



## Research Findings:

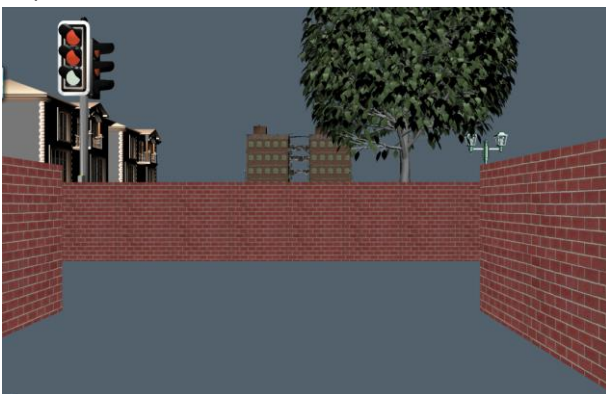
### A Reliance on Landmarks for Navigation in Williams Syndrome (WS)

The results of my previous studies showed that individuals with WS have difficulties with both ‘egocentric’ and ‘allocentric’ spatial abilities, and that this is likely to underlie the specific difficulties often reported in WS when navigating and way-finding. ‘Egocentric’ spatial abilities relates to an understanding of 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, and relates to understanding the spatial layout of an environment.

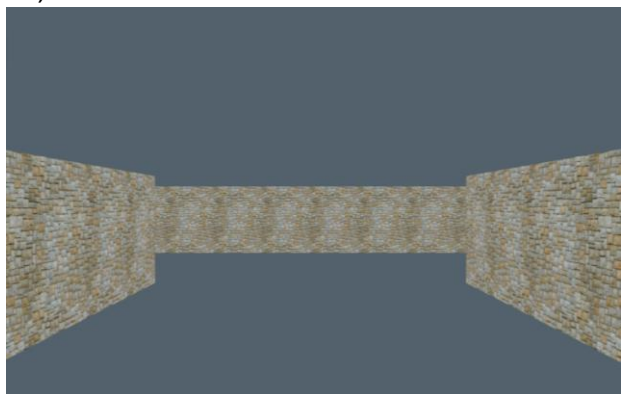
Until now, navigation had only been looked at using environments in which landmarks were present. Therefore, the aim of this study was to examine the extent to which individuals with WS rely on landmarks to guide the learning and retracing of a route. This was important to look at to give us a better idea of whether people with WS are able to use an egocentric strategy when they need to (for example, when landmarks are not available, e.g. school corridors often have very few landmarks, and an individual must rely on their memory of left-right body turns), or whether they need the landmarks to guide them, and get lost without them.

In this study, 18 participants with WS were compared to 48 typically-developing children aged 5, 7, and 9 years on the extent to which they relied on the presence of landmarks for navigation. Each participant was asked to learn six-turn routes in two virtual environment (VE) mazes, one with 12 distal landmarks surrounding the maze and another without landmarks. The VEs were presented on a 17” laptop screen and participants navigated through each maze using the arrows on the keyboard in front of them.

a)



b)



**Figure 1: a) Screenshot from maze with landmarks and b) screenshot from maze without landmarks**

Following learning in the maze with landmarks, the ability to successfully retrace the route after landmarks were removed (use of egocentric knowledge) was examined. Participants were also asked to complete a view-matching task (selecting correct visual scenes from the landmark maze). This test was used

to examine whether visual cues from the maze were recognised in each group, and thus available to be used in a visual-matching strategy to aid navigation.

Results showed that on learning a route with landmarks, individuals with WS performed at a similar level to TD 5 year-olds. However, once these landmarks were removed from this maze, the WS group made significantly more errors than all TD children. Similarly, individuals with WS required significantly more trials and made more errors than all TD groups when learning a route that never contained landmarks. On the view-matching task in which participants were asked to select correct scenes from the landmark maze, all groups performed at a high level, suggesting that participants in all groups were able to use this visual information to potentially aid navigation.

These results show that people with WS rely on the presence of landmarks in an environment (both for learning a route and for retracing a recently-learnt route) more than TD children. When landmarks are removed, TD children, but not individuals with WS, were able to fall back on an 'egocentric strategy' to navigate, and remember the correct sequence of body-turns. Individuals with WS were good at remembering correct visual scenes from an environment, and are likely to rely on the use of this information to navigate. The use of this 'visual-matching' strategy and reliance on landmarks in WS is likely to result in inefficient searching and way-finding strategies. This suggests that changes in the layout or appearance of features within even a well-known environment may result in difficulties with navigation in people with WS.

Thanks again to everyone who took part in this research! To see more results from our lab, please visit: <http://cogdevlab.weebly.com/> and follow the 'For Parents' link.

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