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Therapy Robot Teaches Social Skills to Children With Autism

The QTrobot from LuxAI was designed to help children with autism learn to interact with humans

By **Emily Waltz**

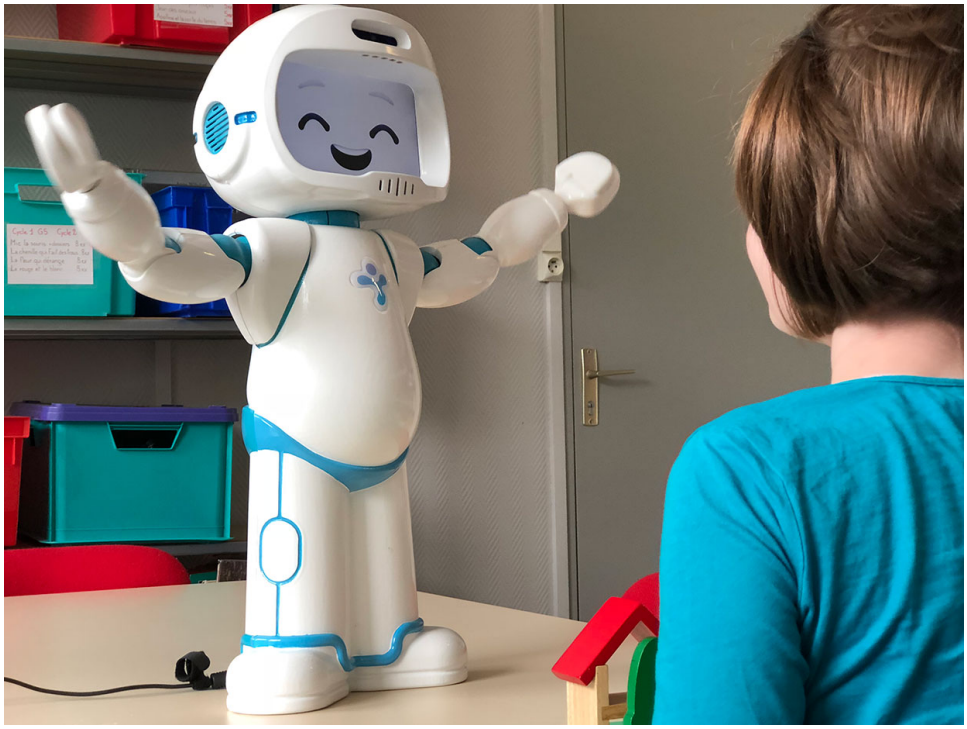

Photo: LuxAI

For some children with autism, interacting with other people can be an uncomfortable, mystifying experience. Feeling overwhelmed with face-to-face interaction, such children may find it difficult to focus their attention and learn social skills from their teachers and therapists—the very people charged with helping them learn to socially adapt.

What these children need, say some researchers, is a robot: a cute, tech-based intermediary, with a body, that can teach them how to more comfortably interact with their fellow humans.

On the face of it, learning human interaction from a robot might sound counterintuitive. Or just backward. But a handful of groups are studying the technology in an effort to find out just how effective these robots are at helping children with autism spectrum disorder (ASD).

One of those groups is LuxAI, a young company spun out of the University of Luxembourg. The company says its QTrobot can actually increase these children's willingness to interact with human therapists, and decrease discomfort during therapy sessions. University of Luxembourg researchers working with QTrobot plan to present their results on 28 August at RO-MAN 2018, IEEE's international symposium on robot and human interactive communication, held in Nanjing, China.

"When you are interacting with a person, there are a lot of social cues such as facial expressions, tonality of the voice, and movement of the body which are overwhelming and distracting for children with autism," says Aida Nazarikhorram, cofounder of LuxAI. "But robots have this ability to make everything simplified," she says. "For example, every time the robot says something or performs a task, it's exactly the same as the previous time, and that gives comfort to children with autism."

Feeling at ease with a robot, these children are better able to focus their attention on a curriculum presented together by the robot and a human therapist, Nazarikhorram says.

In the study that will presented at RO-MAN later this month, 15 boys ages 4 to 14 years participated in two interactions: one with QTrobot and one with a person alone. The children directed their gaze toward the robot about twice as long, on average, compared with their gaze toward the human.

Repetitive behaviors like hand flapping—a sign of being uncomfortable and anxious—occurred about three times as often during sessions with the human, compared with the robot, according to the study.

More importantly, with a robot in the room, children tend to interact more with human therapists, according to feedback the company received during its research, says Nazarikhorram. "The robot has the ability to create a triangular interaction between the human therapist, the robot, and the child," she says. "Immediately, the child starts interacting with the educator or therapist to ask questions about the robot or give feedback about its behavior."

A number of groups have been developing digital therapeutics to treat psychiatric disorders, such as apps to treat substance abuse, and therapeutic video games to treat attention deficit/hyperactivity disorder. But there's something about the embodied robot that gives it an edge over plain screens. "The child is just focused on the app and doesn't interact with the person beside him," Nazarikhorram says. "With a robot, it's the opposite."

Robot-based therapy for autism has been studied for more than a decade. For instance, scientists first conceived of KASPAR the social robot in the late 1990s. It is now being developed by scientists at the University of Hertfordshire in the United Kingdom. And there are at least two other commercial robots for autism: Robokind's Milo and Softbank Robotics' NAO.

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The MIT Media Lab recently used NAO to test a machine learning network it built that is capable of perceiving children's behavior. The algorithm can estimate the level of interest and excitement of children with autism during a therapy session. The research was published in June in *Science Robotics*.

"In the end, we want the robots to be a medium towards naturalistic human-human interactions and not solely tools for capturing the attention of the kids," says Oggi Rudovic, at the MIT Media Lab, who coauthored the machine learning paper in *Science Robotics*. The ultimate goal is to equip children with autism "with social skills that they can apply in everyday life," he says, and LuxAI's research "is a good step towards that goal."

However, more research, involving more children over longer periods of time, will be needed to assess whether robots can really equip children with real-life social skills, Rudovic says.

The QTrobot is a very new product. LuxAI started building it in 2016, finished a final prototype in mid-2017, and just this year began trials at various centers in Luxembourg, France, Belgium, and Germany.

Nazarikhorram says she wanted to build a robot that was practical for classrooms and therapy settings. Her company focused on making its robot easily programmable by autism professionals with no tech background, and able to run for hours without having to be shut down to cool. It also has a powerful processor and 3D camera so that no additional equipment, such as a laptop, is needed, she says.

Now LuxAI is conducting longer-term trials, studying the robot's impact on social competence, emotional well-being, and interaction with people, Nazarikhorram says.

We asked Nazarikhorram if it's possible that pairing robots with children with autism could actually move them further away from people, and closer to technology. "That's one of the fears that people have," she says. "But in practice, in our studies and based on the feedback of our users, the interaction between the children and the therapists improves."

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