CHAPTER 2

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Child development and developmental problems

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LEARNING OUTCOMES

By the end of this chapter you should:

- Understand prenatal brain development
- Know the factors influencing a child's development
- Understand the process of normal development
- Know how to assess development in a child under 5 years of age
- Know the common patterns of developmental abnormality.

You should also take this opportunity to ensure that:

- You are able to perform a developmental assessment on a child under the age of 5 years
- You know how to perform basic assessment of hearing and vision
- You can recognize common patterns of developmental delay
- You know when to refer on for detailed developmental assessment.

Introduction

A knowledge of child development is integral to all of our work as paediatricians. It influences how we interact with our patients and how we manage their medical conditions. In addition, we need to be able to assess and diagnose developmental problems.

Basic science: the development of the nervous system

Prenatal development is an important factor in postnatal developmental issues. The developing brain is vulnerable to a range of influences.

BOX 2.1 Development of the nervous system

16 days	Neural plate forms from ectoderm
18 days	Neural groove
22 days	Neural tube
27 days	Neural tube closed, brain and spinal cord differentiation begins
4 weeks	Triencephalon: three-vesicle stage of brain development
6 weeks	Five-vesicle stage, with differentiation of cerebral hemispheres
From 4–9 months	Histogenesis, cell differentiation into neurons and supporting cells
	Cell proliferation and neuronal migration
Near term	Myelination

Prenatal brain development (Box 2.1)

1st trimester

Differentiation of the nervous system starts with the development of the neural plate from the ectoderm, 16 days after conception. This plate, which stretches along the entire back of the embryo, lengthens and starts folding up, forming a groove at around 18 days. The neural groove then begins fusing shut into a tube at around 22 days post-conception. By 27 days, the neural tube is fully closed and has begun its transformation into the brain (cephalic portion) and spinal cord (caudal portion). Neural crests give rise to the peripheral nervous system. The brain undergoes further differentiation, but the spinal cord retains the tubular structure.

Defects in formation of the neural tube lead to major brain or spinal cord defects, often lethal. Incomplete closure (dysraphism), occurring in the first 3–4 weeks of gestation, may give rise to anencephaly, encephaloceles or spina bifida (Ch. 28). At 4 weeks the brain structures are differentiated into three vesicles: forebrain, midbrain and hindbrain. From 4 to 6 weeks further development of the forebrain takes place, with differentiation of the cerebral hemispheres. The next stage in brain development is histogenesis, with cells differentiating into neurons or glial cells. Neuronal proliferation begins at 2 months of gestation.

Neurological activity in the fetus is manifest by 6 weeks' gestation, with spontaneous arching of the body. Reflex limb movements follow at 8 weeks, with more complex coordinated movements by 10 weeks (hiccuping, yawning, thumb sucking).

Table 2.1 Malformations and timings

Stage	Normal development	Failure
Stage 1 (weeks 3–4)	Formation and closure of spinal cord	Anencephaly Encephalocele Chiari malformation Spina bifida
Stage 2 (weeks 5–10)	Formation of brain segments	Holoprosencephaly Corpus callosum agenesis Dandy–Walker syndrome
Stage 3 (2–5 months)	Neuronal migration and cellular differentiation	Heterotopias Polymicrogyria Agyria-pachygyria Lissencephaly
Stage 4 (5–15 months)	Myelination	Developmental delay Dysmyelinating disease

2nd trimester

Neuronal proliferation continues. Neuronal migration spans a period between 4 and 9 months of gestation. Disorders in neuronal proliferation, migration and maturation result in a variety of brain malformations (Ch. 28). These include lissencephaly, schizencephaly and agenesis of the corpus callosum. These are generally associated with psychomotor delay and seizures. Microcephaly (p. 253) may be a manifestation of abnormal neuronal proliferation or migration.

The second trimester marks the onset of more neurological activity in the form of critical reflexes: continuous breathing movements and coordinated sucking and swallowing reflexes. These abilities are controlled by the brainstem. The brainstem is largely mature by the end of the second trimester, which is when babies first become able to survive outside the womb. The grasp reflex is evident by 17 weeks, with the Moro reflex seen from 25 weeks.

3rd trimester

By the 6th month, nearly all the neurons needed for life are present. Last to mature is the cerebral cortex. Myelination begins near term.

In the last trimester, fetuses are capable of simple forms of learning, like habituating (decreasing their startle response) to a repeated auditory stimulus, such as a loud clap just outside the mother's abdomen.

Brain malformations may result from exogenous and endogenous causes (Table 2.1). Exogenous causes may be nutritional, radiological, viral, chemical, medications or ischaemic. Endogenous causes are genetic.

Postnatal brain development

The nervous system continues to undergo further development and maturation for some time after

birth. By birth, only the lower portions of the nervous system (the spinal cord and brainstem) are very well developed, whereas the higher regions (the limbic system and cerebral cortex) are still rather primitive. Although all of the neurons in the cortex are produced before birth, they are poorly connected. In contrast to the brainstem and spinal cord, the cerebral cortex produces most of its synaptic connections after birth. Synapses are formed at a very rapid rate during the early months of life, achieving maximum density between 6 and 12 months after birth. The infant's brain forms and retains synapses that are frequently used. Synapses decrease due to disuse or natural attrition (apoptosis). Early experiences are thus vital to the formation and retention of synapses. By 2 years of age, a child's cerebral cortex contains well over 100 trillion synapses.

Myelination continues throughout childhood and possibly onwards in adulthood. The timing of myelination depends on the area of the brain in question.

Factors influencing development

There are many influences on a child's development (Box 2.2). These influences interact to produce the picture we see in the child. Genes and environment interact at every step of brain development. Generally speaking, genes are responsible for:

- The basic wiring plan
- Forming neurons and connections between different brain regions.

BOX 2.2 Factors influencing development

Prenatal

- Toxins: infections, drugs, alcohol
- Ischaemia
- Nutrition
- Genetic: chromosomal disorders, single gene defects

Pre- or postnatal?

- Parental IQ: IQ may be partially genetically determined, but parental IQ may also influence parenting

Postnatal

- Social environment
- Personality
- Emotional factors: interaction with caregivers
- Cultural factors
- Nutrition
- Parenting
- Physical health

Experience is responsible for fine-tuning those connections. It is usually not possible to separate out the most significant influences on an individual's development: the 'nature versus nurture' debate.

Normal development

Normal development follows a recognized sequence in most children. Children have to acquire certain skills before being able to move on to the next skill (for example, the development of head control is a prerequisite for sitting). Previous mass observations of children have given us the typical sequence of acquiring developmental skills, as well as the range of expected ages for key developmental skills (known as 'milestones'). It is on these that we base our decisions about whether a child is developing normally. There are, of course, significant variations within the 'normal' range.

During your career, you will build up your own personal knowledge of normal development from interacting with hundreds of children. Nothing can replace this experience, but before you have built up this memory bank, you will need a foundation from which to start. Tables of developmental milestones can provide some guidance on expected developmental skills at certain ages. It is never possible to provide an exhaustive list of milestones. You must also be aware that suggested ages for certain skills may vary between authors. As you gain experience, you will get a feel for what is usual at each age. Nevertheless, it is helpful to learn some key milestones, as well as the normal sequence of skill development, which is perhaps more important.

Typically developing children may show slight variations in their skill levels in different areas of development. For example, they may be slightly more advanced in their gross motor skills and relatively less advanced in their speech and language skills, or vice versa.

Categories of development

Developmental skills can be grouped into the following four categories. These categories are not mutually exclusive, and some skills may span categories:

- *Fine motor and vision*: hand skills, including drawing, puzzles
- *Speech, language and hearing*: communication skills, including receptive and expressive language, and non-verbal communication
- *Gross motor*: large movements, including sitting, walking, running, going upstairs
- *Social behaviour and play*: including feeding, toileting, dressing and social relationships.

Fine motor and vision

A child's visual abilities are developing and changing along with other areas of development. Visual skills are closely linked to fine motor skills. During the first year of life, babies progress from only being able to focus on objects very close by, to rapidly developing distance vision. From a few months of age, visual abilities are being integrated with hand skills in reaching for objects. Subsequently infants develop the ability to focus on rapidly moving objects and to judge distances. Between 1 and 2, children will develop their visual interest in simple pictures, in addition to recognizing real objects. Refinement of hand skills continues, with development in grasp and control. Children often do not have a clear hand preference until around 3 years of age, with 90% demonstrating a clear preference by age 4.

Speech, language and hearing

Prelingual (1st year)

Babies in their first year are learning about communication, and have a variety of communication strategies before they develop language. From very early in life, babies will mimic the facial expressions of adults. Conversational exchanges occur, with babies learning about turn-taking in reciprocal vocalization. Vocalizations are shaped by the language babies hear. Humans have an inherent capacity to learn any language, but our speech sound system is shaped during the first year of life. Vocalizations start as open vowel sounds. Next comes double-syllable babble. Vocalizations become more expressive, varying in pitch and volume. Social communication is an important aspect. Babies use eye contact and facial expressions as part of their communication. Receptive language develops in advance of expressive language. Babies learn to recognize their own name. They develop situational awareness (e.g. when their coat is put on, they become excited about going out) before understanding single words in context. An understanding of an object's use (definition by use) develops prior to understanding object names.

Early lingual (1–2 years)

Receptive language or comprehension of single words begins in this phase. Initially a child can point to named familiar objects. This might include pointing to named body parts on themselves. The ability to recognize those same objects in photographs or pictures develops later.

Expressive language may start as sound labels (for example, 'mmm' at mealtimes, or animal noises). Single words come next. Single words may be used for a variety of purposes: to comment or label or to request. Next comes the ability to join two words together to create novel phrases (e.g. 'mummy car'). Common phrases do not count as joining words together (e.g. 'all fall down').

Non-verbal communication is an important part of this stage of development. Children will use gestures to communicate, particularly pointing to request or to show objects of interest.

Gross motor

Gross motor development proceeds in a cephalo-caudal direction. Typically developing children will all proceed along the same sequence of skill acquisition. Head, neck and trunk control is a vital prerequisite for sitting. Walking is usually achieved by moving through prone into four-point kneeling and then crawling. These actions develop prior to standing and walking. However, some children show a disordered pattern of motor development, which can be considered a normal variant. These are children who bottom-shuffle. They typically prefer the sitting to the prone position. They eventually get up and walk, but often have not crawled.

Social behaviour and play

Paediatricians are often very aware of the different stages of social behaviour in infants and children, from the skilful interactions required when trying to examine children of different ages.

The development of self-help skills, such as dressing and feeding, is likely to be influenced by experience and opportunity.

Developmental milestones

Centiles can be used to define the range of normal for each milestone, in a similar way to those used for growth or puberty. Often the median age or 50th centile is quoted (as here), which is the age by which 50% of children have achieved the skill in question. Sometimes it can be more useful to know the 95th centile (e.g. 18 months for walking), since if a skill has not been achieved by this age, it is very likely to be of concern. Below is a list of milestones, but this is by no means exhaustive and is intended as a guide only. You can find lists in many texts, often with slight variations in the age quoted.

Fine motor and vision

- Watches own hands in finger play — 3 months
- Fixes and follows object through 90 degrees laterally — 3 months

- Grasps objects 4 months
- Passes toy from one hand to the other 6 months
- Inferior pincer grasp 9 months
- Looks for falling toys 9 months
- Bangs bricks together in imitation 12 months
- Refined pincer grasp 12 months
- Builds tower of two bricks 15 months
- Builds tower of three bricks 18 months
- To and fro scribble on paper 18 months
- Builds tower of six or seven bricks 2 years
- Circular scribble 2 years
- Copies vertical line and circle 3 years
- Builds tower of nine bricks 3 years
- Copies three-brick bridge 3½ years
- Copies cross 4 years
- Draws a person with head, body and legs 4 years
- Builds six-brick steps 4 years
- Copies square 4½ years

Speech, language and hearing

- Vocalizes when spoken to 3 months
- Babbles in repetitive strings of double-syllable babble 9 months
- Knows and turns to own name 12 months
- Uses 2–6 recognizable words 15 months
- Points to familiar objects when requested 15 months
- Joins two words together 2 years
- Understands commands with two key words 2 years
- Vocabulary of 200 words 2½ years
- Understands commands with three key words 3 years
- Talks in short sentences 3 years
- Asks 'what?' and 'who?' questions 3 years
- Able to tell long stories 4 years
- Asks 'why?', 'when?' and 'how?' questions 4 years
- Counts up to 20 by rote 4 years

Gross motor

- Lifts head and chest up, supporting self on forearms in prone 3 months
- Little or no head lag on pull-to-sit 3 months
- Rolls front to back (and usually back to front) 6 months
- Sits independently 8 months
- Crawls 10 months
- Walks independently 13 months
- Squats to pick up object 18 months
- Runs 2 years
- Walks upstairs holding on, two feet to a step 2 years
- Jumps with two feet together 2½ years
- Kicks a ball 2½ years
- Stands on one foot momentarily 3 years
- Walks upstairs adult fashion (one foot to a step) 3 years
- Pedals tricycle 3 years
- Hops 4 years

Social behaviour and play

- Smiles 6 weeks
- Responds with pleasure to friendly handling 3 months
- Stranger awareness 9 months
- Enjoys peek-a-boo 9 months
- Helps with dressing 12 months
- Waves bye-bye 12 months
- Takes off socks, hat 18 months
- Spoon-feeds self 18 months
- Plays alongside other children 2 years
- Eats with fork and spoon 3 years
- Helps adult around house 3 years
- Joins in make-believe play with peers 3 years
- Can dress and undress, except for laces 4 years

Developmental assessment

Developmental assessment is a vital skill for any paediatrician. When conducting a developmental assessment, you are aiming to answer several questions:

- Is the child's development normal for his or her age?
- If not, in which ways and to what degree is it abnormal?
- What is the diagnosis?
- What might be the cause(s)?
- What needs to be done?

Screening assessment

In many situations you might be seeking to answer only the first of these questions. This would be the case, for instance, if a developmental assessment were being conducted as part of child health surveillance. For this purpose, you would present the child with a number of tasks that you would expect him or her to be able to do at that age, and see whether he or she could achieve them. You would not be seeking to find out exactly what the child is able to do in each developmental area, but simply establishing whether he or she can perform a set range of age-appropriate tasks. If the

child does not demonstrate the age-appropriate skills, you would refer him or her on for further evaluation. The Denver developmental screening test is an example of a structured assessment tool developed for the identification of children with developmental problems. It is not intended as a detailed diagnostic developmental assessment.

Detailed assessment

The aim of a detailed developmental assessment is to discover the child's precise skill level in each area of development.

Informal assessment

This type of assessment should be one of every paediatrician's skills as it is commonly used in clinical practice. A range of appropriate toys are used, although without a formal scoring system. Using your knowledge of normal development, it is possible to ascertain an approximate developmental age that the child has reached. It is important to realize that, even in typically developing children, there may be differences in age-equivalent scores in each area of development. It would be meaningless to give an overall developmental age when there is significant variation between different areas of development.

Formal assessment

There are a number of standardized assessments that can be used, such as the Griffiths Mental Development Scales (0–8 years; Box 2.3), the Bayley Scales of Infant Development (0–42 months) and the Schedule of Growing Skills (0–5 years). Some standardized assessments require attendance on a training course.

Box 2.3 Griffiths Mental Development Scales

- Developmental assessment tool for children aged 0–8 years
- Two separate modules: 0–2 years and 2–8 years
- Assesses development in six areas:
  - Locomotor
  - Personal/social
  - Hearing and speech
  - Fine motor
  - Performance
  - Practical reasoning
- Gives a score for each area of development (age equivalent)
- Overall developmental quotient is calculated from summary of individual scores

Why is it important to make a diagnosis?

Different developmental difficulties will have differing implications for the child's future. Therefore defining the developmental diagnosis is important. A diagnosis of specific language impairment has very different implications from a diagnosis of autism.

As in other aspects of medicine, diagnosis is important for several reasons:

- *Prognosis*. Diagnosis enables you to give more information about prognosis, based on other children with the same disorder.
- *Intervention*. Diagnosis will inform the most appropriate interventions.
- *Genetic*. Many conditions have a genetic basis, which will be particularly important for families with, or planning, other children.

A developmental diagnosis alone does not tell you what the cause is.

Principles of developmental assessment

General

- Explain to carer you do not expect child to be able to do all the tasks you set.
- Use a systematic/structured approach, completing one area of development before moving on to next.
- Use simple, clear language appropriate to child's age level.
- Unless you are assessing language and understanding, use visual/gestural clues to show child what you want him/her to do.
- Assess skills directly where possible, rather than asking carer about them.
- Do not assess 'irrelevant' areas, i.e. tasks that will not give you developmental information or tasks for which you do not know the age-equivalent.
- Keep pace going; do not leave long gaps between tasks or child may get bored and lose interest.
- Keep it fun; give lots of praise and encouragement.
- Observe children carefully throughout, even when you are not directly testing them; they may spontaneously demonstrate skills that will give you more information.
- Observe quality of how child performs a skill, not just whether he/she can do it; this includes looking at both hands for fine motor skills.

Structure

- Start with tasks you expect child to be able to do quite easily (i.e. below child's age level).

- If they cannot manage these, go down to simpler/younger tasks.
- Work up gradually, increasing age level of tasks in sequence until child can no longer do tasks.
- Save gross motor assessment till last (unless asked to do this specifically), as child is likely to get excited/not want to sit down afterwards.

Positioning and equipment

- Limit number of toys out at any one time.
- Use toys provided. Ask for specific items if you need them.
- Put yourself and child in optimal position to get best out of him/her (especially if this is fine motor or speech and language assessment):
  < 18 months: seated on carer's lap at table opposite you (*not* on floor)
  2–5 years: seated at small table opposite you.

Suggested assessment schema

This schema presents a bare minimum of tasks for estimating a child's developmental skills. Tasks should be presented in increasing order of difficulty. You will develop your own order of assessment, but this is suggested as a framework to get you started.

Infant

Equipment

- 1″ cubes
- Brightly coloured small toy
- Small object (e.g. raisin)
- Cup
- Cloth
- Paper and pencils
- Familiar objects (cup, sock, shoe, brush)
- Mat/blanket on floor

Fine motor and vision

- Ask if there are any concerns about infant's vision.
- Gain infant's visual attention with toy and move through visual fields, looking at fixation and following.
- Offer small toy, looking at reach and grasp, in-hand manipulation, transferring etc.
- Offer one cube to one hand then other hand.
- Offer second cube with child holding first.
- Demonstrate banging two cubes together to see if child imitates you.
- Demonstrate placing one cube on top of another to see if child imitates you.
- Offer third cube.
- Partially hide cube or toy under cloth to see if infant finds it.
- Totally hide cube or toy under cloth to see if infant finds it.
- Hide cube or toy under cup to see if infant finds it.
- Place raisin on table in front of infant (each hand). (N.B. Remove raisin quickly from infant's hand before it is eaten.)
- For older infants, offer pencil/crayon and paper.
- Visual assessment:
  Observed visual behaviour
  Detection of small objects
  Preferential looking acuity system (e.g. Keeler cards).

Speech, language and hearing

- Ask if there are any concerns about infant's hearing.
- Listen throughout assessment for any vocalizations.
- Observe non-verbal communication, including facial expressions, eye contact, gestures.
- Imitate vocalizations back to infant.
- Talk in double-syllable babble to see if infant copies.
- Call infant's name to look for response.
- Clap hands and encourage infant to imitate.
- Wave bye-bye and encourage infant to imitate.
- Offer familiar objects (sock, cup, brush) to look for definition by use.
- Assess understanding of simple instructions ('Give it to Mummy').
- Use limited number of familiar objects to look for single word recognition ('Where's the cup?').
- Hearing assessment:
  Otoacoustic emission and auditory brainstem responses (ABR) testing at birth
  Distraction testing from 7 months (see Ch. 32 for details).

Gross motor

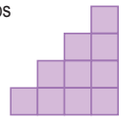
- Lie infant supine on mat.
- Encourage infant to roll.
- Pull to sit.
- Place in sitting position.
- Pull to stand or to bear weight on feet.
- Observe and support stepping/walking.
- Downward parachute.
- Hold in ventral suspension or place in prone position.
- Forward parachute.

Social behaviour and play

- Observe throughout.
- Smile and interact with infant and watch responsiveness.
- Ask about self-feeding etc.

Age (yrs)	Shape that can be copied (drawn without seeing how it is done)
2	
3	
4	
4.5	
5	

A

Age (yrs)	Tower of bricks (number of bricks in a tower)	Shape with bricks
1.5	3	
2	6	
2.5	8	Train 
3	9	Bridge 
4		Steps 

B

Fig. 2.1 **(A) Shapes that can be drawn at different ages; (B) shapes that can be made with bricks at different ages**

Toddler

Equipment

- Small table and chairs
- 1″ cubes (at least 12)
- Paper and pencils
- Range of real objects (cup, spoon, brush etc.)
- Doll or teddy
- Picture book
- Miniature toys
- Beads or puzzle
- Ball
- Stairs

Fine motor and vision (Fig. 2.1)

- Offer 1″ cubes; encourage tower building.
- Build three-brick bridge for child to copy/imitate.
- Build train for child to copy/imitate.
- Build six-brick steps for child to copy/imitate.
- Offer paper and pencils; observe spontaneous drawing.
- Draw shapes for child to copy: horizontal and vertical line, circle, cross, square, triangle.
- Ask child to draw picture of a person (e.g. 'Draw Mummy').
- Look at manipulation/coordination using beads or puzzles.
- Visual assessment:
  - Preferential looking acuity measure (e.g. Cardiff acuity test)
  - Letter matching acuity systems (e.g. Sonksen–Silver, Sheridan–Gardiner).

Speech, language and hearing

- Lay out a number of objects/toys to test single word understanding.
- Increase complexity of questions gradually, to check two-word level of understanding, then three-word level, then prepositions, adjectives, verbs (e.g. 'Where's the duck?', then later 'Give me the spoon and the doll', 'Put the spoon in the cup and give me the car', 'Where's the big pencil?', 'Put the car under the table', 'Make teddy kick the ball' etc.).
- Listen for expressive language throughout.
- Observe non-verbal communication, including facial expressions, eye contact, gestures.
- Use picture book to gain sample of expressive language ('What can you see?').
- Hearing assessment:
  - Performance/conditioning test — child is conditioned to 'perform' in some way when he or she hears a sound; this is done as a game, e.g. place brick in basket.
  - Speech discrimination test (e.g. McCormick toy test) — child is asked to choose a named toy from a set of toys composed of pairs with similar names (e.g. 'tree' and 'key').

Gross motor

- Observe walking
- Place object on floor for child to pick up
- Running
- Jump with two feet together
- Stand on one leg
- Hop
- Kick a ball
- Up and down stairs

Social behaviour and play

- Observe throughout, looking particularly at social interaction.

- Ask about self-help skill.
- Ask about play with peers.

Developmental problems

Delay or disorder?

A child's development can be abnormal in many ways. Delayed development simply means that a child is acquiring skills at a later age than the norm. Development can be delayed in just one area (for example, speech and language delay), or in two or more areas — commonly called global developmental delay.

Children with global developmental delay may present initially with delay in one area of development, but on further assessment it becomes clear that they have more general delay. Disordered development means an unusual pattern or sequence of development. The term also suggests that the problem is due to an underlying developmental disorder, and the child is unlikely to 'catch up'.

Any child presenting with delayed (or disordered) development in one area needs careful evaluation of the rest of his or her development. Delay in one area can be the initial presenting feature of global developmental delay (Ch. 18).

Common patterns of developmental delay and their causes

Speech and language delay

Speech and language delay is the most common preschool developmental problem, occurring in 5–10% of all children. It is more common in boys. This is discussed fully in Chapter 29.

You should understand the difference between speech delay (difficulties with speech sound production), expressive language delay (difficulties in choosing or using appropriate words to convey meaning) and receptive language delay (problems with understanding language). Children with developmental language delay or specific language impairment typically have difficulties in both receptive and expressive language. Usually understanding (receptive language) is in advance of expression.

Tongue tie is not an adequate reason for speech delay, and operative treatment is not indicated unless tongue movements are severely limited.

Delay in gross motor skills

Delay in gross motor skills may typically present with delayed sitting and poor head control, or with delay in walking. The upper limit of the normal age of walking is 18 months.

Possible causes of delayed sitting/poor head and trunk control include:

- Central neurological (brain) disorders, such as cerebral palsy, brain malformations
- Neuromuscular conditions, such as spinal muscular atrophy
- Severe global developmental delay (severe learning difficulties), which may sometimes present initially with delayed gross motor skills.

Possible causes of delayed walking include:

- Central neurological disorders, such as cerebral palsy, particularly of diplegic distribution
- Neuromuscular problems, such as Duchenne muscular dystrophy
- Spinal problems
- Orthopaedic problems, such as developmental dysplasia of the hip
- Global developmental delay.

Bottom-shuffling, a normal variant, is usually associated with a later average age of acquiring independent walking. Children who bottom-shuffle typically do not crawl, dislike the prone position, and are reluctant to take weight through their feet, adopting the 'sitting on air' position when held under their arms. Although it is a normal variant, bottom shuffling can also be associated with pathological underlying causes, such as cerebral palsy; therefore careful clinical examination is warranted.

Global developmental delay

Global developmental delay simply means delay in two or more areas of development. Many children presenting with global developmental delay are subsequently found to have significant learning difficulties (previously termed 'mental retardation'). Where the cause is environmental/social or secondary to ill health, children may 'catch up' with time and appropriate input/stimulation.

Possible causes of global developmental delay include:

- Environmental/psychosocial issues: lack of experience, deprivation, poor parenting, ill health
- Any condition causing learning difficulties, such as chromosomal disorders or syndromes.

www.guideline.gov/summary/summary.aspx?view_id=1&doc_id=4106

Guideline on investigations in children with global developmental delay

Further reading

Quality Standards Subcommittee of the American Academy of Neurology and the Committee of the Child Neurology Society 2003 Practice parameter: evaluation of the child with global developmental delay. Neurology 60(3):367–380

Sheridan M, Frost M, Sharma A 1997 From birth to five years: children's developmental progress. Routledge, London