AUTISM in CONTEXT

www.petervermeulen.be

Are sensory issues in autism actually sensory?

Improving Practice, Improving Every Life

10th Anniversary Autism Professionals Conference

7 and 8 March 2019, International Convention Centre (ICC), Birmingham

Experience: sensory discomfort

Valid

Explanation: possible causes

Intervention: possible solutions

????

J Autism Dev Disord (2009) 39:1–11
DOI 10.1007/s10803-008-0593-3

ORIGINAL PAPER

A Meta-Analysis of Sensory Modulation Symptoms in Individuals with Autism Spectrum Disorders

Ayelet Ben-Sasson · Liat Hen · Ronen Fluss · Sharon A. Cermak ·
Batya Engel-Yeger · Eynat Gal

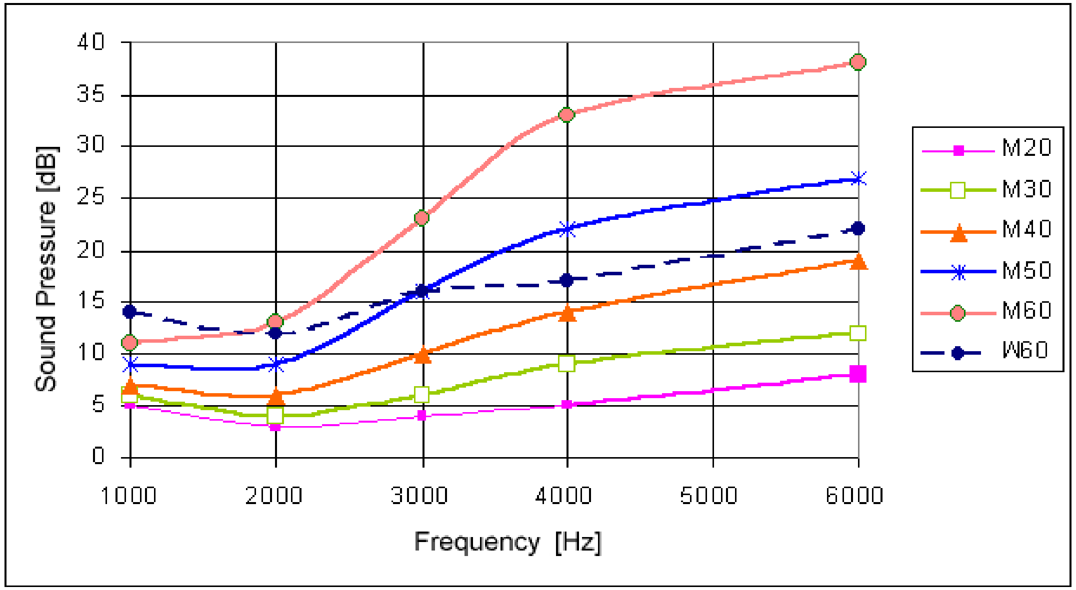
autism

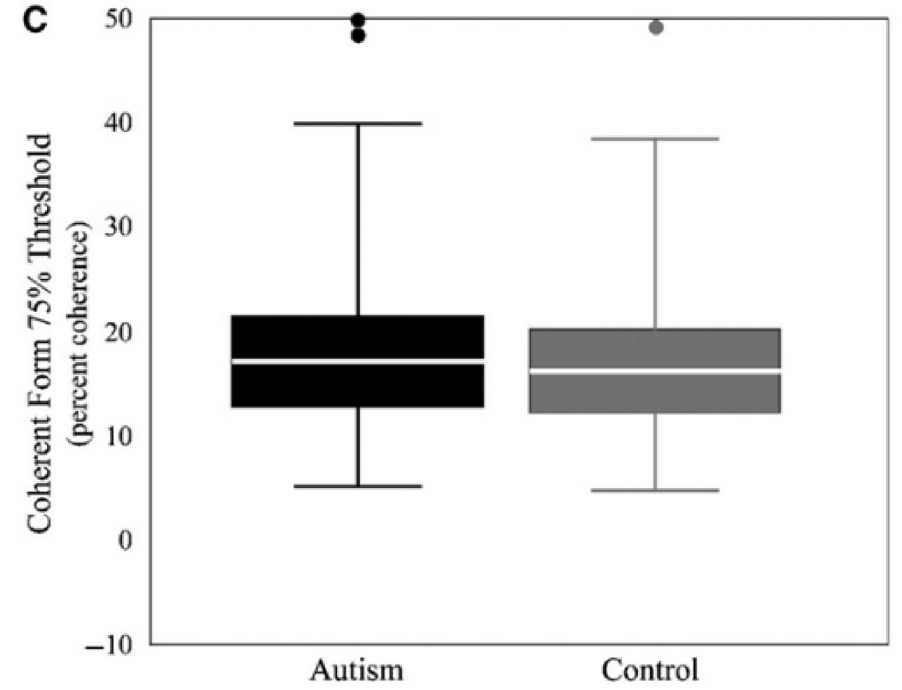
hyperreactivity

hyporeactivity

sensory seeking

No unambiguous, clear indications for difference in sensory thresholds in autism





Probably even increased perceptual capacity

Research in Developmental Disabilities 85 (2019) 197–204

Contents lists available at ScienceDirect

Research in Developmental Disabilities

journal homepage: www.elsevier.com/locate/redevdis

ELSEVIER

Implications of capacity in the classroom: Simplifying tasks for autistic children may not be the answer

Anna Remington[a,*], Mary Hanley[b], Susanna O'Brien[a], Deborah M. Riby[b], John Swettenham[c]

[a] Centre for Research in Autism and Education (CRAE), Department of Psychology and Human Development, UCL Institute of Education, University College London, United Kingdom
[b] Department of Psychology, Durham University, United Kingdom
[c] Department of Language and Cognition, University College London, United Kingdom

ARTICLE INFO

Number of reviews completed is 2

Keywords:
Autism
Attention
Perception
Learning

ABSTRACT

Background: Research has demonstrated evidence for increased perceptual capacity in autism: autistic people can process more information at any given time than neurotypical individuals. The implications of this for educating autistic pupils have not been investigated. For example, this ability to process more information at any given time may explain why autistic children sometimes process more peripheral task-irrelevant information than neurotypical individuals (e.g. in background classroom wall-displays).

Hyporeactivity probably more autism specific

- Decreased responsivity to **pain**
  (Moore, 2014)
- Reduced detection of **temperature**
  (Duerden a.o., 2015)
- Reduced **odor** detection
  (Dudova a.o., 2011; Muratori a.o., 2017)
- Poorer identification of **flavours**
  (Bennetto a.o., 2007)

Sensory issues: not only in autism…

YALE JOURNAL OF BIOLOGY AND MEDICINE 88 (2015), pp.69-71.

FOCUS: AUTISM SPECTRUM DISORDERS

YJBM

Sensory Features as Diagnostic Criteria for Autism: Sensory Features in Autism

Jordan N. Grapel*, Domenic V. Cicchetti, and Fred R. Volkmar

Yale Child Study Center, Yale University, New Haven, Connecticut

In this study, we examined the frequency of sensory-related issues as reported by parents in a large sample of school-age adolescents and adults with autism/autism spectrum disorder (ASD†) [1] as compared to a group of individuals receiving similar clinical evaluations for developmental/behavioral difficulties but whose final diagnoses were not on the autism spectrum. In no comparison were the features examined predictive of autism or autism spectrum in comparison to the non-ASD sample. Only failure to respond to noises had sensitivity above .75 in the comparison of the broader autism spectrum group, but specificity was poor. While sensory issues are relatively common in autism/ASD, they are also frequent in other disorders. These results question the rationale for including sensory items as a diagnostic criterion for autism.

Default strategy for coping with sensory overload

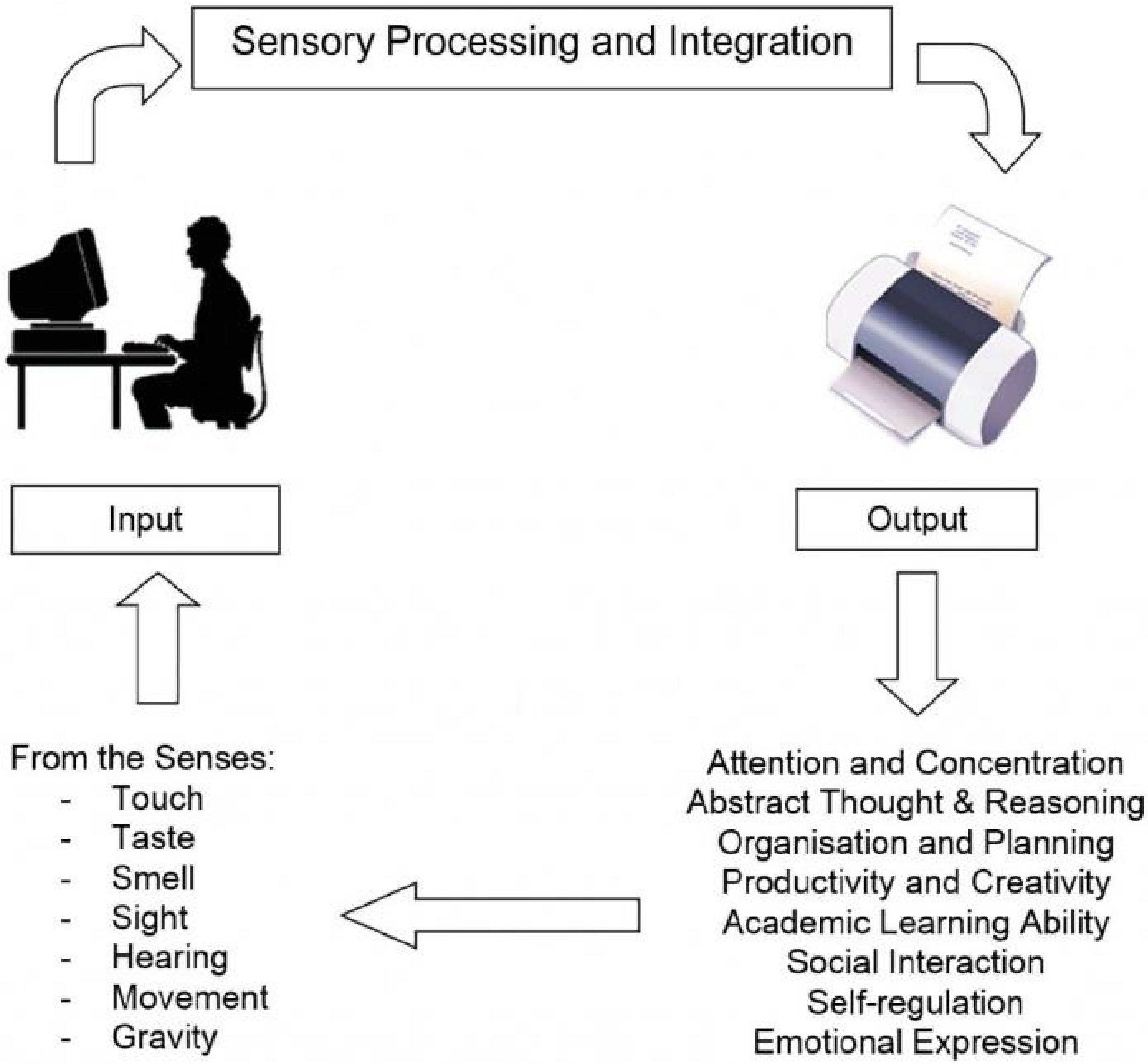
Reduce or Avoid sensory input

What is the idea behind this strategy?

The idea is: the brain receives input from the senses.

However, that idea - based on the computer metaphor – has been challenged by recent findings in neuroscience.

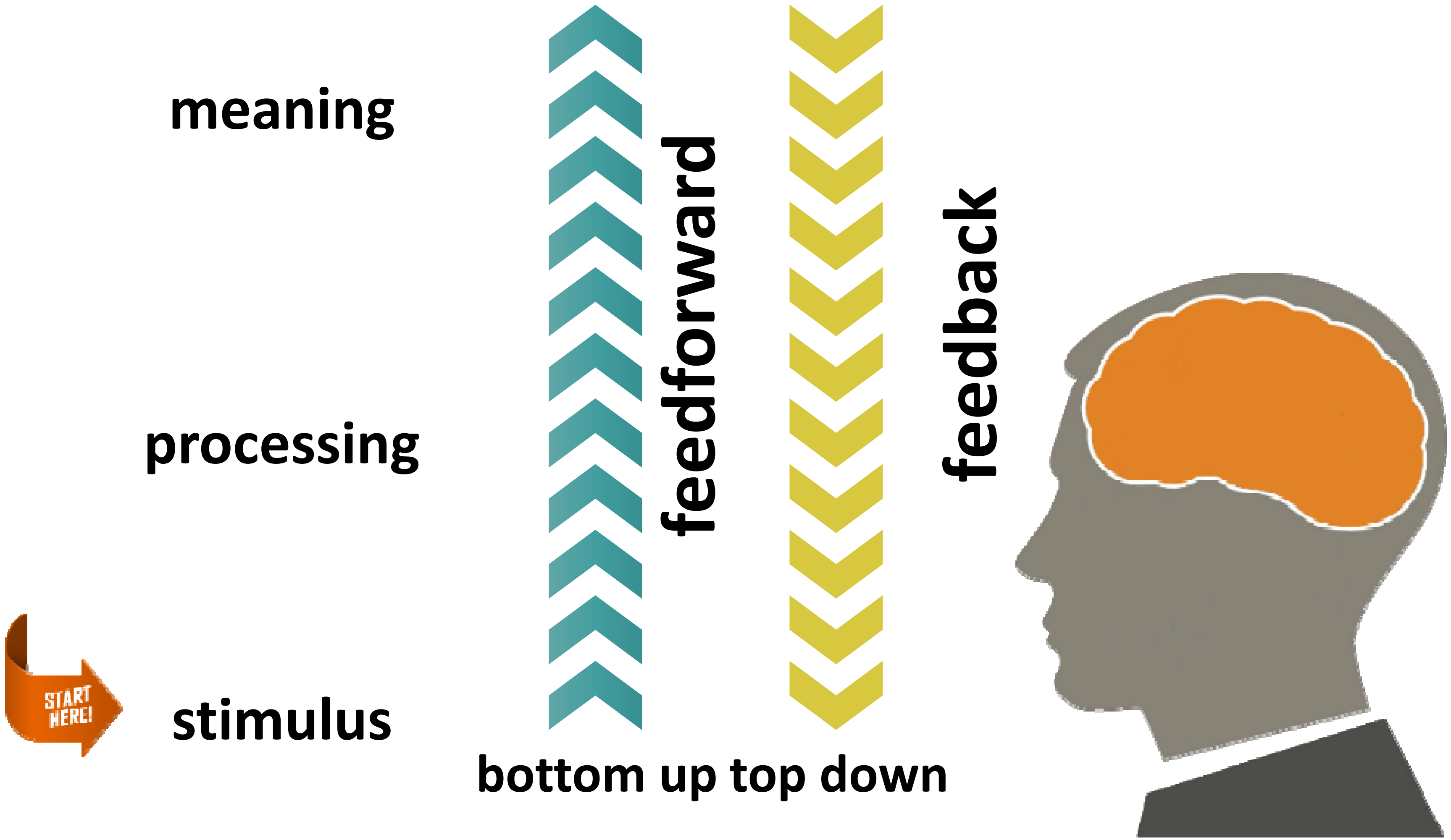
computer metaphor



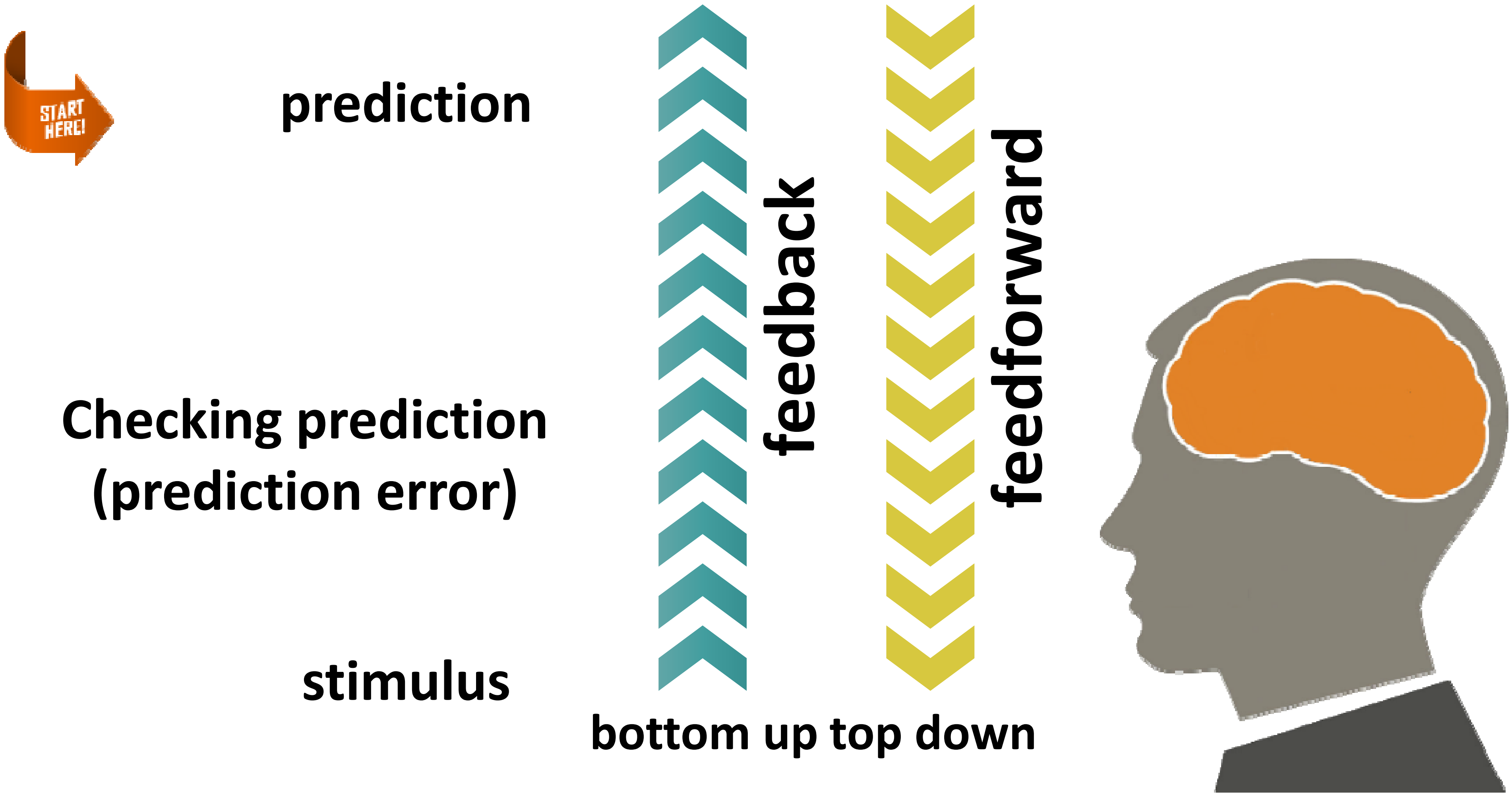
What's wrong with our current ideas about the brain?

- Information processing is not linear
- Sense making is not just integrating all the details of the sensory input
  - There isn't enough time to calculate and make that puzzle! (Daniel Kahneman: *Thinking fast, thinking slow*)
  - Processing all the sensory input (computing) is not very helpful for survival!
- So, the brain does not compute, It guesses,
- This is known as: **the predictive mind**

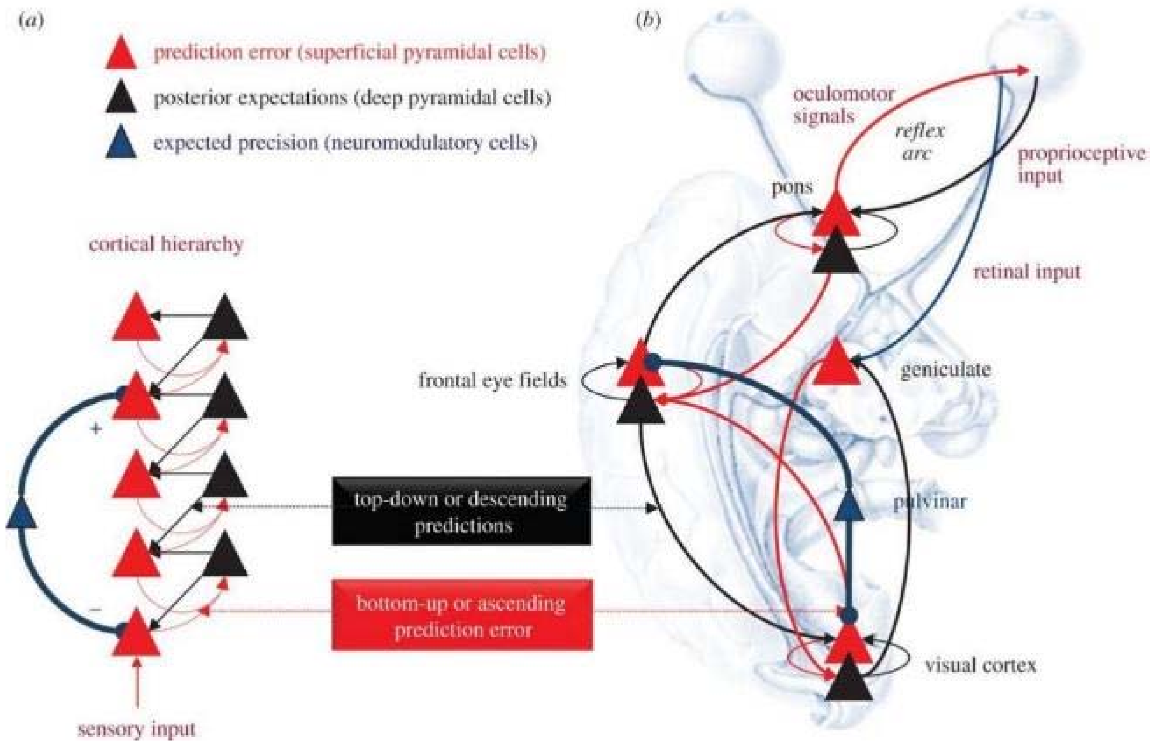
So, it does NOT work like this



But it works like this



The brain does not process stimuli, only what is different from the stimuli it predicted…



From *The Lancet*

The brain likes it easy and efficient

The brain tries to minimize the prediction-error

Difference between
predicted sensory input
and actual sensory input

Big difference:
surprise, stress

Small difference:
relaxed and energy for
more important things

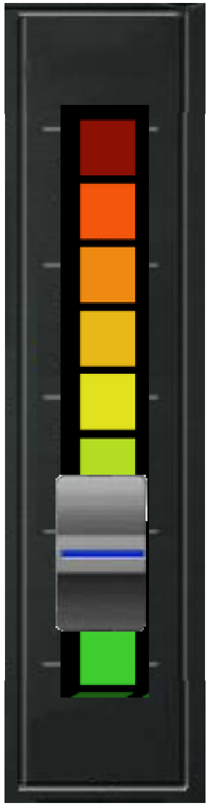
We cannot avoid prediction errors

That’s why the brain uses a **variable precision** of its own predictions

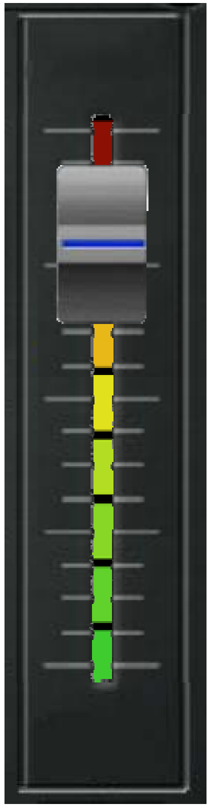
Sometimes, it must be precise
Sometimes, good enough is OK

Precision determines the filter in our brain

sensory input



prediction
(prior beliefs)

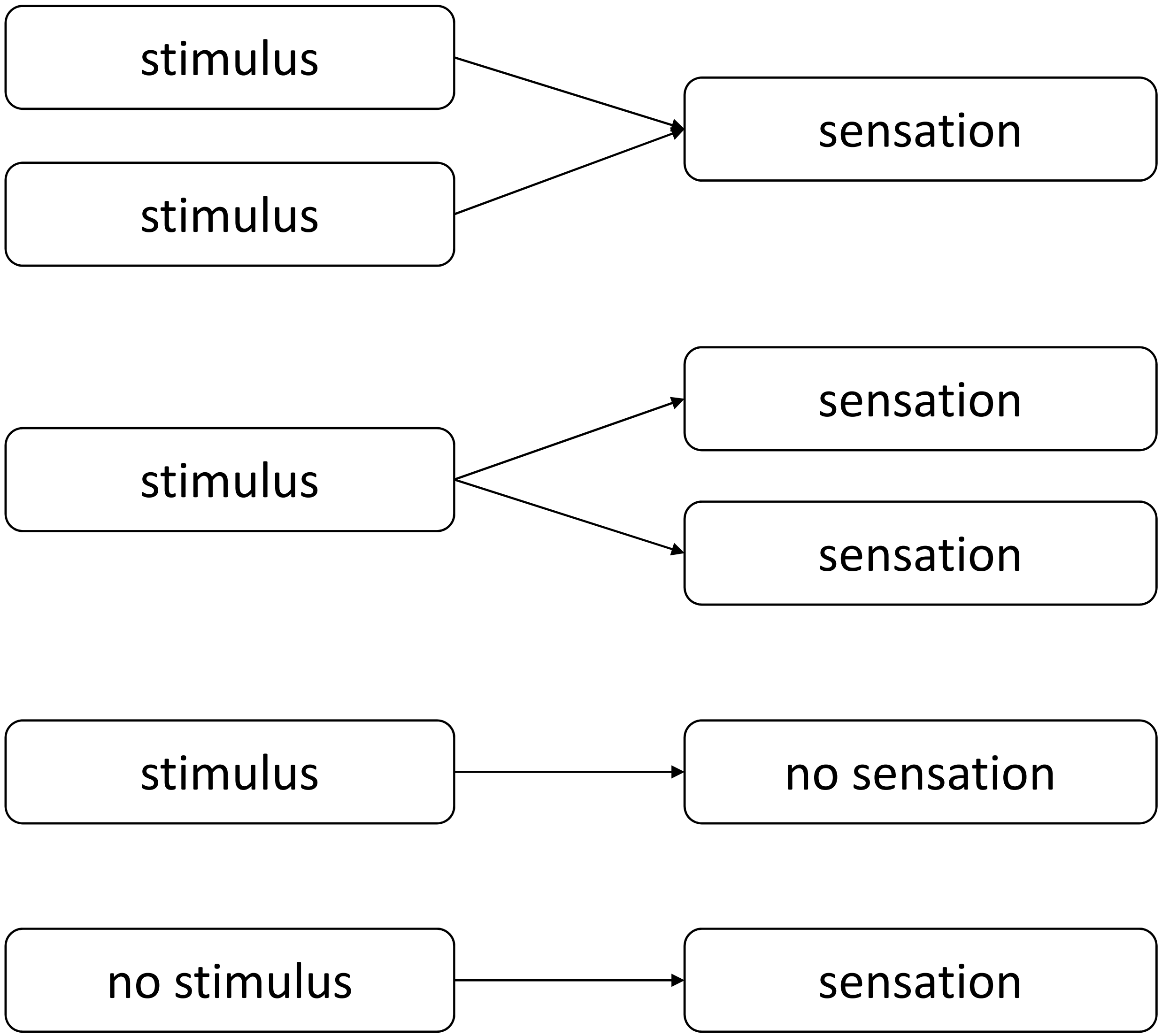


Why so complicated?

Bayesian brain:

Working with probabilities is appropriate in situations that are uncertain

The input coming from the senses is unreliable!



EXAMPLE:

Color is in your brain: Tomato is not always red, yet you ‘see’ red

Color is in your brain: you can see the same color as two different colors

The dancing gorilla you don’t see

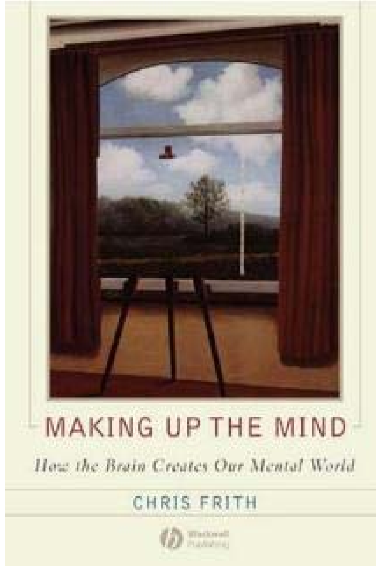
Hallucinations, phantom pain, illusions

Perception is controlled hallucinating.

We don't see the world, but our model of the world.

Our perception of the world is an **illusion** that (in most cases, fortunately) coincides with reality.

Chris Frith

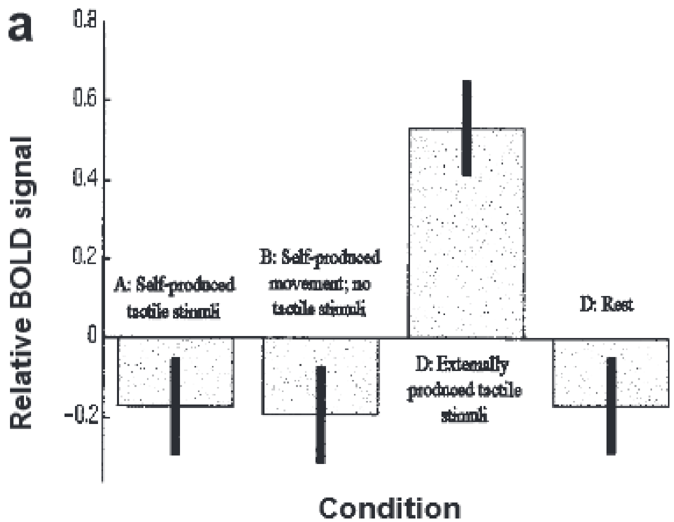


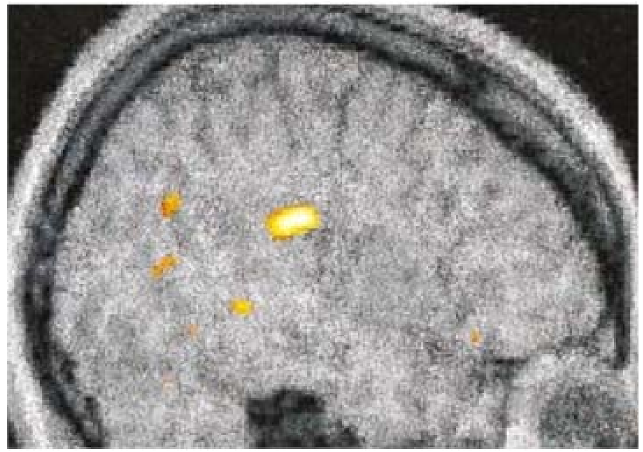
Why can't you tickle yourself?

Sarah-Jayne Blakemore,[CA] Daniel Wolpert and Chris Frith

Wellcome Department of Cognitive Neurology, Institute of Neurology, University College London, 12 Queen Square, London WC1N 3BG, UK

[CA]Corresponding Author



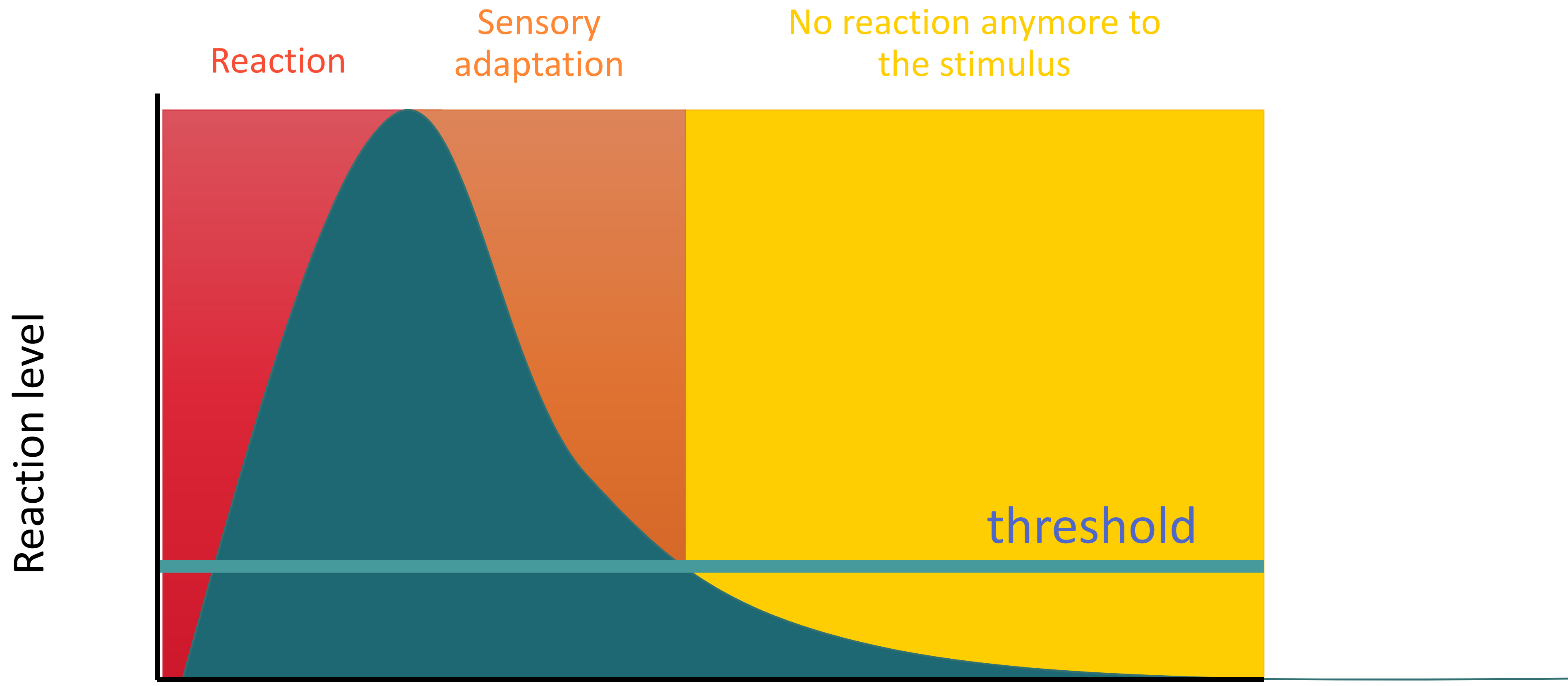


[redacted]. I'm sensitive to sounds. Loud sounds. Sudden sounds. Worse yet, loud and sudden sounds I don't expect. Worst of all, loud and sudden sounds I *do* expect but cannot control — a common problem in people with autism. Balloons terrified me as a child, because I didn't know when they were going to pop.

Today I know that if I had been able to pop balloons myself, poking a small balloon with a pen and producing a soft sound, then working my way up to bigger and bigger balloons and louder and louder pops, I might have been able to tolerate balloons. I've heard a lot of people with autism say that if they can initiate the sound, they're more likely to be able to tolerate it. The same is true if they know the sound is coming; fireworks set off at random by kids down the block are shocking, but fireworks set off at the city park as part of a holiday program are acceptable.

Temple Grandin, The Autistic Brain, p. 69

Sensory adaptation



Sensory receptors become less sensitive to an **expected** stimulus and no longer pass on the input

Hyperresponsivity:
reduced habituation in autism because of **reduced predictivity** (Turi et al., 2015)

SCIENTIFIC REPORTS

OPEN

A striking reduction of simple loudness adaptation in autism

Rebecca P. Lawson[1,2], Jessica Aylward[1], Sarah White[1] & Geraint Rees[1,2]

Received: 09 April 2015
Accepted: 07 October 2015
Published: 05 November 2015

Reports of sensory disturbance, such as loudness sensitivity or sound intolerance, are ubiquitous in Autism Spectrum Disorder (ASD) but a mechanistic explanation for these perceptual differences is lacking. Here we tested adaptation to loudness, a process that regulates incoming sensory input, in adults with ASD and matched controls. Simple loudness adaptation (SLA) is a fundamental adaptive process that reduces the subjective loudness of quiet steady-state sounds in the environment over time, whereas induced loudness adaptation (ILA) is a means of generating a reduction in the perceived volume of louder sounds. ASD participants showed a striking reduction in magnitude and rate of SLA relative to age and ability-matched typical adults, but in contrast ILA remained intact. Furthermore, rate of SLA predicted sensory sensitivity coping strategies in the ASD group. These results provide the first evidence that compromised neural mechanisms governing fundamental adaptive processes might account for sound sensitivity in ASD.

CrossMark

Children with autism spectrum disorder show reduced adaptation to number

Marco Turi[a,b], David C. Burr[b,c], Roberta Igliozzi[d], David Aagten-Murphy[e], Filippo Muratori[d,f], and Elizabeth Pellicano[c,g,1]

"A key determinant of habituation is stimulus predictability.
… **a lack of predictability** would compromise habituation and lead to hypersensitivity."
(Sinha et al., 2014)

CrossMark

Autism as a disorder of prediction

Pawan Sinha[a,1], Margaret M. Kjelgaard[a,b], Tapan K. Gandhi[a,c], Kleovoulos Tsourides[a], Annie L. Cardinaux[a], Dimitrios Pantazis[a], Sidney P. Diamond[a], and Richard M. Held[a,1]

[a]Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology, Cambridge, MA 02139; [b]Department of Communication Sciences and Disorders, Massachusetts General Hospital Institute of Health Professions, Boston, MA 02129; and [c]Department of Biomedical Engineering, Defense Institute of Physiology and Allied Sciences, New Delhi, India DL 110054

Psychological Review
2014, Vol. 121, No. 4, 649–675

0033-295X/14/$12.00 http://dx.doi.org/10.1037/a0037665

Precise Minds in Uncertain Worlds: Predictive Coding in Autism

Sander Van de Cruys, Kris Evers, Ruth Van der Hallen, Lien Van Eylen,
Bart Boets, Lee de-Wit, and Johan Wagemans
KU Leuven

(e.g., under the form of enhanced discomfort to bright light; Kern et al., 2001). When the gain of the neural units representing the prediction errors is fixed at a high level, it is easy to see that hypersensitivity becomes very likely, especially for unexpected input, as is the case in ASD. Overweighting of irrelevant prediction errors causes sensory overload.

Seeing that unpredictability is at the core of the sensory overload, we can also attempt to explain its negative affective impact. Uncertainty has long been identified as a factor that intensifies stress and anxiety (Herry et al., 2007; Miller, 1981). In addition to leading to increased stress and anxiety, persistent significant prediction errors may actually by themselves generate negative affect (Huron, 2006; Van de Cruys & Wagemans, 2011). When prediction theories (Chevallier et al., 2012) that this is an important aggravating factor in the syndrome. Indeed, social interactions are not perceived to be that enjoyable or rewarding in individuals with ASD (Chevallier et al., 2012). Unsurprisingly, a lot of interventions focus on increasing the reward of social interactions. If social situations are avoided from early on in life, the number of social learning experiences decreases, and so, in a vicious circle, even more social impairments ensue.

Taken together, these factors arguably make individuals with ASD more vulnerable to mood and anxiety problems, which are indeed overrepresented in ASD (Kim, Szatmari, Bryson, Streiner, & Wilson, 2000). Hence, mood problems, anxiety, and anxious avoidance should in our view be considered as secondary symp-

No stronger sensory response, but stronger experience of stimuli, stronger reaction in limbic system

RESEARCH ARTICLE

Perceptual and Neural Response to Affective Tactile Texture Stimulation in Adults with Autism Spectrum Disorders

Carissa J. Cascio, Estephan J. Moana-Filho, Steve Guest, Mary Beth Nebel, Jonathan Weisner, Grace T. Baranek, and Gregory K. Essick

J Autism Dev Disord (2008) 38:127–137
DOI 10.1007/s10803-007-0370-8

Tactile Perception in Adults with Autism: a Multidimensional Psychophysical Study

Carissa Cascio · Francis McGlone · Stephen Folger · Vinay Tannan · Grace Baranek · Kevin A. Pelphrey · Gregory Essick

Interventions focused on limbic system, rather than on sensory system …

UC San Diego

Are Sensory Problems in Autism Really Sensory?

146.148

M. Zinni [1,2], M.Westerfield [3,1], L. E. Mash [4], S. Wee [2], L. Chukoskie [3] & J. Townsend [2]

1. Neuroverse, Inc., San Diego, CA; 2. Department of Neurosciences, Univ. of California, San Diego; 3. The Institute for Neural Computation, 4. SDSU/UCSD Joint Doctoral Program in Clinical Psychology, Univ. of California, San Diego

BACKGROUND

Abnormal responses to sensory stimulation are a commonly reported clinical feature of autism spectrum disorder (ASD). Both over- and under-responsiveness have been reported in all sensory modalities, although the nature and affected sensory modality of these abnormalities varies greatly between individuals. Despite the general consensus that sensory abnormalities are an important clinical symptom in autism, there is little or no understanding of the underlying mechanisms. Because the vast majority of evidence regarding these sensory symptoms in ASD are based solely on behavioral descriptions, it is not clear whether these symptoms are related to differences in function at a basic sensory level or whether these symptoms result instead from the influence of poorly modulated arousal and attention on sensory responsiveness.

METHODS

Participants

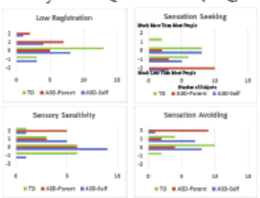
	Controls	ASD
N	16 (All Male)	17 (All Male)
Age Mean	22.0 (3)	20.2 (3)
WASI VIQ	113.3 (13)	109.8 (15)
WASI PIQ	106.1 (8)	112.8 (13)
SRS-Total T-Score	50.2 (6)	57.4 (12) self-reported
ADOS Comm+Soc.		10.8 (4)

Standard deviations are given in parenthesis.

WASI - Wechsler Abbreviated Scale of Intelligence (Pearson)
VIQ: Verbal IQ Score
PIQ: Performance IQ Score
SRS - Social Responsiveness Scale (Western Psychological Services)
ADOS - Autism Diagnostic Observation Schedule (Western Psychological Services)

Social Responsiveness Scale ratings from parents showed higher (more social impairment) scores than did the ASD adult self-report ratings (Total T-Scores ASD Self-Report: 57.4 (12); ASD Parent Report: 68.8 (9), $p < 0.006$). ASD adults all met diagnosis based on ADOS and DSM-IV.

Sensory Profile Questionnaire (SPQ)

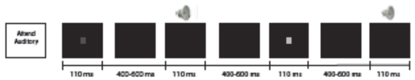


Parents ranked sensory symptoms in adults as more severe for all scales than did the adults themselves on self-report.
Although all control adults reported some sensory abnormalities, ASD adults were significantly more affected on all scales. Compared to control adults, ASD adults were: less responsive to their sensory environment overall (greater Low Registration, $p < 0.0005$); less Sensation Seeking ($p < 0.025$); had greater Sensory Sensitivity ($p < 0.0025$); and showed greater Sensory Avoidance ($p < 0.0015$)).

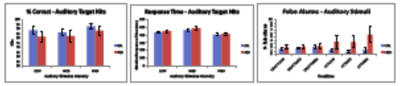
Electroencephalographic (EEG) and Heart Rate (HR) Methods

- 70-channel BioSemi ActiveTwo EEG system. For HR recording, 2 of the electrodes were placed just under the left rib and on the right clavicle for a lead II configuration.
- EEG was digitized at 1024 hz (resampled to 512 hz for analysis), re-referenced offline to the average of the left and right mastoid electrodes and high-pass filtered at 0.1 hz
- Data were corrected for eye-related artifacts using Independent Component Analysis (Jung et al., 2000)
- Data were epoched into trials time-locked to each event of interest (from 100 ms prior to 1000 ms following stimulus onset), and averaged according to event type
- EEG baseline correction was performed using a 100 ms pre-stimulus window
- Event-related brain potentials (ERPs) for each event type were quantified by calculating the mean amplitude between two time points.

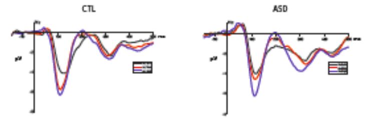
AUDITORY STIMULUS INTENSITY



We examined response to changes in auditory and visual sensory intensity and the modulation of this response by attention, by asking subjects to pay attention to stimuli of one sensory modality while ignoring stimuli of the unattended modality.
The task was to press a button when they detected a target stimulus in the attended modality (attend auditory: change from 1000 hz tone to 950 hz tone; attend visual: box smaller than usual, change from 4.51° to 3.64° visual angle).
Targets appeared 18.75% of the time (attended and unattended).
Stimuli were presented at low, medium, and high levels of intensity, resulting in six experimental conditions of interest for each visual or auditory stimulus presented (attended low, attended medium, attended high, unattended low, unattended medium, and unattended high).
Because participants with ASD had more difficulty remaining fixated on the screen, only responses to auditory stimulation are shown.



The ASD group committed more false alarms than the CTL group overall when the auditory stimuli were attended than when unattended ($p < 0.05$). No other group effects or group interactions were significant ($p > 0.05$).



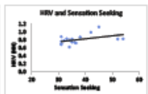
Differential sensory response to changes in intensity was evaluated by comparing event-related brain potentials (ERPs) in both groups. The N1, P2, and P3 components were measured across clusters of electrodes.

The modulation of auditory event-related brain potentials as a function of stimulus intensity level did not differ between groups (group main effects and group * intensity interactions $p > 0.05$). This finding suggests that the reported sensory difficulties in the ASD group are not reflected in differences between groups in the modulation of obligatory sensory responses to auditory tones.

HEART RATE AND AROUSAL

Arousal data was collected in two paradigms: during a resting state session and during an arousal specific paradigm. In this arousal paradigm, participants either watched a silent video (Unattend Condition) interrupted periodically by an alarm clock sound (5 times with roughly 2 minutes between each alarm) or watched a fixation point on the screen and waited for the occasional alarm (Attend Condition).

Resting Heart Rate



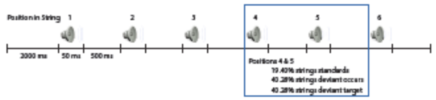
There was a significant association between HR and the Sensation Seeking index from the Sensory Profile such that higher HR and lower HRV (NN) were associated with lower Sensation Seeking in the ASD group ($p < 0.05$)

Adults with ASD have significantly higher Heart Rate (HR, Beats Per Minute); lower Heart Rate Variability (NN, mean inter-beat interval and NN50, number of pairs of adjacent intervals differing by more than 50 ms). All $p < 0.05$. This effect was observed during both the resting state session and during the arousal paradigm. No alarm, event-specific differences were observed between groups.

Lower Heart Rate Variability is generally associated with higher levels of stress and anxiety and reduced resiliency in coping with environmental and physiological stressors.

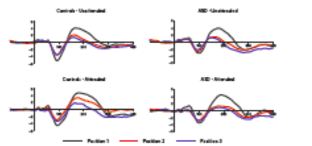
Funded By:
R21-MH096582 (NIMH)
We thank the participants and their families for their time and enthusiasm.

AUDITORY STIMULUS REFRACTION AND HABITUATION



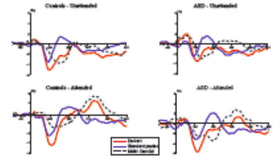
To examine neural refraction and habituation of auditory response to repeated sensory stimulation, we embedded repeated auditory stimuli in attended and unattended conditions. (CTL, n = 13; ASD, n = 8)
Stimuli were a standard tone, deviant tone, and a target deviant tone (not responded to during the unattended block).
The three tones were: 950 hz, in some blocks standard, other blocks deviant; 1250 hz in some blocks standard, other blocks deviant; guitar pluck, always a deviant target.
In unattended blocks, the participant watched a silent video (Mr. Bean). In attended blocks, the participant responded to the target tone. The unattended session was always completed first and on a different day than the attended.

Sensory Refraction



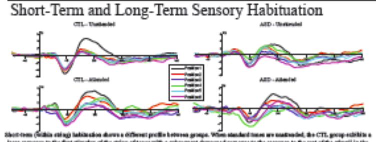
Reduced responses to repeated auditory sensory stimulation were similar in ASD and Control adults in both early and late ERP sensory responses in both attention conditions ($p > 0.05$).

Sensory Discrimination and Habituation

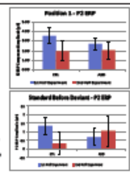


While ASD and Control groups were similar in their ERP response to the detection of a change within the string (MMN, mismatch negativity response), there was a trend for this response to be larger in the ASD group when the stimuli were attended than when unattended ($p < 0.075$).

Short-Term and Long-Term Sensory Habituation



Short-term (within string) habituation shows a different profile between groups. When standard tones are unattended, the CTL group exhibits a large response to the first stimulus of the string of tones with a subsequent dampened response to the response to the rest of the stimuli in the string. However, in ASD when standard tones are unattended, the response to subsequent tones is more graded, with an additional large response to standard stimuli in positions 4 and 5 where deviant stimuli often occur. Even when the stimuli are unattended, the ASD group remains sensitive to the context of changes in the environment.



The difference between groups in habituation to tones differs not only within string (short-term habituation), but over the course of the experiment. For unattended stimuli, there is a greater reduction in response to the first stimulus of the string for the CTL group when the 1st and 2nd halves of the experiment are compared, than for the ASD group. In ASD subjects, the ERP response to the standard unattended tone that occurs before a deviant was not reduced over time.

CONCLUSIONS

- We found significant reported sensory problems in adults with ASD. This persistence of reported sensory problems in adults suggests that while there is less focus on sensory problems in adults than in children with ASD, the problems may be no less severe.
- We found little evidence however that these problems have a true sensory base. Brain responses to increases in sensory stimulus intensity were typical in ASD as was the neural refractory period (typically reduced neural response to an immediately repeated stimulus).
- The ASD adults did show evidence of increased levels of arousal during continued auditory sensory stimulation, as well as reduced habituation of sensory response to unattended sensory stimulation over time.
- These findings suggest that in adults with ASD, sensory difficulties that are experienced in daily life may be a function of differences in the modulation of general arousal and the effects of attentional state rather than abnormalities in basic sensory response.
- We are currently investigating these effects in children to determine whether or not there is evidence of an abnormal basic sensory response in children with ASD. Such a finding would indicate that these effects change with behavioral intervention over the course of development.

References

Brown, et al. (2001, Jan-Feb). The adult sensory profile: measuring patterns of sensory processing. *Am J Occup Ther.*, 55(1), 75-82.
Jung, T.P., et al. (2000). Removing electroencephalographic artifacts by blind source separation. *Psychophysiology, 37*, 163-178.

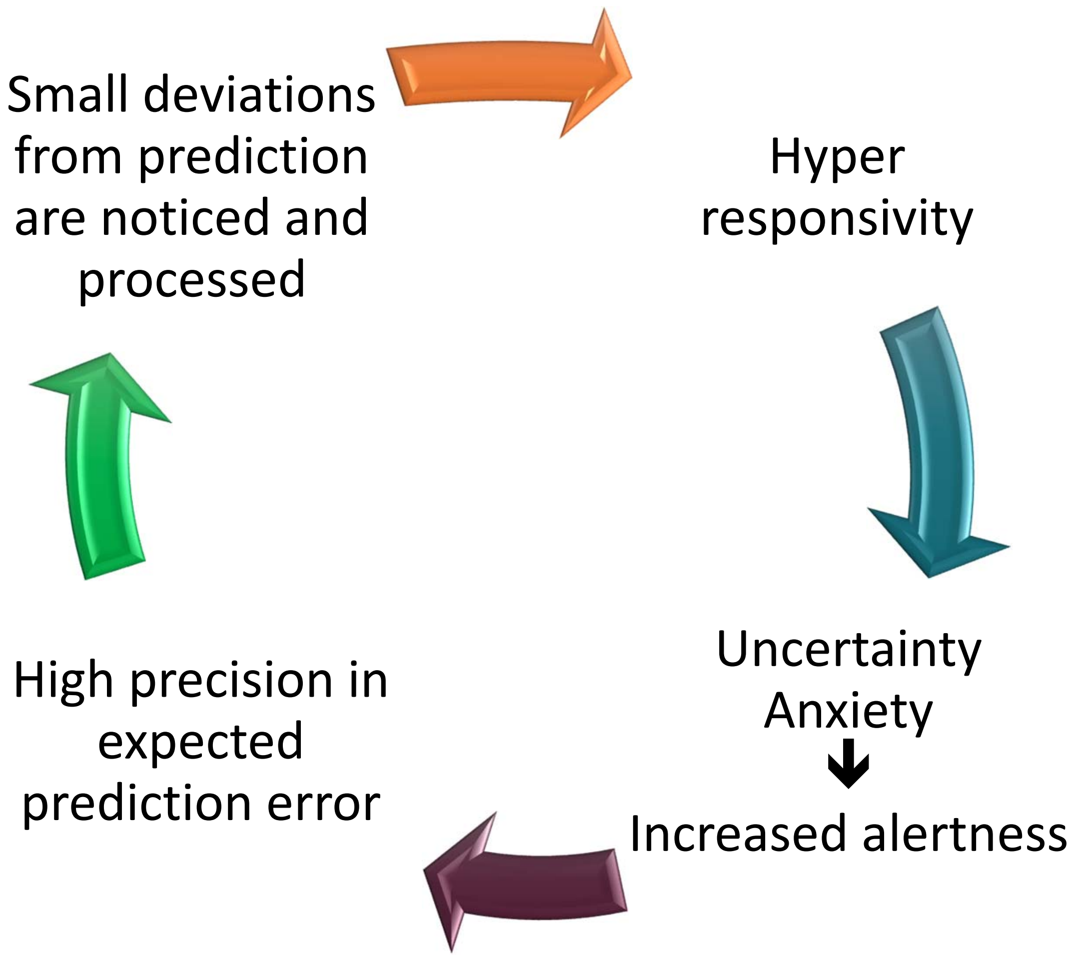
RESEARCH ARTICLE

Tactile Hypersensitivity and GABA Concentration in the Sensorimotor Cortex of Adults with Autism

Laurie-Anne Sapey-Triomphe, Franck Lamberton, Sandrine Sonié, Jérémie Mattout, and Christina Schmitz

Sensory hypersensitivity is frequently encountered in autism spectrum disorder (ASD). Gamma-aminobutyric acid (GABA) has been hypothesized to play a role in tactile hypersensitivity. The aim of the present study was twofold. First, as a study showed that children with ASD have decreased GABA concentrations in the sensorimotor cortex, we aimed at determining whether the GABA reduction remained in adults with ASD. For this purpose, we used magnetic resonance spectroscopy to measure GABA concentration in the sensorimotor cortex of neurotypical adults (n = 19) and ASD adults (n = 18). Second, we aimed at characterizing correlations between GABA concentration and tactile hypersensitivity in ASD. GABA concentration in the sensorimotor cortex of adults with ASD was lower than in neurotypical adults (decrease by 17%). Interestingly, GABA concentrations were positively correlated with self-reported tactile hypersensitivity in adults with ASD (r = 0.50, P = 0.01), but not in neurotypical adults. In addition, GABA concentrations were negatively correlated with the intra-individual variation during threshold measurement, both in neurotypical adults (r = –0.47, P = 0.04) and in adults with ASD (r = –0.59, P = 0.01). In other words, in both groups, the higher the GABA level, the more precise the tactile sensation. These results highlight the key role of GABA in tactile sensitivity, and suggest that atypical GABA modulation contributes to tactile hypersensitivity in ASD. We discuss the hypothesis that hypersensitivity in ASD could be due to suboptimal predictions about sensations. ***Autism Research*** *2019*.

Sensory or anxiety and uncertainty?



Uncertainty drives anxiety, sensory issues in autism

BY **ANN GRISWOLD** / 8 APRIL 2016

Sensory overload: *Children with autism may perceive uncertainty as a threat.*

©shutterstock.com/ Kuznetcov_Konstantin

Source: www.spectrum.org

J Autism Dev Disord (2016) 46:1962–1973
DOI 10.1007/s10803-016-2721-9

ORIGINAL PAPER

The Relationship Between Intolerance of Uncertainty, Sensory Sensitivities, and Anxiety in Autistic and Typically Developing Children

Louise Neil[1] · Nora Choque Olsson[2] · Elizabeth Pellicano[1,3]

Strategies for sensory issues: traditional way

Taking away stimulus → Reducing stimulus → Controlling stimulus → Stress coping

But from **Hyperacusis – Tinnitus** we learned:

- Do not eliminate sounds, but make sounds predictable and controllable :
- Working on **'feedforward'** (*prediction*) instead of 'feedback' (*stimulus*)

We need to 'feed' the brain in order to let it update it's models and reduce the prediction errors (prediction errors = stress / unpleasant)

Research in Developmental Disabilities 85 (2019) 197–204

Contents lists available at ScienceDirect

ELSEVIER

Research in Developmental Disabilities

journal homepage: www.elsevier.com/locate/redevdis

Implications of capacity in the classroom: Simplifying tasks for autistic children may not be the answer

Anna Remington[a,*], Mary Hanley[b], Susanna O'Brien[a], Deborah M. Riby[b], John Swettenham[c]

[a] Centre for Research in Autism and Education (CRAE), Department of Psychology and Human Development, UCL Institute o College London, United Kingdom
[b] Department of Psychology, Durham University, United Kingdom
[c] Department of Language and Cognition, University College London, United Kingdom

Also: avoid creating Learned helplessness

Behavioral Neuroscience
2013, Vol. 127, No. 4, 487–497

0735-7044/13/$12.00 DOI: 10.1037/a0033010

Environmental Enrichment as an Effective Treatment for Autism: A Randomized Controlled Trial

Cynthia C. Woo and Michael Leon
University of California Irvine

Strategies for sensory issues?

Tackle the prediction errors!

Changing prediction → Giving control → Changing stimulus → Stress coping

- Predictability in (changes) in sensory environment
- Contextual clarifying of stimuli:
  PUSH THE CONTEXT BUTTON
- Changing the brains model of the world

Pain 74 (1998) 327–331

PAIN

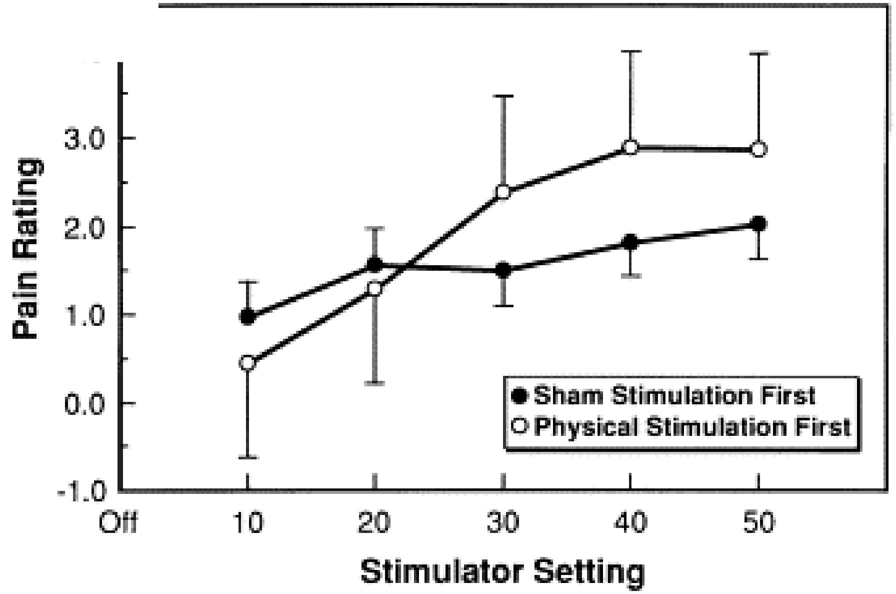
The role of prior pain experience and expectancy in psychologically and physically induced pain

Timothy L. Bayer[b], John H. Coverdale[a,b,*], Elizabeth Chiang[b], Mark Bangs[b]

[a]*Department of Psychiatry and Behavioural Science, School of Medicine, The University of Auckland, Private Bag 92109, Auckland, New Zealand*
[b]*Department of Psychiatry and Behavioral Science, Baylor College of Medicine, Houston, Texas, USA*

Received 2 April 1997; received in revised form 27 October 1997; accepted 29 October 1997

If you can induce pain through information, you can also remove/reduce pain through information



Lorimer Mosely: why things hurt Pain treatment 2.0

Correspondences

Visual distortion of a limb modulates the pain and swelling evoked by movement

G. Lorimer Moseley[1,2], Timothy J. Parsons[1] and Charles Spence[3]

The feeling that our body is ours, and is constantly there, is a fundamental aspect of self-awareness [1]. Although it is often taken for granted, our physical self-awareness, or body image, is disrupted in many clinical conditions [2] (see also [3] for a list of such conditions). One common

Strategies for sensory issues?

Tackle the prediction errors!

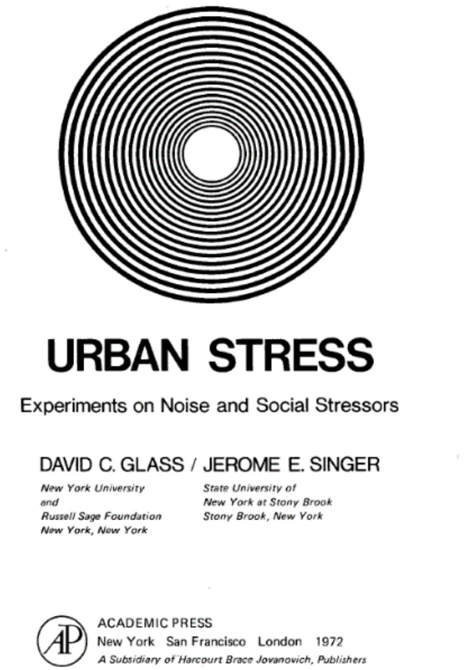
Changing prediction → Giving control → Changing stimulus → Stress coping

- Knowing how to ‘control’ the stimulus
- Generating a competitive stimulus (*again: predictability!*)

Noise is only stressful when unpredictable and uncontrollable

David Glass & Jerome Singer (1972):

Urban Stress: Experiments on Noise and Social Stressors



URBAN STRESS

Experiments on Noise and Social Stressors

DAVID C. GLASS / JEROME E. SINGER

New York University and Russell Sage Foundation New York, New York

State University of New York at Stony Brook Stony Brook, New York

ACADEMIC PRESS
New York San Francisco London 1972
A Subsidiary of Harcourt Brace Jovanovich, Publishers

The importance of control

Perception, 2015, volume 44, pages 569–586

doi:10.1068/p7833

The sensory experiences of adults with autism spectrum disorder: A qualitative analysis

Ashley E Robertson§, David R Simmons
School of Psychology, University of Glasgow, UK; e-mail: ashleyerobertson@icloud.com
Received 6 August 2014, in revised form 2 April 2015

Abstract. It has been well established that individuals with autism spectrum disorder report unusual experiences with sensory stimuli compared with typically developing individuals. However, there is a paucity of research exploring the nature of such experiences. A focus group was conducted with six adults with a diagnosis of autism or Asperger syndrome. Data were coded and analysed using an inductive, qualitative thematic analysis. Four main themes encompassing both positive and negative sensory experiences emerged from these data: (a) the importance of particular aspects of stimuli in their perception, (b) the importance of having control over stimuli, (c) how emotions/mental states could impact/be impacted by sensory stimuli, and (d) physical responses to stimuli. These data are discussed alongside extant literature. Limitations, possible implications, and potential directions of future research are also discussed.

Keywords: autism spectrum disorders, sensory, qualitative, focus group

[redacted]. I'm sensitive to sounds. Loud sounds. Sudden sounds. Worse yet, loud and sudden sounds I don't expect. Worst of all, loud and sudden sounds I *do* expect but cannot control — a common problem in people with autism. Balloons terrified me as a child, because I didn't know when they were going to pop.

Today I know that if I had been able to pop balloons myself, poking a small balloon with a pen and producing a soft sound, then working my way up to bigger and bigger balloons and louder and louder pops, I might have been able to tolerate balloons. I've heard a lot of people with autism say that if they can initiate the sound, they're more likely to be able to tolerate it. The same is true if they know the sound is coming; fireworks set off at random by kids down the block are shocking, but fireworks set off at the city park as part of a holiday program are acceptable.

Temple Grandin, The Autistic Brain, p. 69

Conclusion: tips

- Take the stress / discomfort around sensory environment seriously
- Address the cause of the distress: prediction errors, not the stimuli
- Address the prediction-errors: reduce uncertainty, not stimuli
  - Make the sensory environment more predictable for the brain (predictability on neuron level is not the same as conscious ‘expectations’!)
  - Clarify the sensory environment to reduce prediction-errors on neuron level
  - Give information about sensory environment
- Empowering approach: not avoiding, but coping
  - Not: one size fits all
  - Give autistic people (feeling of) control over their sensory environment
  - Teach autistic people how to survive sensory stress (coping strategies)