Module:
Biological Foundations of Mental Health

Week 5
Biological basis of learning, memory & cognition

Topic 1
Cerebral cortex and mental health – Part 2 of 3

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Lecture transcript

Slide 3

In 1948, Grant and Berg published their now very famous Wisconsin Card Sorting Test. It is a test of cognitive reasoning. In the Wisconsin Cart Sort Test, you have to classify cards according to different criteria. You have three ways to classify a card, and the only feedback you get is whether you are doing it correctly or not. Cards can be classified according to the colour of its symbols, the shape of the symbols, or the number of the shapes on each card.

Let's watch as someone plays the game. Our player chooses blue squares first. She's lucky, because the first rule needs her to classify the cards by colour. She continues to follow the colour rule. Then suddenly the rule changes.

Our player now has to decide on which rule to try out. She can choose either shape or number. She chooses number, and again, she is lucky. As you will notice later when you try the game yourself, after the rule changes, you are prone to making more mistakes. The task measures how well people can adapt to the changing rules.

Slide 4

The Tower of Hanoi was designed to test your cognitive abilities. The rules of the game are straightforward. You are presented with three pegs and a number of discs stacked up on one of the pegs in order of size, with the biggest disc at the bottom. Your task is to transfer the whole tower onto a different peg disc by disc, but you are not ever allowed to place the larger disc onto a smaller one.

To do this task, you have to think ahead several moves to make the best decisions. The task tests your ability to plan. Let's watch as someone plays the game.

Slide 5

In this task, you are presented with a number of coloured shapes and are then asked to name the colours as fast as you can from left to right. Once you have completed this task, you are given a similar list. But this time, you are not presented with shapes but rather with coloured words. The trick is that the actual word red, for example, is not necessarily coloured red but blue or some other colour. You are then asked to name the colour the word is printed in as opposed to the colour the word spells out. Why not try it for yourself?

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You will notice that it is much harder to get the colour right when reading the words, because the printed word distracts you. Reading is automatic, and it takes effort to suppress the meaning it generates. So the Stroop task measures inhibitory control.

Slide 6

The final task we look at is commonly used as an assessment in cognitive neuroscience to measure attention and working memory. In the task, you are asked to look at a sequence of objects. In the two-back test, you are asked to respond when you see an object repeated after a sequence of two images have been displayed. In a three-back test, you have to wait until you see the same image after a sequence of three images have been displayed, and so on.

Let's have a look at someone playing the two-back game. The sequence starts, and when our player notices that the fish appears again after the pencil, she clicks. And the same happens when she sees the image of the cheese repeated.

The game will get harder as the player has to hold longer intervals in mind. Recalling three-back is harder than two, and so on. The n-back game tests working memory. That's the ability to hold information in mind while you manipulate it.

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