

# Normal development and behavior

## objectives:

- ❖ Highlight the importance of knowing the normal childhood development and behavior for the future medical practice.
- ❖ Explain the logic of the evolving developmental and behavioral milestones in human beings.
- ❖ Explain the landmarks of these milestones during the critical periods of development in early childhood.
- ❖ Show the technique of exploring these milestones in children.


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**Special thanks to team 437 & Faisal alsaif**

 Notes

 Important

 Book

# Growth vs development

The term child development is used to describe the skills acquired by children between birth and about 5 years of age.

## Growth

- Growth: Increase in size of body (or separate parts of it) or difference in proportion
- It is not linear; most rapid growth is during the **first 2 years** and then at puberty, **Thus, those are the golden years for growth = optimal environment must be achieved**
- Different tissues grow at different times, First 2 years mostly the CNS

Parameters of average growth: **very important. Have to memorize :**

### Weight:

- Gain of 20-30 g/day
- Double (**birth weight**) by 4-5 months of age
- Triple at 1 year
- Quadruple at 2 years

### Height: ( average newborn height is 50 cm )

- 50% in the first year
- At 2 years reaches  $\frac{1}{2}$  of adult height
- Double by 3-4 years
- Triple by 13 years

## Development

- ❖ Change in function, including those influenced by the emotional and social environment.
- ❖ Development is influenced by genetic potential and the child environment.

## Brain growth<sup>1</sup>

- ❖ The brain is smooth at 28 weeks. (**no sulci or gyri**)
- ❖ Most of the growth of the brain is outside the uterus.
- ❖ The first 2 years of life, the brain increases to up to 80% of adult size (three to four times).
- ❖ It grows by making sulci and gyri which are important to increase the capacity of the brain.
- ❖ The brain continues to grow, until by adulthood (18 years) it reaches its largest size.

## Brain development ( the first 2 years )

- ❖ Number of neurons is fixed in the fetus.
- ❖ Growth is by making connections and synapses in which the neurons are myelinated.
- ❖ The brain has 2 hemispheres; each area of the brain is specialized in certain cognitive domain e.g. hearing, vision, thinking, each one is in a special area.
- ❖ Thinking, judgment and cognition is in the frontal lobe. (**frontal and prefrontal cortex**)

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1- Imp for OSCE. in the ward, take the head circumference chart alone (not with the weight and height) That's the one that come in the exam.

# Child development

Fields of development include:

<p>Gross motor for mobility: (big muscles)</p> <ul style="list-style-type: none"><li>the most obvious initial area e.g. rolling, sitting, crawling, walking....</li></ul> 	<p>Fine motor and Vision: (always mention together)</p> <ul style="list-style-type: none"><li>Grouped together as vision is necessary for fine motor development, hand function e.g. holding toys, spoon, writing, coloring</li></ul> <p>You need to make sure his vision is ok before evaluating fine motor, if not fix it before evaluating</p> 
<p>Social, emotional and behavioral:</p> <ul style="list-style-type: none"><li>A spectrum of psychological development and self dependent skills. This is to interact</li></ul> <p>Just know this domain as "self dependent skills" or "daily living skills". Eg. dressing/undressing, drinking, showering/bathing, brushing teeth and washing face.</p> 	<p>Hearing, speech and language:</p> <ul style="list-style-type: none"><li>Normal speech and language development is dependent on good hearing skills to be able to communicate</li><li>Speech is articulation and pronunciation and is a function of muscles.</li><li>Language includes the ability to express, choose words and understanding (both expressive and receptive). Its a function of the CNS</li></ul> 

You can't assess speech without clear hearing ( must be screened for by hearing test )

- ❖ all newborn infants have their hearing screened. assessment of vision relies on parental observation; screening of visual acuity and squint occurs at school entry.
- ❖ A deficiency in any one skill area can have an impact on other areas and may result in global developmental delay (domains depends on each other, so a delay in one domain could affect others) ex; A child 6 months old who isn't able to sit by himself yet independently , he won't be able to develop fine motor skills because he is using his hand to support him and not to fall down ,you need to develop your ability to sit to explore fine movement
- ❖ **Language is the key to develop, if you have two domains affected one of them is language, fix language first!!**
- ❖ Knowledge of normal growth and development of children is important:
  - To help children achieve their maximum potential
  - To recognize abnormal deviations from normal pattern so:

Act as an entry point for the care and management of children with special needs

Refer for further diagnostic work up and management e.g. impairments of hearing and vision must be recognized and treated early

The four domains of development are the most important part of the lecture and may come as an OSCE station. Know all the domains and 2 examples from each!!!

# Child Development

## Influences on development

- It is the result of an interaction of heredity (genetic) and the environment of the developing brain.
- The child's physical (e.g. food, shelter, vision, hearing, good health) and psychological (e.g. security, role models, opportunities to learn from play, affection, care, self respect and independence) needs must be met.
- Child's development can be significantly impaired if the environment fails to meet the child's needs. **Known as environmental deprivation**
  - If the child has no interaction with human, he will have abnormal language development.
  - Note that even if the genetic is poor if you put the child in rich environment it will have a big impact and the child will develop more than his genetic potential

## Developmental assessment

Normal development is monitored via:

- Parents (or close caregiver) **Surveillance:** is for all the children and done by general pediatricians by asking about development and concerns. **Screening:** for certain age group (6m, 18m, 24m) and have specific test
- Regular child health surveillance (eg. when child comes in for immunization) (Surveillance is not screening)
- Whenever a child is seen by a healthcare professional (brief opportunistic overview) (eg. sick in ER)

## Indications for developmental assessment:

- Part of routine immunization visit and routine examination of infant to diagnose treatable conditions e.g. deafness
- History of difficulties in pregnancy, labor or the newborn period
- Hypoxic symptoms: convulsions or meningitis early in life (first 2 years of life) might affect the growing brain and may lead to cerebral palsy (any NICU admission)
- Unusual behavior or physical feature (dysmorphic features) (eg. convulsions, abnormal involuntary movements, physical dysmorphic features), Difficulties during labor: Hypoxia, head injury, prolonged labor, CTA acceleration and deceleration and early rupture of membranes

# Child Development

## Developmental screening

- Be familiar with WIDE SPECTRUM of normal development<sup>1</sup> (eg. can skip crawling and walk straight away and there is an age range for each milestone )
- History, physical and developmental examination
- Explore each domain of development separately (cover 2 areas of each domain)
- Specific developmental delay: Lag behind chronological age (age from date of birth) in one domain , Nowadays, we commonly see specific language delay due to lack of parental stimulation and prolonged screen time
- Developmental age : the ability to do the skills where it fits in developmental age vs Chronological age : age since birth
- **Global developmental delay**: Lag behind chronological age in **two or more** domain

## Typical development

- ❖ It's the interaction of heredity and environmental factors on the developing brain
- ❖ Hereditary factors affect the potential of the child, while environmental factors influence the extent to which that potential is achieved .
- ❖ Environment has to meet the child's physical and psychological needs . It varies with age and stage of development

## Physical and psychological needs

- ❖ Development can be impaired if environment fails to meet the child's physical or psychological needs resulting in atypical development ( interaction depends on both environmental and genetic makeup )
- ❖ Physical needs: ( warm, clothing, shelter, food, good vision and hearing) . Good vision as it's a sensory input so to be able to achieve the milestones , Ex : if the vision is impaired u can't judge the fine motor skills
- ❖ Psychological needs : ( affection, security, role model, play, independence)

## Developmental patterns

- ❖ The normal pattern for developing skills:
  - 1- **constant**, varies in rate between children, there's an average duration, it has to be achieved at this period otherwise it's a red flag Ex: not all children walk at the same age
  - 2- **longitudinally**: relating to each stage to what has gone before and what lies ahead
  - 3- A deficiency in any one skill area can have an impact on each area, each area is not isolated there is an interaction between different skills

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1- Normal development implies steady progress in all four developmental fields with acquisition of skills occurring before limit ages are reached

**In OSCE after asking about the domains ask:**

- Difficulty in pregnancy, labor or newborn period?
- Any hypoxic ischemic insults in first 2 years of life? (Eg. cord around neck or NICU admission)

# Child Development

## Developmental milestones

- ❖ **Median age** is the age when half of a standard population of children achieve that level; a guide to when stages of developmental are likely to be achieved .
- ❖ limit age ( **more imp**) is the age by which the developmental milestones should have been achieved. ( **if not then it's abnormal**)
- ❖ **limit ages** are usually two standard deviation (SD) from the mean , it's more useful as a guide than the median age
- ❖ Chronological age, physical growth (Including: weight , height and head circumference) and developmental skills usually progress together ( these 3 elements are very imp to assess the milestones and IQ )
- ❖ there are ranges over which new skills are acquired. developmental milestones are the important developmental stages
- ❖ If a child has been born preterm, this should be considered when assessing developmental age by calculating it from the expected date of delivery. Thus the anticipated developmental skills of a 9-month- old baby (chronological age) born 3 months early at 28 weeks' gestation are more like those of a 6-month- old baby (corrected age). Correction is not required after about 2 years of age.

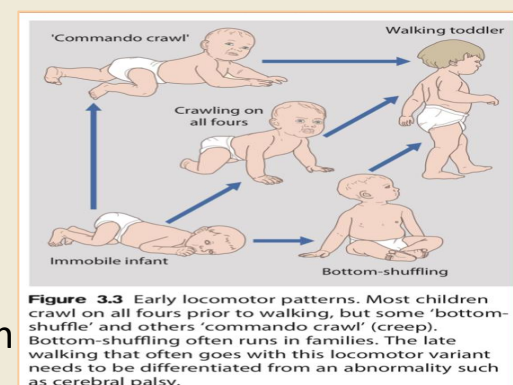
## Median vs red flag (limit) age

Developmental milestones of walking unsupported:

- the median age is 12 months and is a guide to the common pattern to expect, although the age range is wide
- the red flag age is 18 months (2SD from the mean) **here must investigate**
- many will be normal late walkers, but underlying problem such as cerebral palsy, a primary muscle disorder or global developmental delay should be ruled out.

## Variation in pattern of development

- ❖ there is some variation in the way skills are acquired in otherwise normal children; while most infants (83%) crawl, some bottom-shuffle and others become mobile with their abdomen on the floor, so-called commando crawling or creeping.
- ❖ The red flag age of 18 months for walking applies to children who crawled as their early mobility pattern. Children who bottom-shuffle tend to walk later than children who crawl.
- ❖ Overall, of children who bottom-shuffle, 50% will walk independently by 18 months and 97.5% by 27 months of age. Late-walkers



# Developmental assessment

## Developmental history

<p><b>Prenatal ( pregnancy) risk factors</b></p>	<ul style="list-style-type: none"> <li>● Maternal infections: Specific infections affect the mother and the fetus e.g. TORCH Infection: Toxoplasmosis, Rubella, CMV, Herpes virus ( will result in developmental delay , microcephaly, growth retardation , intellectual disability)</li> <li>● History of any febrile illness or skin rash during pregnancy</li> <li>● Antenatal screening test</li> <li>● Antenatal U/S (including Nuchal translucency, amount of amniotic fluid, and size of baby Amniotic fluid if oligohydramnios= can't urinate or polyhydramnios = can't swallow)</li> </ul>
<p><b>Perinatal factors (intrapartum)</b></p>	<ul style="list-style-type: none"> <li>● Perinatal fetal distress, Hypoxic Ischemic insult (ask about how many hours was the labour , aspiration of meconium , or PROM , if PROM present for more 18 - 24 h , take seriously and make sure the child is not infected )</li> <li>● APGAR score (the status of the fetus at birth) : ask the family هل تنفس بسرعه او تغير لونه لازرق او دخل للعناية المركزة</li> </ul> <p>If the baby cries immediately, breathes spontaneously and able to swallow feeding within the first 24 hour, it is a good indication of no hypoxic ischemic insult.</p>
<p><b>Postnatal development</b></p> <p>Most importantly to ask about weeks of gestation and birth weight specifically</p>	<ul style="list-style-type: none"> <li>● Duration of gestation and birth weight: Preterm babies have tendency to have periventricular hemorrhage, Small for gestational age; tend to have hypoglycemia. Thus more brain insults</li> <li>● Sucking or swallowing difficulties (needed NG Tube?)</li> <li>● Fever, lethargy, irritability, CNS infection</li> <li>● Major illnesses: A congenital heart disease, Congenital liver or renal failure.</li> </ul>
<p><b>Emotional and environmental deprivation</b></p>	<p>An environmental stimulation is very important for brain development + ask about sleep and diet</p>
<p><b>Family history</b></p>	<p>Similar problem or other developmental disabilities</p>

### Signs of hypoxic stress:

- Deceleration on CTG
- Change in colour of amniotic fluid (passed meconium)

# Developmental assessment

## Developmental pattern

- ❖ **Developmental delay:** Child is behind but will catch up eventually. **Disability:** Child is significantly delayed that even if they improve they will still be behind their peers esp. if they continue to have delay after 6y)
- ❖ **Accelerated development:** he is delayed but able to catch up
- ❖ **Developmental regression:** Loss of the previously acquired skills which might indicate neurodegenerative disorder. ( could be secondary to anything eg. medical problem, environmental factor, PTSD)
- ❖ When determining the developmental age in OSCE always give a range (eg. 6-12 month) not an exact age (eg 9 months).

## Developmental assessment is done at :

Newborn

6 weeks

4 months

6 months

1 year

18 months

2 years

by 2 years most of the brain has grown

Measure head circumference at the widest diameter of the head 3 times, then take average of readings.  
(imp for OSCE)



# Developmental assessment

## Physical examination

<b>Requirements of general P E</b>	<ul style="list-style-type: none"><li>○ Stethoscope for the heart and lungs</li><li>○ Patellar hammer for jerks</li><li>○ Non-stretch tape for skull circumference + head circumference chart (Plot reading in growth chart may come in OSCE)</li><li>○ Scales for weighing + weight and height chart</li> <li>○ Developmental assessment tools:<ul style="list-style-type: none"><li>■ To assess child's skills by play and facilitating observer assessment</li><li>■ It allows a quick screening of mobility, hand skills, play, speech and language.</li></ul></li> <li>○ One-inch block or cubes</li><li>○ Blunted end pencil or crayon and paper</li><li>○ Picture card or book</li><li>○ Bell for hearing assessment</li><li>○ A ball, doll.</li></ul>
<b>Abnormal appearance</b>	<ul style="list-style-type: none"><li>○ Dysmorphic features</li><li>○ Craniofacial and lip deformities</li></ul>
<b>Cardiovascular</b>	<ul style="list-style-type: none"><li>○ Congenital heart disease (don't forget to check the lecture from our team!)</li></ul>
<b>Skin</b>	<ul style="list-style-type: none"><li>○ Hyperpigmentation</li><li>○ Hypopigmentation</li></ul> <p>Skin and CNS are related to each other, so do not forget to examine the child for any unusual skin lesion</p> <p>Ex: cafe au lait spots</p>
<b>Growth parameters</b>	<ul style="list-style-type: none"><li>○ Head circumference (measure it 3 times and take the maximum) plotted on head circumference chart</li><li>○ The most important is maximum head circumference, because the size of the brain is reflected by the size of the skull imp in osce and mcqs</li></ul>
<b>Hip</b>	<p>Subluxation or dislocation of the hip leads to abnormal gait. wobbling gait, a treatable condition</p>

# Developmental assessment

Assessing if development is normal in all four domains

## Gross motor development (median ages)

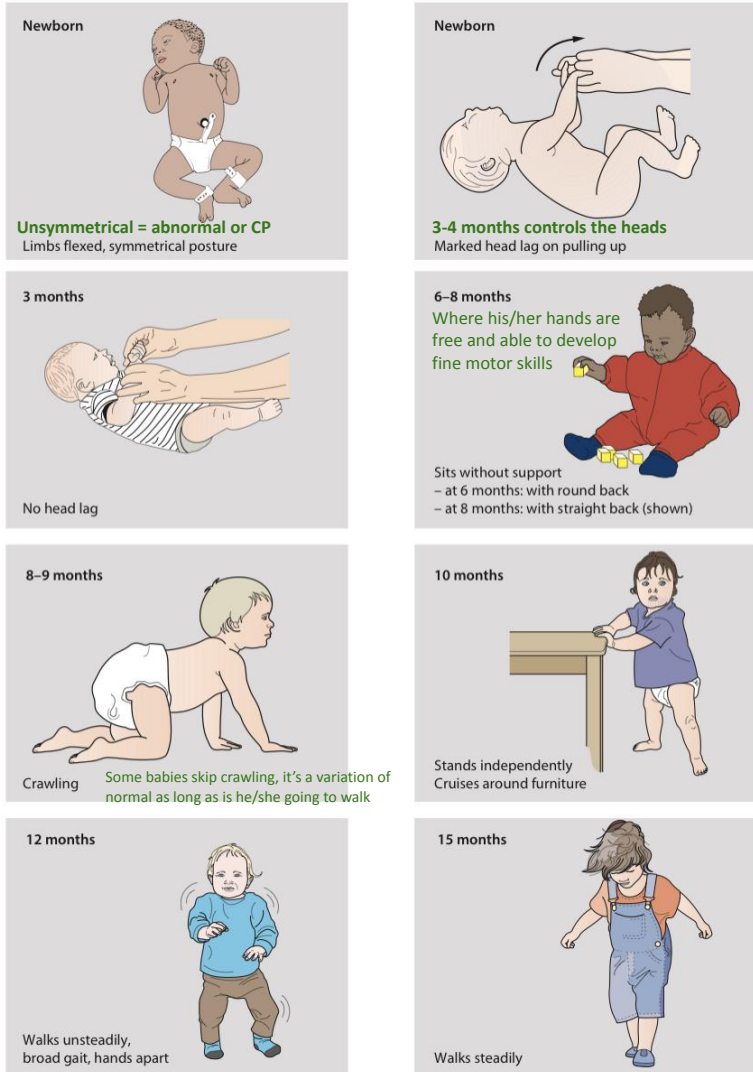


Figure 3.5 Gross motor development (median ages).

## Vision and fine motor (median ages)

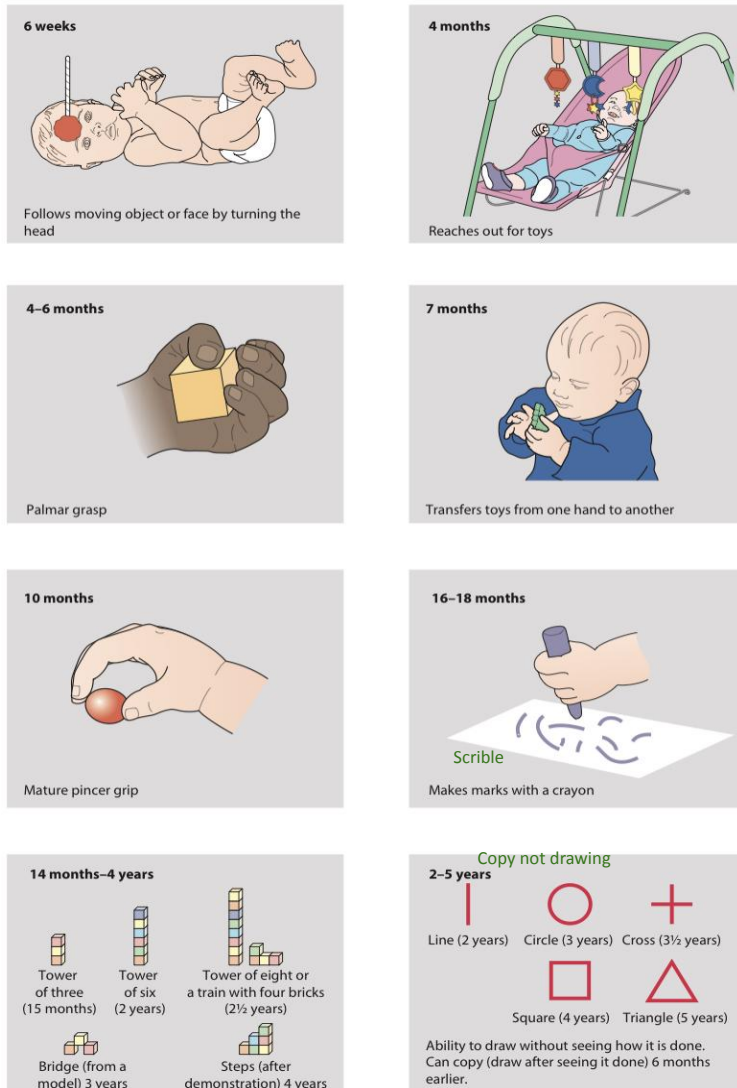


Figure 3.6 Vision and fine motor skills (median ages).

## Hearing, speech and language (median ages)

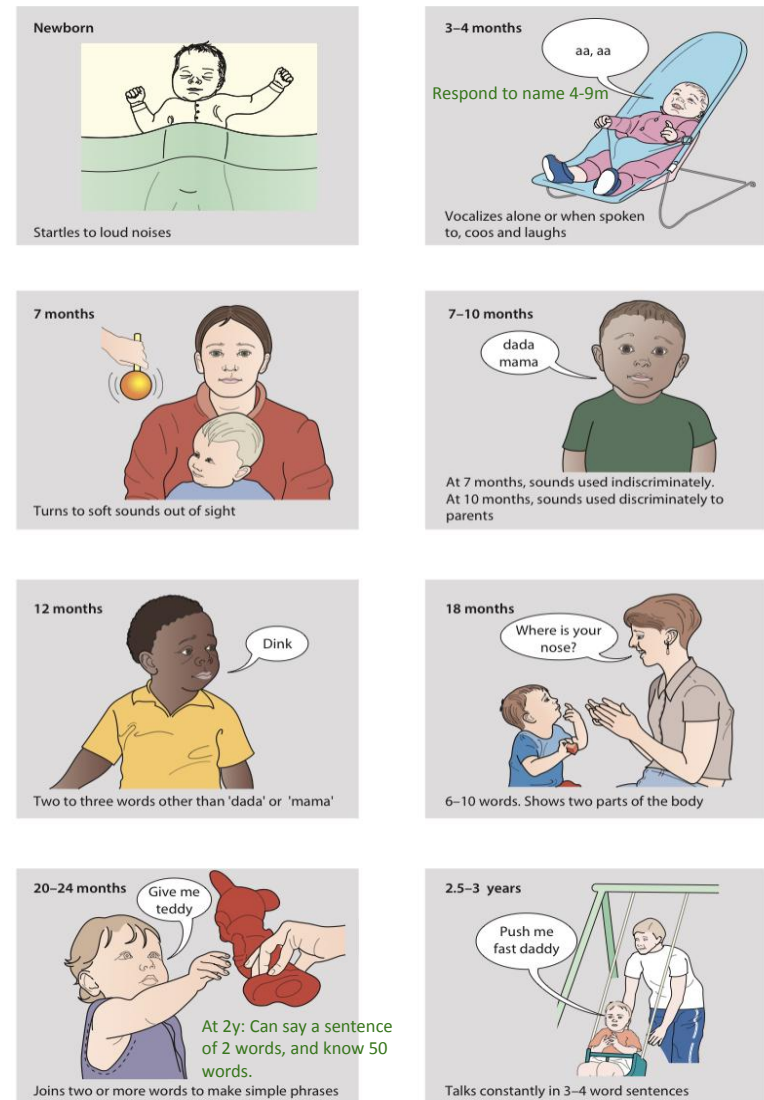


Figure 3.7 Hearing, speech and language (median ages).

## Social, emotional and behavioural development (median ages)



Figure 3.8 Social, emotional and behavioural development (median ages).

# Developmental assessment

## Summary

### Development domains with red flag ages

**Gross motor development**

- Acquisition of tone and head control
- Primitive reflexes disappear
- Sitting
- Locomotor patterns
- Standing, walking, running
- Hopping, jumping, peddling

Gross motor	Red flag ages
Head control Sits unsupported Stands with support Walks independently	4 months 9 months 12 months 18 months

**Vision and fine motor development**

- Visual alertness, fixing and following
- Grasp reflex, hand regard
- Voluntary grasping, pincer, points
- Handles objects with both hands, transfers from hand to hand
- Writing, cutting, dressing

Vision and fine motor	Red flag ages
Fixes and follows visually Reaches for objects Transfers Pincer grip	3 months 6 months 9 months 12 months

**Hearing, speech and language development**

- Sound recognition, vocalization
- Babbling
- Single words, understands simple requests
- Joining words, phrases
- Simple and complex conversation

Hearing, speech and language	Red flag ages
Polysyllabic babble Consonant babble Saying 6 words with meaning Joins words 3-word sentences	7 months 10 months 18 months 2 years 2.5 years

**Social, emotional, behaviour development**

- Smiling, socially responsive
- Separation anxiety
- Self-help skills, feeding, dressing, toileting
- Peer group relationships
- Symbolic play
- Social/communication behaviour

Social behaviour	Red flag ages
Smiles Fear of strangers Feeds self/spoon Symbolic play Interactive play	8 weeks 10 months 18 months 2–2.5 years 3–3.5 years

Figure 3.9 Development domains with red flag ages.

## Summary

Table 3.1 Developmental milestones by median age

Age	Gross motor	Vision and fine motor	Hearing, speech, and language	Social, emotional, and behavioural
Newborn	Flexed posture	Follows face or light by 2 weeks	Stills to voice Startles to loud noise	Smiles by 6 weeks
7 months	Sits without support	Transfers objects from hand to hand	Turns to voice Polysyllabic babble	Finger feeds Fears strangers
1 year	Walks independently	Pincer grip (10 mo) Points	2–3 words Understands name	Drinks from cup Waves
15–18 months	Walks independently and steadily	Immature grip of pencil Random scribble	6–10 words Points to two body parts	Feeds self with spoon Beginning to help with dressing
2½ years	Runs and jumps	Draws	3-word to 4-word sentences Understands two joined commands	Parallel play Clean and dry

There is rapid progression of language after 18 months:

- 18 months → 6-10 words
  - 24 months → 50 words (and 2 word sentences)
- General easy to remember points regarding language:
- 2 years:
    - 2 word sentences
    - Follows 1-2 step commands
  - 3 years
    - 3 word sentences
    - Follows 3 step commands

# Developmental assessment

## Newborn

- On Prone position: the pelvis is high, knees are under the abdomen. (neutral flexed position. If extended may indicate hypotonia)
- On ventral suspension the head is not in the plane of the body (don't do this baby may fall)
- The hips are not extended
- If you extend the legs, they will come back. Why this position/posture? Intrauterine position
- He loses it after 6 weeks of birth.

## 6 weeks

- When prone, the pelvis is flat and the legs are stretched, briefly raises head (for few seconds).
- On ventral suspension, the head is held up momentarily in the same plane of the body
- Supine: there is a head lag when pulled into sitting position, still no head control on pulling to sitting position (still not 100% head control, but minimal)
- Vision: able to follow up to 90 degrees with a moving objects. (may come as MCQ)
- Social: Smiling (6-8 weeks) a social smile; returning the smile when smiled at. Newborns can smile but not socially (random smile, not in response)

## 4 months Complete head control at 3-4 months

### Gross Motor:

- In the sitting position there is no head lag on pulling to sitting position

### Fine Motor:

- Reach out for gross objects and brings them to the mouth (now has good trunk support so the baby can use fine motor skills)

### Language:

- Turns head towards sounds (not Answering to name specifically)

### Adaptive:

- They laugh with sound

### Losing the primitive reflexes.

- They are replaced by postural reflexes, which is essential for independent sitting and walking.
- Continuation of primitive reflexes indicates a previous hypoxic ischemic encephalopathy (HIE)

**Primitive reflexes:** (Doctor recommended you watch youtube videos of these reflexes to understand)

- Moro reflex: Sudden extension of the head causes symmetrical extension then flexion of the arms, disappears by 4 months.

- Grasp reflex: Flexion of fingers when an object is placed in the palm

- Rooting reflex: Head turns to stimulus when touched near the mouth

- Stepping response: Stepping movements when held vertically and dorsum of feet touch a surface

- Asymmetrical tonic neck reflex: When lying supine and turn the head to one side, the infant adopts an outstretched arm to the side to which the head is turned.

Sucking reflex – child sucks when nipple/teat placed in their mouth (automatic feeding action)

- Absence may suggest CNS abnormality

- Persistence after 4-6 months may indicate abnormality (cerebral palsy, HIE) (may come as MCQ)

- Asymmetry suggests focal motor lesions (e.g.brachial plexus injury)

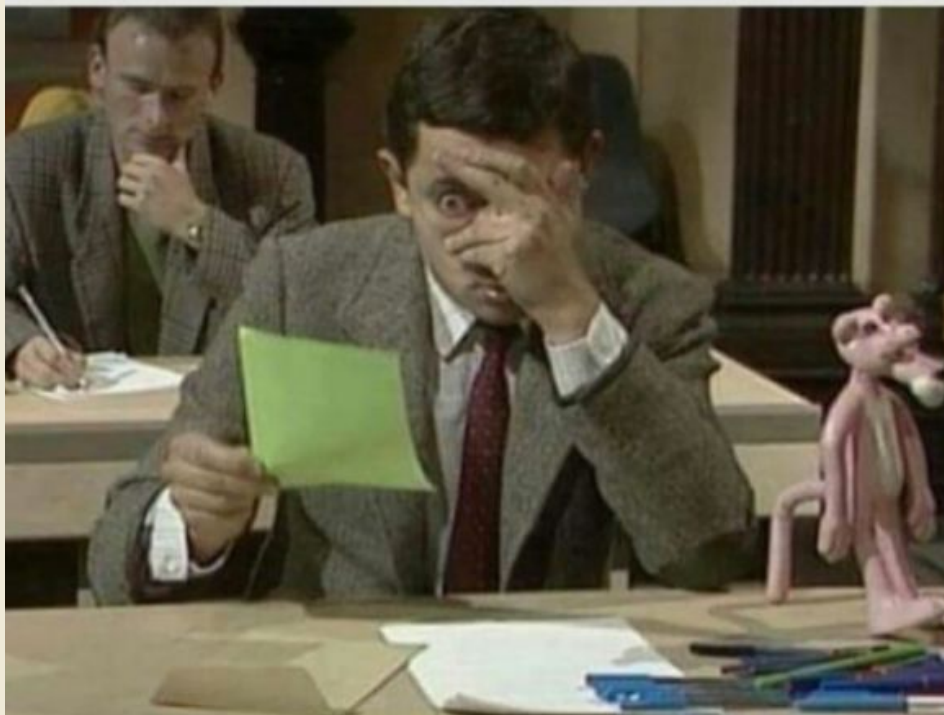
# Developmental assessment

## 6 months

- **Gross motor:**
  - Tripod sit, can't sit independently \*Tripod sit: leaning on hands forward for support with their backs rounded
  - Rolls from prone to supine position (4-6 months)
- **Fine motor skills:** ○ Transfer one cube, object from one hand to another.
- **Language:** babbles
- **Hearing test at 6-7 months:** Put the infant in the mother's lap and distract him, then make a sound if turns his head toward the sound, it's positive (not accurate, better to send for audiology screening)
- **Stranger Anxiety** (recognises unfamiliar people)

## 9-10 months

- **Gross motor:**
  - Sits up independent with back straight
  - Pulls to standing position
  - Crawl
- **Fine Motor:** (9-12 months)
  - Index finger approach (mature pincer grip)
- **Early language:**
  - 1 word: Repetitive consensus sounds (mama and baba) with no meaning
  - made of a consonant and a vowel
  - Responds to "no" (has to learn it from environment first )
- **Socially:** (gestures)
  - Start to interact
  - Play peek-a-boo
  - Pat a table (bange the table to make sounds)
  - Wave bye bye
  - Reach to be picked up



# Developmental assessment

## 12 months

- **Gross Motor:**

- Walks on hands and feet like a bear
- Pull himself to stand from sitting position
- Walk with one hand held
- Cruising → walks 2-3 steps around furniture

- **Language:**

- Two to three words with meaning, no sentences yet.
- Able to recognize the names of siblings or some objects
- Follows 1-step command (first with pointing and gestures then without )
- Uses facial expression, sounds and actions to make needs known

- **Social:**

- Responds to own name (9-12 months)
- separation anxiety

- **Adaptive:**

- Releases objects or cubes to another person at request
- Releases ball with throw

## 18 months

- **Gross Motor:**

- Runs but stiffly
- Walks up stairs with one hand held MCQ
- Walks forward

- **Fine Motor:**

- Stack 3 cubes over each other MCQ
- Scribbling MCQ
- Imitate vertical stroke only

- **Language**

- Names familiar pictures
- Points to three body parts on request, either on self or on a teddy bear
- Follows simple commands

- **Adaptive:**

- Shows affection towards others
- Starts to eat with spoon

# Developmental assessment

## 24 month

- **Gross Motor:**

- Runs well
- Walks up and down the stairs, one step at a time
- Kicks ball (important in osce )

- **Fine Motor:** (depends on environmental exposure)

- Stacks a tower of 6 cubes imp
- Draws vertical and circular stroke imp
- Holds spoon very well

- **Language:**

- 3 words phrases, subject, verb and object
- Uses "I, me, you" (e.g. I want water)
- Understand routine 2-step commands

- **Adaptive:**

- Parallel play (playing alone but watching others play and copying them. Not engaging yet )
- Helps to dress/undress
- Listens to stories

## 36 months

- **Gross Motor:**

- Rides tricycle
- Stands on one foot briefly

- **Fine Motor:**

- Copies a circle imp
- Turns one page at a time
- Puts on shoes
- Dress/undress fully except for buttons

- **Language**

- 3 or more words into a sentence
- Recognizes colors, plurals
- Counts to 10 (counts and understands quantity)

- **Adaptive**

- Knows gender and age
- Plays make-believe cooperative play

## 48 months

- **Gross Motor:**

- Hops on one foot

- **Fine Motor:**

- Uses scissors
- Buttons clothes

- **Language:**

- 100% intelligible! (good pronunciation)
- Uses past tense
- Understands 3-part directions

- **Adaptive:**

- Fully toilet-trained by day differ from environment to another , but in development you need to detect red flags ex ; 2 years old not talking , no waiting , you have to do hearing and language.
- Tries to comfort someone who is upset

# Developmental evaluation

## ❖ Factors affect developmental evaluation:

1- Prematurity: consider corrected age for developmental evaluation not chronological age. e.g. the anticipated developmental skills of a 12-month-old baby (chronological age) born 3 months early at 28 weeks gestation are more like those of a 9-month-old baby (corrected age).

2- Familial factors:

- Some kids talk earlier or later
- Siblings with similar problems

3- Spectrum of normal range

4- Environmental Factors: lack of environmental stimulation, screen time

5- Sensory Input: R/O vision and hearing pathology

### Dr notes

- The 4 domains of development are the most important part of this lecture
- The MCQs may include 2-4 questions from this lecture
- The OSCE station for this lecture will most likely include either head circumference or developmental evaluation
- No babies in OSCE
- If you ask the mother questions in the exam and she says no MOVE ON don't waste your time  
(won't bring complicated past history for undergrad) but make sure to ask the main questions.
- In OSCE most cases brought are 18, 24, 36 and 48 months.
- Always mention sleep and diet , don't miss it in clerking

When you read a whole page  
but then realize you forgot to  
understand.





## EXTRA!

The percentage of children who take their first steps unsupported is:

25% by 11 months

50% by 12 months

75% by 13 months

90% by 15 months

97,5% by 18 months

- Any child who is not walking by age of 18 months must be assessed and examined for an underlying cause. - Postural reflexes appear at 4 to 12 months:

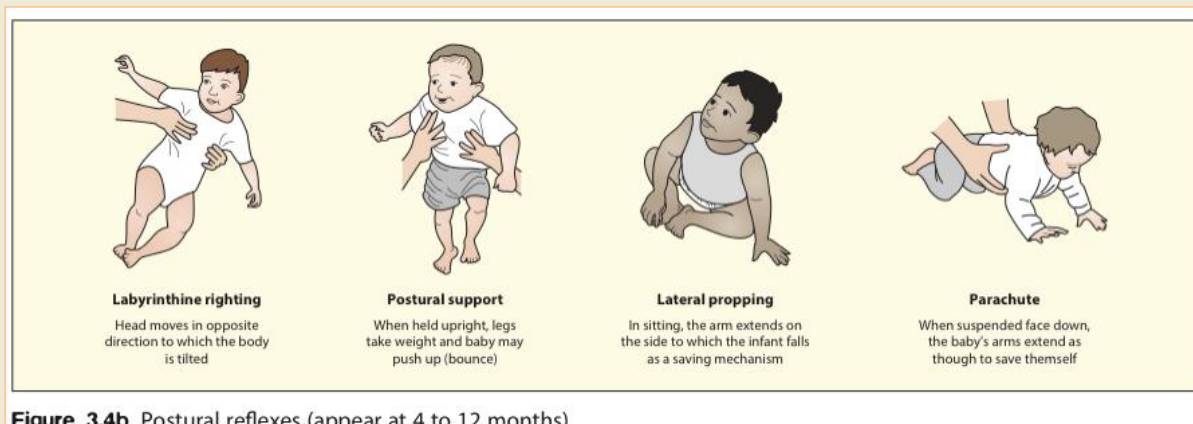


Figure 3.4b Postural reflexes (appear at 4 to 12 months)

- Normal development implies steady progress in all four developmental domains with acquisition of skills occurring before red flag ages are reached.

- At different ages, different developmental domains are dominant and this helps guide initial developmental questioning. Thus, for a child aged:

Less than 18 months	Gross motor abilities, acquisition of vision and hearing skills then hand skills
18 months to 2,5 years	Speech and language, fine motor skills with only brief questioning about gross motor skills
2,5 to 4 years	Speech and language, social, emotional and behavioral development

- Development screening, Ages and Stages Questionnaire (start at age of 4 months and ending at 60 months)

- IQ tests can be compromised by cerebral palsy

- By 25-26 weeks gestation, a fetus responds to noises and voice

- At birth, a baby startles to loud sounds

- There two tests for hearing: Automated otoacoustic emission (AOAE) and Automated Auditory Brain Response (AABR).

- AOAE must be offered before a baby leaves the hospital and if abnormal, we perform AABR

# EXTRA!

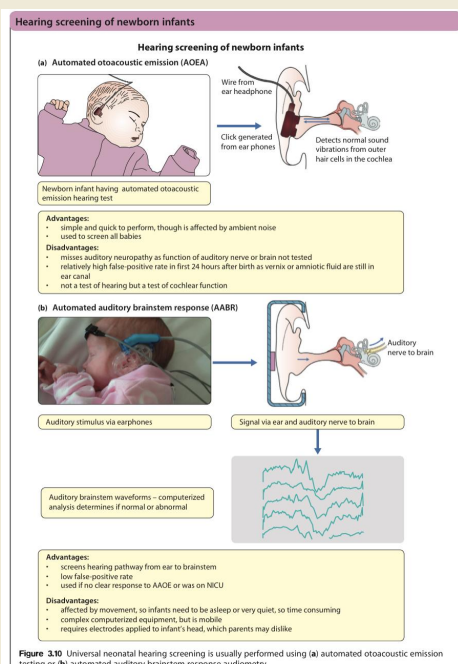
- All newborn infants must have their hearing screened
- Screening of visual acuity (VA) and squint occurs at school entry
- In the school years, the evidence of developmental progression is predominantly cognitive and the development of abstract thinking, although there is also further maturation of early developmental and social skills.

-Median age vs Red flag age:

Median age	Red flag age
It's the age when half of children achieve that skills : it serves as a guide to when stages of development are likely to be reached but it doesn't tell us if the child's skills are outside the normal range	It is the age by which a developmental milestone should have been achieved. It is more useful than median age  Failure to meet a red flag age is a prompt for more detailed assessment to determine if investigation or intervention is required

## Risk factors for hearing loss:

- 1- Family history of hereditary hearing loss
- 2- Genetic syndromes with hearing loss, e.g. Down syndrome
- 3- Craniofacial anomalies of ear (including cleft lip and palate)
- 4- Admission to NICU ( >48 h). Why? may have experienced mechanical ventilation, severe hyperbilirubinemia, ototoxic drugs, e.g. **gentamicin**, hypoxic-ischaemic encephalopathy, complications of prematurity. Those babies should have both AOAEE & AABR!!!
- 5- Congenital infection, e.g. CMV (cytomegalovirus), rubella.
- 6- Bacterial meningitis



## When to refer to audiology?

- Abnormal AABR
- Having a risk factor for hearing loss (look above)
- If any parenteral or professional concern about hearing
- Speech and language delay
- After significant head injury or skull fracture particularly basal skull fracture
- Following bacterial meningitis (URGENT REFERRAL)
- Genetic syndrome associated with hearing loss
- Congenital infection, particularly congenital CMV

## EXTRA!

- Newborn visual acuity at birth is poor because fovea is immature and the optic nerve is unmyelinated. It improves to normal adult level by about 5 years of age
- By 6 weeks, babies may have transient squint

### Vision screening indications:

- Birth: for structure of the eye and red reflex (cataract impede a red reflex)
- 6-8 weeks: check red reflex for cataract; fixing and following
- Preschool vision screening by orthoptist: checks visual acuity and eye alignment

Age	Test
Birth	Aware of light Fixes on a face and begins to follow horizontally contrasting black and white patterned image or dangling coloured ball
6–8 weeks	Face fixation and follows objects to either side
6 months	Fixates on 2.5-cm brick Visually directed reach Responds to preferential looking tests of acuity (e.g. Keeler or Teller cards)
12 months	Fixates 1-mm objects e.g. 'hundreds-and-thousands' cake sprinkle
1–2 years	Preferential looking tests of acuity (e.g. Cardiff cards)
2–3 years	Names or matches pictures in linear array (e.g. Kay pictures or Lea symbols). Distant and near
3 years +	Names or matches letters (e.g. Sonksen logMAR, or logMAR crowded). Distant and near

*Note:* single letters/pictures should not be used as they overestimate acuity and will miss significant interocular differences (i.e. miss amblyopia). At all ages: observe the child's eyes. Is eye contact established? What is the child looking at? How does the child respond to what is apparently seen?

# Questions

1- Steven has just had his first birthday party. During his party he commando crawled with great speed, although he cannot walk. He managed to pick off all the Smarties (round chocolate sweets) from his birthday cake. He can say two words with meaning. After his birthday party, he impressed his guests by waving goodbye.

**Which area of Steven's development is delayed?**

- A. Fine motor and vision
- B. Gross motor
- C. Social, emotional and behavioural development
- D. Speech and hearing
- E. None – his development is within normal limits

2- Gerald is a 16-month-old boy who has not yet said his first word and does not babble much. His mother believes he does not hear well because he does not startle when a door slams or show any response to his name. His development is otherwise normal.

**Which test would be best to assess Gerald's hearing?**

- A. Auditory brainstem response audiometry
- B. Distraction hearing test
- C. Otoacoustic emission
- D. Speech discrimination testing
- E. Visual reinforcement audiometry

3- Evie is a 10-day-old infant and was born in London. Her health visitor reviews the family at home. She is feeding well and has a normal examination except that she has a squint. The health visitor tells her parents that she will keep this under review.

**At what age does Evie need to be referred for further review if the squint is still present?**

- A. 2 weeks
- B. 6 weeks
- C. 12 weeks
- D. 8 months
- E. 12 months

4- Sophie is a well 8-week-old baby who was born at term. She has come for a routine developmental check.

**Which of the following would you NOT expect her to be able to do?**

- A. Auditory brainstem response audiometry
- B. Fix and follow a toy
- C. Quieten to a loud noise
- D. Raise her head when lying prone
- E. Reach out and grasp an object

5- 1- Joanna is an active toddler. She is just being potty trained and has had several days where she has remained dry. She enjoys pulling her clothes off to use the potty but can't dress herself again. She enjoys playing by pretending to make her mother a cup of tea but does not play well with her older siblings, as she has not yet learnt how to take turns. She is very bossy and demands things by saying 'give me' or 'me drink'. She can build a tower of six blocks and enjoys running and climbing on furniture.

**What developmental age is Joanna?**

- A. 12 months
- B. 18 months
- C. 24 months
- D. 2.5 years
- E. 3 years

# Answers

**1- E. None – his development is within normal limits**  
**He has achieved normal milestones for a 12-month-old.**

**2- E. Visual reinforcement audiometry**

**This is the most reliable test for a child of Gerald's age. The test requires an assistant to play with the child and keep his attention. Behind a soundproof window, another assistant will play sounds through a loudspeaker at particular frequencies. When the child turns around to the noise, a glass-fronted box with a previously dark toy inside lights up as visual reinforcement to reward the child for turning around.**

**3- C. 12 weeks**

**Newborns may appear to squint when looking at nearby objects because their eyes over-converge. By 6 weeks of age, the eyes should move together when following an object, and by 12 weeks of age there should be no squint present.**

**4- E. Reach out and grasp an object**

**An 8 week old infant will not be able to voluntarily reach out to grasp an object; she will only be able to grasp what is placed in her hand.**

**5- C. 24 months**

**Joanna is dry by day, can undress, and has symbolic play. She is not yet playing interactively; she will learn this at about 3 years of age. She is constructing two word sentences. She constructs a tower of six blocks and can run. In assessing development, find the most advanced skill that cannot be performed.**