

NORMAL DEVELOPMENT



BASIC CONCEPTS IN NORMAL DEVELOPMENTS

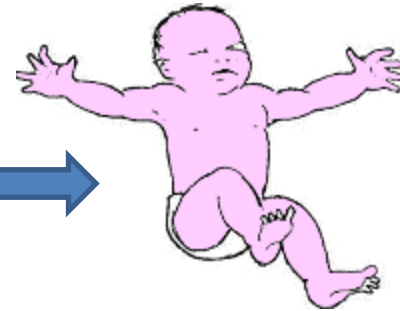
POSTURAL BEHAVIOR

- Total postural behavior of an individual is the result of the interaction of all reflexes
- Postural reflexes interaction & integration form background for movements and skills
- Initially when a child born this integrations is not present
- With maturation and integration of lower centers contribute to the development of higher center
- With inhibitory control from higher centers the movements are integrated



POSTURAL BEHAVIOR

- At birth body is under the unopposed control of lower center of CNS which generate involuntary reflex movement and posture
- Baby is influenced by neonatal reflexes, body responds mechanically and automatically
- This affects muscle tone and posture or then movements
- The baby at birth is at a primitive, crude level, a reflex level
- His movements are automatic no component of voluntary control



How high level of skills are learned?

Primitive postural reflexes

Involve changes in tone and distribution

Affects posture and movements

Maturation of higher CNS centers

Integration of reflex activity

Voluntary movements

High level skills

At about 15 months of age motor system matures and progresses to a level of proficiency in the basic motor functions so that a child is able to accomplish a number of skills

Development of these early function is basis of further sensorimotor development



BASIC COMPONENT OF MOTOR DEVELOPMENT

- There are four basic component

Head control

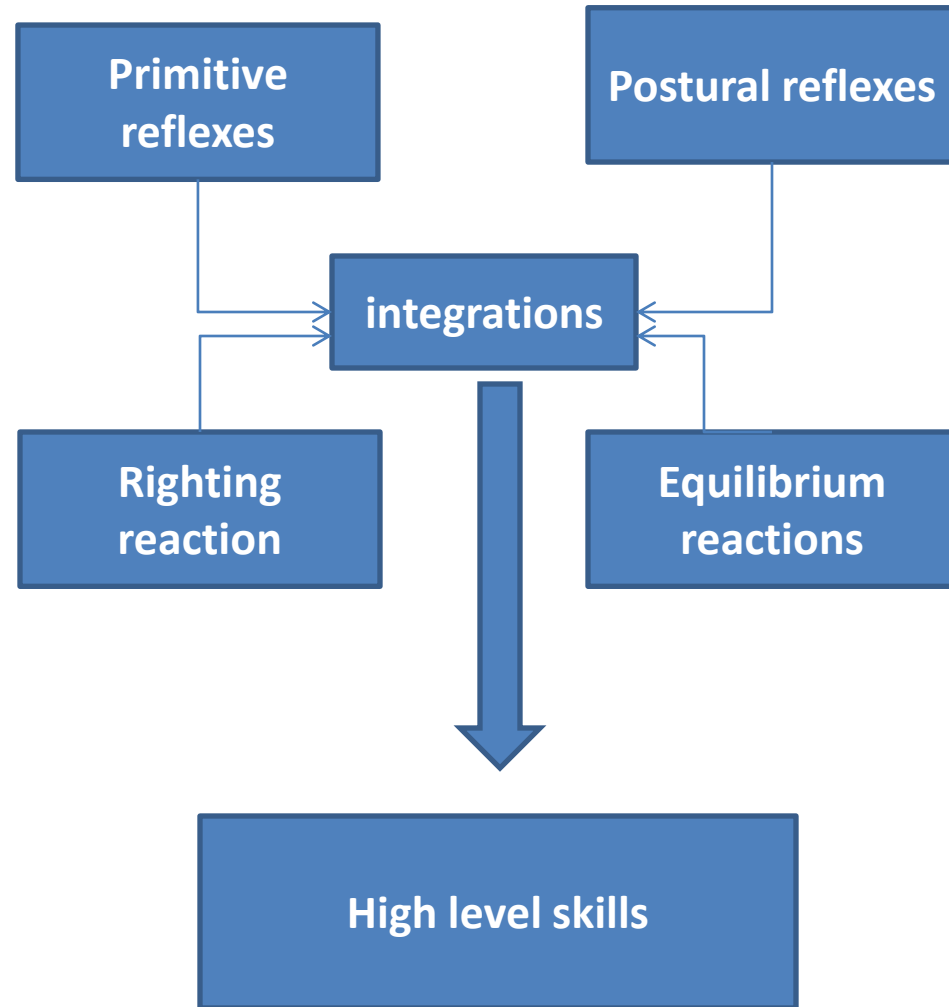
Increased extensor control

Developing rotatory components

Equilibrium reactions

HIGHER LEVEL MOVEMENTS

- Postural reflexes supply the basic balance of tone
- First 5-6 month movements are in pattern of total flexion and extension against gravity
- Rightening reactions
- Equilibrium reactions
- Finally high level skills



HIGHER LEVEL MOVEMENTS

- As the head rights extensor tone develops in upper limb and child assumes the prone-on-elbow---to extend elbows---quadruped and finally reciprocal creeping
- Both flexor and extensor tone is developed to produce coordinated movements



Extensor tone and landau reaction

- As heads uprights into extension
- Extensor tone starts developing down to neck and trunk
- Thus initiating landau reaction



Landau Reaction Reflex

- Baby is born with minimal righting reaction which act as protective response when prone

ATNR & SIDELYING

- As the ATNR integrated, neck righting become more mobile so that by four to five months of age the baby is turning from side lying to prone
- Body righting on body and rotatory component,, leads to quadruped and sitting
- Body righting on head...head assumes vertical in the side lying position



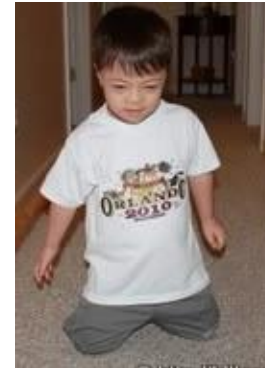
ROTATION IN BODY

- Using neck righting and body righting, complete rotation of the body is used to turn to prone to supine
- by 18-24 month, righting reaction and postural reflexes are well integrated and child use partial rotation to get sitting, then turns to the quadruped position and up to standing
- By 4-5 $\frac{1}{2}$ adult method of symmetrical sitting is used to assume sitting and standing position



DEVELOPMENT OF EQUILIBRIUM REACTIONS

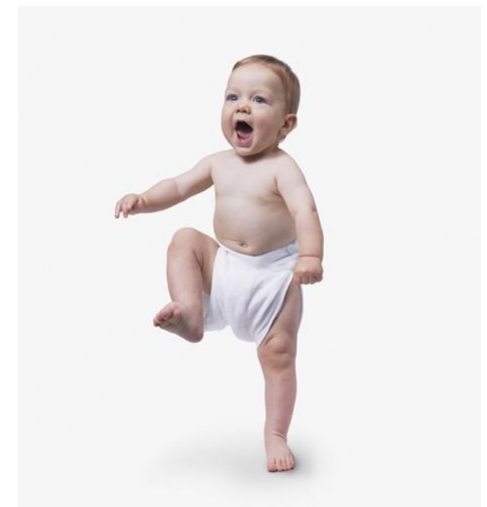
- The development of equilibrium reactions overlaps with that of Rightening reactions and responsible for modification and transformation of righting reactions
- Equilibrium reaction develops as child needed stability in balance and independent function
- If postural reflexes and tone is dominant then righting and equilibrium reaction are compromised
- This further delays or prevent normal sensorimotor development
- Vestibule apparatus and cerebellum are involved in maintain of equilibrium



DEVELOPMENT AND DISTERIBUTION OF BASIC TONE

HOW MUSCLE TONE DEVELOP?

- At birth-dominated by flexor tone
- 10-12 month-extensor tone developed, flexor tone strengthened, balance and coordinated patterns of movements from gross to skills
- Rotatory components for more skills develop
- Primitive and postural reflexes play a dominant role in regulation, balance, and distribution of muscle tone
- Which further determine posture and movements
- Automatic and voluntary movements are difficult in hyper tonus
- Each reflex produce specific posture
- Total postural behavior is the result of interaction of all the reflexes



CONTRIBUTION OF REFLEXES

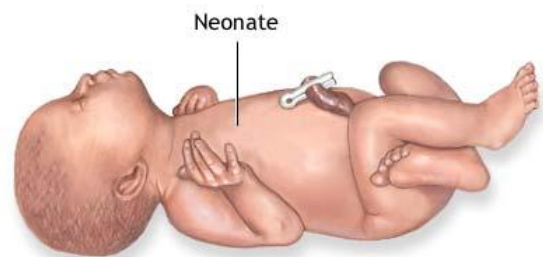
Rooting reflexes—one example

- Stroking the newborn, s cheek/or palm, the infant, s mouth will root, the arm will flex and the hand will come up to his open mouth
- Prime important is its functional role for survival
- Best seen during breast feeding
- Develops opening the mouth

NORMAL DEVELOPMENT

NEONATE-ONE MONTH

- Momentary neck extension
- Reflexive flexion posture
- No functional muscle has developed
- Hip are flexed with weight bearing on head and upper limb
- Symmetrical in supine
- Limbs retracted assuming position of abduction and flexion
- Pronounced head lag, rounding of back, no extensor tone
- No rotation except for neck righting, rooting reflex stimulates rotations
- Hands fisted mostly, grasp reflex
- Eye able to focus with in a limit range



ADAM.



TWO MONTH

Prone:

- Neck extension develop to 45 degree
- Extension developing down trunk
- STN(tension in down trunk and upper limb) appear upper limb
- Still no scapular stabilization
- Back less rounded in sitting due to extensor tone developing



TWO MONTH

Supine:

- lack of flexor control
- ASTN(pattern of flexion and extension with neck rotation) appears

Rotation:

- Lateral flexion and initial rotation influenced by galant and rooting reflex

Hands:

- Reflexive grasp, hands maintain flexed position
- Involuntary release

Eyes:

- Focusing improved
- Coordination of hearing and vision
- Follows moving object to midline, disassociation of head from trunk



FOCUSING TWO MONTH



THREE MONTH

Prone:

- Neck extension
- Chin tucked
- Increased extension in back and upper limb
- Upper limb move forward and bear weight
- Scapular stabilization
- Less flexion at hips but no full weight bearing yet



THREE MONTH

Flexion:

- Increased flexion control
- Improved balance between flexors and extensor
- Head has more midline orientation
- Hands coming together to midline especial when holding a toy
- Eye focus in midline
- Head in alignment with trunk



THREE MONTH

Rotation:

- Weight bearing on forearm
- Head turning creates weight shift
- Sensation of rotation beginning
- If unable to shift weight, rotation may not develop

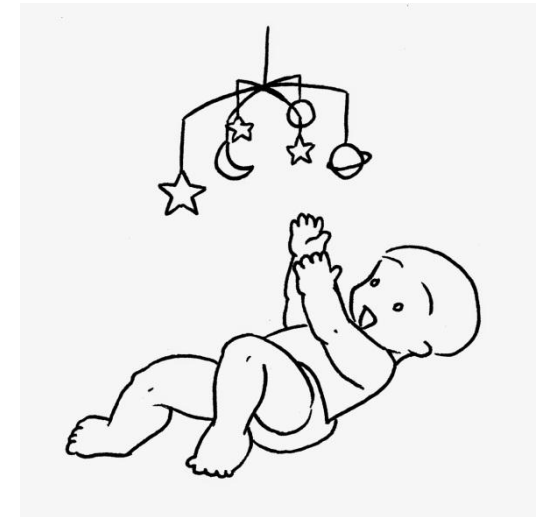


THREE MONTH



Hands:

- Reaches out with both upper limbs
- Lunges at object and can make contact, may or may not be able to grasp
- Brings hand together and looks at them
- Might suck fingers or fists
- Beginning to pull at clothing
- Continue to scratch surface
- Retains object using an ulnar grasp as opposed to the palmar reflex grasp



THREE MONTH

Eye:

- Follow slow moving object through 180 degree
- May see head rotating with eyes
- Reaches with eyes when held in sitting position

FOUR MONTH

Prone:

- Increased extension at trunk LANDAU REACTION
- Neck and limb extended
- Hands to midline, increased adduction, elbow in line with shoulder
- Able to arch back in supine this give pelvic stability and mobility, weight bearing on heel
- Disassociation b/w UL & LL increased
- Pelvis rotation yet not present it need AP stability of pelvis



FOUR MONTH



Supine:

- Increased flexor control
- Head in midline
- LL continue to be abducted
- Hands and upper limb more in midline
- Scapular stability increased
- Increased weight shift bilaterally
- Gross grasp continuing on ulnar side
- Eyes follow object smoothly



FIVE MONTH

Extension:

- Sitting less support
- Increased extension and scapular stability
- Limbs reaching forward
- Shifting weight on forearm
- Reaching with hand open(ulnar release)
- Less flexion on hip
- Neck stable
- Equilibrium reaction begin in prone
- Foot to mouth causes elongation of lower spine and neck,



FIVE MONTH



FLEXION

- Pull to sit with no head and neck lagging →
- Starts to lift and flex lower limbs
- Abdominal control developing with pelvic stability
- Weight shift side lying
- Rotation in upper trunk
- Stability and mobility in shoulder girdle
- In side lying shoulder retract
- Can roll back to supine,
- Rolling prone to supine by neck extension and flexion, roll like a log
- Grasps object in front of face
- Use palmar grasp with increased use of radial digit
- Can lift a cube, slap, pat, raking movements with fingers
- Bilateral hand approach due to ulnar and radial release
- Maintain fixation on self



SIX MONTH

- Sit with back straight
- Strong landau
- Balance tone in flexors and extensor
- Stands weight bearing positive supporting
- Pull to sit: active flexion of neck, abdominal control with raise lower limb
- Good balance between flexion and extension
- Righting reaction starts
- Equilibrium reaction in supine
- Weight shift to extended upper limb, more control in shoulder and scapulae



SIX MONTH- ROLLING

Roll from supine to prone:

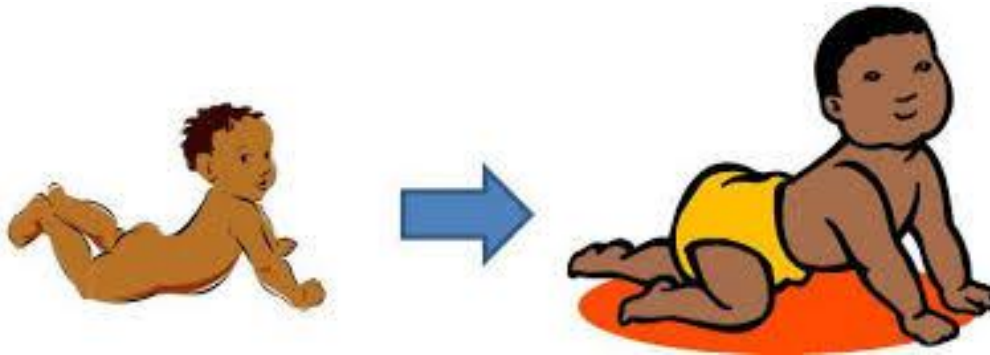
- Body righting on body
- Need increased neck flexion
- Upper limb reaches out and cross midline of body
- If initiate roll with lower limb needs increased flexion to past the mid line, asymmetrical movement of lower limb crossed extension

SIX MONTH -HANDS

- Radial palmar grasp
- If drops object may rescue it
- Transfer objects from hand to other
- Reaches out with one hand while holding object other
- Pats image in mirror

EIGHT MONTH

- Pivot-prone-type position- hyperextension in lower back
- Stability in pelvis, weight bearing



EIGHT MONTH-QUAUDRUPED

- Able to push backward in quadruped
- Increased stability and mobility in hip
- Need neck and back extension, anti gravity posture
- Controlled extension in UL
- Begins to rock back and forward (weight shifting and proprioceptive stimulation, balanced hip flexion and extension)



EIGHT MONTH- sitting

- Sit with balance
- Able to push back into sitting, first symmetrically, then develops asymmetrically side sitting position using pelvis rotation and stability in shoulder
- In sitting lower extremities have more extension to recover balance
- All component of extension are available
- Able to pull stand with minimal abduction for standing



EIGHT MONTH-kneeling

- Able to kneel, with back and hip extension and knee flexion (disassociation)
- Protective extension fully develop



EIGHT MONTH-rotation

- Pushes back into quadruped position, rotates pelvis into side sitting
- Begins lower extremities out in front for long sit position
- Righting reaction, equilibrium reaction and disassociation of body parts are in voluntary control

EIGHT MONTH- crawling on stomach

- Crawling on stomach reacquire
- a) weight on one side of pelvis, shifting weight to other side
- b) proprioceptive in put into the pelvis and shoulder



EIGHT MONTH- creeping forward

- Has sufficient trunk, shoulder, and pelvic girdle stability
- Reciprocal movements
- Half kneels using rotation



EIGHT MONTH-standing

- Stand with feet flat(positive supporting integrated)



EIGHT MONTH- hands

- Pincer grip
- Increased maturity of neutral to supination but not complete
- Crude voluntary release of objects

EIGHT MONTH- hands

- Fore finger isolation, beginning to isolate fingers
- Pick up small objects with pincer grip
- More advance use of hands combine with wrist extension and supination

TEN MONTH

- Independence in sitting
- Grasp and release function
- Pincer position (finger and thumb) is available voluntarily
- Can twist, turn, pivot and regain sitting balance
- may be able to Bear walks on the hand
- Control cruising sideways
- Walks both hand held, LL in abd & ext rot
- Initial standing (high guard upper extremities, abd & ext rotation lower extremities)



12-15 month

- Independent in standing, walking, and hand use



summary

MILESTONE	APPROXIMATE AGE (IN MONTHS) ABLE TO PERFORM
Roll	3-4
Sit independently	5-6
Belly crawl	7-8
Creep (quadruped)	8-9
Pull to stand	9-10
Cruise	11
Walk	12

MONTH/YEAR	POSITION/ACTIVITY	MILESTONE
1 month	Prone	Lifts head and turns to side
2 months	Vertical	Rights head
	Prone	Recurrently lifts head to 45 degrees
	Supported sitting	Head erect and bobbing
3 months	Prone	Lifts head to 45 degrees (sustained)
		Recurrently lifts head to 90 degrees
		Supports self on forearms.
		Rolls to side
4 months	Prone	Lifts head to 90 degrees (sustained)
		Rolls to supine
	Supine	Rolls to prone
		Assists with head when pulled to sit
	Supported sitting	Head steady, set forward
5 months	Prone	Supports self on extended arms
		Rolls to supine segmentally
	Supine	Lifts head when pulled to sitting
		Rolls to prone segmentally
	Supported sitting	Head erect and steady
	Standing	Takes weight on lower extremities

6 months	Prone	Can lift one arm and weight bear on the other Pivots in a circle
	Sitting	Erect for 1 minute with hands propped forward Protective extension sideways
7 months	Prone	Up on all fours Progress is forward in any manner
	Sitting	Erect without support but unsteady Protective extension forward
8 months	Prone	Crawls in any manner
	Sitting	Erect without support
	Standing	Pulls to stand
9 months	Prone/supine	Rotates to sitting
	Sitting	Goes to prone Protective extension backward
	Standing	Pulls to standing with rotation and support
10 months	Sitting	Pivots
	Locomotion	Cruises
12 months	Locomotion	Stands up without support Walks with high guard
	Kneeling	Kneels without support
15 months	Locomotion	Walks with medium guard Can stop, start, and change directions without falling

18 months	Locomotion	Walks with no guard carrying object Walks fast with feet flat Squats to play Goes up/down stairs on all fours
2 years	Locomotion	Walks up/down stairs one at the time holding rail Walks with heel-total gait Runs forward well
3 years	Locomotion	Pedals and steers tricycle well Jumps forward on both feet Alternates feet going upstairs Walks backward easily
4 years	Locomotion	Walks downstairs with alternating feet, holding rail Gallops
5 years	Locomotion	Able to walk long distances on toes Skips Hops forward on one foot Smooth reciprocal movements in walking and running

Thanks

QUESTION?