Focus on working memory

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Working memory (WM) capacity helps hold information necessary for everyday life performance. This stupendous task requires filtering of the huge amount of data available so relevant information is fresh in the mind.

Some people are really good at filtering irrelevant information from entering their WM while others are not so good at it. We are all aware that the subset of information required to fulfil tasks on a few days' leave is different to that used at work or passing exams with short-term memory. Still, we do not have a clear understanding of where these individual differences come from.

New evidence from behavioural studies and neuroimaging indicates that WM is strongly influenced by attentional control. However, exactly how this is achieved is not fully understood.

The EU-funded project GENEVA, with a Marie Sk?odowska-Curie Individual Fellowship, looked to determine if there is a genetic component to remembering the right information for the right time. "While this process of choosing the correct information so that we are able to remember the right information and complete tasks at hand successfully might sound easy to perform, we know from research that individual differences exist," explains fellow and lead researcher, Dr. Andria Shimi.

Short-term memory ability on trial

GENEVA researchers used a combination of molecular genetics, electroencephalography with event-related potentials and behavioural experiments to delve into the biological pathways underpinning the interplay between attentional control and WM capacity.

Some combinations of visual features are used in everyday experience to support object recognition. In one experiment based on this premise, the researchers extended previous studies with recognition of repeated patterns in arrays of colour-shape-location combinations. Results from the GENEVA project are currently in preparation for publication.

The genetics behind having a good memory

Project research focused on genes that regulate the dopamine neurotransmitter. It examined whether variants in these genes determine efficiency in attentional selection and ultimately influence short-term remembering.

"Our findings supported our expectations by showing that the DAT1 gene influences working memory performance," reports Dr. Shimi. This finding links individual differences in performance with specific genetic variants and sheds light on the underlying biological mechanisms of WM capacity.

Challenges turned into achievements

"In research, challenges always arise. However, a career in science requires determination and perseverance to overcome any difficulties that might come on the way and this is what we did," comments Dr. Shimi. Optimising the protocol for genotyping participants took longer than expected, but in the end the researchers managed to develop a genetic protocol that allowed them to genotype all of the participants successfully.

"We had to retest many samples to validate our

genetic procedure but all hours spent in the lab were worth it in the end," Dr. Shimi says. The happy and very useful result is that they have developed a new protocol that can also be used by other scientists in the field.

Translating the research into clinical practice

The next steps will be to transfer this research to clinical populations. Applications range from memory disabilities in neurodegenerative diseases to education where memory plays such a big part. "I aim to study whether these genetic variants are implicated in neurological patients with attention and WM deficits. Such knowledge has the potential to offer new means for studying and further understanding of neurological disease featuring working memory symptoms," concludes Dr. Shimi.

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