Module:
Psychological Foundations of Mental Health

Week 4
Beyond basic cognition and emotion

Topic 3
Delving deeper into social cognition – Part 4 of 4

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Lecture transcript

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My name is Francesca Happé. And I'm a professor of cognitive neuroscience at the Institute of Psychiatry, Psychology, and Neuroscience.

I've been researching autism for more than 25 years. And I'm going to tell you today about current theories and studies of social cognition in Autism Spectrum Disorder-- sometimes called ASD.

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Autism is a neurodevelopmental condition, but there's currently no biological test for autism, so the diagnosis is behavioural. A child or adult will get a diagnosis of autism if they show social and communication problems and rigid and repetitive behaviour and interests. These need to be shown at a level that's actually impairing. Most people have some traits of autism, but people with autism have social difficulties that really affect their everyday life.

Autism isn't rare, and current estimates suggest around 1% of children and adults have a diagnosis of autism. Many more males than females are diagnosed with ASD. It isn't clear whether this reflects biological sex differences or is also due to male stereotypes of autism. Perhaps we are missing or misdiagnosing many women and girls.

Autism is rarely pure. And it's common for people with autism to also have epilepsy, intellectual disability, anxiety and depression, ADHD, sleep and eating problems. Many of these are amenable to treatment.

Twin and family studies have shown that autism is highly heritable. In a minority of cases, there's a rare single gene mutation, but for most it's suspected to be polygenic-- that means caused by many genes, each a very small effect.

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The newest diagnostic criteria in the Diagnostic and Statistical Manual of Mental Disorders-- called DSM-5-- describes the social and communication problems in autism spectrum disorder as follows-- to receive a diagnosis of ASD, someone must show persistent deficits in social communication and social interaction across contexts. And these include deficits in social emotional reciprocity-- for example, not sharing your interests-- deficits in nonverbal communication-- for example, odd eye contact or body language-- and deficits in developing, maintaining, and understanding relationships-- that can include problems making friends or difficulties fitting your behaviour to different social contexts.

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These social and communication problems emerge early in development, typically before the age of three years. However, diagnosis sometimes takes much longer. We have adults coming for first diagnosis in their 70s in the diagnostic clinic at the Maudsley.

Parents' earliest worries usually include lack of language, reduced social response, and rigid behaviour. Some parents report apparent regression. Their child appears to develop some words and some normal play and then loses these around 18 months.

A characteristic early sign of autism is reduced or absent joint attention. Joint attention includes behaviours like following where somebody else is looking, pointing to direct someone's attention, or showing things of interest to an adult. There is also typically a lack of pretend play in the early years of children with autism.

Later on, social difficulties are seen in impaired peer interaction, problems making and keeping friends. And most people with autism also have odd use of eye contact and sometimes odd or wooden body language. And it can be hard for people with autism to understand the body language and facial expressions of other people.

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What underlies these social and communication difficulties in autism? There are many theories. Some suggested a main general problem that impacts social interaction-- for example, difficulties generally in shifting attention or tracking motion.

Other theories suggest that the core impairment is in specifically social processing. And I'm going to tell you about three such theories of autism. The first is the social motivation account, the second, the mirror neuron theory, and the third is the theory of mind account of autism.

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First, the social motivation account. Several researches, including Geraldine Dawson and Ami Klin in the states and Coralie Chevallier in France, have suggested that the primary impairment in autism is in social motivation. They suggest that infants with autism don't find social stimuli, such as faces and voices, intrinsically rewarding. So they don't pay attention to these stimuli, and they fail to learn about the social world.

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This social motivation theory predicts that the earliest sign of autism would be lack of social interest. So the research group at Yale tested this theory by using eye tracking to find out what six-month-old infants like to look at. They found reduced attention to social stimuli at six months in infants who later went on to get a diagnosis of autism. So the infants later diagnosed with autism spent less time looking at the actress in general and her face in particular.

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However, not all social orienting is abnormal in autism. Punit Shah, a PhD student in my department here at IOPPN, recently showed that adults and children with autism show the usual preferential

attention to face-like stimuli. Have a look at his paper, where he elegantly demonstrates that the proto face-- that arrangement of three black dots that looks like eyes above a mouth-- draws the automatic attention of people with autism just like control participants.

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The next theory explaining the social difficulties in autism is the broken mirror theory. You've already been introduced to the notion of mirror neurons in earlier parts of this topic. Gallese and Goldman have suggested that healthy mirror neuron system activity is necessary to understand the intentions and thoughts of others. And Andy Meltzoff-- in classic work on infant imitation-- suggested that it's imitation that allows us to notice that somebody else is like us and is at the root of later mental state attribution.

So theorists have suggested that in autism a problem in mirror neurons may result in later social difficulties. However, clever experimental work by Antonio Hamilton and Jeff Bird has shown that automatic imitation is intact in autism, and this threatens the mirror neuron theory of autism.

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The third and last theory to explain the social communication difficulties in autism is the idea of problems in theory of mind. I think that social and communication problems in autism are well explained by a problem in theory of mind that is sometimes called mind blindness.

You heard about theory of mind earlier in this topic-- the ability that most neurotypical, or ordinary, children have to understand that somebody else may not know something that they know or may think something different from what they think.

Simple tests, like the Sally-Anne task, have shown that most children with autism don't track another person's mental states. They seem to be mind blind. They fail tests of theory of mind. So in the Sally-Anne task, they may answer that Sally will look where the hidden object actually is, even though she couldn't possibly know that it was moved.

The idea that autism is a sort of mind blindness has really refined our understanding of this condition. Before this idea, autism was thought of as a general lack of social interest or lack of sociability, but now we understand that many people with autism want to have friends and are socially interested, but they find it difficult to make a connection with another mind because they don't represent what others are thinking.

Mind blindness can explain many features of autism, including problems of communication and over-literal understanding. If you say to a child with autism, we're going swimming in the minibus, they may think that you're going to fill the minibus with water and go swimming in there. And if you tell a child with autism, I'll be back in a minute, they may get very upset if you take 65 seconds to return.

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The theory of mind account of autism has been very influential, but there are several criticisms. First of all, it's been suggested that the theory of mind problems are not primary, not the first and core origin of autism. This is partly because our theory of mind tests have been designed, first of all, for children who are three or four year old, but the signs of autism appear much earlier.

This is part of the reason why the social motivation account has been popular-- the idea of problems much earlier than we can test theory of mind. However, recently, people have been studying autism from infancy by following the children born into families where there's already a child with autism. Because autism is heritable, these children have a higher risk of developing autism at around three or four years and having a diagnosis.

But by tracking these infants from birth, we can see what the first social difficulties are. And interestingly, these studies suggest that it's not until around 12 months that infants later diagnosed

with autism show any abnormalities compared with ordinary infants. At 12 months, infants who will later have autism show reduced imitation, a lack of response to their name, reduced social interest and less social smiling.

But before this time point, there's very little to tell apart which children will later develop autism. Indeed, the earliest signs may be at around six months on non-social tasks, where children with autism show sticky attention to any kind of stimulus.

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The second criticism of the theory of mind account of autism has been that problems on theory of mind tests are not specific to autism. There are some other clinical groups who also fail false belief tests, like Sally-Anne. These include children who are congenitally deaf but born into hearing homes, and so don't have sign language from their early years, and also children who are intellectually disabled and have a low IQ, but don't have autism.

These groups don't show the characteristic social difficulties we see in autism, and so it seems to me it's unlikely that they lack theory of mind. Perhaps they failed these tasks, like Sally-Anne, for other reasons-- problems in memory, for example, or language.

My student, Antonio San Jose Casares, used a non-verbal theory of mind test to see whether people with autism would still be impaired and more impaired than individuals with intellectual disability without autism. Her test is a simple penny hiding game, where the adult hides a penny in one of their hands and asks the child to guess which hand the penny is in.

After a few goes, the child gets to have the penny and is asked to hide it. It's their turn to try and fool the experimenter. When children with autism play this game, they will hide the penny from sight but fail to hide the information from the mind of the guesser. So they may leave the empty hand open or transfer the penny between their hands in plain sight of the guesser.

These kinds of mistakes suggests that even when a theory of mind task has no languished demand and no memory demand, people with autism still struggle. By contrast, these simple tasks suggest that intellectually disabled children without autism can be perfectly good at connecting with another mind and that their problem on complex theory of mind tasks has to do with other demands-- verbal demands, memory, or executive function difficulties.

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The third and last criticism of the theory of mind account is that this explanation may not be universal. Not every individual with autism fails the Sally-Anne task. Indeed, older and brighter individuals pass this and many other theory of mind tasks. Despite this, they still show problems of connecting with other minds in everyday life and find it difficult, for example, to make and keep friendships.

How are they passing these theory of mind tasks? Have they developed mind-reading ability late? Or perhaps they're using a different route.

One individual with autism I know said that when she was tested on the Sally-Anne task, she, first of all, wanted to give the wrong answer, but she stopped herself because she remembered that when psychologists ask questions, it's always a trick. So she gave the opposite answer and passed the test. Clearly, this isn't the same as having a natural theory of mind.

More advanced theory of mind tests can reveal continuing deficits even in intelligent adults with autism.

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This is one example of an advanced mind reading test. These are the Frith-Happe animations.

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In a minute you'll get to see one. You can watch the triangles moving around. And your job is just to decide what's going on. Have a look at the following animation.

Even though the triangles don't have faces and there's no sound, you still are left with an impression of interaction, I hope. Perhaps you thought that the small triangle was being coaxed out of home by the big triangle-- the mother-- to try and explore. Perhaps the little one was reluctant and the big one was encouraging.

When people with autism watch these animations, they're more likely to give a physical description, to say the small triangle moved outside the enclosure and then back in again, the large triangle moved slightly to the right. They don't automatically attribute mental states or see in the simple movement pattern an interaction between minds.

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There's also evidence that spontaneous mind-reading is still impaired in adults with autism who pass the Sally-Anne task. In this eye tracking study by Senju, Southgate, White, and Frith, adults with autism didn't show spontaneous mentalising. They didn't automatically look to where the character with a false belief was going to search. This anticipatory eye gaze is a clear sign of theory of mind in typically developing children and adults, and can be examined even in very young infants.

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Work with eye tracking has suggested that there may be two kinds of mentalising-- two ways in which theory of mind is used. The first is an unconscious or implicit form that we can see even in infants as young as seven months. This is often tested with eye gaze tracking. And adults have this, too, as tested by reaction time studies, for example.

The second type of mentalising would be a conscious, deliberate form. And it may be this ability that develops around three to five years old, and is measured in verbal theory of mind tasks, such as the Sally-Anne task.

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Lack of implicit mentalising from the earliest years will shape the development of children with autism. The developmental effects of lack of theory of mind are probably far-reaching.

Here you can see two little boys. The one on top is perhaps a neurotypical and non-autistic child. And he's playing in the cupboard. And he's at least as interested in what his mother or father think about his play as he is in the pots and pans themselves.

So his learning environment is automatically shaped by the people around him. He's learning through social interaction and automatically orienting to others' eye gaze and pointing. He's interested in what others find interesting. And he automatically infers the thoughts and feelings behind people's actions. He will spontaneously imitate others' actions. And all the time, he's paying attention to and learning from others.

The little boy below is stacking up the cans. He's interested in how tall a tower he can make. And he's not at all interested in whether his mother or father approve of what he's doing. Perhaps this is a little boy with autism. He is a child who will be looking less at faces. He's interested in what he finds interesting, not necessarily what anybody else is doing. And he's not motivated by social rewards. Indeed, he may find social interaction puzzling or frightening. And all of this means that he's failing to learn from others, and to acquire the knowledge and skills that other people automatically share.

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However, not every aspect of social development is affected in autism. And an important distinction can be made between caring about people and understanding people. Theory of mind impairs the understanding of others' minds, but many children and adults with autism are strongly attached to

their parents and to others that they love.

Similarly, many people with autism respond to other people's distress and have great empathy for others, even at the same time as having difficulty knowing what others may be thinking. Many people with autism that I know are very upset by stories of famines or natural disasters. They've been hungry, they've been cold, and they know that that's not nice and they don't want anybody else to suffer it. So even without being able to read minds, they have a natural empathy for others' distress.

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This can be contrasted with another clinical group-- individuals who have psychopathic traits or are callous and unemotional. Alice Jones looked at the difference between boys who had conduct disorder and psychopathic tendencies-- they were cold and callous-- and boys who had autism spectrum disorder-- who showed normal levels of empathy.

She used neuroimaging and also experimental tasks, including the triangles test you just saw, to show that while the callous, unemotional boys were good at theory of mind, but showed poor empathy, the children with autism showed poor theory of mind, but good empathic concern.

Indeed, a callous psychopath may use their understanding of theory of mind to manipulate and be Machiavellian. They know what you're feeling and thinking, they just don't care. Whereas an adult with autism may not know what's going on in your mind, but does care.

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There are many aspects to social cognition outside theory of mind. Empathy is one, and stereotyping, or biases, are other aspects of social cognition that don't require theory of mind.

Rather depressingly, people with autism turn out to have the same stereotypes as the rest of us. In this very old test-- the PRAM test-- children are asked to make an assumption based on gender. They're shown these two cards.

This is Jack and this is Chloe, they're told. One of these children likes to play with dolls. Which child likes to play with dolls? And most ordinary children will guess that it's Chloe who likes to play with dolls. They show that cultural gender bias.

Unfortunately, people with autism also choose Chloe. They also make the same stereotyping assumption. So while lacking theory of mind impairs some aspects of social cognition in autism, other aspects of social cognition, including stereotyping, appear to be intact.

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To summarise, social deficits are a key diagnostic feature of autism spectrum disorder. There are several candidate theories for the underlying deficit, including problems in social motivation, problems in mirror neurons, or difficulties in theory of mind.

Infant sibling studies are proving to be very illuminating regarding the primary core deficit in autism. And it's important to remember that not every aspect of social cognition is abnormal in autism. There are lots of other processes of social cognition that haven't even been tested, so there's lots left to explore.