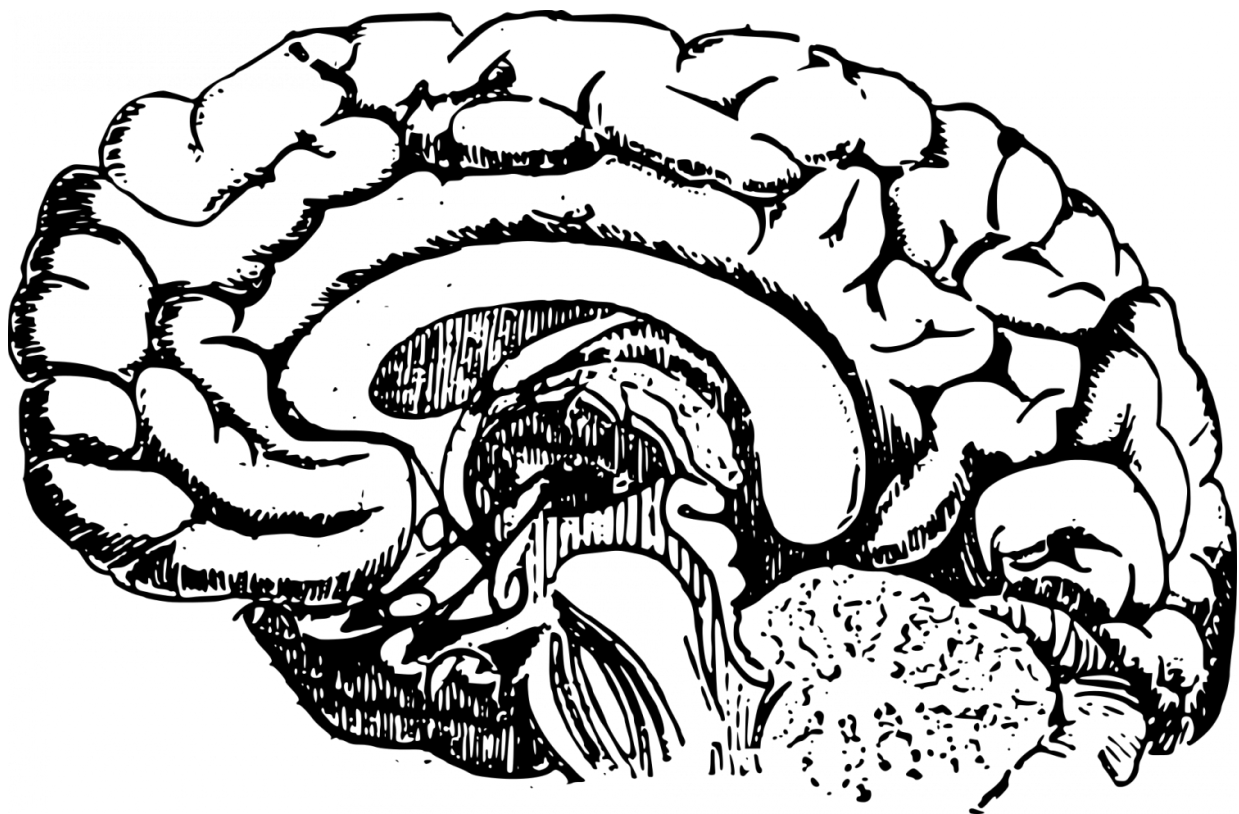


# 'Noisy' autistic brains seem better at certain tasks. Here's why neuroaffirmative research matters

March 27 2024, by Pratik Raul, Jeroen van Boxtel and Jovana Acevska

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Autism is a [neurodevelopmental difference](#) associated with specific experiences and characteristics.

For decades, [autism research](#) has focused on behavioral, cognitive, social and communication difficulties. These studies highlighted how autistic people face issues with everyday tasks that allistic (meaning non-autistic) people do not. Some difficulties may include recognizing emotions or social cues.

But some research, including our own study, has explored specific advantages in autism. Studies have shown that in some cognitive tasks, autistic people [perform better](#) than allistic people. Autistic people may have greater success in identifying a simple shape [embedded within a more complex design](#), arranging blocks of [different shapes and colors](#), or [spotting an object within a cluttered visual environment](#) (similar to Where's Wally?). Such enhanced performance has been recorded in [babies as young as nine months](#) who show emerging signs of autism.

How and why do [autistic individuals](#) do so well on these tasks? The answer may be surprising: more "neural noise."

## **What is neural noise?**

Generally, when you think of noise, you probably think of auditory noise, the ups and downs in the amplitude of sound frequencies we hear.

A similar thing happens in the brain with random fluctuations in neural activity. This is called neural noise.

This noise is always present, and comes on top of any brain activity caused by things we see, hear, smell and touch. This means that in the

brain, an identical stimulus that is presented multiple times won't cause exactly the same activity. Sometimes the brain is more active, sometimes less. In fact, even the response to a single stimulus or event will fluctuate continuously.

## Neural noise in autism

There are many [sources of neural noise](#) in the brain. These include how the neurons become excited and calm again, changes in attention and arousal levels, and biochemical processes at the cellular level, among others. An allistic brain has mechanisms to [manage and use this noise](#). For instance, cells in the hippocampus (the brain's memory system) can make use of neural noise to enhance memory encoding and recall.

Evidence for high neural noise in autism can be seen in [electroencephalography \(EEG\) recordings](#), where increased levels of neural fluctuations were observed in autistic children. This means their neural activity is less predictable, showing a wider range of activity (higher ups and downs) in response to the same stimulus.

In simple terms, if we imagine the EEG responses like a sound wave, we would expect to see small ups and downs (amplitude) in allistic brains each time they encounter a stimulus. But autistic brains seem to show bigger ups and downs, demonstrating greater amplitude of neural noise.

Many studies have linked this noisy autistic brain [with cognitive, social and behavioral difficulties](#).

## But could noise be a bonus?

The [diagnosis of autism has a long clinical history](#). A shift from the medical to a more social model has also seen advocacy for it to be

reframed as a difference, rather than a disorder or deficit. This change has also entered autism research. Neuroaffirming research can examine the uniqueness and strengths of neurodivergence.

Psychology and perception researcher [David Simmons and colleagues](#) at the University of Glasgow were the first to suggest that while high neural noise is generally a disadvantage in autism, it can sometimes provide benefits due to a phenomenon called [stochastic resonance](#). This is where optimal amounts of noise can enhance performance. In line with this theory, high neural noise in the autistic brain might enhance performance for some cognitive tasks.

Our 2023 research [explores this idea](#). We recruited participants from the general population and investigated their performance on letter-detection tasks. At the same time, we measured their level of autistic traits.

We performed two letter-detection experiments (one in a lab and one online) where participants had to identify a letter when displayed among background visual static of various intensities.

By using the static, we added additional visual noise to the neural noise already present in our participants' brains. We hypothesized the visual noise would push participants with low internal brain noise (or low autistic traits) to perform better (as suggested by [previous research](#) on stochastic resonance). The more interesting prediction was that noise would not help individuals who already had a lot of brain noise (that is, those with high autistic traits), because their own neural noise already ensured optimal performance.

Indeed, one of our experiments showed people with high neural noise (high autistic traits) did not benefit from additional noise. Moreover, they showed superior performance (greater accuracy) relative to people with low neural noise when the added visual static was low. This suggests

their own [neural noise](#) already caused a natural stochastic resonance effect, resulting in better performance.

It is important to note we did not include clinically diagnosed autistic participants, but overall, we showed the theory of enhanced performance due to stochastic resonance in autism has merits.

## Why this is important?

Autistic people face ignorance, prejudice and discrimination that can [harm well-being](#). Poor mental and [physical health](#), reduced [social connections](#) and increased "camouflaging" of autistic traits are some of the negative impacts that autistic people face.

So, research underlining and investigating the strengths inherent in autism can help reduce stigma, allow autistic people to be themselves and acknowledge autistic people do not require "fixing."

The autistic brain is different. It comes with limitations, but it also has its strengths.

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