**Therapeutic Toy Design for Children Affected by Autism**

Jay Thakore, Walter Goodwin, James McMahon, Abdelaziz N’goan, Danial Shahmirzadi
Department of Mechanical Engineering, Stevens Institute of Technology, Hoboken, NJ 07030

**Introduction**
- Autism is a multifaceted neurological disorder that affects the four fundamental aspects of sensory processing, communication mechanisms, elusive social interaction skills, and whole child/self-esteem
- In the United States alone it is estimated that 1 in every 50 children has autism, which translates to about $3.2 million per person in additional medical expenses over their lifetime
- A durable, effective therapy is best achieved through various multifaceted, multidisciplinary approaches that are directly linked to the underlying neurological mechanisms

**Background & Significance**
- Lack of motor skills plays major role in impairing social & communication skills
- Reward based stimulation through lights and sounds encourage amusement, motivation, and improvement

**Objective**
- The aim of this project is to simulate, design, manufacture, and assess a toy that can help cultivate sensory, social, communication, and motor skills in autistic children
- Develop toy with interchangeable panels to allow for hundreds of variations in order to progress with the child’s development and preference and increase replayability
- Incorporate statistical and visual feedback to accurately evaluate patient’s symptoms and progress

**Modeling**
- Path panel (easy)
- Button activity
- Path panel (medium)

**Structural Analysis**
- Raw Drop Displacement Test: Indicate areas of displacement throughout toy
- Structural integrity and design are important as autistic children have tendency to damage toys in frustration

**Prototype**

**Feedback & Evaluation**
- Key concept is to integrate feedback with toy to ensure patients are developing concurrently with toy usage
- Camera and real time button activity statistics primarily used to track patient improvement

**Results & Conclusion**
- Interchangeability of the activities ensures children will not quickly exhaust a specific task, maintaining incentive to engage with toy
- By monitoring the child’s progression using cameras and completion statistics, therapists and parents can appropriately evaluate and reward their behavior
- After visiting two schools, the majority of the children played with all three activities for the entire duration of five minutes as shown below

**Events**
- King Abdullah University of Science & Technology International Poster Competition, Thuwal, Saudi Arabia
- Women in Engineering Day, Stevens Institute of Technology, Hoboken, New Jersey
- Biomedical Engineering Society Annual Meeting, San Antonio, Texas (submitted)
- School Visits: Garden Academy, Maplewood, New Jersey, Harbor School, Eatontown, New Jersey

**References**