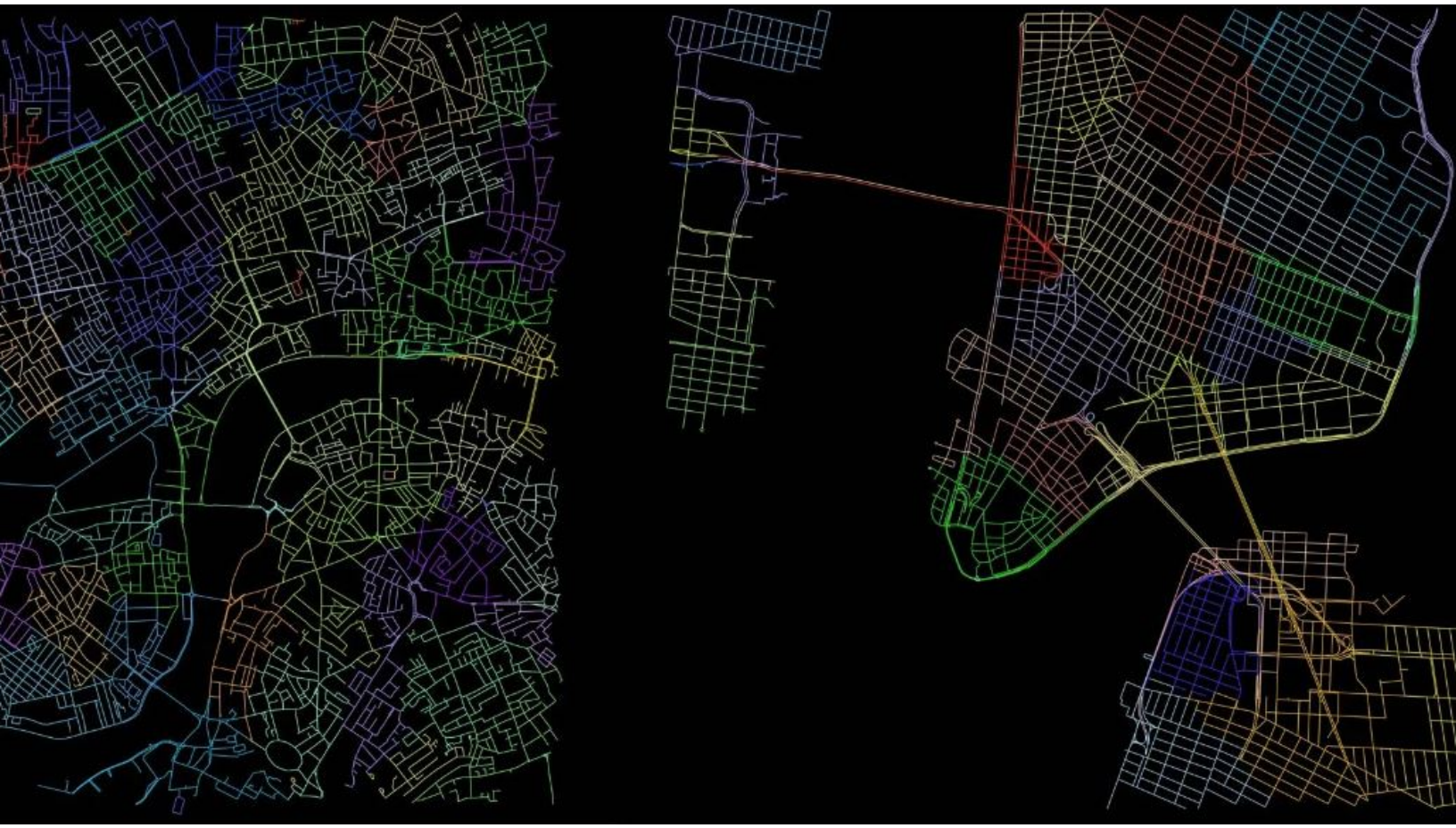
Northumbria University NEWCASTLE



Map of London and New York City streets

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Northumbria research helps find key to spatial navigation skills

A long-term study involving a Northumbria University architect has found that growing up in rural or suburban areas improves spatial navigation.

Professor Ruth Dalton, from the Department of Architecture and Built Environment, conducted research which found that being raised in a city – particularly a city with grid-patterned streets – is detrimental to the development of spacial navigation.

The study, which also involved researchers at University College London, the University of Lyon and the University of East Anglia, found that people whose home cities had grid layouts are slightly better at navigating similarly organised streets, despite having poorer performance overall. This is because early childhood environments influence not only navigational ability, but styles as well.

Involving almost 400,000 participants from 38 countries, the study was featured as the cover story in a recent edition of the prestigious journal, Nature.

The findings were obtained from individuals playing the mobile phone game Sea Hero Quest, a citizen science venture designed for neuroscience research, created by Deutsche Telekom in partnership with academics, Alzheimer's Research UK and game developer Glitchers.

Sea Hero Quest was designed to aid Alzheimer's research by shedding light on differences in spatial navigational abilities. More than four million people have played the game, contributing to numerous studies across the project as a whole, and the volume of data is such that a number of further studies are being conducted to analyse different aspects of the findings.

Dr Dalton said: "As an architect I've often wondered whether the environments we grow up in have an effect on how we see the world around us, how we make sense of it, and how it shapes our partialities.

"What was so exciting for me about this study was that it has provided the first evidence that the environment in which we spend our formative years does have an effect on us later in life; in this case in how easily (or not) we're able to find our way around complex environments."

For the study, the game featured a wayfinding task, requiring participants to navigate a boat through a virtual environment to find checkpoints shown on a map. Dr Dalton and her colleagues found – after controlling for confounding effects of age, gender and education level – that while current areas of residence had no effect on people's scores, where they grew up influenced their performance in the game.

The researchers compared the home cities of the study participants by

analysing the entropy (disorder) of the street networks, to gauge the complexity and randomness of the layouts.

People whose hometowns had lower entropy – ordered grid layouts like in Chicago or New York – were worse at completing the wayfinding task. Those from cities with organic, less ordered street layouts, like Prague, performed only slightly worse than those from rural areas.

To test if people from cities could more effectively navigate environments comparable to where they grew up, the researchers developed a city-themed version of Sea Hero Quest, called *City Hero Quest*, which required participants to drive around city streets in a virtual environment that varied from simple grids to more winding street layouts.

People who grew up in cities with grid layouts were slightly better at navigating similar environments, although the difference was not as great as their inferior performance in *Sea Hero Quest*.

Lead researcher Professor Hugo Spiers of University College London said: "We found that growing up outside of cities appears to be good for the development of navigational abilities, and this seems to be influenced by the lack of complexity of many street networks in cities.

"In our recent research, we have found that people's spatial navigation skills decline with age, starting in early adulthood. Here, we found that people who grew up in areas with gridded streets can have comparable navigation skills to people five years their senior from rural areas, and in some areas the difference was even greater."

Co-lead author Dr Antoine Coutrot from the University of Lyon added: "Growing up somewhere with a more complex layout of roads or paths might help with navigational skills as it requires keeping track of direction when you're more likely to be making multiple turns at different angles, while you might also need to remember more streets and landmarks for each journey."

Dr Susan Kohlhaas, Director of Research from Alzheimer's Research UK said: "Thanks to the amazing response to *Sea Hero Quest*, the team have now been able to collect data from more than four million players, equating to nearly 2,000 hours' of lab-based research.

“If we’re to understand dementia, it is vital that we have participation from as many people as possible with diverse backgrounds and experiences, and this study demonstrates why that’s important.

“In this study, researchers found that spatial navigation is different in those with a rural background, but we cannot conclude that living in a rural area will help guard against

dementia. Dementia risk is a complex mix of age, genetics and lifestyle and where we live has a number of impacts on our health.

“Further research will be needed to unravel this complex mix of risk factors. However, *Sea Hero Quest* is an amazing example of how mass participation in research can help scientists get us one step closer to breakthroughs.”

The latest findings build upon the study’s previous revelations, which include the fact that those from Nordic nations, as well as North Americans and Antipodeansrank highest for their navigational skills.

Dr Dalton added: “It was such a joy to be part of this great team of scientists working on Sea Hero Quest, and I’m very much looking forward to the next papers we are preparing for publication – there are more exciting revelations to come, so watch this space!”

Research such as this has contributed to Northumbria’s ranking for research excellence in Architecture, Built Environment and Planning rising by 13 places since 2014, with 76 per cent of this work being rated either world-leading or internationally excellent in the Research Excellence Framework 2021.

Contacts

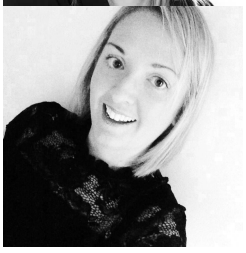
Rik Kendall
Press Contact
PR and Media Manager
Business and Law / Arts, Design & Social Sciences
rik.kendall@northumbria.ac.uk
07923 382339

Andrea Slowey
Press Contact
PR and Media Manager
Engineering and Environment / Health and Life Sciences
andrea.slowey@northumbria.ac.uk
07708 509436

Rachael Barwick
Press Contact
PR and Media Manager
rachael.barwick@northumbria.ac.uk
07377422415

James Fox
Press Contact
Student Communications Manager
james2.fox@northumbria.ac.uk

Kelly Elliott
Press Contact
PR and Media Officer
kelly2.elliott@northumbria.ac.uk



Gemma Brown
Press Contact
PR and Media Officer
gemma6.brown@northumbria.ac.uk