Kids with autism learn, grow with the 'social robot'

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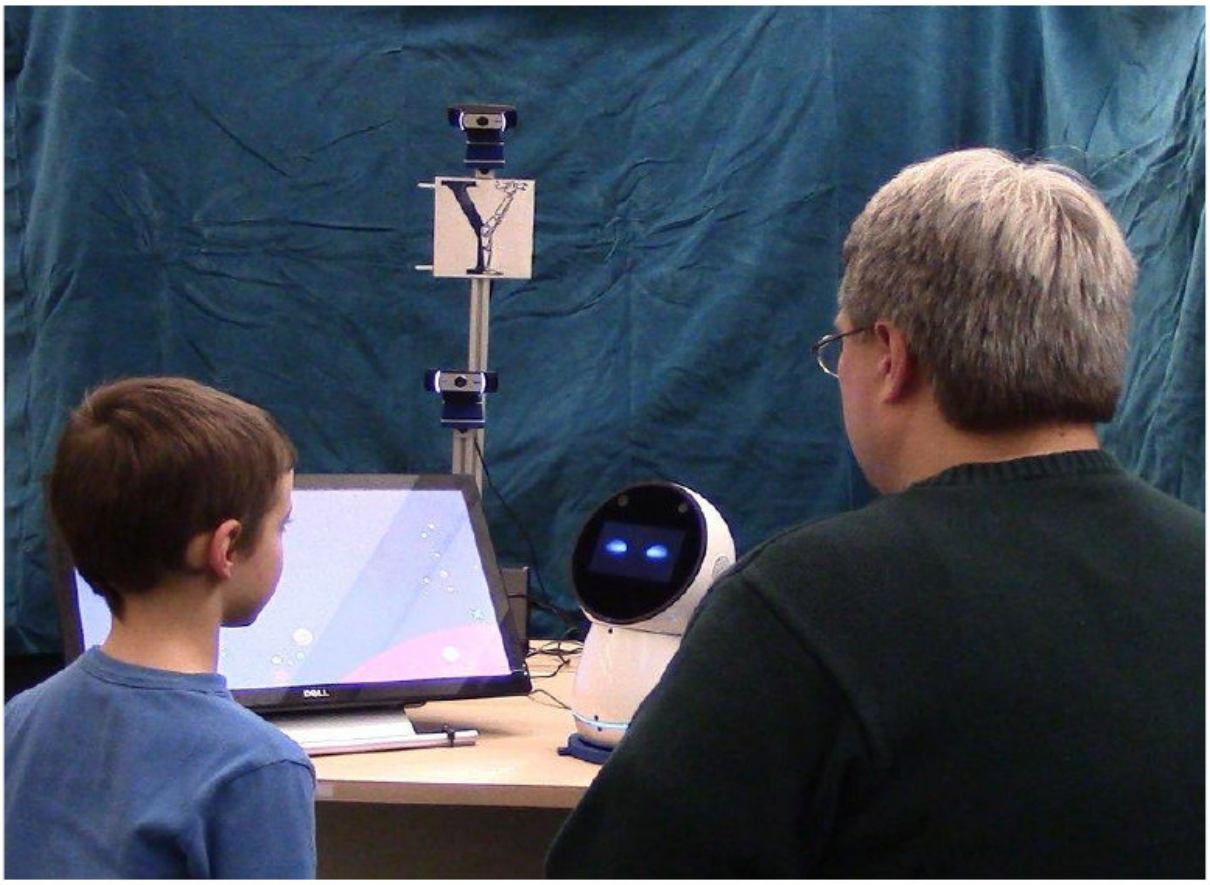

Robot interaction with child with ASD, alongside a caregiver. Credit: Scassellati et al., Sci. Robot. 3, eaat7544 (2018)

Robots may hold the keys to social success for kids with autism.

That's the takeaway from an experimental home-based therapy in which autonomous "social" robots modeled and encouraged behaviors like maintaining eye contact and paying attention while playing with 12 children with autism spectrum disorder. The kids were between 6 and 12 years of age.

For the mother of one boy who took part in the month-long experiment, the gains were a real eye-opener. She said her son's interactions with people who he's not close to had been "a little awkward at times."

"From watching the robot and interacting with the robot, that really engaged him, and it made him, I think, connect the dots. His interactions became more consistent. His eye contact became more consistent," said the mother, who did not want to be identified. She sat beside her son as an observer during the half-hour daily sessions.

"It really just showed me how bright he is and how quick he is," the mother said, giving her fingers a quick snap. "And it gave us time together, to kind of learn about each other. He's a lot of fun, and this really brought out really good qualities for him."

The Yale University-led experiment was the first to deploy an autonomous robot in the home for autism therapy, said study leader Brian Scassellati.

"We dropped these robots off and left them in the home for a month, and all decisions about what to do, how difficult to make a problem, and how to keep a child engaged were made by the robot," Scassellati said.

He is director of the NSF Expedition on Socially Assistive Robotics at Yale.

Developed specifically to support autism therapy, the desktop robots told

stories and guided kids through a series of interactive games focused on improving social skills, emotional understanding, sequencing and perspective.

Other studies investigating robots in autism therapy have focused on scripted or human-controlled interactions in a laboratory, Scassellati said.

That includes work by a group of Dutch researchers, who earlier this year also reported success in helping children with autism improve their social skills after working with their own robotic design.

Their robot—named "Nao" and tested by researchers at the Radboud University Medical Center in the Netherlands—walked, talked and danced under the real-time control of attending therapists.

In contrast, Scassellati's robot charted its own decision-making course during daily therapy sessions, using software developed for this experiment.

As a caregiver looked on, the desk-based robot (accompanied by a camera and a touch-screen monitor) told stories and led interactive games.

"The robot acted in part as the game moderator, selecting appropriate difficulty levels, posing new challenges [and] advancing the narrative of the games," Scassellati explained. By turns, it took on the role of partner, competitor, coach or mentor, while "encouraging engagement and appropriate social behavior."

Such behaviors included teaching kids how to comfortably make eye contact or how to pay attention to others during a conversation.

In other words, Scassellati said, the robot basically hit all the bases that a human therapist might touch, without the high cost such treatment would entail.

After a month of robotic training, researchers analyzed more than 125 hours of therapy session video. It showed that the children were paying closer attention during interactions with adults—gains that lasted even after the robot training ended.

The findings suggest that robot-human interactions hold the potential to enhance people-to-people interactions under some circumstances.

As to why, Scassellati acknowledged that the jury is still out. With a robot, he said, there's no social pressure to get things right the first time, and that lowered level of anxiety may be key.

"The best hypothesis that we have is that the robots are social, but not too social," Scassellati said.

"They are social enough that people treat them like agents; they make eye contact with them, they talk to them, and they generally treat them as if they were alive. However, they are not so social that the children feel nervous or anxious about interacting with them," he added.

Thomas Frazier, chief science officer for Autism Speaks, an autism advocacy organization, said using a robot to interact with both child and caregiver, and tailoring the difficulty of tasks and games is an "important advance."

"The authors are careful to note several of the current limitations, including the relatively restricted context in which the robot is being used. But, at the same time, this provides a nice advance toward the ultimate goal of personalized support throughout the day and in various

settings," Frazier said.

"The fact that engagement was so high, performance improved and caregivers felt that the child's behavior improved is impressive," he added.

The report was published Aug. 22 in *Science Robotics*.

More information: B. Scassellati el al., "Improving social skills in children with ASD using a long-term, in-home social robot," *Science Robotics* (2018). robotics.sciencemag.org/lookup … /scirobotics.aat7544