INTERVIEW

'Curiosity is a pillar of academic performance'

Sophie von Stumm runs the Hungry Mind Lab at Goldsmiths, University of London. Jon Sutton poses the questions.

Tell me all about the Hungry Mind Lab.

I founded the Hungry Mind Lab in early 2014 to bring together my students and collaborators to jointly study individual differences in the interplay of intelligence and personality. Our research focuses in particular on factors or variables that influence learning, learning behaviours and knowledge attainment. We currently have nine members in our lab, who work across a wide range of projects – for example studying language development in toddlers, imagination in university students, or the relationship between mood and IQ. We use a wide range of methods, including longitudinal data analysis, experience-sampling methods and experimental designs, and we consider various scientific approaches, for example psychometrics, behavioural genetics, psychology and epidemiology.

OK, so take something like imagination. Surely that's a tricky one to pin down?

Intuitively, yes, but we are hopeful that we'll get it nailed with the right set of psychometric tests. Specifically, we are combining implicit and explicit measurement approaches to assess imagination. Explicit tests ask people directly to rate or state who and what they are like, for example 'I am the life of a party' with the range from Totally Agree to Totally Disagree as answer options. By contrast, implicit tests try to get at that part of personality that we are not aware of, that is not available to introspection. Adapting this rationale, we have developed a test that measures automatic associations in memory between yourself and your characteristics – in this case imagination. These tests are known as 'implicit associations tests' and are administered on computers using an experimental trial setup. We are very excited about our tests and to find out if it works – we will start piloting next week!

So what have you found so far in your studies of imagination?'

We first conducted a thorough literature review on imagination, but we came back empty-handed – not much research has been published on this topic. We then wrote a press release to reach the general public. The response was amazing – we received letters, e-mails and phone calls from people who wanted to tell us about their imagination, from consultancy businesses that specialise in improving imagination, and from other scientists studying imagination. It crystallised quickly that there is an enormous interest in imagination and that people differ greatly in imagination. For example, one father told us about his teenage daughter, who had never enjoyed story-time as a young child and also struggled with reading and verbal communication later, because she said she could not create mental images of what was said. This condition is known as 'aphantasia', which has only recently been recognised, and marks one extreme end of the imagination dimension. But we also had letters from people on the other end: for example, from the man who explained that he was compelled to regularly use LSD to satisfy his imagination, and from the woman who started to have the most colourful and vivid dreams day and night after her 50th birthday, although she'd never before had such experiences.

We took careful note of all these responses and experiences, because they will help us develop a theoretical model of imagination. Of course, they are mostly inspirations – and no substitute for producing reliable and valid empirical evidence.

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Is technology pretty key to your approach?

We do work a lot on innovating assessment methods to advance the behavioural sciences. One reason for focusing on assessment is our belief that good measurement is the bone marrow of psychological science. The other reason is that extremely large samples are needed to produce reliable studies and reliable evidence about the causes and consequences of individual differences. Luckily we live in a time of constant technological innovation and advancement, and we take advantage of that where we can.

For example, we are currently recruiting families with two- to four-year-old children to participate in a study that uses digital language recorders to document all sounds in the child's environment for up to 16 hours. The language recorders are very small and are carried by the child in a special T-shirt pocket. The recordings are then analysed with automated algorithms that compute, for example, the number of words that the child has heard and the number of words that the child has spoken. With these data, we can then study the relationship between language environment and language development in early life.

Another example for the use of technology in assessment at the Hungry Mind Lab is moo-Q, an iPhone application that is freely available from

the App Store. It repeatedly assesses people's mood and IQ across time. After doing moo-Q five times, you get access to your personalised chart that plots your mood and brain function across hours, days and weeks. We developed the app to test if changes in mood were associated with changes in cognitive function – without using lab-based mood assessments that are biased. moo-Q was implemented by PSYT (psyt.co.uk), an amazing start-up company that specialises in developing software solutions for psychological research. We are now trying to get as many people as possible to download and use moo-Q – essentially, we are trying to crowd-sample for this research!

Your 'hungry mind' metaphor gets pretty literal when you look at the impact of meal type on cognitive performance in children. What did you find there?

It was a longitudinal study published in the journal *Intelligence* in 2012 of about 5000 Scottish children, who were assessed on IQ at age three and then again two years later at age five. Their mothers reported on dietary habits; in particular they listed how often their child ate a freshly prepared meal as the main meal of the day compared to a pre-fabricated meal, like frozen or take-away. This is of course a very crude way of looking at dietary differences; but nonetheless, we found that children who received more often freshly prepared meals had a higher IQ at age three, and also they showed greater IQ gains over time until age five. The effects were small but the results suggest that eating fresh foods is generally beneficial for cognitive development.

How does this relate to socio-economic status though? Isn't it the case that children of a lower socio-economic status start off disadvantaged in terms of IQ, and the gap then grows? When you add this to your thoughts on meal type, does that increase your concern that particular 'hungry minds' are not getting the nourishing they need?

Indeed this is what I think, although the socio-economic status-related differences that we observe in children's IQ are likely to be due to many more variables than plain diet. I recently published a study, also in *Intelligence*, on a very large sample of children from the UK, who had been assessed on IQ from the age of two years through to age 16. The data showed that children from less privileged family backgrounds scored six IQ points lower at age two than children from wealthier families at age two, and by age 16 this gap had almost tripled. I think these results indicate that there is a complex nexus of variables associated with socio-economic status that have cumulative effects over time on children's cognitive development. Some of these variables we know of – for example, the quality of education that children receive, the stability of the home environment, and again nutrition that we mentioned before. What is less well understood is to what extent each of these variables contributes to cognitive growth, how many variables there are, how these variable interact, and if it is possible to improve children's cognitive outcomes by practical, cost-efficient interventions – by changing one or two of these variables.

How aware are people of their own individual differences?

That's a difficult question to give a simple answer to. On the one hand, we know ourselves pretty well. For example, self-report personality tests have been shown to have very good predictive validity for achievement outcomes, for example job performance and academic attainment. On the other hand, we are also fairly delusional about ourselves: we tend to suffer from what is called 'unrealistic optimism', for example when we expect outcomes that are much better than probability would dictate for ourselves.

We all tend to engage in 'unrealistic optimism' on a daily basis, but the effect becomes particularly evident when asking people about their levels of ability. For any task, may it be driving a car, writing an exam or recognising faces, people who did the worst overestimate their performance to the greatest extent – in fact, they claim they were top-level performers! Conversely, people who actually do well often underestimate their own performance.

Why do you think that might be?

I think there are two distinct reasons for these misestimations, although they may not be the ones we'd have thought of in the first instance. Bad performers overrate their performance, not because they don't want to admit they didn't do well, but because they don't know, don't realise how badly they did – it's called the double-curse of incompetence. By contrast, those who did well know exactly how well they did, for example because they know what answers on an exam they got right, but they overestimate how well other people do in the same task. Hence, they end up believing their own performance was only OK instead of great. This estimation error in task performance translates into errors when we evaluate our own intelligence: people who score badly on IQ tests will tell you with greatest confidence that they came top, while the clever ones will be humble about their scores!

You've also applied the 'hungry mind' idea to your own academic development, and that of others.

I firmly believe that intellectual curiosity is a pillar of academic performance, alongside intelligence and effort. Many of my students and colleagues view my work on curiosity and my studies on IQ and socio-economic status as distinct or separate investigations. But I think they are highly related – curiosity is the core driver of individual differences in engaging with the environment, and engagement with the environment is what makes us learn and knowledgeable. Children from deprived backgrounds often have fewer opportunities to engage, and even if they are curious their engagement possibilities are likely to remain limited. And with that they often struggle to achieve their full intellectual potential.

However, a lot of my work in this area looks at university students and why some do better than others in terms of academic achievement. In 2011 I published a large-scale meta-analysis in *Perspectives on Psychological Science* that demonstrated for the first time that there was more to being an exceptional student than IQ and working hard. We found that intellectual curiosity made a substantial contribution to achievement, and we are currently running a series of experimental studies to identify the behavioural mechanisms that underlie the relationship between curiosity and knowledge.

What next for your own hungry mind?

We have two goals for the immediate future at our lab. For one, we want to produce a reliable measure of individual differences in imagination, and for the other we are waiting to complete the data collection on our language study, so we can start to identify specific environmental factors that influence language development in early life. In the long run, I hope that our work will inspire new cross-disciplinary research – in particular, I want to see our progress in 'phenotyping' behaviours, for example with the language recordings, be related to 'genotype data' that are currently much more developed. With this, I envisage that we will be able to better understand gene–environment correlations and interactions that give rise to individual differences in behaviour.