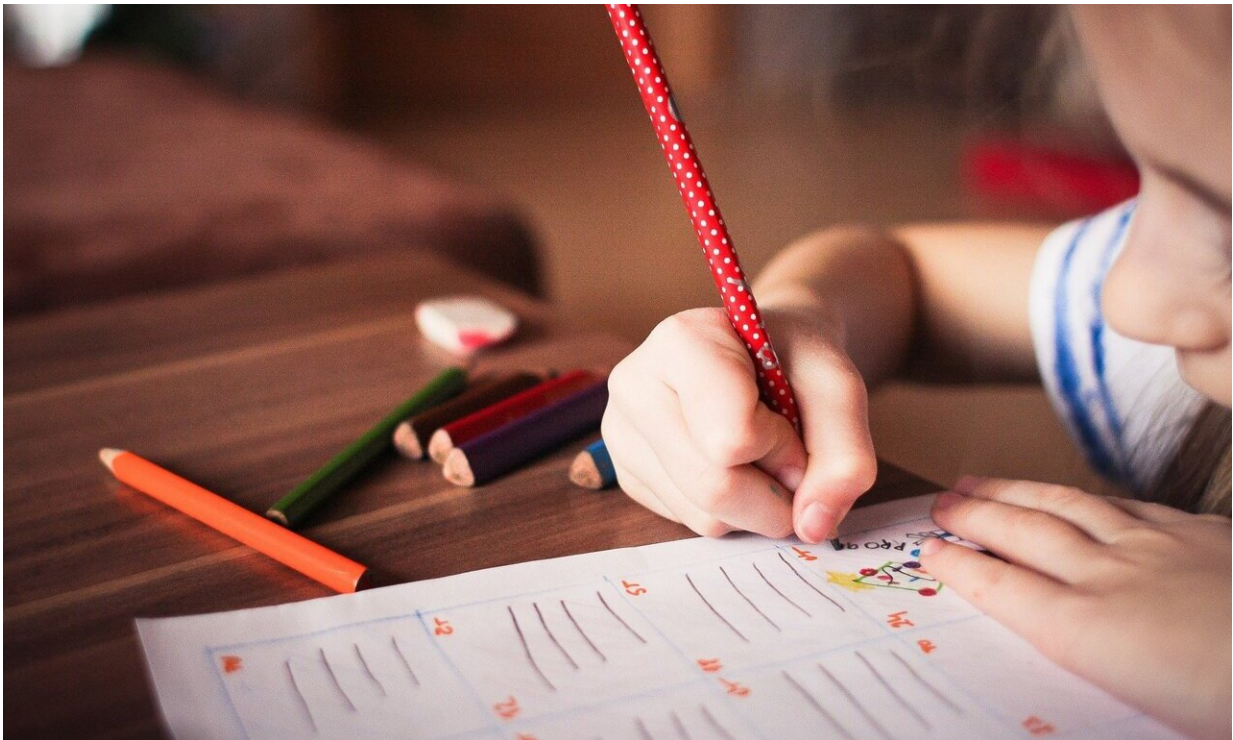


Children with dyslexia show stronger emotional responses

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Children diagnosed with dyslexia show greater emotional reactivity than children without dyslexia, according to a new collaborative study by UC San Francisco neuroscientists with the UCSF Dyslexia Center and UCSF Memory and Aging Center.

In the study, published online in an early form November 20, 2020 in *Cortex*, [children](#) with [dyslexia](#) who watched emotionally evocative videos showed increased physiological and behavioral responses when compared to children without dyslexia. This higher emotional reactivity was correlated with stronger connectivity in the brain's salience network, a system that supports emotion generation and self-awareness.

The results broaden current conceptualizations of typical dyslexia and suggest the syndrome is much more complex than just a weakness in [reading skills](#), adding support to the growing awareness that dyslexia is often associated with hidden interpersonal strengths.

"There are anecdotes that some kids with dyslexia have greater social and [emotional intelligence](#)," said Virginia Sturm, Ph.D., the John Douglas French Alzheimer's Foundation Endowed Professor in the UCSF Memory and Aging Center and a member of the UCSF Weill Institute for Neurosciences. "We don't want to say that all kids with dyslexia are necessarily gifted in this way, but we can think about dyslexia as being associated with both strengths and weaknesses."

The researchers recruited 32 children between the ages of 8 and 12 with the classic 'phonological' form of dyslexia to participate in the study, as well as 22 children without dyslexia. The team tested the children with dyslexia to confirm that they all had difficulty reading, assess their comprehension of emotional terms and measure their performance on a range of cognitive tests. Children and parents also responded to questionnaires regarding their emotional and mental health.

At the UCSF Dyslexia Center, the children were fitted with sensors to monitor breathing, skin conductance, and heart rate, and their [facial expressions](#) were filmed as they viewed short film clips designed to elicit specific positive and negative emotions such as amusement and disgust. For example, they watched a baby laughing and a woman who was about

to vomit.

The researchers found that the children with dyslexia displayed greater emotional facial behavior and were more physiologically reactive while watching the film clips than children without dyslexia. In addition, functional MRI scans of the children's brain activity revealed that the children who were most expressive had stronger connectivity between the right anterior insula and the right anterior cingulate cortex—key structures in the salience network that support emotion generation and self-awareness. In the children with dyslexia, those with stronger emotional facial expressions also had greater parent-reported [social skills](#) but also greater symptoms of anxiety and depression.

These findings suggest that many children with dyslexia may possess strengths around social acumen, since stronger emotional responses can be a key element of successful social relationships. Some adults with dyslexia report that they made it through school by "charming their teachers". This ability to make social connections, often interpreted as a purely compensatory strategy, could instead be a sign of enhanced emotional abilities at a neurological level.

Still, a dyslexia diagnosis is not a guarantee of social success. As the parent reports indicate, higher emotional reactivity and sensitivity can also be a risk factor for developing anxiety and depression, as these children could possibly be detecting emotional cues differently from neurotypical individuals. One more reason to make sure that these children are protected and appropriately served in schools, college but even in the work place as adults

"The message for families is that this condition may be defined by its negative effects on reading, but we need to look more deeply and broadly to all brain functions in dyslexia in order to gain a better understanding of associated strengths and identify effective remediation

strategies," said Maria Luisa Gorno-Tempini, MD, Ph.D., the Charles Schwab Distinguished Professor in Dyslexia and Neurodevelopment and co-director of the UCSF Dyslexia Center and the UCSF-UCB Schwab Dyslexia and Cognitive Diversity Center.

"Our findings have implications for education for children with dyslexia," said Sturm, also an associate professor in the UCSF departments of Neurology and of Psychiatry and Behavioral Sciences in the UCSF Weill Institute for Neurosciences, whose work has previously focused on emotion processing in the aging brain. "We need to base teaching on strengths as well as weaknesses. For example, kids with dyslexia may do better in one-on-one or group teaching scenarios depending on how they connect emotionally with teachers or peers. But we also need to be aware of their vulnerability to anxiety and depression and be sure they have adequate support to process their potentially strong emotions."

The researchers have other questions that they hope to answer. In future work they will attempt to determine whether emotional reactivity leads to increased empathy. The researchers hope that in better understanding social and emotional processing and other strengths in dyslexia they will be able to develop more targeted interventions and decrease stigma towards this condition.

Despite some unanswered questions, the study is a major advance in our understanding of dyslexia, the researchers say. It also demonstrates the effectiveness of the growing integration of UCSF's clinical and basic neuroscience community across departments under the umbrella of the UCSF Weill Institute for Neurosciences and across UC campuses through the UCSF-UCB Schwab Dyslexia and Cognitive Diversity Center.

"It's novel for a medical institution to take on dyslexia because it's often

considered an academic and educational problem. But dyslexia is based in the brain and we need an integrated approach between neurology, psychiatry, psychology and education to better serve these children and their families," said Gorno-Tempini, who is also a professor of neurology and of psychiatry and behavioral and director of the Language Neurobiology Laboratory at the UCSF Memory and Aging Center. "Whenever I share these results with families they are astounded because it helps them understand that dyslexia is about far more than academic challenges—it's about having a particular kind of brain with its own strengths and weaknesses, just like all of us."

More information: Virginia E. Sturm et al. Enhanced visceromotor emotional reactivity in dyslexia and its relation to salience network connectivity, *Cortex* (2020). [DOI: 10.1016/j.cortex.2020.10.022](https://doi.org/10.1016/j.cortex.2020.10.022)

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