

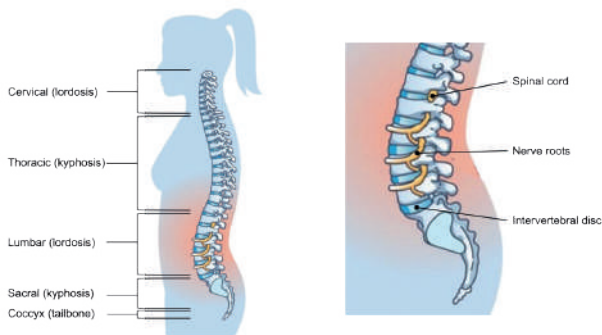


# **Back Pain in Children and Adolescents**

Manuel Cassiano Neves  
David M Farrington

The spine is made up of bones (vertebrae), extending from the skull to the bottom of the back, connected by ligaments (strong soft tissue connections between the bones) and separated by the intervertebral disks, that work as shock-absorbers. The vertebrae protect the enclosed spinal cord and the exiting nerve roots and provide support for the thorax and abdomen. The muscles attached to the spine provide mobility.

### Lateral Spine Column



According to the World Health Organization (WHO), in 2020 low back pain (LBP) affected 619 million people globally and it is estimated the number of cases will increase to 843 million cases by 2050, driven largely by population expansion and ageing.<sup>1</sup>

LBP is the single leading cause of disability worldwide and can be experienced at any age, most people experiencing an LBP episode at least once in their life. Until some years ago, it was thought this would be mostly an adult problem however recent studies have shown a prevalence rate of LBP in children ranging from 7% to 58%, increasing with age.<sup>2</sup>

Until recently children presenting with back pain were thought to usually have an organic origin for their pain.<sup>3</sup>



Manuel Cassiano Neves



David M Farrington



In younger children (<5 years) a cause of back pain can often be found. However, in older children and adolescents the most common cause of back pain is “non-specific”.<sup>4</sup> Sedentary lifestyle, obesity, and increased backpack weight are possibly related with a substantial increase of non-specific back pain in children and adolescents.<sup>5</sup> Possible risk factors are associated with psychosocial difficulties, sport participation, obesity, and positive family history of LBP.

The cause of back pain is tremendously varied and changes with the age of the patient. True injuries probably cause a lower percentage of pain than overuse. Repetitive running, jumping, conditioning, seem to be more commonly related with back pain than acute injuries. More infrequent causes of back pain include infection, tumor, trauma, or deformities such as scoliosis (spinal curvature), kyphosis (round back), spondylolysis (defects or broken area of bone), and spondylolisthesis (slippage of one vertebra over another).

## ASSESSMENT

Back pain in children should be assessed carefully, yet most children will only require a detailed medical history, a thorough and systematic physical examination, and simple radiographic evaluation. An in-depth, detailed history provides essential information when evaluating children with back pain. The patient history is often the most critical part of determining a definitive diagnosis.

### Signs and Symptoms

Back pain can occur in any part of your child’s back or spine. Age is an important factor since LBP is uncommon in young children and more frequent in older adolescents.

Your doctor will need to document nature of pain (sharp or dull), timing (onset, duration, frequency, night-time), location (including radiation to the extremities), severity of pain and factors that aggravate or relieve the pain. Your physician may include questions about neurologic symptoms, such as numbness, weakness, or gait abnormalities. Similarly, it is important to note constitutional symptoms as weight loss, fever, chills, lethargy, malaise, or anorexia.

Potential “red flags” (warning signs and symptoms) associated with identifying an “organic cause” of back pain include symptoms >4 weeks, night pain, age <5 years, peripheral joint disease, systemic symptoms, bowel/bladder incontinence, morning stiffness or neurologic signs/symptoms.<sup>6</sup>

### Physical examination

Physical examination of a child complaining of back pain will



be different according to the patient's age. However, a systematic and protocolized examination is crucial. During the examination your doctor will assess your child's gait, general body build, posture, and movement. The spine examination will include inspection, palpation, and range of motion. Combined with a complete neurologic examination and specific orthopedics tests all will offer your clinician the best chance to identify a cause for the pain.

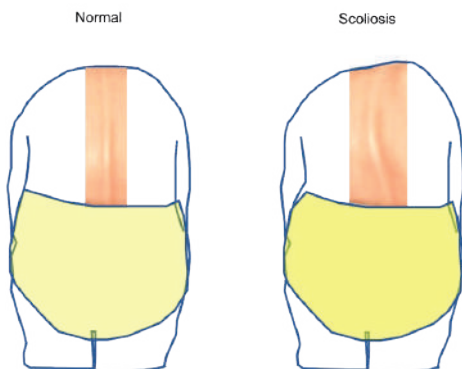
Gait assessment will include heel and toe walking, and single-leg stance and hop. This allows your physician to gather information regarding lower limb strength, balance, and coordination.

Next, your doctor will inspect your child's back, standing posture and spine alignment. The examiner will inspect the patient from the back, front and side with the patient standing and then bending forward (Adam's test). Adam's forward bend test is helpful to evaluate the patient for spine deformities: structural vs. postural kyphosis (round back), and scoliosis. Your physician will also assess shoulder, scapular, and pelvis level, flank symmetry, and trunk shift. Any rotation of the vertebrae (rib or lumbar paravertebral hump) will be documented.

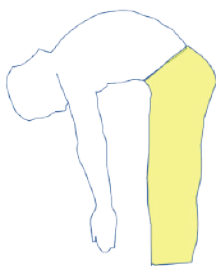
Following inspection, your doctor will assess the spine range of motion and flexibility. Your physician will also include the range of motion of the hips, knees, ankles, and feet. Next, the examiner will carefully palpate the entire spine and trunk musculature. Palpation is helpful to further delimitate the patient's pain and identify areas of tenderness.

Then, your doctor will perform a complete neurologic assessment including lower limbs strength and sensitivity, and tendon and abdominal reflexes. Finally, certain specific tests may be performed to guide diagnosis toward more specific conditions.

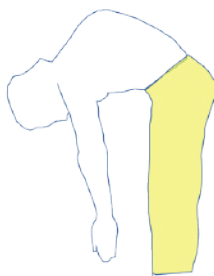
The medical history and physical examination findings will guide your doctor which diagnostic studies may be required next.



Rounded back



Kyphosis



## Diagnostic tests

**Simple spine radiographs** seem to be the best diagnostic screening tool for children with back pain and are useful for evaluating bone alignment, deformities, displacements, fractures, certain tumors, infections, and other bone disorders.

**Laboratory tests** are indicated in all young children (<5 years) with back pain, especially if long-lasting, patients with night-time pain, and any child with coexisting constitutional symptoms. A complete blood count (CBC), erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) may be requested if your doctor is considering infection, inflammatory disorders, or malignancy as a possible cause of the back pain.

If simple radiographs do not lead to a certain diagnosis, advanced imaging tests may be indicated by your doctor.

**Magnetic resonance imaging (MRI)** is useful when soft tissue lesions (spinal cord, nerve roots and discs) are suspected and cannot be evaluated with simple radiographs. MRI is very helpful in the diagnosis of infections, tumors, and neurologic causes of back pain. **Computed tomography (CT)** is useful to define more precisely bone pathology (tumors or fractures) previously detected in simple radiographs. CT is not considered a spine screening tool, even though it provides the best images of bone structures and allows 3-dimensional reconstruction of complex lesions. CT can be performed rapidly and usually does not require sedation, yet it may expose children to significant ionizing radiation. More rarely, your physician may indicate a **Bone Scan**. This technique is useful when MRI findings are inconclusive or in children with diffuse back pain. Bone scans are very sensitive in detecting conditions affecting bone metabolism (infection, benign and malignant tumors, and stress fractures). These lesions appear as areas of increased uptake of a radioactive material previously injected by vein.

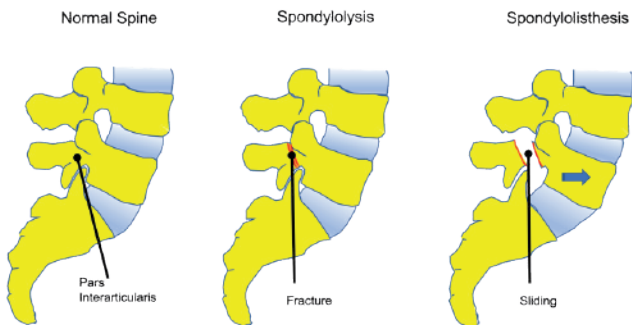


## Treatment

The most common cause of back pain in children and adolescents is non-specific back pain, mostly related to postural defects with core muscle imbalance or weakness related with a sedentary life. Physical examination in these cases shows no relevant findings. Your doctor may prescribe some type of analgesic for pain relief and physical therapy to improve posture, stretching hamstrings and strength muscle groups.

**Muscle strain** or **overuse** (acute or chronic) is another common cause of back pain. Acute strains usually resolve after a period of rest or activity modification. Non-steroidal anti-inflammatory drugs (NSAIDs) and cold packs may be useful relieving acute symptoms by decreasing swelling. After several days, warm packs may be preferred to relief muscle spasm.

Children practicing sports and activities that involve repetitive hyperextension of the lumbar spine as gymnastics, football or wrestling are at risk for an increase stress in the low back resulting in repetitive trauma to the spine leading in some cases to a stress fracture in the vertebra called **spondylolysis**. In some cases, the lesion becomes unstable (or because of a congenital defect) and the upper vertebra slips over the inferior one, causing **spondylolisthesis**. This condition may associate neurologic signs and symptoms due to compression.



The pain aggravates with back extension rather than bending forward. Most of these patients present hamstring tightness modifying the pelvis position and therefore increasing the lumbar curvature (lordosis). Treatment is mainly non-operative, with sports activities restriction, lengthening the tight hamstrings muscles and core strength. Sometimes your doctor will order a brace to provide symptoms relief. Surgery is restricted to patients resistant to non-operative treatment.

Nerve compression may also be secondary to a **herniated disc**, although this condition is rare in adolescents. A forceful



activity like weightlifting can be associated to this condition. A condition unique to childhood is **slipped vertebral ring apophysis**. Ring apophysis material is displaced into the spinal canal. The lesion is related to activities that increase vertebral axial loading. The patient presents acute onset pain often radiating down the leg associated with weightlifting, straining, or spine flexion. Surgery may be indicated to remove the fragment.

**Round back** is the result of a postural defect mostly related to poor muscle strength and hamstring tightness and can be corrected with core exercises and hamstring stretching. In adolescents the deformity may become rigid and painful and is associated with structural changes characterized by wedge shaped vertebra that collapse anteriorly and result in a hunched appearance that can progress to a severe deformity. This condition, known as **Scheuermann's kyphosis**, may require transitory use of a brace and physical therapy. Severe deformities may need surgical treatment.

Infections and tumors are uncommon but can be a cause of back pain in children and adolescents. Infections can affect the vertebra (vertebral osteomyelitis) or the disc (discitis) usually in younger children (<5), complicating diagnosis due to the lack of signs and symptoms. It may begin with mild dull pain or inability to walk. However, in severe cases the presence of fever, malaise, and low back stiffness are signs that suggest an infectious disorder of the spine. Lab work and imaging techniques (radiographs, MRI, or bone scan) are helpful establishing the diagnosis. Most cases are treated with antibiotic therapy.<sup>7</sup>

Tumors of the spine are rare in children and mostly benign, as osteoma osteoid or osteoblastoma. The presence of relentless pain, that gradually worsens specially at night-time, associated with fever, weight loss, and malaise requires prompt evaluation by your doctor. Treatment is specific diagnosis dependent.<sup>8</sup>

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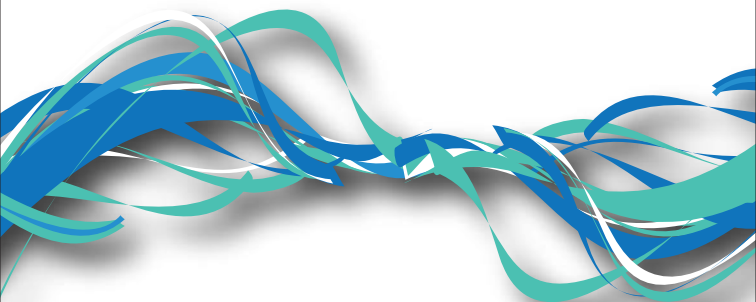
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**European Paediatric Orthopaedic Society**



## **Contact**

European Paediatric Orthopaedic Society (EPOS)  
EPOS Central Office  
Z.A. La Pièce 2  
1180 Rolle  
Switzerland

Tel +41 21 822 09 25

e-Mail: [sanni.hiltunen@epos.org](mailto:sanni.hiltunen@epos.org)