INSIDE JEB

Kids don't walk like scaled-down adults

Children walking in a forest. Photo credit: Walton LaVonda, U.S. Fish and Wildlife Service, Public domain, via Wikimedia Commons (https://commons.wikimedia.org/wiki/File:Children_walking_forest.jpg).

Enticing walking toddlers to keep going, even over short distances, can be hard and bigger kids are sometimes just as challenging; but there may be more to their lack of cooperation than simple stubbornness. Children up to the age of 10 seem to tire more easily than adults when walking and, after years of designing and building artificial limbs and braces to help children, Vivian Rose (University of Houston, USA) was sure that kids walk in a completely different way from adults. Yet, most of the devices currently available to help children with disabilities walk are simply scaled-down versions of the designs used for adults, taking no account of the differences between adult and kids' movements. Could the devices be improved if we knew more about how kids walk? Frustrated by the lack of knowledge, Rose joined Christopher Arellano's biomechanics group at the University of Houston, to get a better handle on how children walk.

'Vivian is amazing with kids', says Arellano, recalling her patience – developed helping youngsters learn to walk with assistive devices – as she worked with the 5–6 year old recruits. One of her main challenges was convincing the youngsters to breathe through a tube to record how much oxygen they were consuming while walking. 'We first tried out a mask, but the children did not like that option, so Vivian did lots of research figuring out the size of the mouthpiece and nose clips, so they were comfortable', says Arellano. Then, the youngsters had to walk on a treadmill in time with a metronome at their normal step rate, and then faster (125%) and slower (75%), while the team recorded their movements in 3D. 'The kids were all pretty excited but, overall, pretty cooperative and some got a kick out of seeing their "avatar" skeleton move around and dance on the screen', Rose recalls, adding that all eight of the young volunteers were keen to return to the lab the following day to complete the experiments.

Rose and Arellano then faced the Herculean task of analysing the kids' walks, but it quickly became clear that the children's movements, as they transferred energy from one step to another, were completely unlike those of adults. 'The data looked so different!', exclaims Arellano. For example, when the kids were taking longer strides while walking at a slower step rate, they used both legs to propel themselves forward, unlike adults, who only push off with the trailing leg. In addition, the children's legs were less springy than adult limbs – probably because they haven't yet learned how to coordinate the muscles around the ankle – allowing them to store less energy to reinvest in the next step and making them less economical. Consequently, the kids used 36% more energy than a child-sized scaled-down adult, although the youngsters were able to adjust the springiness of their limbs over the course of a stride, much like adults.

In short, children most definitely do not walk like scaled-down adults and Rose is keen to apply the lessons she has learned to improve artificial limbs and braces for children. 'Rather than focus on flexibility, propulsion or the energy storage and return properties of a prosthetic foot and ankle for walking, young children may benefit from greater vertical stability and support', she says. And the next time you're struggling to get your 6 year old to keep up, have a little sympathy. They may look like a mini-me by your side, but they still have a long way to go before they truly stride in your step.

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