**Robot Therapy**

* *Robot therapy is coming up in a big way, which entails different therapeutic elements to treat children and adults with autism.*

*Social robots* [*provide therapy*](http://www.technologyreview.com/view/521746/how-social-robotics-is-revolutionising-therapy-for-autistic-children/)*(or co-therapy, in combination with the efforts of a human expert) and potentially even help teach autistic children new skills.*

*When used in a clinical setting, these talking robots may help diagnose autism earlier.*

* Although autism does not require extensive tretment, considering the nature of disorder, it is important to emphasize on the various aspects of improving the mental health and abilities of a child.
* Studies across different parts of the world are emphasizing on the use of physical therapists for treating autism and controlling the symptoms. Research has revealed that kids showed remarkable improvement in their conversational *skill while interacting with robots*, as compared to sessions with human therapists. Parents also reported that these children, exposed to robot therapy, showed greater result and improvement at home.

***What are Social Robots?***

*A* ***social robot*** *is an* [*autonomous robot*](https://en.wikipedia.org/wiki/Autonomous_robot) *that interacts and communicates with humans or other autonomous physical agents by following social behaviors and rules attached to its role. This definition suggests that a social* [*robot*](https://en.wikipedia.org/wiki/Robot) *must have a physical embodiment (screen characters would be excluded).*

*A social robot should communicate and interact with humans and embodied agents. These are likely to be cooperative, but the definition is not limited to this situation*. Moreover, uncooperative behavior can be considered social in certain situations. The robot could, for example, exhibit competitive behavior within the framework of a game. The robot could also interact with a minimum or no communication. It could, for example, hand tools to an astronaut working on a space station. However, it is likely that some communication will be necessary at some point.

***Autism***

* *Autism is a lifelong, developmental disability that affects how a person communicates with and relates to other people, and how they experience the world around them.*
* *Autism is a spectrum condition. This means that, while all autistic people share certain difficulties, being autistic will affect them in different ways.* Some autistic people also have learning disabilities and other conditions. As a result, people need different levels of support. Autistic people may also experience over- or under-sensitivity to sounds, touch, tastes, smells, light or colors.
* *People with autism typically have trouble communicating, looking people in the eye, and can get upset by loud noises or bright lights.*
* *They may also have a sensitivity to touch, tastes, smells and colours.*
* *In particular, many autistic people like order and predictability.*

**Numbers**

*By current definition, the onset of autism is prior to age 3 years.*

* *When autism was first characterized by* ***Leo Kanner*** *in 1943, the prevalence was estimated at 1 in every 2,000 children.*
* *Today, one out of every 68 children is affected with autism or a related disorder.*
* *Thus, it is more prevalent than breast cancer or childhood diabetes.*
* *The recurrence rate for having a second child with autism if one already exists within a family is thought to be 15-20%.*
* *„The robots have no emotion, so autistic children find them less threatening than their teachers and easier to engage with.“*

*~ Ian Lowe, headteacher of the Topcliffe Primary School in*

*Castle Vale, Birmingham*

* Researchers have always taken keen interest in using various technologies for treating autism, which is a developmental condition typically characterized by repetitive behavior and social deficits, because many children seem to be more interested in using iPads, computers, or other devices. Their interest is unusually more than that of others.
* Robot therapy does not work equally for every patient, like most medications and physical therapist. The result is usually different and varies according to the condition. In fact, some parents have also complained about increased repetitive behaviors, although it is not clear why this happens. While the recent technologically advanced treatments are believed to be extremely beneficial and promising, these therapies aren’t competent enough to replace human therapies. Therefore, it should be noted that just because you are taking your child for a robot therapy does not mean that physical therapy is not needed. It is best to give both to a child, but at regular intervals.

**Goals**

* The main goal of using this technology is to promote overall social behavior and not just engage the child in some technical device. *When a child interacts with the robot, it is almost the same as interacting with a normal person to develop social behavior.* However, the reason behind this interaction and improvement is still a question. Most parents who have got their autistic children treated with sessions of robot therapy have failed to understand how and why this improvement occurs. Although it is true that most patients have shown *remarkable improvement* by the sixth sessions, with visible gains in their social behavior and abilities, there are question with respect to the abilities of a robot to treat autism.

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* *One of the major purposes of a robot in autism is to help teach children with autism appropriate social responses and create situations in which children can practice these skills. The use of a robot in therapy may be able to prime social responses that otherwise would not be possible.*
* *A second purpose of the robot is to help the children apply the social responses learned from the robot to interactions with the therapist, and, ultimately, with family and peeers outside the clinic.*

**Romibo**

At the Duck’s Nest preschool in Oakland, Calif., a fluffy blue robot asks a group of toddlers, “I want to be your friend. Will you please be my friend?”

*Robotics experts are testing this low-cost and affable robot, called*[*Romibo*](http://www.romibo.org/), at schools across the country. According to its creator, *Aubrey Shick*, special-needs children can benefit most from social robots like Romibo — particularly those with autism.

((([Indeed, behavioral experts](http://blogs.du.edu/magazine/academics-research/tech-savvy-research-team-aims-to-help-kids-with-autism-disorders) say that human facial features can overwhelm those with an autism spectrum disorder (ASD). [Researchers at Vanderbilt University](http://news.vanderbilt.edu/2013/03/robot-helps-children-with-autism/) found that autistic children are more comfortable looking at a robot than a human therapist.)))

*“The robot is safe. The robot’s facial features don’t change,” says Laura McGuire, the mother of Liam, an autistic child.*

*“There’s not so much to figure out with talking to a robot, where there was a lot to figure out in talking to a human being.”*

**Kelly**

[Recent studies have shown](http://online.wsj.com/news/articles/SB10001424127887324582004578456681984219240) that social robots [provide therapy](http://www.technologyreview.com/view/521746/how-social-robotics-is-revolutionising-therapy-for-autistic-children/) (or co-therapy, in combination with the efforts of a human expert) and potentially even help teach autistic children new skills.

And when used in a clinical setting, these talking robots may even help diagnose autism earlier. Most autistic children aren’t diagnosed with the disease until they are at least 3 years old. But studying eye movement in high-risk babies (those with an autistic family member) can lead to an earlier diagnosis. A sophisticated social robot with cameras for eyes could study such movement in an infant over periods of time to detect signs of autism.

*In 2013, interest in social robotics grew when the*[*University of Notre Dame published results*](http://news.nd.edu/news/15169/) *from a study of 19 children with autism, which may be the largest trial to date for this technology. The researchers purchased a $14,000 talking robot, nicknamed Kelly, to coach autistic children to make eye contact or take turns talking. Kelly is a Nao “humanoid” robot, developed by French parent company*[*Aldebaran*](http://www.aldebaran-robotics.com/en/)*in collaboration with eight universities and robotics companies in the U.K., France, Switzerland, Greece, and Denmark.*

The results were promising: Social robots do seem to help autistic children.

**Nao**

<https://www.youtube.com/watch?v=nNbj2G3GmAo>

<https://www.youtube.com/watch?v=mkt52Utz2Gk>

Today, NAO is the leading humanoid robot being used in research and education worldwide.

Robotics is the fastest growing and most advanced technology used in education and research. The NAO humanoid robot is the ideal platform for teaching Science, Technology, Engineering and Math (STEM) concepts at all levels.

It is equipped with many sensors: Tactile Sensors, Ultrasonic sensors, A Gyro, An Accelerometer, Force Sensors, Infrared sensors, 2 HD Cameras, 4 Microphones and high accuracy digital encoders on each joint.   
  
It has two processors on board: an Intel Atom 1.6Ghz (The main computer includes SSD drive, WiFi, Bluetooth and wired network) and an additional ARM-9 processor in its chest.   
  
The advanced software package includes a full SDK and API in Java, C++, C# (.Net), Matlab, and Python. Every robot comes standard with Choregraphe, an award winning software that makes it easy to program the robot using a drag and drop interface which simplifies the programming for new and advanced users alike. The software package includes an advanced simulation software based on Webots.

*NAO was programmed with a series of verbal prompts and gestures that imitate those used by human therapists. The robot adapted its behavior to each child automatically depending on how he or she responded.*

The researchers tested the effectiveness of the robot-based system in joint attention training with a dozen 2-5-year-old children, six with ASD and six without. They compared how the children performed in short human-led and robot-led sessions and found that all of the children spent more time looking at the robot than they spent looking at the human therapist.

<https://www.youtube.com/watch?v=7T7cIY-MIxc>

**Bubblebot**

It sounds like a game, but this so-called "bubblebot" is an important early step in the budding field of socially assistive robotics. The bubblebot was designed to help children with autism develop social skills, but the possibilities for therapeutic robots don't end there. Socially assistive robots could provide companionship to lonely seniors, teach coping skills to adolescents with depression or even help someone quit smoking or lose weight.

Robot therapy isn't as out there as it sounds. For decades, robotic systems have helped provide physical therapy, says ***Brian Scassellati, PhD, a social robotics researcher at Yale University***. Recovering stroke victims, for instance, have used a robotic system to help guide their limb movements during physical rehabilitation exercises. "Socially assistive robots don't offer physical support, but rather cognitive or social support," he says. "Anytime you could use a good personal coach or trainer, we're starting to see robots involved in that kind of application."

The goal isn't merely to provide kids with a robotic playmate. *Rather, researchers hope that robotic systems can help the children learn valuable social skills such as imitation, taking turns and maintaining joint attention with another person. "The ideal is that the robot is a peer. It* ***encourages*** *the child to exercise those social behaviors that the child otherwise couldn't or wouldn't do,"* says Maja Mataric, PhD, a robotics researcher at the University of Southern California who developed the bubblebot with her then-graduate student David Feil-Seifer, PhD, now a robotics researcher at the University of Nevada, Reno.

***The ultimate objective***, of course, is that the child would extend those behaviors to his or her interactions with other people. And there's evidence that happens. As Scassellati and Mataric describe in a recent review, a variety of studies have reported that kids with autism will look from the robot to a parent and back again, or excitedly point out some feature of the robot to an adult or another child (*Annual Review of Biomedical Engineering*, 2012). In their excitement, the children seem to naturally seek out those joint displays of attention that are so important for social interaction.

*Maja Mataric, PhD, a robotics researcher at the University of Southern California describes one child with autism who engaged with the bubblebot. The boy tried to tell the robot what to do, but became frustrated when the robot was unable to follow his instructions. "Then he said, ‘This is how my teacher feels when I don't do what the teacher says,'" she recalls. "This was an incredible narrative of empathy that the therapist was just jumping up and down about."*

**Leka**

The role that technology plays in the treatment of children with autism has been known for some time, but now a company has developed a robot designed specifically for people with the condition.

*Called* [***Leka***](http://www.leka.io/)*, the motion-sensitive bot lets children play learning games by providing sensory stimulation through movement, lights, vibration and sound.*

*Its makers have likened it to a 'guide dog' for children with the condition, helping them to navigate the challenges of learning and social interaction.*

According to Leka's makers, the interactive robot can help to stimulate children with developmental disorders *such as autism spectrum disorder and Down's syndrome, or multiple disabilities.*

The model revolves around the concept of gamification, where *typical elements of gaming, such as point scoring and competition, are applied to learning to make it more accessible.*

A selection of single and multiplayer games will be available to users to help develop motor and intellectual skills.

Current game applications include hide and seek, a colour-based bingo and 'touch-blink-spin'.

**Milo**

*Milo can sense when a child begins to get frustrated or agitated and can react accordingly.*

More specifically,  Pamela Rollins, who has studied communication disorders for years, worked with a company called Robokind to develop a robot named “Milo”. *Milo is  made partially of plastic and is 2 feet tall. He’s programmed to teach kids about a wide range of social interactions. Some experts say he’s proving more successful than humans in helping children with autism.*

"We found that especially with the fluent children, they were engaged with Milo 87 percent of the time,” Rollins said. “We also looked at how much they were engaged with the therapist when she tried to talk to them. It was about 3% ."

*The robot speaks 20% slower than an average human and has a broad, but still limited, range of facial expressions. He is less likely to display emotions that get in the way of learning.*

“If you don't get it, he can repeat it over and over and over and over and over and never get frustrated,” Rollins said.

During a lesson, the robot explains a social situation to the child with ASD. They then watch a video of the described social situation together, during which the robot comments on the appropriate behaviors displayed by the actors, reinforcing the previous explanation. As a final test, the child watches short videos of the correctly modeled behavior or one with errors, and then discusses.

The robot can sense when a child begins to get frustrated or agitated and can react accordingly. There is even a module designed to teach children how to calm themselves down when they’re agitated. It can also progress children through lessons as they master modules focusing on different social situations, such as how to greet someone or how to interact at a birthday party.

**Can these robots replace human therapists?**

So what do these results suggest about the use of robots in therapy?  For helping specific kinds of populations, such as people with autism, social robots appear to be extremely effective. *Not only can robot-enhanced therapy ease the workload of human therapists, they can also lower the cost of treatment and help patients who have greater difficulty dealing with humans in social settings.   Robots can be used in a variety of different ways while their value in providing direct feedback to patients and interacting with them on a regular basis helps improve the overall therapy process.*

As robots become more sophisticated, versatile, and affordable with time, we are likely to see more of them in treatment settings, especially with the growing problem of finding enough trained human therapists to keep up with demand.  Though it can never completely eliminate the need for human therapists, *robot-enhanced therapy is already yielding results, especially with difficult populations such as dementia patients and individuals with autism.*

*So, is there a robot therapist in your future?  What do you think?*

*Questions remain about the type of robot that will have long-term success with an autistic child. It’s still too early to know whether special needs children will respond better to simpler robots like Romibo or a more sophisticated device*[*like the 23-inch-tall Nao*](http://www.aldebaran-robotics.com/en/)*. It’s also not yet clear why some children respond to social robots and others do not and how well the learned skills translate to the real world.*