

How people with autism spectrum disorders understand idioms and other figures of speech

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One of the LanPercept tests participants' interpretation of the idiom "You are a tomato!". The cartoon shows four choices; participants must choose one of the choices they feel best illustrates the idiom. Credit: LanPercept

How do children and young adults with autism spectrum disorders (ASD) understand idioms and other figures of speech? A 4.15 million euro EU project based out of the Norwegian University of Science and Technology is examining the links between language and perception in autistic individuals as just one of 15 cross-disciplinary projects designed to bring a better understanding to how our perception and language

interact and change over time and in individuals.

If someone said you were "barking up the wrong tree", would you look around for a tree and wonder why that person thought you were barking? What if someone told you that you "had your head in the clouds"? Would you feel your head or look around for clouds? In all of these cases, probably not.

But if you were someone with high-functioning autism, you might very well look around for a tree, or for clouds, or feel for your head. Now, researchers from a major EU 4.15 million euro Marie Curie Initial Training Network called "LanPercept" and coordinated out of the Norwegian University of Science and Technology's (NTNU) Department of Language and Literature Studies, are studying links between language and perception in people with [autism spectrum disorders](#) (ASD).

The study is just one of 15 different projects being pursued by LanPercept researchers, who are drawn from eight universities across Europe and whose expertise includes neuroscience, developmental psychology, linguistics and technology development. Participating in the project are also two teams from the private sector, an eye-tracking company and a neurorehabilitation institution.

"The (LanPercept) network is unique in bridging together basic research and clinical research with a strong focus on methodology and advanced techniques for studying language and perception," says Mila Vulchanova, a professor and director of NTNU's Language Acquisition and Language Processing Lab and LanPercept coordinator. "This is a must for the European researcher of the future."

The projects range from studying spatial language and non-linguistic spatial abilities in healthy adults and patients with Alzheimer's disease to examining how children develop an understanding of pronouns that are

ambiguous. The ASD research is being conducted by Sobh Chahboun, one of 11 "Early Stage Research Fellows" funded by LanPercept and one of two based at NTNU.

Idioms must be learned

It's easy to see how Chahboun could put any child at ease: she is spritely and friendly with an easy smile – and fluent in five languages. While Chahboun is based out of NTNU, her research subjects – 74 children and [young adults](#) who have high-functioning autism, and 71 matched typically developing children and young adults – are in Spain, where the NTNU researchers are working in partnership with David Saldaña at the Departamento de Psicología Evolutiva, Universidad de Sevilla. It also helps that one of Sobh's three native tongues is Spanish.

The NTNU team's study looks at how individuals with high functioning autism understand and interpret idioms, like "barking up the wrong tree" or "biting off more than you can chew."

Every language has idioms, which are a kind of short hand, amusing way of describing a situation or dilemma. But rarely do idioms actually have any literal relationship to the situation they describe. For that reason, they are among the last bits of language that children learn, typically around age 10 to 12. And they have to be learned in the appropriate context and stored in long-term memory, very much like words.

Somewhere around the age of 10-12, typically developing children are fairly fluent in idioms, while young adults around age 16 and above are more or less accomplished users of these kinds of expressions. As a consequence, the research group has selected their research participants from these two crucial age groups, to see how this understanding develops in both groups over time.

Understanding language literally

Individuals with high-functioning autism can have very high IQs, but they nevertheless struggle with communicating with others, may often be preoccupied with small details or the structure of things, and have difficulty "reading" another person's emotions or facial expressions. Children with high-functioning autism also have a hard time understanding idioms, even though their basic language skills may be highly advanced.

"Individuals at the higher end of the autism spectrum are very good linguistically," says Vulchanova, who is one of Chahboun's supervisors. "We have evidence from our earlier published research that they are often very good with grammar, and are often better with grammar than typically developing children their age, because they can perceive the regularities of language better."

In spite of this, people with ASD tend to understand language literally, which makes idioms very difficult for them to comprehend.

IQ tests and more

Before beginning the idiom experiments with her participants, Chahboun conducts a series of background tests to document each individual's intellectual development. These tests include IQ scoring, a vocabulary test for verbal intelligence, reading speed and a test that determines grammatical skill levels, among others. The tests also allow the researchers to match the ASD study participants with typically developing participants, so that the differences they see can confidently be attributed to the task itself – interpreting idioms.

"If you are testing for understanding of figurative language (idioms), we

need to make sure that the deficits the (ASD) kids have are due to figurative language problems and not to their structural (basic) language," Chahboun said. "Our (ASD) kids usually have good intellectual and cognitive skills, and most have an IQ of over 120, where the normal level is between 90 and 110."

Comparing children with high-functioning autism to their typically developing peers as they look at different idioms can help researchers expand the understanding how best to support and communicate with people with ASD, Chahboun said.

"You are a tomato"

One of tests the team is using to measure language and perception in the two groups involves showing participants a specific idiom, such as "you are a tomato," a phrase used in Spanish to remark on a person's sunburned complexion.

The test first shows each participant the idiom as words on a computer screen, and then the words in context, presented either visually or as spoken [language](#). Study participants are then asked to click on an image that reflects the meaning of the expression. In the case of the tomato idiom, the hand-drawn pictures show a choice of a person with a head that is literally a tomato, a person smelling a tomato, a person with red spots on her face, and a person with sunburn.

It's likely clear to you that the meaning of the idiom is the last image, a person with a sunburn. But for ASD study participants, this selection was not immediately obvious, and they erred in their choice more than 50 percent of the time. They also struggled longer to make their decisions than the control group of typically developing youths did.

Complex metaphors most difficult

Chahboun tested different kinds of idioms: In addition to biological idioms, which are those that are related to our biology, such as "you look like a tomato," she also looked at cultural idioms, such as "kill two birds with one stone"; instructive idioms, such as "beauty is in the eye of the beholder". In a separate experiment she tested reactions to novel metaphors, such as "Mozart's 25th symphony caresses your ears," compared to conventional metaphors.

Conventional metaphors were the most difficult to decode for the ASD participants, while the biological idioms were the easiest for both typical and ASD participants. A novel, but not unexpected finding was that giving participants additional information about the idiom, either spoken or screen-based context, actually made it harder for ASD participants to decode the idiom – likely because of difficulties in integrating visual and auditory information. This is consistent with previous research conducted by the NTNU team, Vulchanova noted.

"Despite strengths and advantages in other cognitive domains, autistic people may have problems integrating two modalities, whereas for typically developing people, having extra multi-modal support is good," Chahboun said.

The research team hopes this research will advance our current knowledge of the cognitive and linguistic profiles of autistic individuals and can help improve the way parents and educators who work with children with autism communicate with them. "We have to be careful how we present information to children from this group," Chahboun said. "The way we present information will really affect the way they understand this information."

She also says she hopes her research can help improve the opportunities

that are available to children with ASD. "I hope this will help autistic [children](#) with their education, and support them so they can have a better quality of life in general," she said.

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