



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

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Project Title iTherapy: Robotics Companion for Physical Therapy	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Children with special needs may have gross motor skills issues. To improve gross motor skills kids go to physical therapy. One of the basic exercises is kicking a ball. This involves two persons, the therapist, and the assistant. Our goal is to build a robot that can substitute for the assistant for this exercise. When the patient kicks the ball, the robot would go and get the ball and roll it back to the patient, instead of the assistant. Our robot becomes especially useful when such exercise needs to be performed at home, where both parents are required to perform this exercise.</p> <p>Methods/Materials To build the robot we used the Vex IQ kit. The robot needed to accomplish 4 tasks, detecting where the ball was, picking up the ball, retreating to the throwing position and throwing the ball back to the patient. The experiment was done in phases. In Phase 1 we built a robot that accomplished the above tasks with manual control. Phase 2 we automated the throw of the ball. Phase 3 we tried to automate detecting the ball, picking up and throwing back to the patient.</p> <p>Results In phase 1, we found human control had varying results, based on the skill of the robot driver. In phase 2, we found far more consistent results with an automated throw. For the full automated operation in phase 3, we first tried the bumper switch to detect the ball, but when we tested it the switch wasn't sensitive and the ball kept moving. Then, when we tried to use the color sensor, with a bright color ball. The color sensor resulted in improved detection, we plan to continue to improve the automation using additional sensors.</p> <p>Conclusions/Discussion Our conclusion is with improved sensors this robot can be used in the physical therapy offices and households to train special needs kids for improving their gross motor skills.</p>	
Summary Statement Robotic assistant for physical therapy for children with special needs, to assist in exercises for improving gross motor skills.	
Help Received For phase 3 automation of the robot and reliable performance with respect to detecting the ball, we reached out to professors from various universities. We received advice from Prof. Aaron Steinfeld of Carnegie Mellon University. We have incorporated his feedback to our project.	