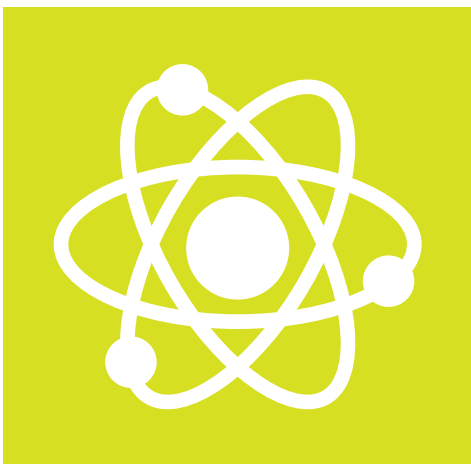




# CEREBRAL PALSY FOUNDATION

DISCOVERY FOR DISABILITY

## LEARN ABOUT CP





# CEREBRAL PALSY FOUNDATION

DISCOVERY FOR DISABILITY



**CEREBRAL**  
REFERS TO THE BRAIN;

**PALSY**  
REFERS TO THE LOSS  
OR IMPAIRMENT  
OF MOTOR FUNCTION

## WHAT IS CP

Cerebral palsy (CP) describes a group of permanent disorders of the development of movement and posture, causing activity limitations, attributed to non progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication and behavior, epilepsy, and by secondary musculoskeletal problems.

### MOTOR TYPES

The specific motor types present in CP are determined by the extent, type, and location of a child's abnormalities. (Fig. 1)

#### SPASTIC CEREBRAL PALSY

Spastic CP is the most common type. People will experience increased muscle tone and their movements may appear stiff or awkward. Different parts of the body can be affected:

- **Spastic hemiplegia/hemiparesis** (Fig. 2) typically affects the arm, hand, and leg on one side of the body.
- **Spastic diplegia/diparesis** (Fig. 2) involves muscle stiffness that is predominantly in the legs. The arms may be affected to a lesser extent
- **Spastic quadriplegia/quadruparesis** (Fig. 2) is the most severe form of CP. It is caused by widespread damage to the brain or significant brain malformations.

#### DYSKINETIC CEREBRAL PALSY

Dyskinetic motor patterns (also includes athetoid, choreoathetoid, and dystonia ) are characterized by slow and uncontrollable writhing or jerky movements of the hands, feet, arms, or legs.

#### ATAXIC CEREBRAL PALSY

Ataxia affects balance and depth perception. Children with ataxia will often have poor coordination and walk unsteadily with a wide-based gait.

#### MIXED TYPES

Mixed types of CP refer to symptoms that don't correspond to any single type of CP but are a mix of types. For example, a child with mixed CP may have some muscles that are too tight and others that are too relaxed.

**CEREBRAL PALSY CAN BE DESCRIBED BY THE WAY IT AFFECTS PEOPLE'S MOVEMENT, THE PART OF THE BODY AFFECTED AND BY HOW SEVERE THE AFFECTS ARE**

FIGURE 1

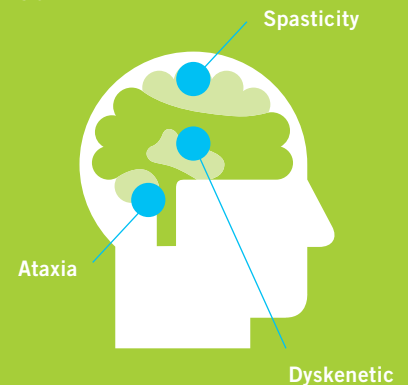


FIGURE 2



Spastic hemiplegia/  
hemiparesis/unilateral



Spastic diplegia/  
diparesis/bilateral



Spastic quadriplegia/  
quadruparesis/bilateral



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## SEVERITY CLASSIFICATION

Cerebral palsy varies in severity and can be classified by gross motor function, manual ability and communication.

### GROSS MOTOR FUNCTION

The gross motor skills (e.g. sitting and walking) of children and young people with cerebral palsy can be categorized into 5 different levels using a tool called the Gross Motor Function Classification System (GMFCS). GMFCS looks at movements such as sitting and walking.

# MOST CHILDREN WITH CP WILL WALK

## 60% WILL WALK WITHOUT THE USE OF AN AID

## 10% WILL WALK WITH AN AID

## 30% WILL USE A WHEELCHAIR

## GMFCS E & R DESCRIPTORS AND ILLUSTRATIONS FOR CHILDREN AGES 6 – 12 YEARS

### LEVEL 1



Children at home, school, outdoors, and in the community. They can climb stairs without the use of railing. Children perform gross motor skills such as running and jumping, but speed, balance and coordination are limited.

### LEVEL 2



Children walk in most settings and climb stairs holding onto railing. They may experience difficulty walking long distances and balancing on uneven terrain, inclines, in crowded areas or confined spaces. Children may walk with physical assistance, a hand-held mobility device or use wheeled mobility over long distances. Children have only minimal ability to perform gross motor skills such as running and jumping.

### LEVEL 3



Children walk using a hand-held mobility device in most indoor settings. They may climb stairs holding onto a railing with supervision or assistance. Children use wheeled mobility when traveling long distances and may self-propel for shorter distances.

### LEVEL 4



Children use methods of mobility that require physical assistance or powered mobility in most settings. They may walk for short distances at home with physical assistance or use powered mobility or a body support walker when positioned. At school, outdoors and in the community children are transported in a manual wheelchair or use powered mobility.

### LEVEL 5



Children are transported in a manual wheelchair in all settings. Children are limited in their ability to maintain antigravity head and trunk postures and control leg and arm movement.

GMFCS Descriptors: Palisano et al (1997) Developmental Medicine and Child Neurology 39:214-23



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## MANUAL ABILITY CLASSIFICATION SYSTEM (MACS)

The ability of children from 4 – 18 years old with cerebral palsy to handle objects in everyday activities can be categorized into 5 levels using the Manual Ability Classification System (MACS). MACS level is determined based on knowledge about the child's actual performance in daily life. It is not done by conducting a specific assessment, but by asking someone who knows the child and how that child performs typically. MACS is based on the use of both hands in activities, not an assessment of each hand separately.

MACS IS BASED ON THE USE OF BOTH HANDS DURING FUNCTIONAL ACTIVITIES



## MACS LEVELS

### LEVEL 1

Handles objects easily and successfully. At most, limitations in the ease of performing manual tasks requiring speed and accuracy. However, any limitations in manual abilities do not restrict independence in daily activities.

### LEVEL 2

Handles most objects but with somewhat reduced quality and/or speed of achievement – Certain activities may be avoided or be achieved with some difficulty; alternative ways of performance might be used but manual abilities do not usually restrict independence in daily activities.

### LEVEL 3

Handles objects with difficulty; needs help to prepare and/or modify activities – The performance is slow and achieved with limited success regarding quality and quantity. Activities are performed independently if they have been set up or adapted.

### LEVEL 4

Handles a limited selection of easily managed objects in adapted situations – Performs parts of activities with effort and with limited success. Requires continuous support and assistance and/or adapted equipment, for even partial achievement of the activity.

### LEVEL 5

Does not handle objects and has severely limited ability to perform even simple actions. — Requires total assistance.

MACS Descriptors: [www.macs.nu](http://www.macs.nu)



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## COMMUNICATION FUNCTION CLASSIFICATION SYSTEM (CFCS)

The CFCS is a tool used to classify the everyday communication of an individual with cerebral palsy. The CFCS consists of 5 descriptive levels for everyday communication performance.

**1 IN 5**  
PEOPLE WITH  
CEREBRAL PALSY  
**WILL HAVE**  
COMMUNICATION  
DIFFICULTIES



## CFCS LEVELS

### LEVEL 1

Effective Sender and Receiver with unfamiliar and familiar partners. The person independently alternates between sender and receiver roles with most people in most environments. The communication occurs easily and at a comfortable pace with both unfamiliar and familiar conversational partners. Communication misunderstandings are quickly repaired and do not interfere with the overall effectiveness of the person's communication.

### LEVEL 2

Effective but slower paced Sender and/or Receiver with unfamiliar and/or familiar partners. The person independently alternates between sender and receiver roles with most people in most environments, but the conversational pace is slow and may make the communication interaction more difficult. The person may need extra time to understand messages, compose messages, and/or repair misunderstandings. Communication misunderstandings are often repaired and do not interfere with the eventual effectiveness of the person's communication with both unfamiliar and familiar partners.

### LEVEL 3

Effective Sender and Receiver with familiar partners. The person alternates between sender and receiver roles with familiar (but not unfamiliar) conversational partners in most environments. Communication is not consistently effective with most unfamiliar partners, but is usually effective with familiar partners.

### LEVEL 4

Inconsistent Sender and/or Receiver with familiar partners. The person does not consistently alternate sender and receiver roles. This type of inconsistency might be seen in different types of communicators including: a) an occasionally effective sender and receiver; b) an effective sender but limited receiver; c) a limited sender but effective receiver. Communication is sometimes effective with familiar partners.

### LEVEL 5

Seldom Effective Sender and Receiver even with familiar partners. The person is limited as both a sender and a receiver. The person's communication is difficult for most people to understand. The person appears to have limited understanding of messages from most people. Communication is seldom effective even with familiar partners.

CFCS Descriptors: Hidecker et al (2001) *Developmental Medicine and Child Neurology*, 53(8):704-10.



# CEREBRAL PALSY FOUNDATION

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## CAUSE AND TIMING

Cerebral palsy is caused by abnormal development or damage to the motor area of the brain's outer layer (called the cerebral cortex), the part of the brain that directs muscle movement. This damage can occur before, during, or shortly after birth.

### EXAMPLES OF BRAIN DAMAGE SEEN IN CP

#### CONGENITAL CP

The majority of children have Congenital cerebral palsy (that is, they were born with it), although it may not be detected until months or years later. Possible causes may include genetic abnormalities, congenital brain malformations, maternal infections/fevers, or fetal injury.

#### ACQUIRED CP

A small number of children have Acquired cerebral palsy, which means it begins after birth. Some causes of Acquired cerebral palsy include brain damage in the first few months or years of life, brain infections such as bacterial meningitis or viral encephalitis, problems with blood flow to the brain, or head injury from a motor vehicle accident, a fall, or child abuse.

#### DAMAGE TO WHITE MATTER OF THE BRAIN (*periventricular leukomalacia*, or PVL)

The white matter of the brain is responsible for transmitting signals inside the brain and to the rest of the body. Damage from PVL looks like tiny holes in the white matter of an infant's brain. These gaps in brain tissue interfere with the normal transmission of signals. Researchers have identified a period of time between 26 and 34 weeks of gestation, in which periventricular white matter is particularly sensitive to injury.

#### ABNORMAL DEVELOPMENT OF THE BRAIN (*cerebral dysgenesis*)

Mutations in genes, infections, fevers, trauma, and other conditions can interrupt the normal process of brain growth. This can cause brain malformations that interfere with the transmission of brain signals during fetal development.

#### BLEEDING IN THE BRAIN (*intracranial hemorrhage*)

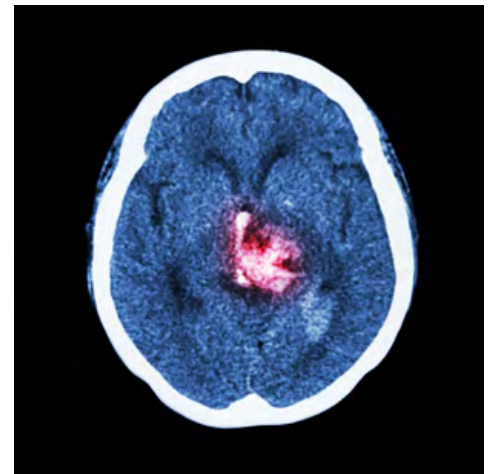
Bleeding inside the brain from blocked or broken blood vessels is commonly caused by fetal stroke. Some babies suffer a stroke while still in the womb because of blood clots in the *placenta* that block blood flow in the brain. Other types of fetal stroke are caused by malformed or weak blood vessels in the brain or by blood-clotting abnormalities.

#### SEVERE LACK OF OXYGEN IN THE BRAIN

*Asphyxia*, a lack of oxygen in the brain caused by an interruption in breathing or poor oxygen supply, is common for a brief period of time in babies due to the stress of labor and delivery. If the supply of oxygen is cut off or reduced for lengthy periods, an infant can develop a type of brain damage called *hypoxicischemic encephalopathy*, which destroys tissue in the cerebral motor cortex and other areas of the brain.

OF ALL CHILDREN WITH CEREBRAL PALSY,

**60%**  
ARE BORN AT TERM



IT IS THE MOST COMMON PHYSICAL DISABILITY IN CHILDHOOD



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## RISK FACTORS

There are some medical conditions or events that can happen during pregnancy and delivery that may increase a baby's risk of being born with Cerebral palsy.

### RISKS DURING PREGNANCY

#### MULTIPLE BIRTHS

Twins, triplets, and other multiple births are linked to an increased risk of cerebral palsy.

#### INFECTIONS DURING PREGNANCY

Infections such as *toxoplasmosis*, *rubella* (German measles), *cytomegalovirus*, and herpes, can infect the womb and placenta. Inflammation triggered by infection may then go on to damage the developing nervous system in an unborn baby.

#### BLOOD TYPE INCOMPATIBILITY BETWEEN MOTHER AND CHILD

#### EXPOSURE TO TOXIC SUBSTANCES

Mothers who have been exposed to substances during pregnancy, such as methyl mercury, are at risk of having a baby with cerebral palsy.

#### MOTHERS WITH THYROID ABNORMALITIES, INTELLECTUAL DISABILITY, EXCESS PROTEIN IN THE URINE, OR SEIZURES

Mothers with any of these conditions are slightly more likely to have a child with CP.

### WARNING SIGNS DURING CHILDBIRTH

There are also medical conditions during labor and delivery, and immediately after delivery that act as warning signs for an increased risk of CP. However, most of these children will not develop CP. Warning signs include:

#### LOW BIRTHWEIGHT AND PREMATURE BIRTH

Premature babies (born less than 37 weeks) and babies weighing less than 5 ½ pounds at birth are at increased risk.

#### BREECH PRESENTATION

Babies with cerebral palsy are more likely to be in a breech position (feet first) instead of head first at the beginning of labor. Babies who are unusually floppy are more likely to be born in the breech position.

#### COMPLICATED LABOR AND DELIVERY

A baby who has vascular or respiratory problems during labor and delivery may already have suffered brain damage or abnormalities.

#### LOW APGAR SCORE

The Apgar score is a numbered rating that reflects a newborn's physical health. Doctors periodically score a baby's heart rate, breathing, muscle tone, reflexes, and skin color during the first minutes after birth.

IN MOST CASES,  
BRAIN INJURY LEADING  
TO CEREBRAL PALSY  
**OCCURS  
DURING  
PREGNANCY**



#### JAUNDICE

More than 50 percent of newborns develop *jaundice* (a yellowing of the skin or whites of the eyes) after birth when *bilirubin*, a substance normally found in bile, builds up faster than their livers can break it down. Severe, untreated jaundice can damage brain cells and can cause deafness and CP.

#### SEIZURES

An infant who has seizures faces a higher risk of being diagnosed later in childhood with CP.



# CEREBRAL PALSY FOUNDATION

DISCOVERY FOR DISABILITY

CEREBRAL PALSY, EXCEPT IN ITS MILDEST FORMS, CAN BE EVIDENT IN THE FIRST 12-18 MONTHS



## SIGNS AND SYMPTOMS

The signs of Cerebral palsy usually appear in the early months of life, although specific diagnosis may be delayed until age two or later. Infants with CP frequently have developmental delays, in which they are slow to reach developmental milestones such as learning to roll over, sit, crawl, or walk.

Some infants with CP have abnormal muscle tone. Decreased muscle tone (*hypotonia*) can make them appear relaxed, or even floppy. Increased muscle tone (*hypertonia*) can make them seem stiff or rigid. The symptoms of CP differ in type and severity from one person to the next, and may even change in an individual over time. All people with CP have problems with movement and posture, and some also have a certain level of intellectual disability. Seizures, abnormal physical sensations or perceptions, and other medical disorders are common in individuals with CP. People with CP may also have impaired vision or hearing, and communication issues.



### CHILDREN WITH CP EXHIBIT A WIDE VARIETY OF SYMPTOMS,\* INCLUDING:

- lack of muscle coordination when performing voluntary movements (*ataxia*);
- stiff or tight muscles and exaggerated reflexes (*spasticity*);
- weakness in one or more arm or leg;
- walking on the toes, a crouched gait, or a "scissored" gait;
- variations in muscle tone, either too stiff or too floppy;
- excessive drooling or difficulties swallowing or speaking;
- shaking (*tremor*) or random involuntary movements;
- delays in reaching motor skill milestones;
- difficulty with precise movements such as writing or buttoning a shirt.

\*It is important to note that some children without CP also may show some of these signs.

CHILDREN WITH CP ARE LIKELY TO ALSO HAVE OTHER IMPAIRMENTS IN ADDITION TO THEIR MOTOR DISABILITY

### EVIDENCE IN DELAYED MOTOR SKILLS IN THE FIRST 12-18 MONTHS

#### IN A BABY YOUNGER THAN 6 MONTHS OF AGE

THEY DROOP WHEN YOU PICK THEM UP WHILE THEY'RE LYING ON THEIR BACK

THEY FEEL STIFF

THEY FEEL FLOPPY

WHEN YOU PICK THEM UP, THEIR LEGS GET STIFF AND CAN CROSS OR SCISSOR

#### IN A BABY OLDER THAN 6 MONTHS OF AGE

THEY DON'T ROLL OVER IN EITHER DIRECTION

THEY CAN'T BRING THEIR HANDS TOGETHER

THEY HAVE DIFFICULTY BRINGING THEIR HANDS TO THEIR MOUTH

THEY REACH OUT WITH ONLY ONE HAND WHILE KEEPING THE OTHER FISTED

#### IN A BABY OLDER THAN 10 MONTHS OF AGE

THEY CRAWL IN A LOPSIDED MANNER, PUSHING OFF WITH ONE HAND AND LEG WHILE DRAGGING THE OPPOSITE HAND AND LEG

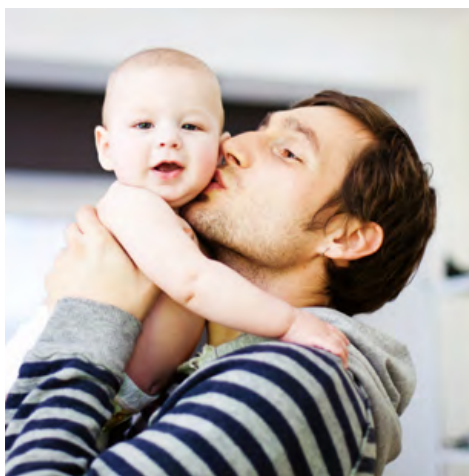
THEY CANNOT STAND WITHOUT HOLDING ONTO SUPPORT





# CEREBRAL PALSY FOUNDATION

DISCOVERY FOR DISABILITY



CEREBRAL PALSY IS A  
**LIFE-LONG  
PHYSICAL  
DISABILITY**  
CAUSED BY DAMAGE OF  
THE DEVELOPING BRAIN

## DIAGNOSIS

Most children with Cerebral palsy are diagnosed during the first 2 years of life. But if a child's symptoms are mild, it can be difficult for a doctor to make a reliable diagnosis before the age of 4 or 5.

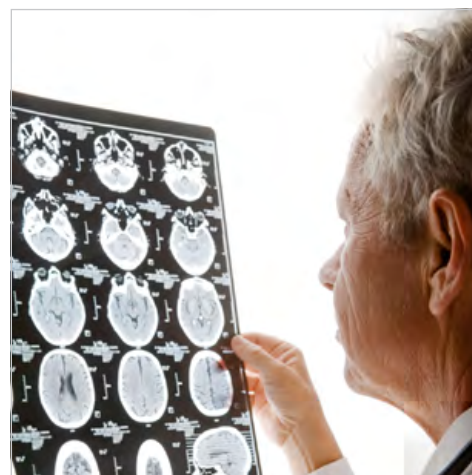
### NEUROIMAGING TECHNIQUES

Neuroimaging techniques that allow doctors to look into the brain (such as an MRI scan) can detect abnormalities that indicate a potentially treatable movement disorder. Neuroimaging methods include:

- **Magnetic resonance imaging (MRI)** uses a computer, a magnetic field, and radio waves to create an anatomical picture of the brain's tissues and structures. An MRI can show the location and type of damage and offers finer levels of details than CT. Some metabolic disorders can masquerade as CP. Most of the childhood metabolic disorders have characteristic brain abnormalities or malformations that will show up on an MRI.
- **Cranial ultrasound** uses high-frequency sound waves to produce pictures of the brains of young babies. It is used for high-risk premature infants because it is the least intrusive of the imaging techniques, although it is not as successful as computed tomography or magnetic resonance imaging at capturing subtle changes in white matter—the type of brain tissue that is damaged in CP.

- **Computed tomography (CT)** uses x-rays to create images that show the structure of the brain and the areas of damage.
- An **electroencephalogram** is another test that uses a series of electrodes that are either taped or temporarily pasted to the scalp to detect electrical activity in the brain. Changes in the normal electrical pattern may help to identify epilepsy.

## MOST CHILDREN ARE DIAGNOSED DURING THE FIRST 2 YEARS OF LIFE



### EVALUATION

Doctors will order a series of tests to evaluate the child's motor skills. During regular visits, the doctor will monitor the child's development, growth, muscle tone, age-appropriate motor control, hearing and vision, posture, and coordination, in order to rule out other disorders that could cause similar symptoms. Although symptoms may change over time, CP is not progressive. If a child is continuously losing motor skills, the problem more likely is a condition other than CP—such as a genetic or muscle disease, metabolism disorder, or tumors in the nervous system.

Lab tests can identify other conditions that may cause symptoms similar to those associated with CP.

Referrals to specialists such as a child neurologist, developmental pediatrician, ophthalmologist, or otologist aid in a more accurate diagnosis and help doctors develop a specific treatment plan.



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## ACCOMPANYING IMPAIRMENTS

### DELAYED GROWTH AND DEVELOPMENT

Children with moderate to severe CP, often lag behind in growth and development. The muscles and limbs affected by CP tend to be smaller than normal, especially in children with spastic hemiplegia, whose limbs on the affected side of the body may not grow as quickly or as long as those on the normal side.

### SEIZURE DISORDER

As many as half of all children with CP have one or more seizures. Children with both cerebral palsy and epilepsy are more likely to have an intellectual disability.

### LEARNING DISABILITY

Approximately 30 – 50 percent of individuals with CP will be intellectually impaired. Mental impairment is more common among those with spastic quadriplegia than in those with other types of cerebral palsy.

### SPINAL DEFORMITIES AND OSTEOARTHRITIS

Deformities of the spine—curvature (*scoliosis*), humpback (*kyphosis*), and saddle back (*lordosis*) – are associated with CP. Spinal deformities can make sitting, standing, and walking difficult and cause chronic back pain. Pressure on and misalignment of the joints may result in osteoporosis (a breakdown of cartilage in the joints and bone enlargement).

### IMPAIRED VISION

Many children with CP have strabismus, commonly called “cross eyes,” which left untreated can lead to poor vision in one eye and can interfere with the ability to judge distance. Some

children with CP have difficulty understanding and organizing visual information.

### HEARING LOSS

Impaired hearing is also more frequent among those with CP than in the general population. Some children have partial or complete hearing loss, particularly as the result of jaundice or lack of oxygen to the developing brain.

### SPEECH AND LANGUAGE DISORDERS

Speech and language disorders, such as difficulty forming words and speaking clearly, are present in more than a third of those with CP. Poor speech impairs communication and is often interpreted as a sign of cognitive impairment, which can be very frustrating to children with CP, especially the majority who have average to above average intelligence.

### DROOLING

Some individuals with CP drool because they have poor control of the muscles of the throat, mouth, and tongue.

### INCONTINENCE

A possible complication of CP is incontinence (loss of bladder control), caused by poor control of the muscles that keep the bladder closed. Medical treatments for incontinence include special exercises, biofeedback, prescription drugs, surgery, or surgically implanted devices to replace or aid muscles.

### ABNORMAL SENSATIONS AND PERCEPTIONS

Some individuals with CP experience pain or have difficulty feeling simple sensations, such as touch.

1 IN 2  
PEOPLE  
WITH CEREBRAL PALSY  
LIVE IN  
CHRONIC  
DAILY PAIN



GLOBALLY,  
OVER  
17 MILLION  
PEOPLE  
HAVE CEREBRAL PALSY



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## CHILDREN WITH CP ARE MORE SUSCEPTIBLE TO ORAL HEALTH CONDITIONS



**1 IN 4 CHILDREN WITH CEREBRAL PALSY HAVE EPILEPSY**



### **INFECTIONS AND LONG-TERM ILLNESSES**

Many adults with CP have a higher risk of heart and lung disease, and pneumonia (often from inhaling bits of food into the lungs), than those without the disorder.

### **CONTRACTURES**

Muscles can become painfully fixed into abnormal positions, called contractures, which can increase muscle spasticity and joint deformities in people with CP.

### **MALNUTRITION**

Swallowing, sucking, or feeding difficulties can make it difficult for many individuals with CP, particularly infants, to get proper nutrition and gain or maintain weight.

### **DENTAL PROBLEMS**

Many children with CP are at risk of developing gum disease and cavities because of poor dental hygiene. Certain medications, such as seizure drugs, can exacerbate these problems.

### **INACTIVITY**

Childhood inactivity is magnified due to impairment and control voluntary movement. While children with CP may exhibit increased energy expenditure during activities of daily living, movement impairments make it difficult for them to participate in sports and activities to develop and maintain strength and fitness. Inactive adults with disabilities exhibit increased severity of disease and reduced overall health and well-being.

### **EPILEPSY**

Many children with intellectual disability and CP also have epilepsy. In general, drugs are prescribed based on the type of seizures an individual experiences, since no one drug controls all types. Some individuals may need a combination of two or more drugs to achieve good seizure control.

### **OSTEOPENIA**

Children with CP who are unable to walk risk developing poor bone density (osteopenia), a family of drugs called bisphosphonates, which has been approved by the FDA to treat mineral loss in elderly patients, also appeared to increase bone mineral density. Doctors may choose to selectively prescribe the drug off-label to children to prevent osteopenia.

### **PAIN**

Pain can be a problem for people with CP due to spastic muscles and the stress/strain on parts of the body that are compensating for muscle abnormalities. Some individuals may also have frequent and irregular muscle spasms that can't be predicted or medicated in advance. Medications such as diazepam can reduce the pain associated with muscle spasms and gabapentin has been used successfully to decrease the severity and frequency of painful spasms. Botulinum toxin injections have also been shown to decrease spasticity and pain. Intrathecal baclofen has shown good results in reducing pain. Some children and adults have been able to decrease pain by using noninvasive and drug-free interventions such as distraction, relaxation training, biofeedback, and therapeutic massage.

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**PAIN CAN BE A PROBLEM FOR PEOPLE WITH CP DUE TO SPASTIC MUSCLES AND THE STRESS/ STRAIN ON PARTS OF THE BODY THAT ARE COMPENSATING FOR MUSCLE ABNORMALITIES**

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# CEREBRAL PALSY FOUNDATION

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## TREATMENTS

Cerebral palsy can't be cured, but treatment will often improve or sustain a child's capabilities. There is no standard therapy that works for every individual with CP. Once the diagnosis is made, and the type of CP is determined, a team of health care professionals will work with a child and his or her parents to identify specific impairments and needs, and then develop an appropriate plan to tackle the core disabilities that affect the child's quality of life.

### THERAPEUTIC OPTIONS

#### PHYSICAL THERAPY

Physical therapy, usually begins in the first few years of life or soon after the diagnosis is made. Specific sets of exercises (such as resistive, or strength training programs) and activities can maintain or improve muscle strength, balance, motor skills, and prevent contractures.

#### OCCUPATIONAL THERAPY

Occupational therapy focuses on optimizing upper body function, improving posture, and making the most of a child's mobility. Occupational therapists help individuals address new ways to meet everyday activities such as dressing, going to school, and participating in day-to-day activities.

#### RECREATIONAL THERAPY

Encourages participation in art and cultural programs, sports, and other events that help an individual expand physical and cognitive skills and abilities. Research has shown improvement in their child's speech, self-esteem, and emotional well-being.

#### SPEECH AND LANGUAGE THERAPY

Speech and language therapy can improve a child's ability to speak more clearly, help with swallowing disorders, and learn new ways to communicate. Examples include sign language and/or special communication devices such as a computer with a voice synthesizer, or a special board covered with symbols of everyday objects and activities to which a child can point to indicate his or her wishes. Treatments for problems with eating and drooling are sometimes necessary if a child has problems controlling the muscles of their mouth, jaw or tongue.

### DRUG TREATMENTS

#### ORAL MEDICATIONS

Medications such as diazepam, baclofen, dantrolene sodium, and tizanidine are usually used as the first line of treatment to relax stiff, contracted, or overactive muscles. Some drugs have side effects such as drowsiness, changes in blood pressure, and risk of liver damage that require continuous monitoring. Oral medications are appropriate for children who need only mild reduction in muscle tone or with widespread spasticity.

CEREBRAL PALSY IS A CONDITION THAT IS PERMANENT

- **Botulinum toxin (*Botox*)**, injected locally, has become a standard treatment for overactive muscles in children with spastic movement disorders such as CP. Botox relaxes contracted muscles by keeping nerve cells from over-activating. The relaxing effect of a Botox injection lasts approximately 3 months. Undesirable side effects are mild and short-lived, consisting of pain upon injection and occasionally mild flu-like symptoms. Botox injections are most effective when followed by physical therapy program and splinting. Such injections work best for children who have some control over their motor movements and have a limited number of muscles to treat, none of which are fixed or rigid.
- **Intrathecal baclofen** therapy uses an implantable pump to deliver baclofen, a muscle relaxant, into the fluid surrounding the spinal cord. Baclofen decreases the excitability of nerve cells in the spinal cord, which then reduces muscle spasticity throughout the body. The baclofen pump is most appropriate for individuals with chronic, severe stiffness or uncontrolled muscle movement throughout the body.



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## SURGICAL TREATMENTS

### ORTHOPEDIC SURGERY

Orthopedic surgery is often recommended when spasticity and stiffness are severe enough to make walking and moving about difficult or painful. For many people with CP, improving the appearance of how they walk – their gait – is also important. Surgeons can lengthen muscles and tendons that are proportionately too short, which can improve mobility and lessen pain. Tendon surgery may help the symptoms for some children with CP but could also have negative long-term consequences. Orthopedic surgeries may be staggered at times appropriate to a child's age and level of motor development. Surgery can also correct or greatly improve spinal deformities in people with CP. Surgery may not be indicated for all gait abnormalities and the surgeon may request a quantitative gait analysis before surgery.

### SURGERY TO CUT THE NERVES

*Selective dorsal rhizotomy* (SDR) is a surgical procedure recommended for cases of severe spasticity when all of the more conservative treatments—physical therapy, oral medications, and intrathecal baclofen—have failed to reduce spasticity or chronic pain. A surgeon locates and selectively severs overactivated nerves at the base of the spinal column. SDR is most commonly used to relax muscles and decrease chronic pain in one or both of the lower or upper limbs. It is also sometimes used to correct an overactive bladder. Potential side effects include sensory loss, numbness, or uncomfortable sensations in limb areas once supplied by the severed nerve.

## ASSISTIVE DEVICES

### COMMUNICATION

Devices such as computers, computer software, voice synthesizers, and picture books can greatly help some individuals with CP improve communications skills.

### ORTHOTICS

Orthotics help to compensate for muscle imbalance and increase independent mobility. Braces and splints use external force to correct muscle abnormalities and improve function such as sitting or walking.

### MOBILITY AIDS

Wheelchairs, rolling walkers, and powered scooters can help individuals who are not independently mobile.

### VISION / HEARING

Glasses, magnifiers, and large-print books/computer typefaces assist with vision. Some individuals with CP may need surgery to correct vision problems. Hearing aids and telephone amplifiers may help people hear more clearly.

## COMPLEMENTARY AND ALTERNATIVE THERAPIES

Many children and adolescents with CP use some form of complementary or alternative medicine. Controlled clinical trials involving some therapies have been inconclusive or showed no benefit and they have not been accepted in mainstream clinical practice. Although there are anecdotal reports of benefit in some children with CP, these therapies have not been approved by the U.S. Food and Drug Administration for the treatment of CP. Such therapies include hyperbaric oxygen therapy, special clothing worn during resistance exercise training, certain forms of electrical stimulation, assisting children in completing certain motions several times a day, and specialized learning strategies. Also, dietary supplements, including herbal products, may interact with other products or medications a child with CP may be taking or have unwanted side effects on their own. Families of children with CP should discuss all therapies with their doctor.

**Stem cell therapy** is being investigated as a treatment for cerebral palsy, but research is in early stages and large-scale clinical trials are needed to learn if stem cell therapy is safe and effective in humans. Stem cells are capable of becoming other cell types in the body. Scientists are hopeful that stem cells may be able to repair damaged nerves and brain tissues. Studies in the U.S. are examining the safety and tolerability of umbilical cord blood stem cell infusion in children with CP.

# TREATMENTS ALSO TARGET OTHER IMPAIRMENTS

IN ADDITION TO MOTOR DISABILITY



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## ADULTS WITH CP

The majority of individuals with CP will experience some form of premature aging by the time they reach their 40s due to the extra stress and strain the disability puts upon their bodies. The developmental delays that often accompany CP keep some organ systems from developing to their full capacity and level of performance. As a consequence, organ systems such as the cardiovascular system (the heart, veins, and arteries) and pulmonary system (lungs) have to work harder and they age prematurely.

### FUNCTIONAL ISSUES AT WORK

The day-to-day challenges of the workplace are likely to increase as an employed individual with CP reaches middle age. Some individuals will be able to continue working with accommodations such as an adjusted work schedule, assistive equipment, or frequent rest periods.

### DEPRESSION

Mental health issues can also be of concern as someone with cerebral palsy grows older. The rate of depression is three to four times higher in people with disabilities such as CP. It appears to be related not so much to the severity of their disabilities, but to how well they cope with them. The amount of emotional support someone has, how successful they are at coping with disappointment/stress, and whether or not they have an optimistic outlook about the future all have a significant impact on mental health.

### POST-IMPAIRMENT SYNDROME

This syndrome is marked by a combination of pain, fatigue, and weakness due to muscle abnormalities, bone deformities, overuse syndrome, sometimes also called repetitive motion injuries,

and arthritis. Individuals with CP may use up to three to five times the amount of energy that able-bodied people use when they walk and move about.

### OSTEOARTHRITIS & DEGENERATIVE ARTHRITIS

Musculoskeletal abnormalities that may not produce discomfort during childhood can cause pain in adulthood. For example, the abnormal relationships between joint surfaces and excessive joint compression can lead to the early development of painful osteoarthritis and degenerative arthritis. Individuals with CP also may have limited strength and restricted patterns of movement, which puts them at risk for overuse syndromes and nerve entrapments.

### PAIN

Individuals with CP may have pain that can be acute or chronic, and is experienced most commonly in the hips, knees, ankles, and the upper and lower back. Individuals with spastic CP may have an increased number of painful sites and worse pain than those with other types of cerebral palsy. Treatments include spasticity management aimed at correcting skeletal and muscle abnormalities.

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### OTHER MEDICAL CONDITIONS

Adults have higher than normal rates of other medical conditions secondary to their cerebral palsy, such as hypertension, incontinence, bladder dysfunction, and swallowing difficulties. Scoliosis is likely to progress after puberty, when bones have matured into their final shape and size.



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DISCOVERY FOR DISABILITY



## KEY FACTS

**CEREBRAL PALSY IS A PHYSICAL DISABILITY THAT AFFECTS MOVEMENT AND POSTURE**

**IN MOST CASES, BRAIN INJURY LEADING TO CEREBRAL PALSY OCCURS DURING PREGNANCY.**

**CEREBRAL PALSY, EXCEPT IN ITS MILDEST FORMS, CAN BE EVIDENT IN THE FIRST 12–18 MONTHS**

**CHILDREN WITH CP ARE LIKELY TO ALSO HAVE OTHER IMPAIRMENTS IN ADDITION TO THEIR MOTOR DISABILITY**

**MOTOR DISABILITY CAN RANGE FROM MINIMAL TO PROFOUND**

**THE RATE OF DEPRESSION IS THREE TO FOUR TIMES HIGHER IN PEOPLE WITH DISABILITIES SUCH AS CP**

**CP IS A CONDITION THAT IS PERMANENT, BUT NOT UNCHANGING**

**IT IS THE MOST COMMON PHYSICAL DISABILITY IN CHILDHOOD**

**THERE IS NO KNOWN CURE**

**EVERY HOUR  
ANOTHER CHILD IS BORN  
WITH  
CEREBRAL  
PALSY**

## ASSOCIATED IMPAIRMENTS

GLOBALLY, OVER 17 MILLION PEOPLE HAVE CEREBRAL PALSY.

1 IN 500 BABIES IS DIAGNOSED WITH CEREBRAL PALSY.

1 IN 2 PEOPLE WITH CEREBRAL PALSY LIVE IN CHRONIC PAIN.

1 IN 3 CANNOT WALK.

1 IN 5 CANNOT TALK.

1 IN 10 HAS A SEVERE VISION IMPAIRMENT.

1 IN 25 HAS A SEVERE HEARING IMPAIRMENT.

OF ALL CHILDREN WITH CEREBRAL PALSY, 60% ARE BORN AT TERM.

CURRENTLY, THE NUMBER OF PEOPLE WITH CEREBRAL PALSY IS EXPECTED TO INCREASE.