
THE CrossFit JOURNAL

No Squats for Coal Miner's Daughter

What if everything we "know" about resistance training for children is based on myth?
Chris Cooper investigates.

By Chris Cooper

November 2013



In 1842, England's Children's Employment Commission observed a disturbing trend, according to [Causes of Short Stature Among Coal-Mining Children, 1823-1850](#) by Peter Kirby. It seemed children working in coal mines were notably shorter than other British children. This was cause for alarm. In their rudimentary version of the Sickness-Wellness-Fitness Continuum, 19th-century British scientists used height as a primary indicator for health. A short child was, by definition, unhealthy.

1 of 8

The commission blamed the laborious nature of coal mining for stunting the growth of its child workers. The heavy loads, it rationalized, permanently compressed the skeleton. To achieve “normal” height, therefore, children should remain unburdened by external load until they reached physical maturity.

Though now thoroughly discredited by sport science, stories like these from child-labor hotspots worldwide resonate with parents, coaches and nervous onlookers alike. Position papers from leading scientific authorities now advocate resistance training but still shy away from “heavy” or “repetitive” lifts. All espouse the benefits of a “properly designed training program” implemented by an “expert,” but none seem confident enough to actually recommend a program.

Is resistance training dangerous for children? If a little is OK, where’s the line? What’s best for our kids?

The Sticky Myth

“A lie can travel halfway around the world while the truth is putting on its shoes.” —Mark Twain

The young miners, called “colliers,” received a lot of attention from physicians and other 19th-century “experts.”

“Colliers who have been habituated, from childhood, to work in pits where the veins of coal are thin, and the workings consequently contracted, have certainly a remarkably stunted appearance, and the boys are commonly of low stature for their respective ages,” according to a report from the Forest of Dean coal field.

Another, from West Yorkshire, noted that coal miners were “notoriously a diminutive race of men,” and a Wigan surgeon claimed that coal-mining children were “smaller, and have a stunted appearance.”



While some parents still believe training can harm children, many other parents now understand its value in keeping their children fit and healthy.

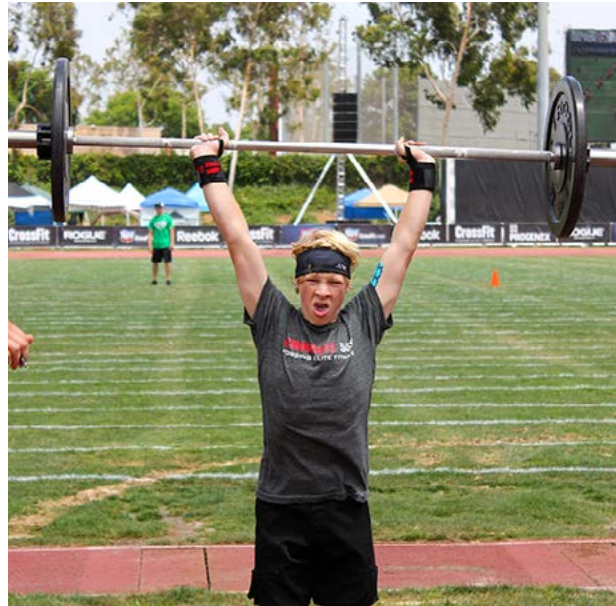
The truth: selection, inadequate nutrition, little access to daylight, high anxiety and the depression of growth hormone caused the child miners' stunted appearance. The shorter kids were chosen to work the mines because they could fit better. And contemporary surveys of rickets—a frailty of the bones caused by inadequate sun exposure—show drastic spikes of occurrences in mining towns, where kids might not see the sun all day in the wintertime. Violence and a high rate of mortality among fathers in mining towns caused a high level of childhood anxiety, which represses growth hormone. The children of the mines weren't tramped down by the weight of their load: they had rickets or were starved or depressed. These were Kirby's conclusions, and they were published in the *Economics History Review* in 1995.

The truth: selection, inadequate nutrition, little access to daylight, high anxiety and the depression of growth hormone caused the child miners' stunted appearance.

The young miners also received some positive attention from the Children's Employment Commission. "In Yorkshire, a contrast was drawn 'between the broad stalwart frame of the swarthy collier ... and the puny, pallid, starveling little weaver, with his dirty-white apron and feminine look,'" Kirby wrote. Though child weavers in Yorkshire probably had better access to daylight and food, their long days of sitting apparently led to a waifish appearance.

Sub-Commissioner James Mitchell thought "the colliers, as a race of men, in most districts, and in Durham amongst the rest, are not of large stature, but they always appear strong and vigorous."

Thomas Tancred, of the Midland Mining Commission, in 1843 said the child miners of West Bromwich had "a development of the muscles of the chest, back and arms, which could not have been surpassed in the athletae who won the laurel-wreaths at the Grecian games."



In a weird twisting of logic, many parents will not allow their children to lift weights but won't think twice about registering them for contact sports like football.

And Jelinger Symons thought "the strength and robustness of the children is owing, first to their ample and nourishing food; secondly, to their work, hurrying in the pits being a healthful gymnastic exercise, where not carried to great excess."

If the hard work of carrying, towing and pushing ore contributed to a stronger, more robust child, why do we remember only the myth of the stunted, shortened child working underground?

In the book *Made to Stick*, Chip and Dan Heath recount the necessary parts of a long-running urban legend. For a myth to have staying power, the Heath brothers write that it must contain "credible, emotional stories." The colliers' story is emotional on its own; for a while, 20th-century science seemed to lend credence. In the early 1900s, doctors worried that repeated stress to the epiphyseal plates (often called "growth plates") could stunt a child's growth.

Growth plates are found at the end of long bones like the femur. When cells—called "chondrocytes"—in the growth plate divide, they stack together, making the bones longer. Osteoblasts harden the stacks to make the bones rigid. During puberty, chondrocyte activity stops, and the epiphyseal plates thin to a small scar and eventually disappear entirely.



A child's age is sometimes a poor indicator of readiness to lift. A better indicator is often the ability to follow instructions and maintain concentration during activities.

When the epiphyseal plate is gone, the potential for bone lengthening—and therefore height—goes with it. A kid's only opportunity to get taller occurs when the growth plates are active. Anything that damages the growth plate can limit potential maximum height.

What damages growth plates? Joint injuries from impact sports, frostbite, falling from high places, crashing a bicycle. In short, anything that can break a bone can fracture an epiphyseal plate. **Injuries reported from resistance training**, on closer inspection, almost always occur when a child falls from a piece of equipment, drops something heavy on herself or pinches something.

Weight training doesn't damage growth plates, but paired with an emotional story like that of the child colliers in England, the myth seems believable. The real risk of injury to growth plates isn't resistance training at all. It's lack of skill training.

"I'd say it remains the No. 1 question we get: 'Should my kid be lifting a load?'" said Dr. Jon Gary of CrossFit Kids. "But

age doesn't tell you everything about a kid's development. How's their skeleton developing? How's their mental status? Can they concentrate long enough to maintain concentration on a five-second lift? Can they listen to instructions?"

Dr. Jon Gary believes attention to detail and the ability to focus are the most important indicators of readiness for weight training regardless of the child's chronological or emotional age.

No Squats ... (continued)

Gary believes attention to detail and the ability to focus are the most important indicators of readiness for weight training regardless of the child's chronological or emotional age.

"It depends on the child. We talk about mechanics and consistency, and then well down that path is intensity, speed and load," Gary said. "For a 5-year-old, that might take years."

Technique and consistency take longer for a child to develop, but Gary believes there's plenty of time.

"What's the rush?" he asked. "We're coming to CrossFit Kids for general physical preparedness, not sport-specific training. No one's going to a NFL camp at age 9. We're going to matriculate your kids up slowly, and it's going to be amazing."

The Reality of Resistance

The fear of overtaxing a child is both new and geographic.

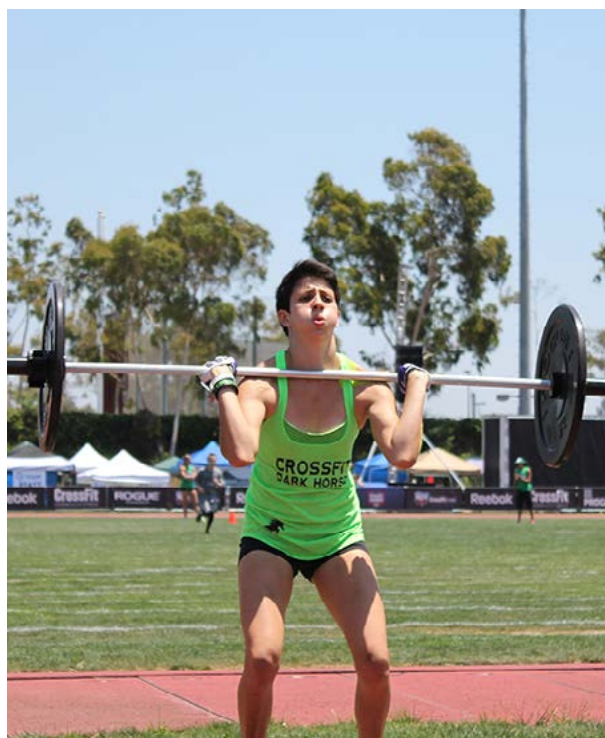
In developing countries, kids tote water on their heads and in their hands, they drag a hoe over unrelenting dirt, and they carry smaller brothers and sisters on their backs. They hunt, they transport firewood, and they even carry rocks on which to sit.

When a child jumps from a snow bank, off a hay bale or out of a tree, the eccentric force upon landing can be estimated mathematically. In a laboratory setting, researchers have had children jump and land on force plates to measure the load at impact and compare it to a percentage of their body weight.

Seventy students from grades four, five and six in the Richmond School District of British Columbia volunteered to perform 12 different jumps. Many of these exercises would be familiar to CrossFit Kids coaches: AF (alternating feet) is a jumping lunge, DJ_{50} is a rebounding box jump to a 20-inch box, and JJ_{SUBMAX} indicates jumping jacks.

When children drop from a 20-inch box, they absorb about 4.7 times their body weight at impact. When they split into a jumping jack, it's about 3.7 times their body weight; even landing a jumping lunge, or a split jerk with a piece of plastic pipe, results in forces around 2.1 times body weight. What if a 50-lb. child was loaded with 102 lb. and asked to do a jumping lunge?

Interestingly, the researchers in the study weren't looking to predict the damage caused by these activities; they were trying to see which built the *most* bone. They were trying



In CrossFit Kids programs, children are monitored carefully, and intensity is only added after good mechanics and consistent movement patterns are seen regularly.

to find the jump that caused the highest stress because they hypothesized that it would be most beneficial—not growth stunting but bone enhancing.

Hopscotch, skipping and even running are plyometric by nature, and parents don't pull their kids from the playground or push to ban sidewalk chalk. Ask their children to perform actions requiring the same muscular forces in a gym, though, and perceptions of risk change. The barbell draws fear and criticism like a lightning rod, though simple play might actually create more strain than an external weight.

"I'd refer to the 2001 American Academy of Pediatrics definition of resistance training," Gary said. "It's the use of any external object—a band, a load, a machine—with which to push against your muscles for the purpose of increasing strength. Anything that provides a resistance to your muscles—a jug on your head, a stretch band, two dry-erase markers substituting as dumbbells—(is) means of resistance. They carry some type of load."

Supporting Science

Over the last decade, research has piled up in support of the safety—and necessity—of resistance training for youth.

The National Strength and Conditioning Association (NSCA) published the first position statement paper on youth resistance training in 1985. Initially, the association advocated only high repetitions and low weights but **amended its position in 1996** in light of overwhelming supporting evidence that even heavy resistance training is safe and effective for youth.

In 2007, the **President's Council on Physical Fitness and Sports** went further, recommending resistance training as a better option for overweight youths than aerobic activity.

"Regular participation in strength-building activities gives obese youth a chance to experience success, feel good about their performances, and gain confidence in their abilities to be physically active," the authors wrote.



As science dispels the myths around children and strength training, more parents begin to understand how programs such as CrossFit Kids can set children up for a lifetime of success on the playing field.

The [Canadian Society for Exercise Physiology](#) took the position, in 2008, that “There is no minimum age for Resistance Training for children ... exercises can include more advanced movements such as Olympic-style lifting, plyometrics, and balance training, which can enhance strength, power, coordination, and balance.”

Across the board, research supports that resistance training—even one-rep maxes—can be safe for kids. The only difference between a safe and an unsafe program is the presence of a skilled coach.

Smooth is Fast

At the Gauntlet event during this year’s CrossFit Games, spectators were awed by teenagers’ heavy lifts. Eighteen-year-old Jesse Lopiz (pictured on Page 1), stood out in winning the varsity division.

After 93 burpees in 10 minutes—some of which ended in pull-ups or muscle-ups—he took a short rest and then ascended a max-clean ladder like it was a gently sloping mountain trail. He moved smoothly through 245 lb., 275

lb., 295 lb. and 305 lb. At 315 lb., he caught the weight easily but failed to stand up with it. He rested, then tried again. Same result: a beautiful pull, a flawless catch, a vertical torso and great rack position. He got stuck in the bottom anyway. It was the same result on the third attempt.

Lopiz doesn’t follow programming with a “strength bias” or do extra weightlifting work.

“I don’t do any of that stuff,” he said. “I just do CrossFit.”

He’s been doing it for almost eight years, starting with CrossFit Kids, learning and practicing for a year with PVC pipe. He then moved to 15 lb., and then to 25, getting very good at 25-lb. lifts before moving to 45 and becoming a master who could execute perfect cleans 10 times out of 10.

“Jesse Lopiz matriculated up slowly,” said Gary, his judge on the clean ladder. “He’s got 315. He can handle the technique, just not the weight yet. A PR clean should look just as close to perfect as your first clean, and your mental state shouldn’t change either.”



For kids, the load on the bar is often irrelevant. Great coaches will evaluate form instead and add weight only when the movement is sound.



Under the close supervision of a trained coach, kids can become stronger and learn movement techniques that will benefit them for decades.

But Think of the Children!

At Gauntlet events, coaches and judges choose the weights and competitive category for the kids. No athletes are asked, "How much can you handle?" Instead, they are required to demonstrate proficiency. If a teen moves well with a 65-lb. thruster, that becomes his prescribed weight for the event. Movement fluency comes first.

When a child struggles to float, parents don't push to ban swimming. They register for classes.

When a child struggles to float, parents don't push to ban swimming. They register for classes. With research now supporting the need for children to lift weights, parents should seek the best way for their children to participate. Education is the real myth-buster.

"The point of the CrossFit Kids course is to keep your child safe," Gary said. "Hundreds of thousands of kids every year go to the pool for the first time. If they can't swim, there are issues with severe consequences. Parents still take the kids to the pool anyway; there are lifeguards and swim coaches. I have the same responsibility in my CrossFit Kids class."



About the Author

Chris Cooper is a staff writer for CrossFit. He owns CrossFit Catalyst in Sault Ste. Marie, Ont. Both of his children lift weights.