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The extent to which autistic traits are predictive of impairments in allocentric spatial navigation

Presley, A.

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The Plymouth Student Scientist

University of Plymouth

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Appendices

Appendix A: Consent Form

Research title: Individual Differences and Everyday Spatial Navigation

Participants will complete an online navigation task. This will be followed by 3 self-report questionnaires in measures of individual difference in everyday thoughts, feelings and experiences. There are no known risks to you in this study.

Participant rights:

I have been informed about the nature of this experiment.

I understand I can freely withdraw at any point, without risk of penalty.

I understand that any data supplied will be destroyed upon request and not used in the experimental results.

I will be debriefed about the study after it has been completed.

My participation will remain confidential and will not be subjected to any harm or deception.

If you have any questions, please contact alastair.smith@plymouth.ac.uk before the experiment begins.

If you consent to participating in this research, please continue.

Appendix B: Brief

Thank you for volunteering to take part in this study.

We are aiming to investigate individual differences in spatial navigation.

In this study, you will first take part in a simple navigational task, which will require you to learn the location of an object within a 3D virtual environment. After this place learning task, you will be asked to complete 3 self-report questionnaires addressing everyday thoughts, feelings and experiences. These are widely used measures of everyday individual differences and are designed to provide a general overview of psychological factors that may relate to navigational behaviour. They are not diagnostic measures, and we are only interested in aggregate anonymous scores across participants. You are not obliged to answer any questions that you do not want to.

Participation is completely voluntary. You have the right to refuse to take part or withdraw at any time during the study without penalisation. If you wish to withdraw at this point or in the future, please contact the researcher using the email provided.

Your data will remain completely anonymous and will be kept strictly confidential. Data will be stored on a secure computer, only accessible by the researchers in this study.

If you do not understand any of this information or wish to ask any further questions, please contact the research supervisor:

Dr Alastair Smith: alastair.smith@plymouth.ac.uk

Appendix C: Debrief

Thank you for participating in this research.

Background

This study is concerned with the individual differences which can impact our navigational capabilities. Previous studies have found that there are large individual differences between the ability to get from one location to another and how we go about doing so. There are two different ways of strategizing when it comes to navigating a way to a targeted location: allocentric and egocentric navigation. Allocentric navigation uses environmental cues as a guide, for example landmarks in relation to one another, whereas egocentric navigation uses basic direction and own body positioning, independently of external cues.

The individual differences that have been studied here are that of autism and anxiety. There are typically levels of variation in behavioural traits relating to autism and anxiety. We are interested in whether this variation in behavioural traits correspond to navigational ability.

How was this tested?

You completed an online navigation task where you were asked to navigate different virtual environments with the common goal to collect the target and then place back in its original location. This was followed by 3 self-report questionnaires: The Autism Quotient (AQ) to measure autistic traits, the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA) to measure anxiety levels, and the NAV-I to measure self-report navigational abilities.

Further information:

If you are interested in learning more about how these individual differences impact navigational abilities and wish to receive a report of this research when it is completed, or if you have been affected by participating in this research and wish to raise concerns or withdraw, please see the below contact details. In the first instance, please contact the supervisor and in the second instance feel free to contact any of the student researchers. Contact the Health and Human Sciences Ethics Committee with concerns regarding the ethical standards of this research. If this study has raised any sensitive issues that you would like support for, please contact the Student Hub or the Samaritans as listed below.

Contact details:

Supervisor: Dr Alastair Smith
alastair.smith@plymouth.ac.uk

Student researcher:
Amber Presley - amber.presley@students.plymouth.ac.uk

Ethics Committee: hhsethics@plymouth.ac.uk
Student Hub: studentservices@plymouth.ac.uk
Samaritans: call on 116 123, or email jo@samaritans.org

Appendix D: NAVI

1. NAV-I

Use the scale under each question to indicate the degree that each statement describes your behaviour. Don't take too long thinking about each question – usually your first 'gut' reaction is the most accurate.

When heading to a place I visit often (e.g. work), I can easily take alternative routes if my usual route is blocked.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I misjudge how long journeys will take, so I'm usually late, or arrive with plenty of time to spare.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I find it easy to locate where I am on a printed map of a city.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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If I take a wrong turn whilst driving or walking, I find it difficult to correct my path without turning back on myself to find the original route.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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When I leave a large building (e.g. shopping centre), I find it hard to get my bearings, and frequently find myself heading in the wrong direction to start with.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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It is rare that I completely lose my bearings when navigating around new cities.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I have a good idea of the distances between buildings (e.g. in a city or on campus) once I've been past them.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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Having visited multiple places in one day (e.g. shops), I can easily take the shortest route back to where I started (e.g. the car).

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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If I get lost in a city that I do not know very well, I often refer to the spatial relationships between multiple distant buildings to help me get my bearings.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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Having reached an unfamiliar destination (e.g. a hotel on holiday), I can easily tell if I have not taken the shortest possible route from where I started.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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When reading printed maps, I usually turn the map so that it is aligned with my direction of travel (e.g. turn the map upside down if I'm travelling south).

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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After I've been to multiple shops, to find my way back to the car/bus stop, I have to re-trace my route past all the shops I have visited.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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Once I've learned the way to get somewhere (e.g. to work), I'll stick to that route every day, no matter whether it is the most efficient path.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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To avoid getting lost when in a new city or town, I stick to main routes and don't tend to explore side streets.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I usually navigate by thinking in terms of taking the third left, then the second right etc.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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When I navigate, I usually think in terms of going left at the church, then right after the library etc.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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When I'm planning a journey using an online map (e.g. Google maps), I often use street view to virtually walk the route (or parts of the route).

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I often use a single large visible building to work out the direction I need to go, and then navigate by heading towards it.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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When I am in an unfamiliar town or city, I find it hard to align a map to the streets/buildings I can see in front of me.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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In buildings where the corridors all look very similar (e.g. hospitals), I quickly lose my bearings.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I am confident in my navigation skills, so after I've been somewhere once or twice, I don't need to look up how to get there again.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I rely on online maps (e.g. Google maps) or sat nav to help me reach a destination, even if I'm going somewhere I've been before, otherwise I think I would get lost.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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When following a route using a printed or online map, I like to double check the map every few minutes to make sure I am going the right way.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I worry about finding my way in an unfamiliar environment, even if know that there are signs or maps that could help me find my way.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I prefer to travel with other people and let them plan the route, so that I don't have to worry about getting lost.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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If I have a passenger with me in the car, or when I walk with someone who knows where we are going, I'll keep asking them if I'm following the correct route.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I don't like it when people ask me for directions, because I worry I might get them wrong.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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As a passenger in a car, or when walking in a group of people, I find it stressful to read a map and give directions.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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Most of the time, I get worried when I have to read a printed map to navigate (e.g. in an unfamiliar city, park, or a museum).

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I like to have a map of places that I visit on me (either printed or on a phone), just in case I get lost.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I often park the car without looking at what is nearby, so I find it difficult to locate the car again after I've been shopping.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I find it difficult to remember a route that I have taken as a passenger, as I rarely pay attention to where we are going.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I can easily tell when I'm coming back to a place I've been before, even if I've only been there once or twice.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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In an unfamiliar city, I pay close attention to where buildings or other landmarks are in relation to each other.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I often walk without paying attention to buildings that I pass on the way.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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When travelling back on an unfamiliar route, I rarely recognise the shops/buildings from the outward journey.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I often get distracted by my phone, or music I'm listening to, and end up going in the wrong direction.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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When walking or driving, I'm often thinking about other things (e.g. what to have for dinner), instead of concentrating on where I'm going.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I tend to drive or walk on autopilot, and often can't remember large parts of the journey.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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I often put an object down (e.g. cup of tea, bag, set of keys) and struggle to find it later.

Not at all like me	A little like me	Somewhat like me	Mostly like me	Very much like me
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Appendix E: The Autism Spectrum Quotient

The full Autism Spectrum Quotient used in this research is available from:

Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). [The autism-spectrum quotient \(AQ\)](#): Evidence from asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. *Journal of autism and developmental disorders*, 31(1), 5-17.