Summary of research findings

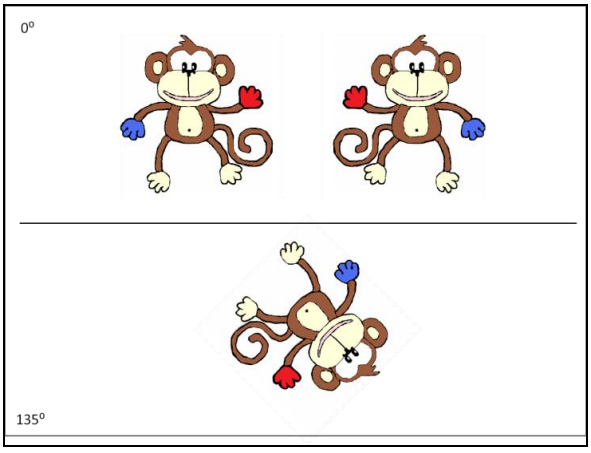
I would like to say a huge thank-you to everyone who took part in the 'mental rotation' and 'navigation strategies' studies. Both projects took place at the same time and involved individuals with Williams syndrome, and typically developing children between 5 and 10 years of age. Below is a summary of the findings.

Study 1: 'Mental rotation of objects and the self' project

This study looked at whether typically developing (TD) children and individuals with Williams syndrome (WS) are able to imagine objects and themselves rotating. This was important to investigate because we know that, in typical adults, how good you are on these types of tasks predicts how well you will do on way-finding and navigation tasks in larger environments. Previous research has already suggested that people with WS have some difficulties on navigation tasks. In our study, we wanted to look at what spatial difficulties might be contributing to this.

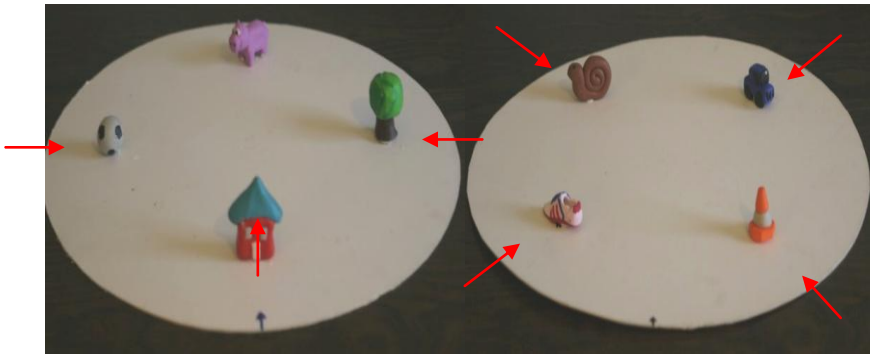
In this study, participants completed two tasks in which they were asked to imagine objects rotating, and two tasks in which they were asked to imagine their body rotating/ moving. Here are examples of an object rotating task and a body rotating task:

Object rotating task



"Can you imagine what the monkey at the bottom would look like if he turned round until he was the right way up? Which of the top two monkeys would he be the same as?"

Body rotating task



Participants **imagine** moving around the board until they are standing facing in the direction of each red arrow. They then have to say, given this imagined position, which object is to their left/right/furthest/closest

Results

We found that in typical development, children between 5 and 10 years of age become increasingly more able to imagine objects and themselves rotating. Imagined rotation is also more difficult the further something is rotated or the further you have to imagine moving. On all of our tasks, people with Williams syndrome performed at a similar level to 5 and 6 year-olds. However, we did find that some older adults with Williams syndrome performed very well when asked to imagine objects rotating. We think that the difficulties in Williams syndrome in imagining the self rotating are likely to be due to the demand on brain areas during such tasks that we already know develop differently in people with Williams syndrome. These results also suggest that people with Williams syndrome are likely to have difficulties in large-scale, real-world navigation when they have to understand the spatial relationships between objects in an environment and remember where they are as they move through space. For example, we looked at this in our second study…

Study 2: 'navigation strategies' project

This study looked at the types of navigation strategies that typically developing children aged 5-10 years and people with Williams syndrome use to find their way around.

There are two main types of spatial abilities that we know people use during these types of tasks: 'egocentric' and 'allocentric'. 'Egocentric' means understanding the location of places in the environment in relation to your own body. This helps you to remember the sequence of left-right body turns along a route. 'Allocentric', on the other hand, means understanding the spatial relationships between objects in the environment. This allocentric skill is important for understanding the layout of an environment and means that you can make short-cuts and know how to find your way to a known location from new starting places.

The Virtual Environment

In a virtual environment (as shown in the image above), participants were firstly shown how to navigate to a hidden exit in the maze and were then asked to find their way from a starting place

to the exit lots of times. On some trials, they were placed unknowingly in a new starting place to see what strategy they were spontaneously using to navigate. On another set of trials, participants were told that they would be starting from different places and had to find the shortest route to the exit. This meant they had to rely on an 'allocentric' strategy.

Results

Typically developing children and people with Williams syndrome were very good at learning the route to the hidden exit. On trials where we examined spontaneous strategies, typically developing children of all ages mostly used an 'egocentric' strategy (relied on following the same sequence of left-right body turns). In contrast, people with Williams syndrome relied on searching for a familiar environmental landmark (e.g. a set of buildings) to help them navigate down the correct path. On trials when participants needed to use an 'allocentric' strategy (understanding the relationship between landmarks in order to make short-cuts), both 5 and 6 year-old children and individuals with Williams syndrome showed difficulties, resulting in lots of errors.

These results suggest that people with Williams syndrome have difficulties with both egocentric and allocentric spatial abilities. These findings are important because they help us to understand what may be underlying some of the navigation difficulties often reported in Williams syndrome. Next I hope to look further into the use egocentric strategies in people with Williams syndrome and what alternative strategies might they be using to find their way around; so I'll be in touch shortly!

To see more results from our lab, please visit: *http://cogdevlab.weebly.com/* and follow the 'For Parents' link.

THANKS AGAIN!

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