CROSS TALK

How to evaluate the 'intense world' paradigm?

BY **GREG BOUSTEAD**

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Last month, in a **Viewpoint**, **Uta Frith** and **Anna Remington raised concerns** about the '**intense world theory**' of autism, an idea that has received considerable **popular press** lately.

The theory holds that circuits in the brains of people with autism overreact to certain stimuli in the environment, hindering their ability to integrate sensory information meaningfully. Many of the **reports on sensory perception** in individuals with autism align with this concept.

However, Frith and Remington argue that the theory hasn't received enough academic scrutiny and that sensory responses in autism are highly variable, with some people underreacting to stimuli rather than overreacting. They maintain that recommending a withdrawal of sensory stimulation based on this paradigm is premature and perhaps even dangerous.

We asked five other researchers to respond to this debate — including the theory's original framer, **Henry Markram** — as part of our discussion series, **Cross Talk**.

What do you think? Share your reactions and follow-up questions in the comments section below.

Henry Markram

Professor of Neuroscience, Director, Human Brain Project,École Polytechnique Fédérale de Lausanne

A welcome debate

Bucking tradition: "Kamila Markram and I think it is great that a debate among autism researchers

has finally started on this topic. At the very least, it is getting people out of their comfort zone. The traditional view is that autism is a form of mental retardation. It is a view that originated in shockingly primitive theories, and developed over more than half a century to become dogma. In our opinion, it has derailed the vast majority of research on autism and puts children with autism in grave danger."

Copy and paste: "Many autism researchers have never worked with a child who has autism, never done a tour of duty in a school for developmentally delayed children. Many look up the symptoms in the Diagnostic and Statistical Manual of Mental Disorders or, worse, copy it from another paper — the first sentences of most papers on autism are virtually identical. When we started our research about 15 years ago, there were 625 patents for the treatment of autism, virtually all of them on ways to stimulate and shock the brain out of the depths of its retardation. There are scientists who do listen to children with autism — the work of Laurent Mottron is a wonderful example. But many listen only to the dogma."

Intense experiences: "The theory suggests that all children who genuinely have autism experience an intense world syndrome, regardless of where they are on the spectrum. The particular nature of the intensity is unique for each child. Their world is intense because microcircuits in the brain — small groups of neurons that work together — are much more reactive and much more plastic than normal. We propose that symptoms of autism are the result of these children's attempts to shield themselves from this intensity and the trauma they experience when they fail. In our view, researchers have overlooked this reason for why the symptoms arise. We have given a full account of the theory in the article we published in Frontiers in Human Neuroscience."

Adverse effects: "We do not propose sensory deprivation, as some people may misinterpret. We emphasize that the current aggressive strategies of forceful enrichment and stimulation, strong rewards and punishments could have severe adverse effects. What we propose is a rich but filtered environment in which unexpected events are decreased as much as possible. It is impossible to imagine how the structure that this implies can harm any child, even if he or she is not on the autism spectrum."

Listen: "Most importantly, autism researchers should start listening to the affected children. Every single one tells us about the overwhelming, aversive intensity of the world they experience in their daily lives. How can researchers keep ignoring what they are saying?"

Sally Rogers

Professor of Psychiatry and Behavioral Sciences,University of California, Davis' MIND Institute

Empirical evidence lacking

The over/under on arousal: “I share Professor Frith’s concerns about the theory. The over-arousal theory of autism is one of the oldest theories that have been offered, dating back into the 1960s and 1970s. Yet the largest body of research examining arousal and response to sensory stimuli in autism demonstrates that patterns of under-arousal are far more characteristic of people with autism than is over-arousal. The over-arousal theory is often used as an explanation for social avoidance, suggesting that people with autism withdraw from social contact to avoid painful over-arousal. And yet when researchers have examined social responses to others in children with autism, as in Lorna Wing’s social subtypes, social withdrawal is a pattern seen in only one subgroup consisting of a minority of children with autism.”
Social contact helps: “In terms of the idea that one should withdraw stimulation from children with autism, the intervention data suggest the opposite. The most successful interventions for young children with autism (including discrete trial teaching, Early Start Denver Model, JASPER, pivotal response training and others) add a considerable amount of social contact and interaction. Thus, I cannot think of empirical evidence from people with autism that solidly supports the theory being discussed here.”

Matthew Belmonte

Professor of Animal Science,Colorado State University

Finding a balance

Gradual encouragement: “I am very concerned about the suggested treatment for young children with autism by withdrawing all stimulation, but I agree with Markram’s previous statement that ‘the autist perceives, feels and fears too much.’ When I was a child, loud noises hurt my ears like a dentist’s drill hitting a nerve. Scratchy clothes still bother me. A better approach is gradually encouraging the young child to tolerate more stimulation. But one must be careful not to drive a child into sensory overload where he completely shuts down.”
Variable sensitivities: “Problems with sensory oversensitivity are highly variable. One child with autism may have visual sensitivity problems, and another may have sound sensitivity. Sensory issues vary from a mild nuisance to very debilitating. Treatments for sensory problems should be a top research priority. I agree with the Markrams that sensory problems in autism can lead to an overstimulating world that is too intense. However, I do not agree with their theory explaining all the social problems in autism.”
Acknowledging advantages: “There is one part of the theory I completely agree with. I hate the deficit model when it is applied to mild autism. Milder forms of autism and Asperger can provide advantages. Half of Silicon Valley probably has mild autism, and they avoid the labels. Many kids

who are just a little geeky and nerdy get an autism diagnosis in order to obtain services."
Same child, different label: "It really bothers me to see a geeky kid labeled 'autistic' going nowhere due to no expectations, and then I go to a gifted conference and I see a similar geeky kid labeled gifted and he is headed toward a great career. They are the same child with different labels."

Temple Grandin

Senior Research Associate,The Groden Center

Moderate value

Historic notion: "Though the intense world theory has been much ballyhooed as a new idea, the notion of sensory overload has, as Remington and Frith point out, been with autism for most if not all of its history. To many people with autism especially, and also to those of us who have grown up with family members who have autism or who have broader-phenotype traits ourselves, the notion seems so self-evident that its scientific and media attention seem out of proportion to its novelty. (Our own 2004 review in Molecular Psychiatry, for instance, described 'hyper-arousal in response to sensory input' as one potential source of 'higher-order abnormalities' of cognition and behavior.)"
A filtered environment: "Remington and Frith seem to construe the Markrams as advocating a withdrawal of stimulation in general, which would indeed impoverish a developing child's environment. However, the Markrams seem to urge a filtered environment in which stimulus contingency and unpredictability are regulated to manageable levels — not so bland as to be nothing more than an occasion for repetitive behaviors, but not so intense as to be full of sound and fury."
"Although the intense world theory conflates neural and perceptual senses of 'intensity' and runs a bit short on specific, testable predictions, such a filtered environment may be found to have value for some people with autism, regardless of whether it is specific to an 'intense world' view or whether this view even constitutes a well-framed paradigm distinct from other theoretical conceptions of autism."

Donald Rojas

Associate Professor of Cognitive Neuroscience,Colorado State

University

No unifying framework

Some evidence: “I agree with the Viewpoint article by Remington and Frith that the intense world theory has not received much academic scrutiny. There are, however, some pieces of supportive evidence in people that are consistent with data from valproic acid (VPA)-treated mice and rats, the animal model that inspired intense world theory.

“For example, there is some evidence for increased brain plasticity in children with autism. Additionally, there is support for a change in the balance of excitation to inhibition in autism from studies of the concentrations of glutamate and gamma-aminobutyric acid neurotransmitters, from studies of alterations in neurotransmitter receptors and from electrophysiological studies. However, these pieces of evidence are also consistent with at least one other all-encompassing theory of autism: the excitation/inhibition imbalance theory proposed by John Rubenstein and Michael Merzenich. Although connectivity changes are also noted in the VPA-exposed rats, human connectivity studies in autism offer a much messier story.”

Open questions: “The bottom line is that the intense world theory is an attractive theory for VPA-induced autism, but how well it does with the majority of autism cases is an open question. VPA exposure itself cannot explain more than a small fraction of cases of autism. Given the behavioral and genetic heterogeneity of autism, it seems highly unlikely that any one theory will provide a grand unifying framework. Intense world theory, like other theories of autism, needs to be thoroughly evaluated. To their credit, the Markrams outline a number of specific predictions and discuss the falsifiability of intense world theory in their 2010 paper in Frontiers in Human Neuroscience.”