatto

Our role as Behavioural Optometrists

- Put simply...
- To do whatever we can to alleviate factors that may inhibit the development of efficient visual skills, and in so doing to enhance learning, personality and quality of life for those we serve



Thank You!