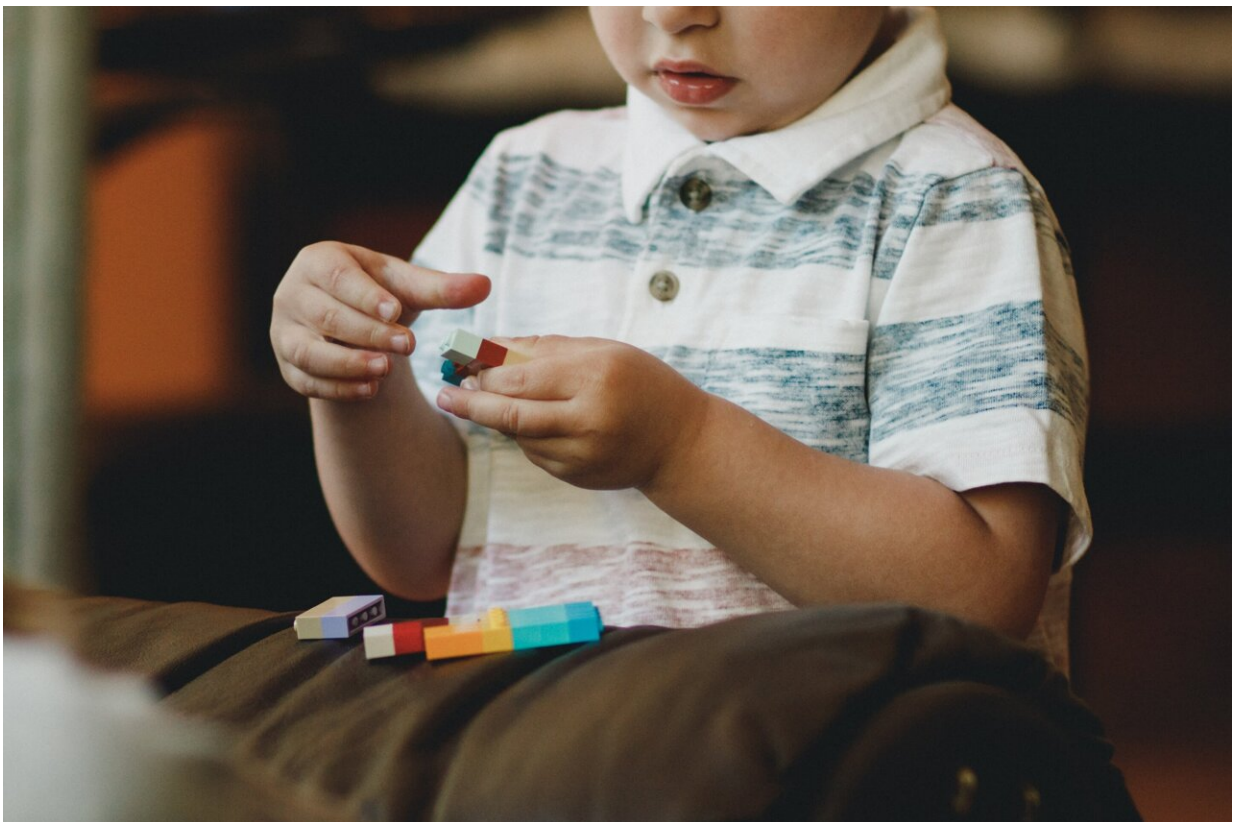


Researchers develop new method for measuring movement behavior in children with autism

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Motor imitation, or the ability to copy the physical behavior of others, is a critical part of cognitive and social development from very early

childhood. However, studies have shown that motor imitation can differ in children with autism spectrum disorder (ASD), and reliable measures of this important skill could therefore help offer earlier diagnosis and more targeted intervention.

Now, researchers at the Center for Autism Research (CAR) at Children's Hospital of Philadelphia (CHOP) have developed a new method of measuring motor imitation, adding to a growing set of computational behavior analysis tools that can detect and characterize motor differences in children with autism. A study describing the method was recently presented as part of the International Conference on Multimodal Interaction.

Researchers have been interested in motor imitation as a means of studying autism for decades. Imitation is important in early development, and imitation differences may be foundational in how social differences in those with autism present themselves. However, creating measures of imitation that are both granular and scalable has proven challenging. In the past, researchers have relied on parent report measures of certain imitation milestones, but these are not necessarily precise enough to measure individual differences or change over time. Others have used behavioral coding schemes or specialized tasks and equipment to capture imitation skills, which are resource-intensive and not necessarily accessible by most of the population.

"Often times, the emphasis is placed on the end state accuracy of an imitated action, failing to account for all the steps necessary to get to that point," said Casey Zampella, PhD, a scientist at CAR and first author of the study. "Actions might be considered accurate based on where the child ends up, but that's ignoring the process of how the child got there. How an action unfolds is sometimes more important for characterizing motor differences than how it ends. But capturing this unfolding requires a fine-grained and multidimensional approach."

To address this, scientists at CAR developed a new, largely automated computational method to assess motor imitation. Participants are instructed to imitate a sequence of movements in time with a video. The method tracks body movement across all limb joints over the full course of the imitation task with both a 2D and a 3D camera. The method also utilizes a novel approach that captures whether the participant has motor coordination difficulties within their own body that might influence their ability to coordinate movements with others. Performance is measured across repeated tasks.

Using this method, researchers were able to distinguish participants with autism from typically developing youth with 82% accuracy. Researchers also demonstrated that differences were driven not only by interpersonal coordination with the video but also intrapersonal coordination. Both the 2D and 3D tracking software had the same level of accuracy, which means children may be able to do the tests at home without using any special equipment.

"Tests like these not only help us learn more about the differences among people with [autism](#), but they may help us measure outcomes, such as the effectiveness of treatment or changes to their life," said Birkan Tunç, PhD, a computational scientist at CAR and senior study author. "When this test is added with many other computational behavioral analysis tests being developed right now, we are approaching a point where we can measure most behavioral cues that a clinician observes."

The research was published in the *Companion Publication of the 2021 International Conference on Multimodal Interaction* October 2021.

More information: Casey J. Zampella et al, Computational Measurement of Motor Imitation and Imitative Learning Differences in Autism Spectrum Disorder, *Companion Publication of the 2021 International Conference on Multimodal Interaction* (2021). [DOI:](#)

[10.1145/3461615.3485426](#)

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