



# CALIFORNIA STATE SCIENCE FAIR 2012 PROJECT SUMMARY

<b>Name(s)</b> <b>Johnny Berman; Maya Flannery; Arjun Mahajan</b>	<b>Project Number</b> <b>J0403</b>
<b>Project Title</b> <b>Innovation in Autism</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Many children with Autism Spectrum Disorders (ASD) struggle with social, communication and behavioral issues. One of the most common, stereotypy (repetitive motions), can create social barriers as well as interfere with a child's ability to learn. Our mission is to develop and program a device that will 1) automatically detect hand flapping and 2) respond with vibration therapy, cuing the child to stop the behavior.</p> <p><b>Methods/Materials</b> We used the Lilypad# set of electronics, which included an accelerometer, to build a device that could record motion on the subject's wrist. Following approval from The Help Group's Institutional Review Board, we tested the device on children with autism. To determine if we could program a device to autonomously recognize stereotypy, we placed the motion-recording device on the children for 35-minute periods. We compared normalized acceleration data during repetitive and normal activities. We defined a repetitive motion as a period where the variation in acceleration values i.e. standard deviation, was high. Periods of stereotypy coincided with increased variations in acceleration. To test if vibration therapy calms the child, we utilized a device that via remote, delivers point vibration when we observed the child performing a repetitive motion. We then compared the frequency and duration of the flapping with and without vibration therapy.</p> <p><b>Results</b> While analyzing the acceleration data from our device, we compared acceleration values with our observations. We found that subjects had somewhat distinguishable repetitive motion patterns. In general, during stereotypy, the acceleration values were high with a larger STD compared to those during non-repetitive motions. However, we were not able to distinguish between intense physical activities (e.g. running) and repetitive motion. We found that all the subjects# repetitive motions decreased in frequency and duration when vibration therapy was delivered.</p> <p><b>Conclusions/Discussion</b> We developed a device that could successfully record and distinguish stereotypy from normal motion in children with ASD. We proved that vibration therapy calms repetitive motions. However, we were unable to program the device to autonomously distinguish between intense physical activity and stereotypy. Such programming would require complex algorithms.</p>	
<b>Summary Statement</b> The goal of our project was to create a device that would autonomously reduce the self-stimulatory behaviors of children with autism.	
<b>Help Received</b> Robotics mentor Arnold Lesin; Professionals and researchers at the Help Group. Based on our research, we deduced the parameters that would be required to program our device. Due to its complexity, a programmer wrote the code based on these parameters.	