

DEEP DIVE

Finding strengths in autism

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Illustration by Margeaux Walter

At 21, Dawn Prince-Hughes was homeless and destitute when she found her calling — at a zoo in Seattle, Washington. It was 1985. Prince-Hughes had fled to Seattle from rural Montana, where she had feared for her life after coming out as gay. She did not yet know she was autistic — she would be diagnosed with autism about 15 years later — but she knew she had trouble making friends. “I had failed miserably trying to connect with human beings,” she says. “They do not make sense to me.”

One morning, pining for nature, Prince-Hughes visited Seattle’s Woodland Park Zoo. Wandering around the enclosures, she turned a corner and saw the gorillas. “It was just an instantaneous recognition,” she says. She felt she understood them almost right away. “It was really clear to me that they were used to communicating through silence and movement, which I considered my first language, too.” She began visiting the animals every day, all day, to observe their behavior. If a staff member walked by, she pumped the employee for information. Away from the zoo, she read and watched everything she could find about gorillas. Eventually, the zoo enlisted her as a volunteer and later hired her as an assistant animal steward, caring for the animals.

Prince-Hughes worked her way through college and then graduate school, earning a Ph.D. in interdisciplinary anthropology. In the early 2000s, she authored **two books on gorillas**, one with a foreword by Jane Goodall. Prince-Hughes credits being on the spectrum for her ability to draw novel conclusions about gorillas and to see them in ways others do not. She is not alone. Evidence is building that autism often brings with it a number of strengths. For Prince-Hughes, those include heightened powers of observation, a laser-like focus and an intuition about animals. “It is true and scientifically proven that subgroups of autistic individuals have abilities that are better than non-autistic individuals,” says neuropsychologist **Isabelle Soulières** of the University of Quebec at Montreal in Canada.

It has long been known that some autistic people, called **autistic savants**, show extreme talents often along with significant challenges. They may have a spectacular memory or extraordinary gifts in music or art. But the recognition of autistic strengths is not limited to savants, who are relatively

rare. Rather, certain subtler strengths seem to systematically accompany the condition.

Autistic people have recognized strengths in themselves for decades. Writing about the **founding of Autism Network International** in 1992, an advocacy organization run by and for autistic people, autism activist Jim Sinclair noted that they and others all “recognized abilities and strengths in many autistic people,” including those “who just didn’t happen to share our skills using language.”

For decades, however, the mainstream scientific community overlooked or even dismissed the idea of unusual abilities in autism. Even when they showed up in studies, researchers often cast them as deficits. Such distortions are costly for science: Glossing over or misinterpreting autistic strengths distorts scientific understanding of autism, Soulières says. It may also lead doctors, teachers and others to pathologize and try to suppress useful traits in people with autism.

Science is starting to catch up with the early observations of autistic people’s strengths. A growing number of researchers argue that many, possibly even most, autistic people show certain advantages, such as an unusual ability to pay attention to visual and auditory information, directness or a strong moral compass. “This is not just about the stereotypical strength of being a savant with one skill at a very, very high level,” says **Kate Cooper**, a research fellow and clinical psychologist at the University of Bath in the United Kingdom. “We now know that the average person with autism, with average characteristics of autism, has strengths.”

Although those strengths might not be dramatic or showy, they set some autistic people apart from their non-autistic peers and may give them a facility for certain types of work. Some of these traits have fueled the success of autistic notables such as animal science professor **Temple Grandin**, environmental activist Greta Thunberg and naturalist Chris Packham. And they show up across the spectrum, among people of varying age, gender, intelligence and verbal ability. “It is essential to recognize that ‘autistic strengths’ are not dependent on verbal ability, IQ scores or so on, and in fact some may be more common in autistic people with more language difficulties, for example,” says **Steven Kapp**, lecturer in psychology at the University of Portsmouth in the U.K.

Which assets show up most often in autistic people is still an open question. But **enhanced visual and auditory perception** are likely to be among them. The results supporting this perceptual acuity have been replicated across labs, countries and age ranges, says **Natalie Russo**, a psychologist at Syracuse University in New York. “Overall, I would say the data are very compelling.” Skills that fall under the audio-visual umbrella include musical abilities and an eye for detail. According to one study, up to 11 percent of autistic people **have perfect pitch**, for example, compared with 0.0001 percent of non-autistic people.

In some autistic people, enhanced perceptual skills may combine with an unusual ability to process large amounts of information and **detect patterns** in, say, a series of numbers or musical notes, Soulières says. One theory is that perceptual brain regions are repurposed to serve cognitive

functions that underlie this **pattern-recognition ability**. Other studies point to positive personality traits — honesty, loyalty and reliability — though these data are largely anecdotal.

The field is still young, as most of the studies supporting even the best-documented strengths are small, and variations in their methodology make it hard to compare their results. The diversity of autism also makes pinning down autistic strengths a challenge, as every person with autism will not have the same suite of strengths. “There are things that are roughly true for many [autistic people] but are never true for all of them,” says **Laurent Mottron**, professor of psychiatry at the University of Montreal. Rather, the vast array of potential strengths may crop up in different combinations across different subsets of autistic people. “We’re always talking about subgroups, and it’s not always the same subgroup who has all these strengths,” Soulières says. **Refining the subgroups** is an active area of investigation, as is designing larger studies.

The diversity of strengths may benefit society, says **Maithilee Kunda**, a computer scientist at Vanderbilt University in Nashville, Tennessee, who studies autism. “As we go forward and humanity is facing all of these crises, we need all of our creatives,” Kunda says. “We don’t want people who are all the same trying to come up with solutions to problems.”

Distorted view:

In the 1940s, when **Leo Kanner** and **Hans Asperger** were first defining autism, both noted certain cognitive strengths associated with the condition. In the following decades, however, the mainstream scientific community mostly overlooked positive aspects of autism. “Because autism is in the Diagnostic and Statistical Manual, it’s defined in terms of the difficulties rather than the benefits that come along with being autistic,” Cooper says. Strengths, she points out, are often the flip side of the challenges. ‘Insistence on sameness,’ for example, contributes to reliability, and ‘restricted interests’ can translate to expertise. But because the diagnostic manual describes these traits as deficits, research has followed the same path, Cooper says.

A number of studies published over the years reflect this ‘deficit’ bias, casting autistic strengths as deficits. In the late 2000s, **Michelle Dawson**, an autistic researcher at the University of Montreal, searched the autism literature back to the 1970s for studies that revealed autistic strengths. At the 2009 meeting of the International Society for Autism Research, she reported that 41 percent of the 71 studies she found classified these **positive attributes as deficits**. In one 2004 study, for example, 17 autistic participants performed a reading comprehension task faster than 17 controls, and only slightly less accurately. But in analyzing their brain-imaging data, the researchers stated that the connectivity differences they saw between the two groups provide “a neural basis for **disordered language in autism**.”

The tendency to **overlook talents** in autistic people persists in the field. In a 2020 study of **moral decision-making**, for example, researchers found that autistic participants were much more likely to reject ill-gotten money than were non-autistic participants. But rather than suggest that autism is associated with a strong moral character, the researchers wrote that the autistic people were “more inflexible” and “suffer an undue concern about their ill-gotten gains.” Kicked off by a tweet from Dawson, the ensuing **uproar on Twitter** — including several hundred retweets and more than 1,200 likes — led the editor of the *Journal of Neuroscience* to add a note to the online version of the paper, stating that the authors are “**aware of concerns**” about their work and “are working to address them in proofs, before the final version of this article is published.”

Yet amid the overriding focus on deficits, a small cadre of researchers has been looking into the possibility that certain strengths also accompany autism. One of the first reports along these lines appeared in 1997, with a study showing that fathers and grandfathers of autistic children are more than **twice as likely to be engineers** as are those of non-autistic children. The scientists hypothesized that genes linked to autism are associated with a superior ability to understand objects and their mechanical properties. It was only a hint, but the whole concept of autistic assets was novel. “Instead of focusing on the social deficits and disabilities, we wanted to look at the other side of the coin, at the things that autistic people do well,” says lead researcher **Simon Baron-Cohen**, who directs the Autism Research Centre at the University of Cambridge in the U.K.

“It is true and scientifically proven that subgroups of autistic individuals have abilities that are better than non-autistic individuals.” Isabelle Soulières

Over the following decades, others joined this hunt for strengths. Google Scholar now delivers 136 results for the keywords “**autistic strengths**,” most of which were published in the past 10 years. Emblematic of this trend is a **new Ph.D. project**, applications for which closed in November, at the University of Bath in the U.K. focusing on “hidden talents” of people with autism. The selected candidate will examine the role of these talents in enhancing mental health in people with autism or other neurodevelopmental conditions.

One way to get a handle on what autistic people do well is to ask them. In one 2019 study, scientists interviewed 24 autistic adults about which traits they **attribute to their autism**, and how those traits have helped them at school, at work and in their relationships, among other realms. Participants reported having an unusual ability to focus, attend to detail and remember facts, experiences or conversations. One participant said that his ability to concentrate on a subject has helped him excel academically in graduate school; another reported winning customer-service awards at work because of his attention to detail. Many also emphasized their creativity, honesty

and empathy, particularly for animals or for other autistic people.

In a 2020 study, Cooper and her colleagues asked 140 autistic adolescents and adults to **list words or phrases** they associate with autism. Some of these terms were negative ('loneliness,' 'emotional difficulties' and 'anxiety'), but others were positive, including 'gifted,' 'unique,' 'caring,' 'focused,' 'rational' and 'attention to detail.' In small focus groups, the participants reported other beneficial aspects of their condition, saying they did not feel constrained by social norms, and describing a sense of pride in being different. They also displayed resilience — they could see a bright side of a difficult situation. And the more positive attributes a participant associated with autism, the prouder she was about being part of the autistic community. This finding may lead to ways of improving **mental health**, Cooper says. "If we can help to create spaces for autistic people to come together and create a strengths-focused sense of their autism identity, this could help individuals feel better about their differences."

Suite of strengths:

Scientists also probe autistic strengths by testing them in people. More than a dozen studies back the idea that unusually good visual abilities tend to accompany autism (though **visual problems** are common as well). These abilities — which are not on the level of a savant but are still above the norm — include discriminating between similar objects and patterns, and **spotting details** such as letters or numbers in a jumble of similar stimuli. In a 2012 study, for example, Soulières, Mottron, Dawson and their colleagues showed that 42 autistic people were significantly faster than 30 controls at recognizing which of **two vertical lines**, flashed briefly on a screen, was longer. In a 2020 study, Russo and her colleagues found that 24 autistic children were better than 30 non-autistic children at **identifying purple letters** among black ones, presented sequentially at different speeds. The work replicated a 2016 study with a similar result. In that work, the autistic children's **advantage was greatest** at the highest speeds. "Those with autism might be more likely not just to spot, but to spot and identify different features in their environment," Russo says.

This strength is also seen in **minimally verbal autistic children**, according to a 2015 study. The data on visual abilities across the spectrum, Soulières says, are strong and have been "replicated by many labs, with different tasks and different groups of individuals in terms of age and intellectual level."

This **visual edge may even be evident in infancy**. In a 2015 study, researchers tested the visual-search skills of 82 9-month-olds who have an older autistic sibling (and therefore an elevated likelihood of having autism), along with 27 controls of the same age. The researchers showed the infants circular images composed of small X's and one O, S, V or +. They tracked the babies' eyes to determine whether the children looked first at the X's or at the other symbol. Babies who

looked at the other symbol, a sign of superior search abilities, had more emerging autism traits, as measured with standard tests, at ages 15 months and 2 years than those who just stared at the X's, the researchers found.

Autistic people may perform better on visual search tasks, some experts suggest, because of a superior eye for detail. **Attention to visual detail** correlates with autism traits, according to a 2020 study, and earlier work suggests that autistic people tend to **focus on detail** more than non-autistic people in certain circumstances. "People with autism might see the world through a filter that enhances the intensity of the details of the images they see every moment of their lives," says **Arjen Alink**, a postdoctoral fellow at the University Medical Center Hamburg-Eppendorf in Germany, who led the 2020 work.

Some autistic people may also have an edge in their perception of sounds. In addition to being more likely to have perfect pitch, people with autism tend to possess **better musical memory** — the ability to recall melodies and the progression of tones and pitches — than their non-autistic peers and are better at detecting dissonant notes in music and at identifying melodies with minimal cues. In a 2005 study, for example, 15 autistic children were significantly more accurate than a group of non-autistic children at telling whether a series of notes played on a keyboard were **going up or down in pitch**. These advantages may come from a weighting of perceptual information in the brain that emphasizes non-social, pattern-like features over social, emotion-related ones, Mottron says.

"People with autism might see the world through a filter that enhances the intensity of the details of the images they see." Arjen Alink

An ability to process a large amount of information may dovetail with some of these perceptual skills. In a 2019 study, 23 autistic and 50 non-autistic children watched videos of a teacher telling a story. The videos included **information displayed** in the background that was either relevant or irrelevant to the story. The autistic and non-autistic children were equally good at answering questions about the story and relevant information, but only the autistic children recalled data from the irrelevant background displays. A 2012 study similarly revealed that increasing the amount of **material in a visual display** makes finding a specific detail in that scene harder for non-autistic adults but not for autistic ones. In a third report, researchers found that demanding visual processing limits the ability of most people — but not autistic people — to tune in to **auditory signals**.

The evidence is mixed on whether autistic people tend to excel at **mentally manipulating objects**

in space. In a 2011 study, Soulières, Mottron and their colleagues asked 11 autistic adults and adolescents and 14 non-autistic controls (of similar age and intelligence) to **mentally rotate** two 3D geometric figures to decide whether they were the same or different. The autistic participants were significantly faster and more accurate than controls. In a 2016 study, 30 autistic children bested 30 non-autistic children **at mental rotation**. Some autistic people “have a better ability to visualize the figure in their head and pull it apart,” Soulières says. Yet there is also evidence to the contrary. A 2014 meta-analysis found no support for an **autistic advantage in mental rotation**, a **conclusion echoed** in a 2017 study. “There are certainly superior abilities in people with autism, but not in the mental rotation function,” says **Christine Falter-Wagner**, a clinical psychologist at Ludwig-Maximilians-Universität München in Germany, who led the 2014 and 2017 studies.

Numbers game:

Another open question is whether a significant number of autistic people are unusually good at **spotting patterns** — visual, numerical or musical — or if that ability is largely limited to autistic savants, in whom this trait is most often studied. Some people believe pattern recognition may be a natural extension of the ability to spot detail and process it. Baron-Cohen has long argued that an ability to see patterns and create systems for organizing information lies at the heart of autism. In his new book, “**The Pattern Seekers: How Autism Drives Human Invention**,” he contends that this important skill undergirds a number of scientific advances and could be key for solving the many challenges that humanity faces.

He gives various lines of support. In a 2015 survey of more than 450,000 people in the general population, he and his colleagues found that having a **career in science**, technology, engineering or mathematics is correlated with high scores on the Autism Spectrum Quotient. And in 2011, he and a team of researchers reported that the prevalence of **autism in Eindhoven** — sometimes referred to as the Silicon Valley of the Netherlands — is twice that of two Dutch cities of similar size that do not have a strong tech industry. Baron-Cohen and his colleagues acknowledge, however, that increased awareness of autism in Eindhoven could contribute to this result.

Though far from proven, the idea has gained traction among experts. People with autism traits “are almost certainly overrepresented” in science and technology fields, says **Sven Bölte**, professor of child and adolescent psychiatric science at the Karolinska Institutet in Stockholm, Sweden. No good data show what proportion of autistic people pursue this type of work, but it is likely just a subset. “Their cognitive strengths may predispose them a little bit more to certain jobs, but in general, we shouldn’t talk too much about limiting them to this area,” Bölte says.

Pinning down the fraction of autistic people who have a specific strength, science-related or not, is tough without huge or representative samples, which are hard to come by. Even with a large study,

however, the outcome might **depend on when it was done**, as autism diagnoses have increased over time. It also may depend on how a strength is defined. **Estimates of hyperlexia** — a precocious ability to identify letters, words and numbers, with accompanying delays in comprehension — vary from 6 to 20 percent of children with autism and other developmental disabilities, depending on whether researchers define the condition as meeting four key criteria established decades ago or just two of three looser criteria. What subset of autistic people are in a study also matters. “These numbers are entirely dependent on the methodological decisions you make,” Mottron says.

What is more, the definition of ‘strength’ may be a matter of debate, as it may depend on the situation. The ability to focus intently on something, for example, can be a boon for completing a project or assignment to meet a deadline, but an obsession to finish can come at a cost to sleep, Kapp says. In the 2019 survey of 24 autistic adults, which Kapp helped conduct, one person reported that their **hypersensitivity to color** was an asset for enjoying nature but was overwhelming when walking down a crowded street; a gardener said her attention to detail made her a master weeder but could be problematic when faced with time pressure. Honesty and openness may help forge close friendships, but an inability to tell a white lie may hurt a friend’s feelings. “This sort of dichotomizing of strengths versus weaknesses is a bit of a fallacy,” says **Ginny Russell**, an investigator on the study and senior research fellow in mental health and developmental disorders at the University of Exeter in the U.K. “The context seems to be really important.”

Translating talent:

Yet emphasizing the positives of these traits has a lot of practical value, experts say. It may shore up an autistic person’s sense of self as well as skills for eventual employment, says **T. A. Meridian McDonald**, who heads the Spectrum for Life Lab at Vanderbilt University. In ongoing work, McDonald is asking more than 1,000 autistic adults to assess the level of encouragement, support and opportunity they received to pursue their special interest. The results may help reveal how early support (or lack thereof) for special interests shapes an autistic person’s identity and skills for eventual employment, she says.

One way to improve support, McDonald says, might be to **modify treatment programs** to focus on strengths. Early intervention in autism is important, she says, but tends to teach a scripted set of social and life skills. An autistic child who spends 40 hours a week in such a program may have little time to pursue special interests, and may even be discouraged from pursuing them, she says. “Early intervention might see an interest in cars as something restrictive that might need to be pared down, but if a typical child showed the same interest, the reaction might be ‘Let’s get you more information on cars,’” McDonald says. Encouraging a special interest might set a child up for

professional success.

Some universities, including **McGill University** in Montreal and **Vanderbilt University**, have launched initiatives to develop autistic strengths and market them to potential employers, and some businesses and agencies already recognize the advantages of having **autistic employees** and hire them. But these efforts are isolated. “In general, for absolutely most companies and society, this is still extremely new,” Bölte says. What’s needed, he says, are national plans for integrating autistic people into the workforce and major shifts in the way society views and approaches autism.

A better understanding of autistic strengths may aid these efforts. In that vein, Mottron aims to explore how autistic strengths relate to the way autistic people learn and store information. Others want to identify groups of autistic people who share certain talents. “These abilities are not present in all autistic individuals,” Soulières says. “Some abilities aggregate together, and it would help to find patterns among abilities in subgroups of individuals.”

As a step in this direction, Soulières and Kunda are studying why some autistic people have an edge in a test of visuospatial abilities that involves arranging colored blocks to match a target design. They are using cameras and eye-tracking software to measure certain parameters as autistic and non-autistic people perform the task, including how much time they spend looking at a block, which blocks they move and in what order, and how quickly they correct their mistakes. Using these data along with new algorithms for analyzing them, the researchers aim to identify different strategies for solving the puzzle. They then hope to link these strategies with other traits and performance on other tasks. The results could lead to a way of defining a person’s unique skill set and even match people to jobs.

Some experts would like to see identifying autistic strengths become part of the diagnostic process. The Diagnostic and Statistical Manual of Mental Disorders is strictly oriented toward deficits, but the World Health Organization’s **International Classification of Functioning, Disability and Health** encourages an assessment of both strengths and weaknesses. Bölte and others are pushing doctors and scientists to use the latter guide to assess abilities in people with autism. “It’s an assessment that’s directed at finding the next steps for achieving a better life for a person,” Bölte says. “That’s the goal.”

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