



DIZZINESS AND IMBALANCE IN CHILDREN

This handout is intended as a general introduction to the topic. As each person is affected differently, speak with your health care professional for individual advice.



Key points

- May be hard to spot by caregivers.
- Check with child's doctor if a regular pattern of dizziness and/or imbalance is noticed.
- Younger children may not have the words to describe what they feel.
- Diagnosis relies on a caregiver giving the child's medical history.
- Most problems are temporary and easy to treat.
- Significant longer-lasting or more serious problems include middle-ear infections, sensorineural hearing loss, inner-ear abnormalities, cytomegalovirus (CMV), meningitis, migraine-related disorders, Usher syndrome, auditory neuropathy spectrum disorder (ANS), and vestibular toxicity.
- Treatment and management depend on the specific disorder and other health conditions.
- Vestibular rehabilitation (an exercise-based therapy) helps many children.
- Often linked to developmental and learning challenges.

What is dizziness and imbalance in children?

Most problems with dizziness and unsteadiness in children are temporary and easy to treat. Unfortunately, they are often overlooked, untreated or misdiagnosed. To rule out the possibility of a more serious condition, it is important to take your child to the doctor if they have repeated signs of dizziness or imbalance.

Children with a malfunctioning vestibular system have dizziness and imbalance. Many also have developmental delays. Vestibular disorders are quite common in children. About 1 in 20 children between the ages of 3 and 17 may be affected. Girls are slightly more affected than boys. Dizziness is more common in older children and teens.

What are the causes?

A child's ability to keep an upright position (postural stability) develops in step with motor development. A baby first develops control of the head, then the torso, and finally the ability to stand. Toddlers use their eyes more than information from their skin, muscles, and joints (proprioception) to balance. By 3 to 6 years of age, children use proprioceptive input in a similar way to adults. Communication between the brain and the 3 parts of the balance system – vestibular, eyes and proprioception – fully matures by 12 years of age.

The balance organs in the inner ear (semicircular canals and otoliths) send information to the brain through the vestibular nerve. These structures are developed at birth. The vestibulo-ocular reflex (VOR) does not fully mature until about 2 months of age. The VOR maintains gaze stability during head movement.

Common causes of short-lived dizziness and imbalance in children include:

- reduced blood flow to the brain for a short time, brought on by common events such as standing up suddenly (orthostatic hypotension) or standing still for a long time
- not drinking enough fluid (dehydration)
- increased sweating, for example on a hot day or playing sports
- skipping a meal
- viral illnesses
- fever
- side effects of some medications

Risk factors connected with dizziness and balance problems in children include:

- impairments that limit a child's ability to crawl, walk, run or play
- frequent headaches or migraines
- certain developmental delays
- a history of seizures in the past 12 months
- stuttering or stammering
- anemia during the past 12 months

Children with a family history of hearing or vestibular problems, dizziness, or motion sickness are more likely to have a balance disorder.

Causes of dizziness and imbalance in children that may be longer lasting or more serious include:

Middle ear infections

Middle ear infections (otitis media) are very common in young children. Persistent infections are among the most common reason children develop balance problems.

Often children with middle ear infections have problems with a blocked or infected Eustachian tube and fluid builds up in the middle ear. The medical term for this condition is otitis media with effusion (OME) or middle ear effusion (MEE). It is sometimes referred to as glue ear.

As well as hearing impairments that may affect speech and language development, middle ear infections impact a child's balance and general motor function. Sometimes middle ear infections happen repeatedly or persistently. If this happens during an important stage of a child's development, such as learning to walk, overall development may be delayed even after a middle ear infection is over. Children who already have motor or vestibular problems before having a middle ear infection may be particularly affected.

Middle ear infections usually result in unsteadiness that is noticeable but not striking. Occasionally, children with an acute middle ear infection will have a sudden and dramatic episode of vertigo, nausea, vomiting, and an inability to walk. In these cases, complications such as meningitis need to be ruled out.

Sensorineural hearing loss

Sensorineural hearing loss (SNHL) is caused by damage to the hair cells in the inner ear or the nerve pathways leading from the inner ear to the brain. It is by far the most common type of hearing loss. Up to 70% of children with SNHL in both ears have a vestibular problem and 20 to 40% have bilateral vestibulopathy (vestibular loss in both ears).

About half of children born with SNHL in one ear (unilateral) have no vestibular nerve. This condition is sometimes called "dead ear". The balance structures in the affected ear may also be damaged.

It is important for children with SNHL to be screened for vestibular dysfunction. Children with complete vestibular loss in both ears have serious delays in controlling posture and movement. Children with unilateral SNHL have similar delays. Symptoms may include:

- delayed walking
- frequent falls
- decreased ability to detect gravity
- difficulty thinking, understanding, learning, and remembering (cognitive dysfunctions)

As a result, children with SNHL may have:

- attention deficit disorders (ADD)
- problems with learning and reading
- spatial disorientation
- difficulty sequencing
- memory-retention problems

Research suggests early diagnosis of complete loss of vestibular function in both ears as well as timely rehabilitation reduces future developmental deficits.

A cochlear implant (an electronic device that partly restores hearing for those with SNHL) comes with a risk of impaired balance. Ask your child's audiologist and doctor about the risks and benefits of cochlear implantation.

Inner ear abnormalities

Congenital (present at birth) inner ear abnormalities are a major cause of sensorineural hearing loss (SNHL) and imbalance in children. Causes include:

- semicircular canal dehiscence (SCD)
- enlarged vestibular aqueduct (EVA)

CT (computerized tomography) scans and MRI (magnetic resonance imaging) can diagnose these abnormalities. Hearing loss and balance impairment may worsen over time. Children with congenital inner ear abnormalities may have severe vertigo lasting days to weeks. These abnormalities are sometimes mistaken for vestibular neuritis.

Congenital inner ear abnormalities may occur on their own or along with a genetic disorder such as Waardenburg, CHARGE, branchio-oto-renal, or Pendred syndrome.

Cytomegalovirus (CMV)

CMV is the leading cause of congenital (present at birth) non-genetic sensorineural hearing loss (SNHL). In Canada, 1 in 200 babies are infected with CMV during pregnancy. Up to 90% show no early symptoms however 8 to 15% will go on to develop SNHL. CMV is the leading cause of intellectual disability, second only to Down syndrome. Severely affected children have

vestibular impairment. One study showed that vestibular dysfunction was more common than hearing loss in children born with CMV.

There have been recent advances in prevention, diagnosis, and drug therapies for CMV. Screening all babies for CMV is being considered in some countries and has already started in Ontario.

Meningitis

Meningitis is an inflammation (swelling) of the protective membranes that cover the brain and spinal cord (meninges). It usually happens when fluid surrounding the meninges becomes infected by bacteria or a virus.

Routine vaccination of Canadian children has greatly reduced the incidence of meningitis. Between 5 to 35% of childhood survivors of meningitis have sensorineural hearing loss (SNHL). Between 3 to 12% have loss of balance function.

Migraine-related disorders

Dizziness and imbalance are symptoms of two episodic syndromes that may be associated with migraine and affect children – benign paroxysmal torticollis (BPT) and benign paroxysmal vertigo (BPV). Children with BPT and BPV often have a family history of migraine. Research suggests children with these conditions have a greater likelihood of developing migraine later in life or having them at the same time as migraine (comorbidity). There is a possible progression from BPT to BPV, and from BPV to vestibular migraine.

Benign paroxysmal torticollis (BPT) is a rare disorder that is fairly harmless and short-lived. It consists of recurrent spells of tilting the head to one side - torticollis means “twisted neck” - in otherwise healthy children. Spells can be as short as 10 minutes or, in rare cases, last for up to 2 months. Other symptoms may include:

- dizziness
- looking pale
- vomiting
- irritability

- lack of muscle control and coordination of voluntary movements (ataxia), such as walking

Symptoms start as early as the first few months of life. BPT usually goes away by the time a child is 2 to 3 years old, but always by age 5.

Benign paroxysmal vertigo (BPV) is a common cause of vertigo that is often overlooked or misdiagnosed. Some practitioners may still refer to it by its older name, benign paroxysmal vertigo of childhood (BPVC). It commonly affects children but is not limited to childhood. BPV is characterized by sudden attacks of vertigo lasting for a few seconds to several minutes at a time and not brought on by movement or position. There is no loss of consciousness during an attack. Other symptoms may include:

- nausea, with or without vomiting
- nystagmus (abnormal eye movements) – this can be hard to detect, as children often shut their eyes during an attack
- tinnitus (ringing in the ears)
- sweating and paleness
- awkwardness, clumsiness, or poor balance
- irritability

Most children are frightened by the symptoms and unable to stand without holding on to something. Once an attack is over, your child is likely to act normally.

While there is no specific test for BPV, various tests may be needed to rule out a more serious diagnosis. These may include:

- hearing tests
- tests to assess balance function
- neurologic tests
- imaging tests such as an MRI

BPV is often confused with its sound-alike, benign paroxysmal positional vertigo (BPPV). BPPV is uncommon in children without a head injury, such as concussion, or cochlear implantation.

BPV is associated with delays in gross and fine motor skills. BPV usually affects children starting at 4 years of age and younger. Girls are affected more often than boys. The attacks usually happen every 4 to 6 weeks. The frequency of attacks goes down with age. BPV goes away along varied timelines.

BPV may be treated with low doses of carbamazepine (kaar·buh·ma·zuh·peen).

Eliminating dietary and lifestyle triggers suggested for migraine may be helpful.

Usher syndrome

Type 1 Usher syndrome (US) is the most common autosomal recessive cause of sensorineural hearing loss and vestibular impairment. An autosomal recessive disorder means two abnormal genes must be inherited, one from each parent.

Children with this rare disorder usually are born profoundly deaf and experience progressive vision loss due to a retinal disease called retinitis pigmentosa (RP).

Auditory neuropathy spectrum disorder (ANSND)

ANSND is a complex condition that affects a person's ability to hear or understand speech. The hearing part of the inner ear (cochlea) detects sound normally but the vestibulocochlear (8th cranial nerve) has a problem sending signals to the brain. Up to 10% of children with permanent hearing loss are affected. Symptoms can start at any age, but most children with ANSD are born with it. ANSD primarily affects children but can happen at any stage of life.

Children with ANSD often have more than one risk factor for developing both hearing loss and balance impairment. Risk factors include:

- prematurity and very low birth weight
- lack of oxygen at birth (hypoxia)
- severe jaundice (hyperbilirubinemia)
- brain abnormalities present at birth (congenital)

- blood vessels rupturing in the brain or between the brain and the skull (intracranial hemorrhage)
- a family history of ANSD
- a drug with a toxic effect on the ear (ototoxin)

ANSD has also been associated with various viral infections including measles, mumps, cytomegalovirus (CMV) and HIV, seizure disorders, and high fever.

Hearing loss with ANSD varies from mild to severe. Speech is usually perceived as distorted and hard to understand. Medical devices and therapies can help children with ANSD develop good language, communication, and hearing skills.

As well as hearing impairment, many people with ANSD also have at least one vestibular symptom. One study suggests vertigo (spinning dizziness) is the most common followed by balance problems, headache, nausea, and vision problems.

Usually, the focus of assessment and rehabilitation for ANSD is on the hearing (auditory) symptoms. The balance and dizziness (vestibular) symptoms are sometimes overlooked. Routine vestibular function testing can help clinicians assess vestibular symptoms and develop an appropriate rehabilitation plan.

Vestibular toxicity

Vestibular toxicity refers to damage to the inner ear caused by some medications or substances. Children at risk include those exposed to:

- aminoglycosides, including gentamicin and inhaled tobramycin (used to treat cystic fibrosis)
- chemotherapies to treat cancer, for example cisplatin

Many vestibular toxins are even more harmful to the balance part (vestibular organs) of the inner ear than the hearing part (cochlea).

Children with tumours that form near the bottom of the skull by the brainstem and cerebellum (posterior fossae tumours) are especially at risk. They may

have been exposed to chemotherapy as well as having an injury to the 8th cranial nerve (vestibular nerve) during surgery or biopsy.

Other causes of dizziness and imbalance in children that may be longer lasting or more serious include:

- vestibular neuritis
- Ménière's disease
- benign paroxysmal positional vertigo (BPPV)
- idiopathic (with no known cause) vestibular disorders
- motion sickness or cyber sickness
- central nervous tumours
- vision abnormalities
- encephalitis
- movement disorders
- dysautonomia
- seizure disorders such as epilepsy
- juvenile arthritis
- endocrine/metabolic disorders such as and underactive thyroid (hypothyroidism)
- blood diseases such as leukemia * injury to the brain (including concussion), neck or spine
- stroke - more information: Heart & Stroke Canada
- behavioural or psychogenic conditions
- late prematurity (babies born between 34 and 36 full weeks of pregnancy are considered "late preterm")

What are the symptoms?

Some signs or symptoms of dizziness and balance disorders in children overlap with those of adults. Others are different. Signs of balance and dizziness disorders in children include:

- delayed developmental milestones and learning problems

- frequent absences from school and/or struggling with writing, reading and math
- difficulty remembering things, concentrating, paying attention, and following directions
- confusion, disorientation, fear, anxiety and/or panic
- fussiness, irritability, crying and/or frustration
- depression
- vertigo (spinning sensation), often accompanied by nystagmus (uncontrollable eye movement), loss of appetite, nausea, vomiting, abdominal pain and/or headaches
- dizziness (feeling light-headed, woozy, or about to faint)
- difficult seeing clearly while moving the head – images may seem to bounce or blur (oscillopsia)
- awkward movements, clumsiness, unsteadiness, or frequent falls
- preferring to keep feet on the ground, for example not wanting to jump or use playground equipment
- frequent car or other motion sickness
- dizziness when playing a video game or scrolling on a computer
- discomfort with sun glare or lights (especially fluorescent, blinking or moving lights)
- dislike of being in crowded areas such as shopping malls
- nausea when looking at patterned carpets or stripes
- difficulty with sports and physical activities including catching or kicking a ball, swimming, or riding a bicycle

Although dizziness and clumsiness are common signs of a balance disorder, on their own they are not necessarily worrisome. For example, it is perfectly normal when:

- children feel light-headed if they are overheated, dehydrated, or stand up too fast
- toddlers fall down more than a few times as they master walking
- children are dizzy as a side effect of a minor condition such as sinus congestion with a cold.

If you start to notice a regular pattern of balance-related signs, however, it is a good idea to check in with your child's doctor.

How is it diagnosed?

Balance and dizziness disorders in children can be hard to recognize and diagnose. A key reason is children may not have the words to describe what they are feeling. In the meantime, you may think your child is clumsy, uncoordinated, lazy, or simply not paying attention. Your child may first be diagnosed with behavioural or learning problems.

Your child's family doctor or pediatrician can sort out if your child is feeling light-headed or faint rather than having true vertigo (spinning sensation). Most children with vestibular disorders do not have vertigo. This is particularly the case when the vestibular impairment is present at birth (congenital) or affects both ears (bilateral vestibulopathy).

Vestibular disorders in children are often diagnosed by a specialist such as an audiologist, otolaryngologist, (an ear, nose and throat or ENT doctor) or neurologist.

The main difference between how children and adults are diagnosed is that a caregiver must be relied on to give the medical history. The doctor will ask you questions about when your child's symptoms started, how long they last, how often they happen, what other conditions your child has or has had in the past, and what medications they are taking. It may help to keep a diary of your child's symptoms.

Younger children often use colourful language to describe their dizziness. They may say, "my brain is spinning," "the house is shaking," "I'm floating," or "my tummy hurts." This is helpful to the doctor.

The doctor will do a physical exam. This includes checking your child's motor development and looking for "red flags" such as:

- no head control at four months
- inability to sit unsupported at 7 to 9 months
- no vestibulo-ocular reflex (VOR) at 10 months
- inability to crawl or bottom shuffle at 12 months
- not trying to walk at 18 months
- inability to stand on one foot and keep balanced with eyes open for at least 2 seconds at 3 years of age, 5 seconds at 4 years of age, and 8 seconds at 5 years of age

These developmental delays often carry over as poorer balance skills throughout childhood.

Some vestibular disorders are associated with sensorineural hearing. The results of your child's newborn hearing screening will be considered. About 1 in 500 babies are born with permanent hearing loss. The number rises to 1 in 50 for babies in neonatal intensive care units (NICUs). Toddlers, preschoolers and older children will likely have their hearing tested by an audiologist.

You may be asked to fill in the Pediatric Dizziness Handicap Inventory. This questionnaire identifies problems 5- to 12-year-olds may have because of dizziness or imbalance. The Pediatric Vestibular Symptom Questionnaire might be used with 6- to 17-year-olds. Using these questionnaires can help the doctor or audiologist decide if vestibular system testing is called for, or what type of specialist referral might be most suitable for your child.

Diagnostic testing of the vestibular system assesses how well the inner-ear balance mechanism is working. No child is too young for balance function testing. The tests will be modified to suit your child's developmental needs. Caregivers play an

important role in successful testing. Information will be given beforehand about how you can best prepare your child as well as help during testing. The testing may be done over several appointments.

How is it treated and managed?

As with adults, treatment and management depend on the specific disorder and other health conditions.

Vestibular rehabilitation can help many children. Vestibular rehabilitation is a type of exercise-based therapy. Its goal is to help train your child's brain to relearn how to balance and how to respond to signals from the vestibular and visual systems. The exercises will be adapted to your child's developmental level. The therapist will suggest ways to help your child practice the prescribed exercises at home in a playful way. Children are often more successful at vestibular rehabilitation than adults because their brains adapt more easily to balance problems.

Sometimes medicine and surgery may be needed. Children with significant hearing loss may need a hearing aid, cochlear implant and/or listening therapy with an audiologist.

What to expect in the future

Children outgrow some dizziness and balance disorders. Others are more persistent. While there is still much to learn, progress is being made in diagnosis and treatments that can help many children with these disorders develop more normally.

Visit our website

View this and other articles about vestibular disorders – www.balance&dizziness.org.

In addition, find information about how the balance system works, the journey from diagnosis to treatment, building a wellness toolkit, and more.

Handout updated June 2022

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