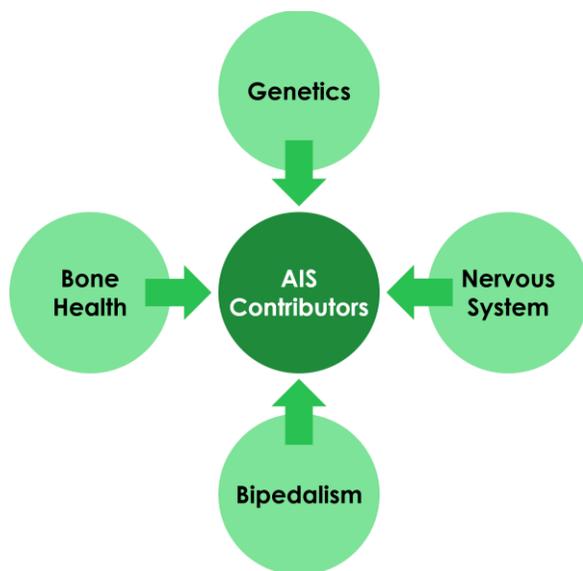


What Do We Know About What Causes Adolescent Idiopathic Scoliosis?

HINT: It's not caused by your child's posture, backpack-carrying habits, or body mechanics



Every so often, during my physical therapy evaluation with a family who has just discovered their teen has scoliosis, I will be asked the following set of questions:

- “Is it their posture that’s causing this?”
- “Do you think it’s the way they carry their backpack?”
- “I have noticed ____ [insert name of child or teen] likes to watch YouTube or study in bed. I wonder if that’s contributed to the scoliosis?”

My answers? “No. No, and No.” I’ll follow with a few statements directed at the teen in front of me and hope that the parents and caregivers sitting in will internalize the message, as well, and unite with me to live out this message.

My general spiel: “Scientists are hard at work in groups across the world working to uncover what causes scoliosis but what we do know is this – you did nothing to cause the asymmetry to develop in your spine and trunk. The development of scoliosis has zero to do with how you sit, stand, carry your backpack, relax on your bed, cross your legs, etc. etc. etc. We all have unique, interesting, and sometimes funky ways that we move in our lives. This discovery of scoliosis is not your fault. Now that we know that the asymmetry is there, we’re going to work on creating as much strength, balance, coordination, and sturdiness in your body.”

“Idiopathic”

The word “idiopathic” in Adolescent Idiopathic Scoliosis (AIS) means, “relating to any condition for which the cause is unknown.”

AIS is different from other types of scoliosis, such as congenital scoliosis, where scoliosis develops because a person is born with a structural variation in one or more of his/her vertebrae, or backbones.

Current knowledge can be divided into several sub-categories, and scientists are researching these various areas to look for links to AIS. What we’re finding at this point are **CORRELATIONS**. Correlations are associations between two events. We are not yet at the stage where we can truly identify the CAUSE.



Image from Canva

The information below discusses **correlations** in each of these different areas of research. The take-home messages at the end of each section talk about how to take this information and put it into action for our kids and teens with scoliosis.

Role of Genetics

The scientific literature supports the hypothesis that there is a genetic component to idiopathic scoliosis. However, it is poorly understood. We do know that if a first degree relative had AIS, there is an increased risk of an individual developing AIS.



Image from Canva

There are different ways in which genes can be expressed in a human being. Some conditions can be traced to a mutation or an alteration in a single gene. An example of this is a condition called cystic fibrosis, which is a genetic condition that causes lung infections and leads to difficulty breathing over time. Other conditions cannot be traced to a single gene. As a result, these conditions are categorized to be polygenic, meaning that multiple genes may interact to contribute to the development of a condition. AIS falls into this category along with other conditions, including rheumatoid arthritis (a type of arthritis affecting the joints), Crohns disease (a condition affecting the digestive system) and Type I Diabetes (a condition affecting the pancreas).

Take Home Message:

Parents should mention any family history of scoliosis to their child's pediatrician. This will allow for early and consistent screening through the use of the forward bend test as the child grows.

Nervous System Variations

Studies have compared the nervous systems of individuals with AIS with individuals without AIS. These studies have found differences in the parts of the nervous system that relate to motor control, proprioception, and the somatosensory system. These parts of the body's nervous system relate to the regulation of our body's movements (motor control), our awareness of where our body parts are in space (proprioception), and how our nervous systems process and respond to what we sense and feel in our environments (somatosensory system).

Additionally, scientists are finding differences in those with AIS in the length of their spinal cord in comparison to the length of the bones and discs that make up the spine. We're learning that in those with AIS, certain parts of the discs and vertebrae (backbones) grow faster than other parts of the discs and vertebrae and faster than the spinal cord itself. *In other words, the skeleton and the nervous system start growing at different speeds.* This isn't seen in those without scoliosis and is a strong area for continued research.



Image from Canva

Take Home Message:

Physiotherapists and movement professionals working with kids and teens with AIS may include interventions that address balance, coordination, and the vestibular system (a system that gives our brains information about motion, head position, and where we are in space). Parents can support and encourage a variety of physical activities that challenge their kid or teen's balance and coordination.

Bone Health

A growing area of research is being done around bone health. In healthy bodies, our bones increase in strength and quality until we are in our mid-20s. Optimizing the bone health of our kids and teens through quality nutrition and physical activity is beneficial. Studies are showing that there may be a relationship between AIS and lower bone mineral density (BMD). There may also be a relationship between AIS and key hormones, such as leptin, that help to regulate skeletal growth, bone quality, and energy balance in growing kids.

Take Home Message:

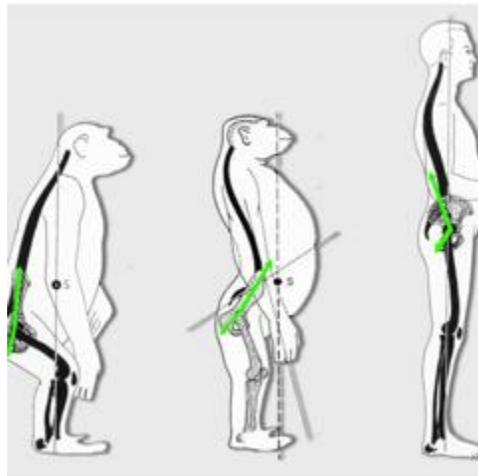
Parents of kids and teens with AIS may speak their physician about how to best optimize bone health and bone quality. Interventions may include vitamin D and calcium supplementation, nutrition, and physical activity recommendations.

Bipedalism = Walking on Two Feet

One fascinating fact about AIS is that it is thought to be a uniquely human condition, meaning that even though scoliosis has historically been found in other animals, its features do not fit

what we see in AIS. A fairly recent example is a giraffe that lived at the Santa Barbara Zoo from 1987 to 2008 named Gemina. Around the age of 3, Gemina developed a 90-degree curve in the bones/discs of her neck. Even though Gemina had scoliosis, the way her neck bones/discs changed shape did not fit the same pattern of changes that we see in AIS.

Scientists believe that it is the unique ability of humans to walk around on two feet that leads us to have an increased risk of developing scoliosis. This is due to the unique loads placed on the bones and discs of our spines when we're upright. Other animals, such as dogs and chimpanzees who primarily use all four limbs, don't experience these same loads.



Schlösser TPC, et al. 2017

Take Home Message:

This is another aspect of scoliosis that is out of our control. We are all human. We walk and run in the world on our two feet.

My one take-home as a physiotherapist and a person with lots of friends and family members entering parenthood is to *encourage all of the stages of movement development in infants*. I remember when I was young, the kid of a family friend skipped crawling and went right on up to standing! We all marveled at it at the time. Looking back after going through so much movement and physical therapy training, I recognize the importance of having infants and toddlers experience each stage of development. It offers the developing brain, nervous system, muscles, joints, and connective tissues healthy training to prepare the body for the next stage of life.

Summary

All in all, researchers are learning more and more every day about what contributes to the development and progression of AIS. However, at this point, we are still treating the effects of AIS on the spine and trunk. We are not yet treating the cause of AIS.

Our message to families and especially teens: What led to the development of scoliosis is completely out of your control and looks to be related to a huge multitude of factors. Now that we know that the scoliosis exists, we as the clinicians, family, and friends in your lives are all here to help you through the process and the experience.

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Kelly Grimes is a physiotherapist living and working in the city of New York in the US. She has been in practice for 14 years, six of them happily immersed in helping individuals with scoliosis and other spinal structural variations live powerful lives. Kelly is trained at the C2 level of the BSPTS Concept by Rigo method (a Schroth-based method) and Level 2 of the SEAS approach. She is also a Co-Chair of the Communications Committee of the Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT).

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