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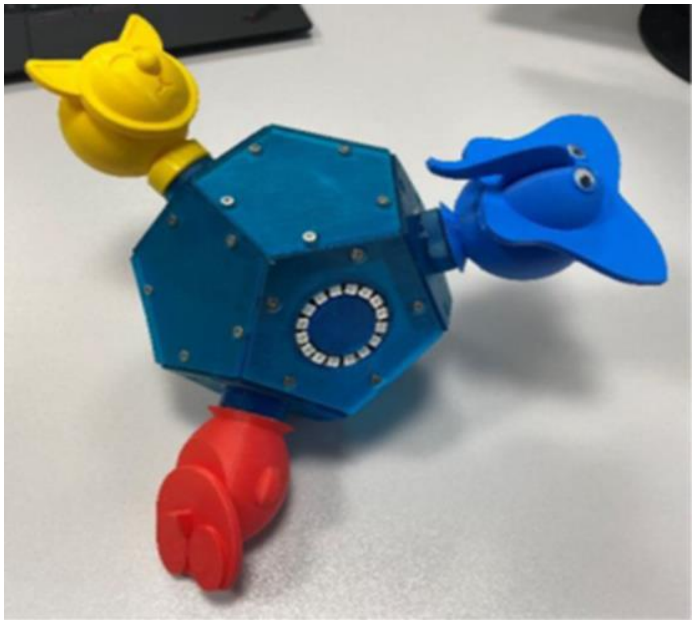
PLAIN ENGLISH SUMMARY

'TangiBall' toy finds finds motor issues in young children with autism

“[Y]ou first need to start backwards. What are we trying to do? What are the problems we are trying to solve?.. It's [turning] a clinical problem into a data problem”.



Background

Children with autism develop their motor skills in a different way (Mari et al., 2003; Torres et al., 2013, 2013). Early experiences depend on parents and repeat. Yet children with autism develop along a different path (Torres et al 2013). Planning what to do, how long to do it, and how fast, is different. Differences only increase with age (Chua et al, 2021). By the teenage years, a large variety of coping methods are present, which are now built-in (Torres et al., 2013).

Method

In this project we built a toy with sensors inside. The sensors detect and record motor movement in children aged 2 to 5, when they play with the toy. The toy is a pentagonal prism, with 12 faces. Inside are lights, sensors, a data storage card, and a minicomputer. Each face has a different shape on the surface with hole. Into each hole rods get put, and and each has a different shape on the end with a different animal character. If the correct peg is in the right hole the toy lights up with a sound. The min-computer takes the information from input rods and the whole toy. Together the lets us work out speed and movement type.

Five children with autism and five controls played with the TangiBall in 2022 and 2023. Children were usually aged between 3 to 4 years of age. Children with autism played with the toy less even when holding the toy. So were turning the toy over and exploring less.

Results

All children played with toy for between 5-10 minutes of time. This produced about 10,000 lines of information each time.

There were differences in smooth movement between typical children and children with autism. Children with autism played with the toy for a shorter amount of time.

Interviewed people thought that:

1. The toy was good because it found physical differences
2. Parents like being in a physical and face to face (not virtual) meeting with a doctor and the toy would be part of this
3. Parents liked that the toy was “simple to play with”. As “physical objects are better” and “good for non-verbal children”. Most parents liked the design.

Conclusion

Embedded sensor use as a clinical tool is still in its infancy. Few people have experienced sensor being use at home, work or in clinic. Data collected in clinic as soon as possible are useful and do not waste parent, family, or doctor time. When children played with the toy differences existed between both groups. Those differences can be useful for doctors and other clinical staff. Future care systems will need to use new digital tools like this toy.

Funding Statement

This research was funded by the National Institute for Health and Care Research (NIHR) Applied Research Collaboration Kent, Surrey, Sussex

The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care.

Acknowledgments

A big thank you to the following organisations. Without them, this project would not have been possible: British Academy of Childhood Disability Castang Fellowship (2017-2019); Evidence search: Using the Internet of Things for Diagnostic Purposes. Kevin Burgoyne. (8th March 2017) BRIGHTON, UK: Brighton and Sussex Library and Knowledge Service.