Autism and the predictive mind
Context blindness 2.0

PETER VERMEULEN, PhD

AUTISM in CONTEXT

from neurodiversity to neuroharmony

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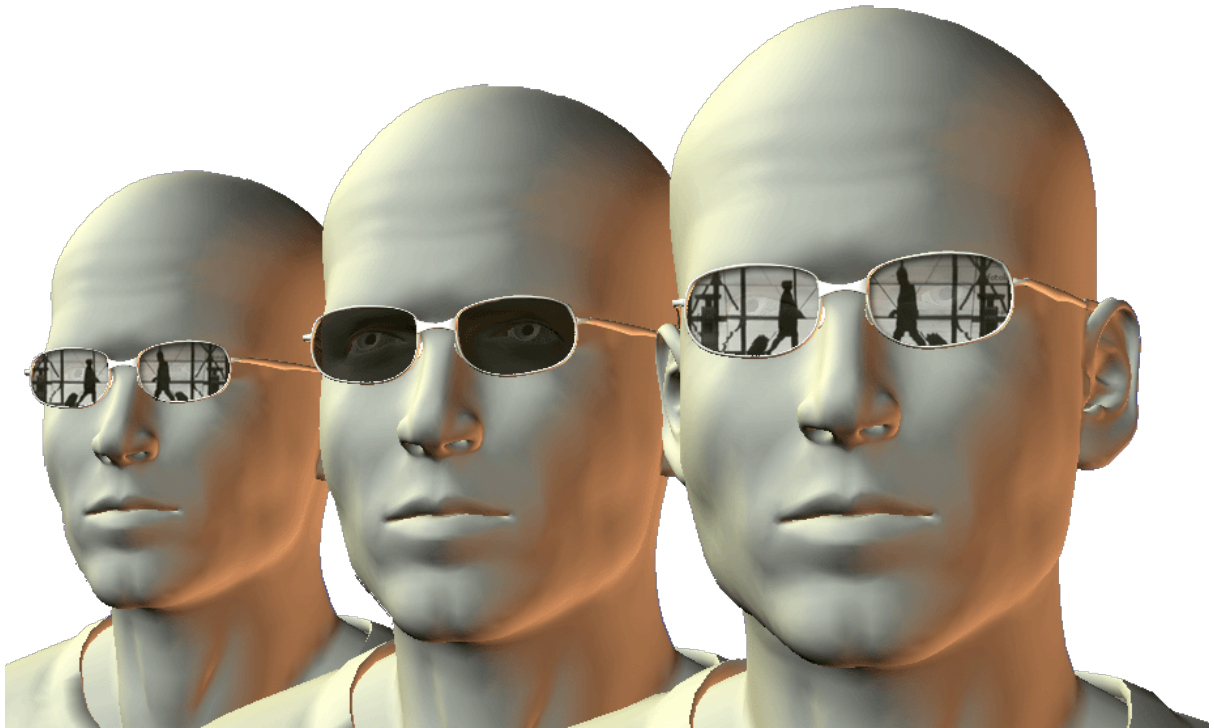
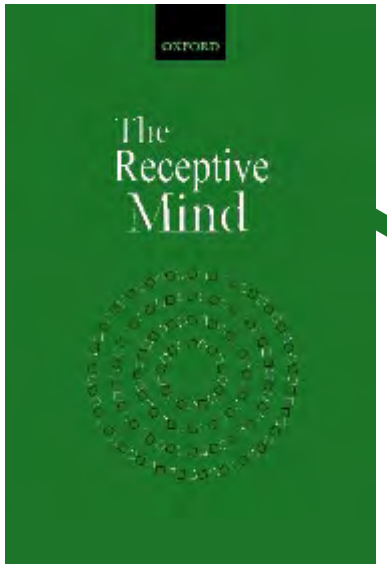
peter_autisme



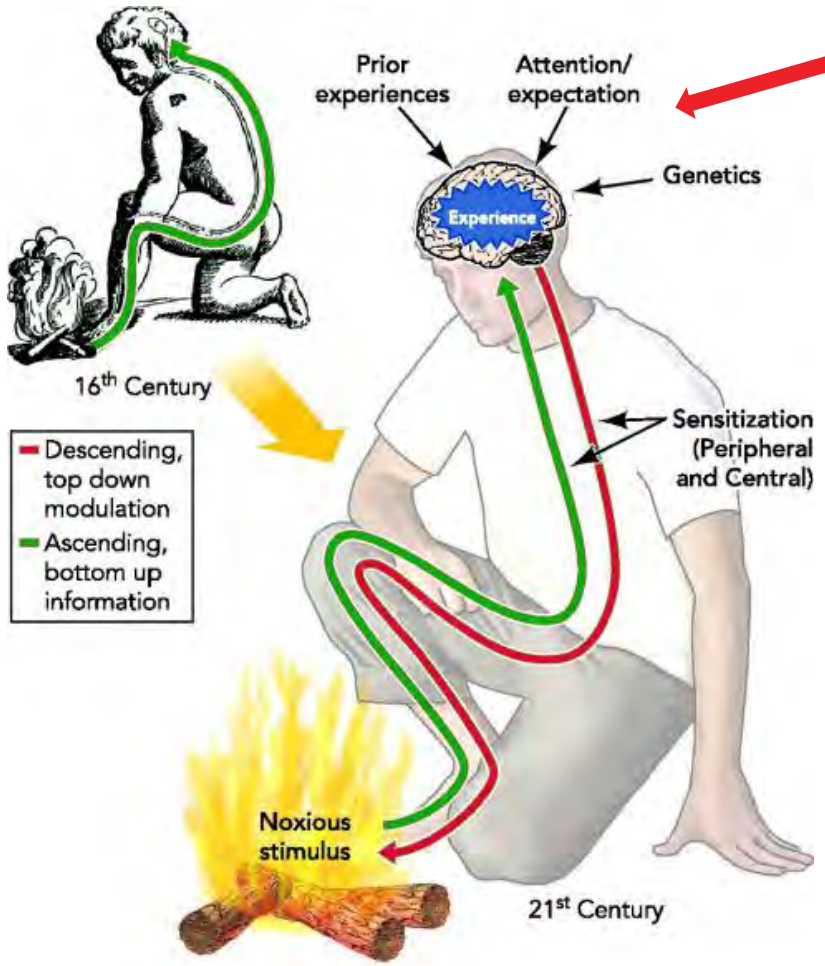
Autism friendliness

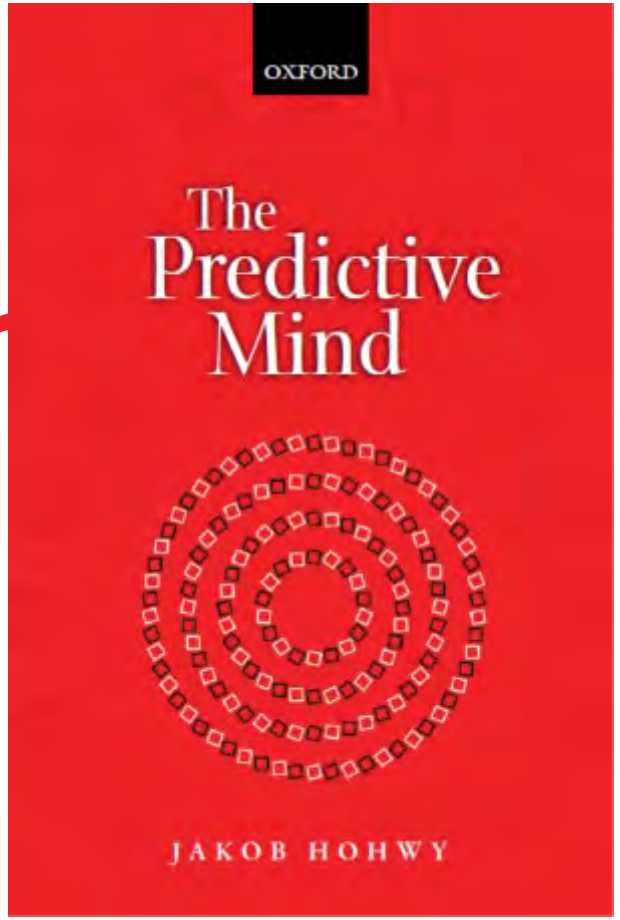
- An autism friendly approach starts from an understanding of autism from within!

- Knowledge of “autistic thinking” is the key to success in education and treatment!

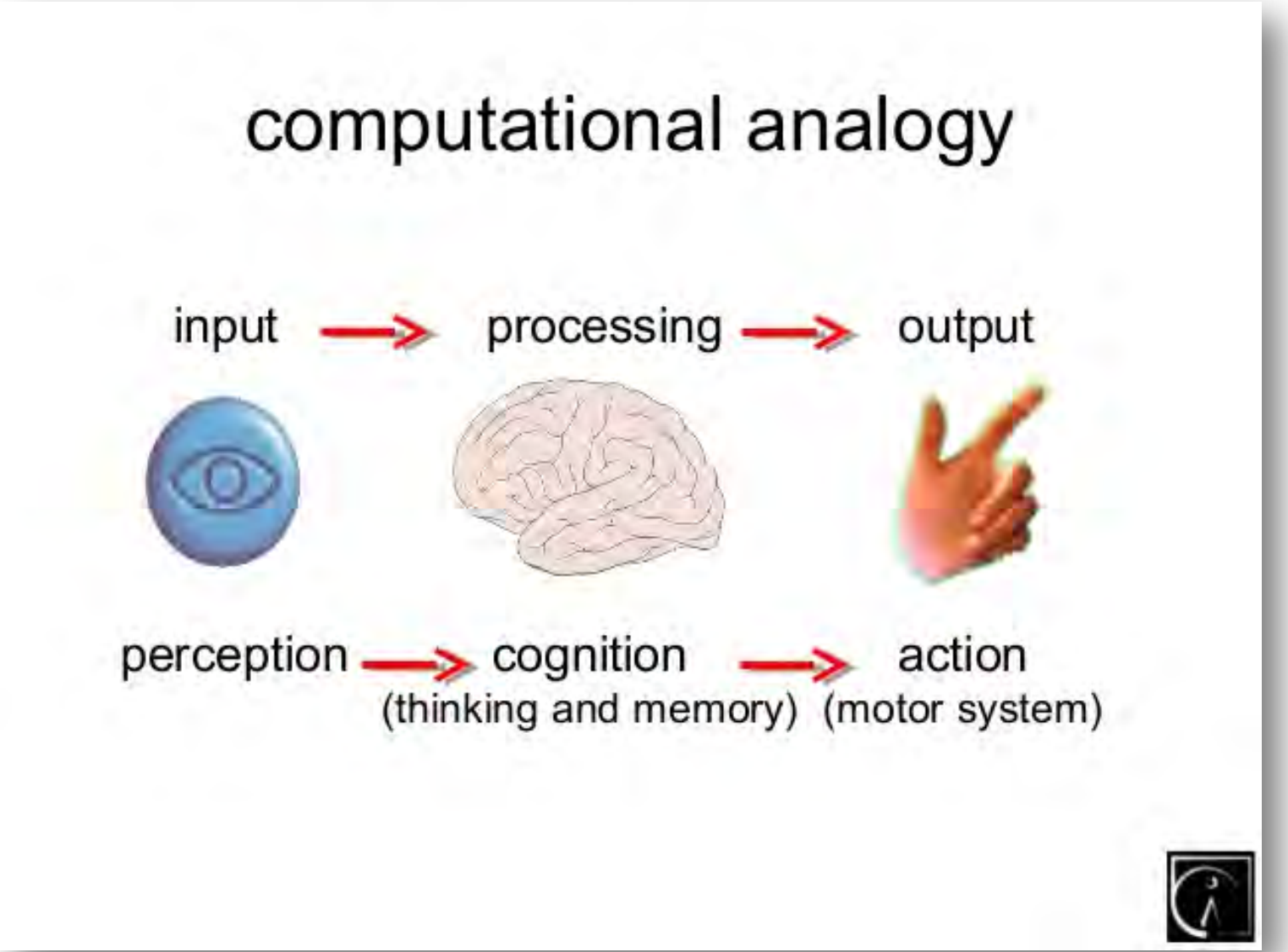


Copernican revolution in brain science





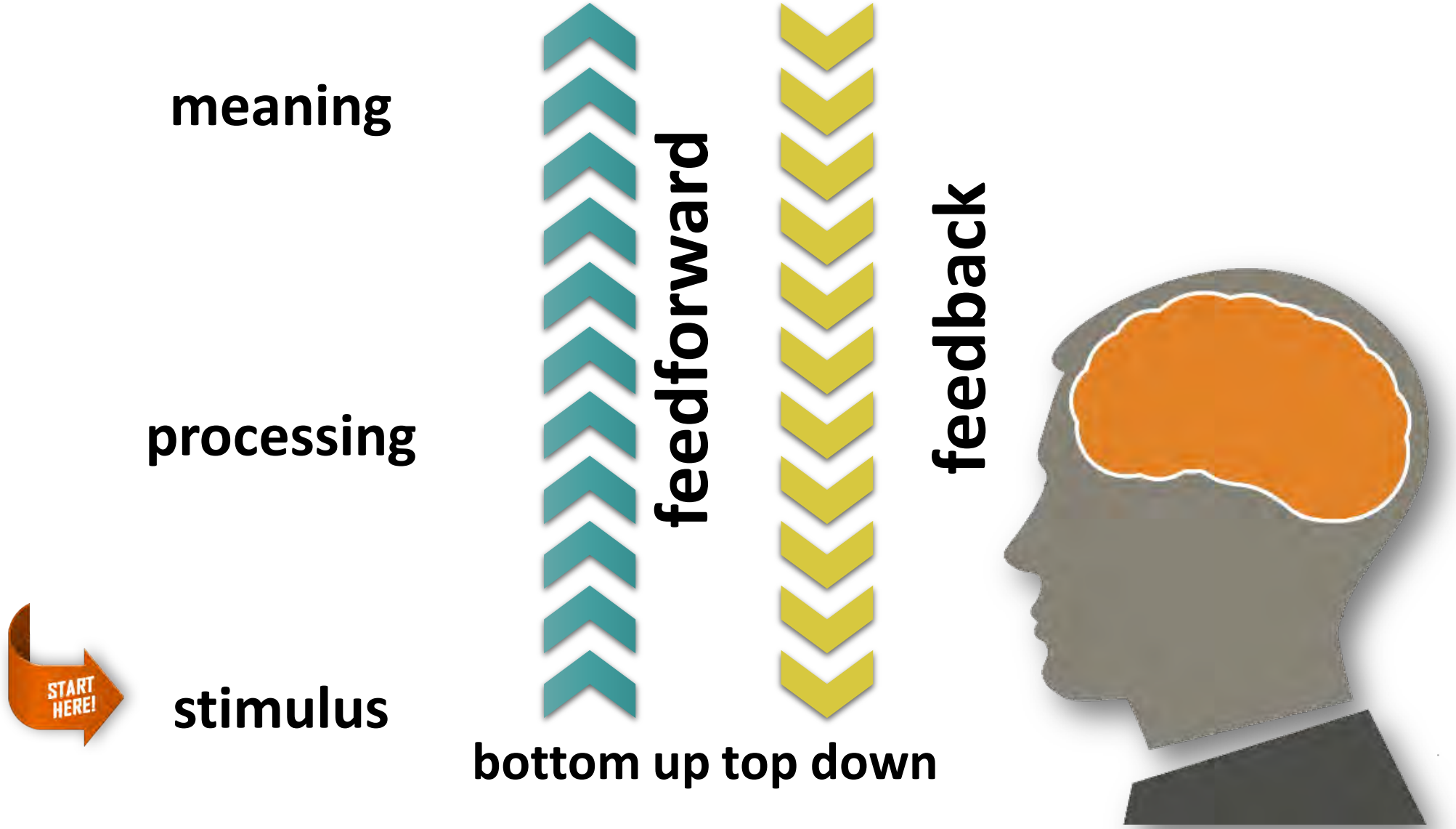
Default idea about the brain



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)
  - Processing all the sensory input (computing) is not very helpful for survival! (Smilodon story)
- So, the brain does not compute, It guesses,
- And it can make smart guesses because it uses context,
- This is known as: **the predictive mind**

So, it does NOT work like this



But it works like this

prediction

Checking prediction (prediction error)

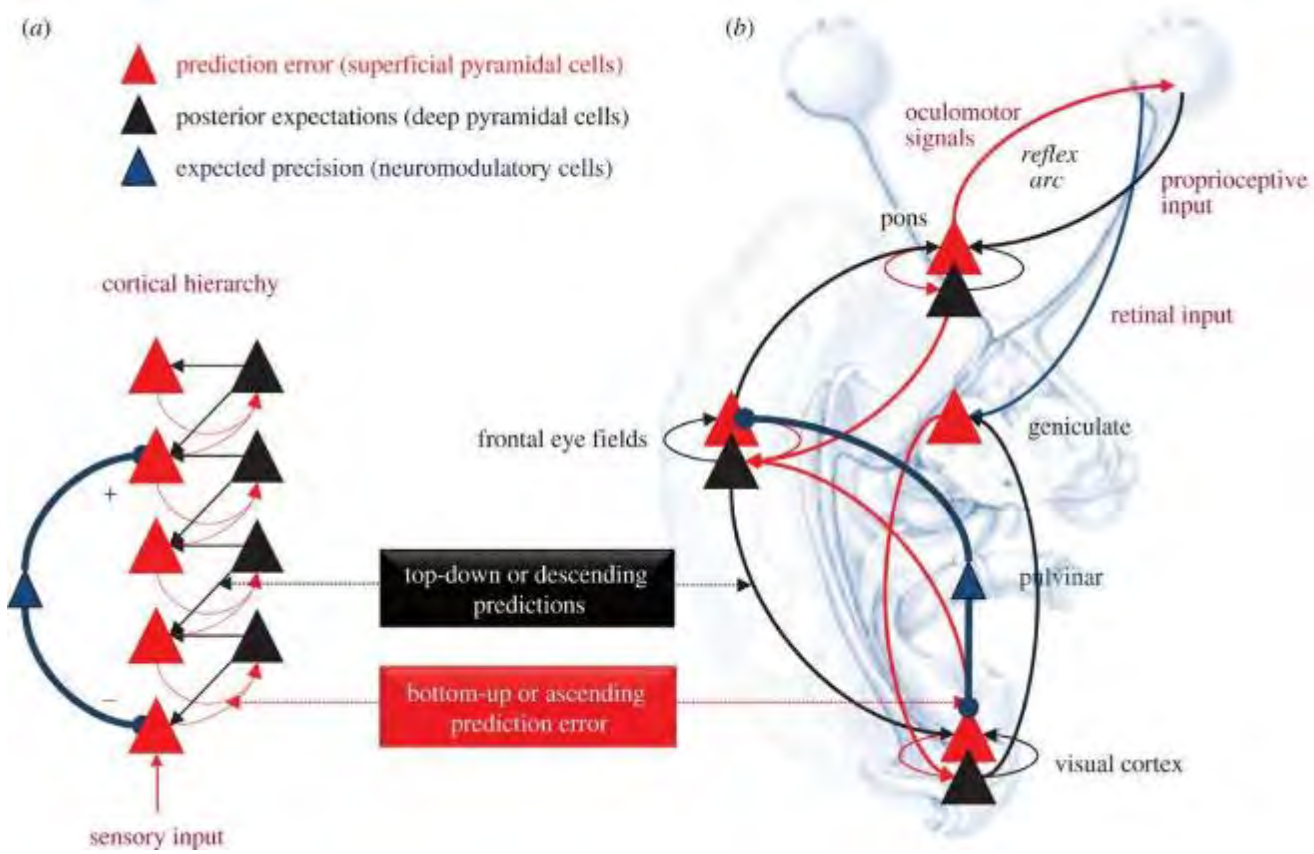
stimulus

feedback

feedforward

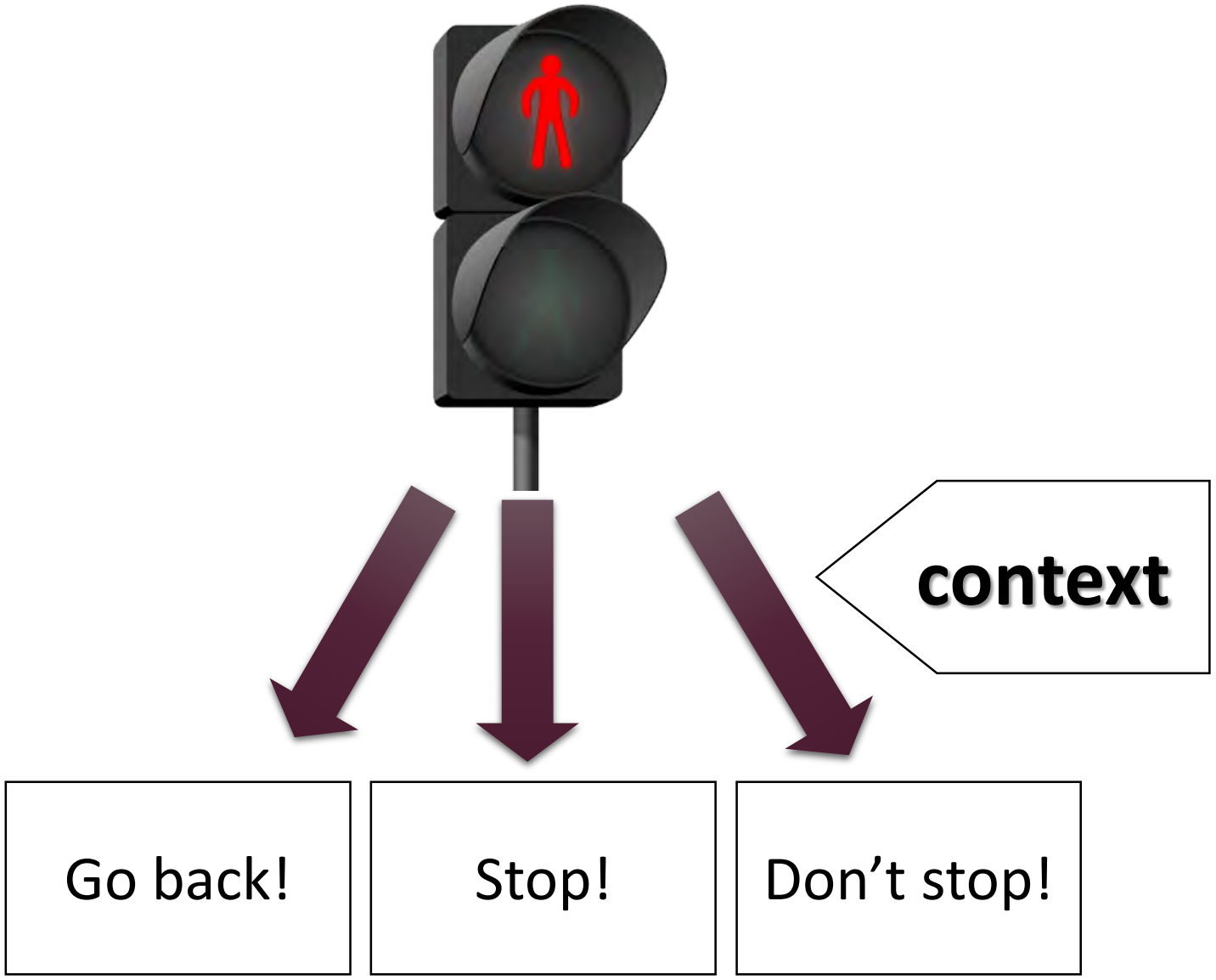
bottom up top down

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



From *The Lancet*

Living in a relative (VUCA) world



Nothing has an absolute meaning! Everything depends on context.

Therefore, our brain became an expert in **using context for making quick and smart guesses**.

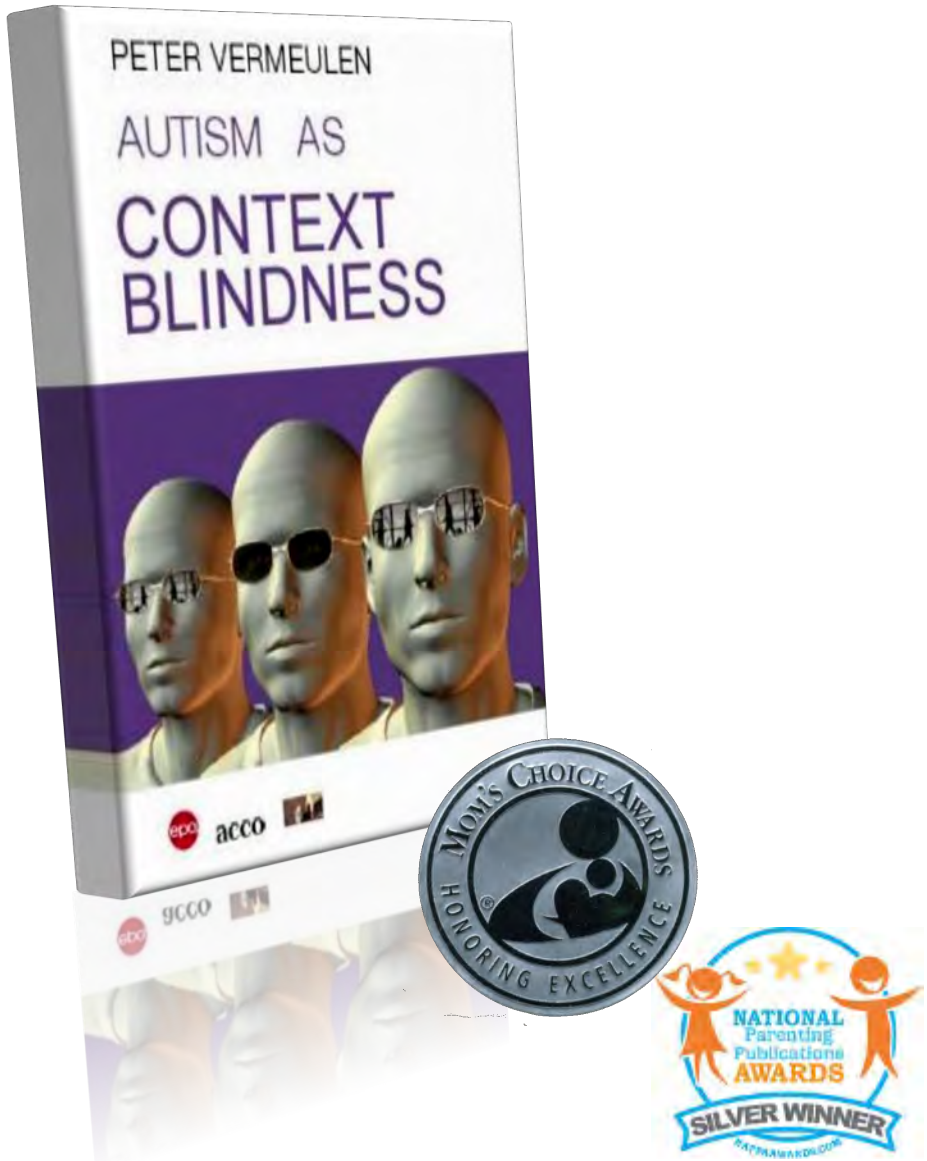
Autism and the predictive mind: hypotheses

- Not enough, too broad predictions (hypo-priors) (Pellicano & Burr, 2012)
- Too specific predictions (Hohwy, 2015; Brock, 2012; Qian & Lipkin, 2011)
- HIPPEA: High, Inflexible Precision of Prediction Errors in Autism (Van de Cruys e.a., 2013, 2014)
- An imbalance of the precision ascribed to sensory evidence relative to prior beliefs. (Friston e.a., 2013; Lawson, Rees & Friston, 2014)

Autism and the predictive mind: context!

- In ASD, the dysfunction of prediction based on context may impair the ability to adapt quickly to an ever changing socio-emotional world. (Gomot & Wicker, 2012, p. 245)
- In particular, we think autism is associated with an inability to flexibly adjust the degree of precision in a different context. (Van de Cruys e.a., 2013, p.97-98)
- Autism may be related to problems with making predictions sensitive to the wider context."
  (Palmer e.a., 2015)
- Comparably, reduced *global processing* in autism may reflect a reduced role for top-down predictions in *integrating* sensory features into a more broadly coherent or context-sensitive percept." (Palmer e.a., 2017)

Autism as context blindness



Context blindness:

Reduced ability to use the context **spontaneously** when giving meaning to (especially vague, ambiguous and abstract) stimuli.

Autism as context blindness 2.0

Context blindness 2.0:

Reduced ability to use the context unconsciously and **spontaneously** to generate **predictions** about the world and process **prediction errors**.

Autism as a prediction disorder

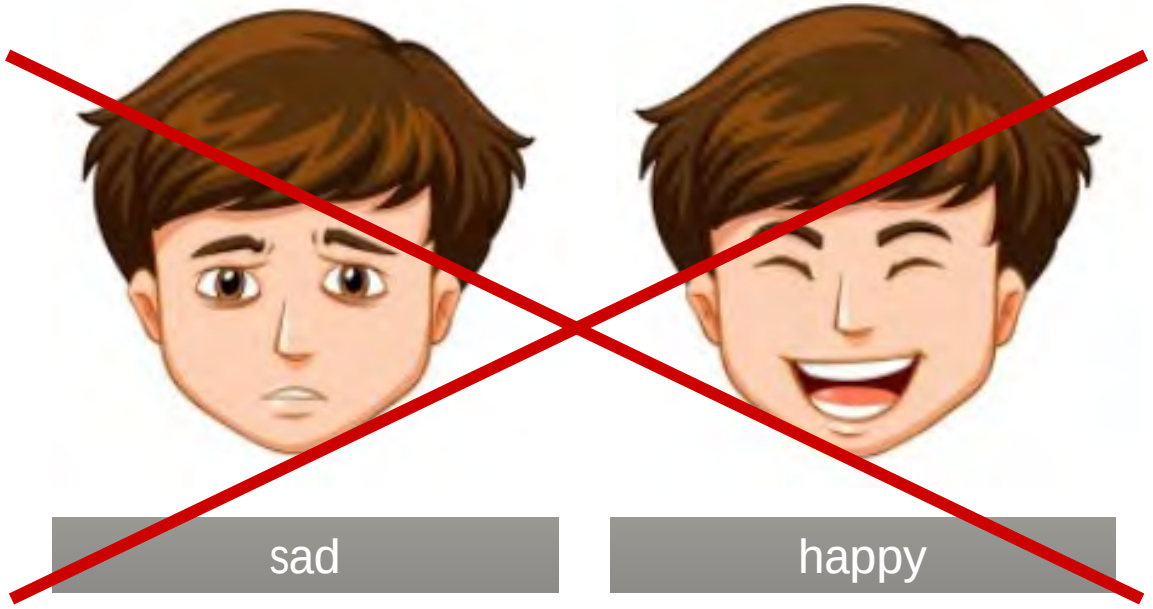
This new idea could change our ideas about many things in autism such as:

- Sensory issues and what to do about them
- Communication
- Emotion recognition and how to teach socio-emotional skills

Context and emotion recognition

Relation facial expression –emotion is not fixed

We never see facial expressions out of context



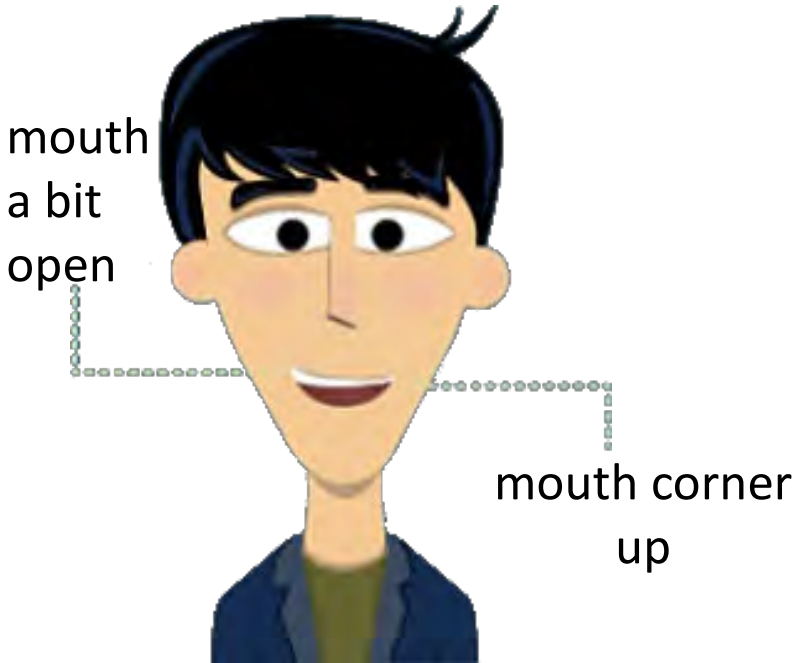
Recognizing emotions

prediction error

prediction

CONTEXT

He's pleased!



Again: context…

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20(5) 286–290

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http://cdps.sagepub.com
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Context in Emotion Perception

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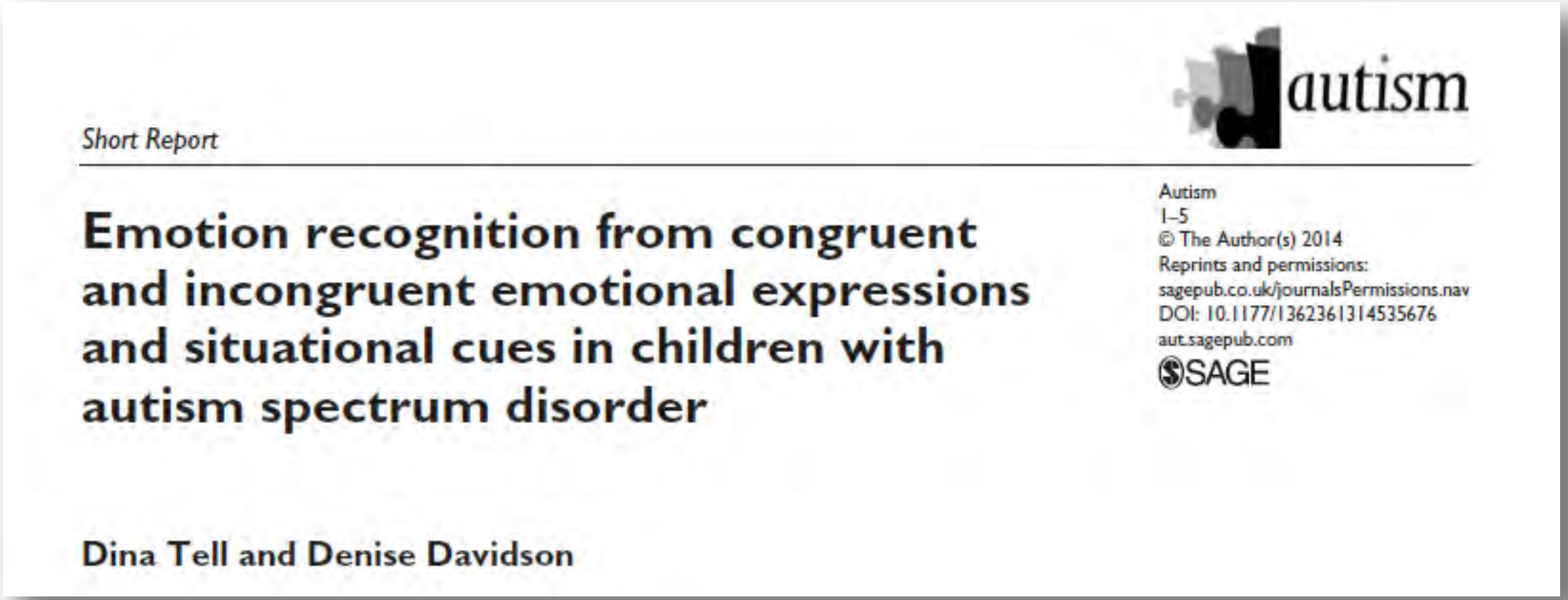
Abstract

We review recent work demonstrating consistent context effects during emotion perception. Visual scenes, voices, bodies, other faces, cultural orientation, and even words shape how emotion is perceived in a face, calling into question the still-common assumption that the emotional state of a person is written on and can be read from the face like words on a page. Incorporating context during emotion perception appears to be routine, efficient, and, to some degree, automatic. This evidence challenges the standard view of emotion perception represented in psychology texts, in the cognitive neuroscience literature, and in the popular media and points to a necessary change in the basic paradigm used in the scientific study of emotion perception.

Context more important than the face!

But people with autism rely on the face, not the context!



autism

Short Report

Emotion recognition from congruent and incongruent emotional expressions and situational cues in children with autism spectrum disorder

Dina Tell and Denise Davidson

Autism
1–5

DOI: 10.1177/1362361314535676
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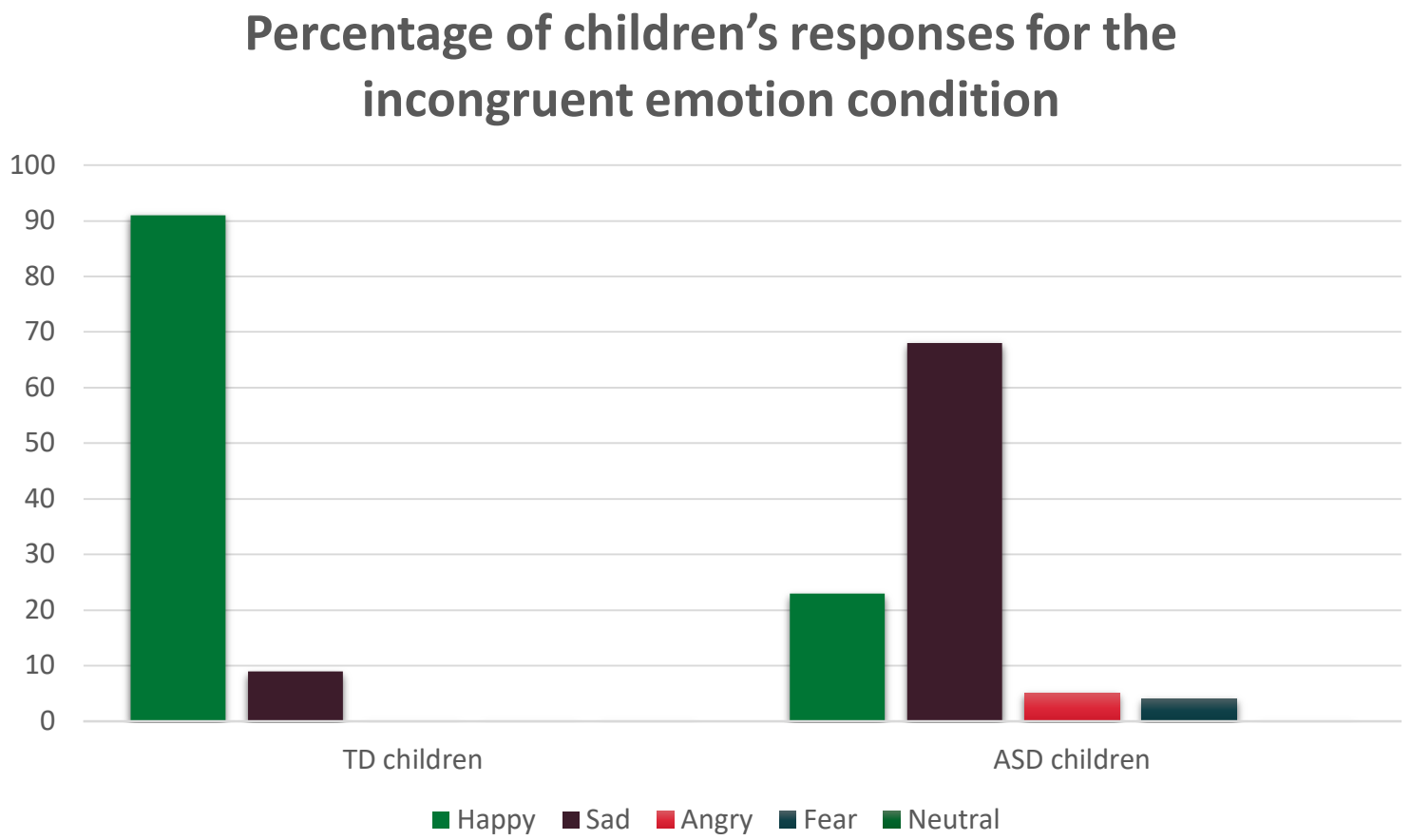
Context more important than the face!

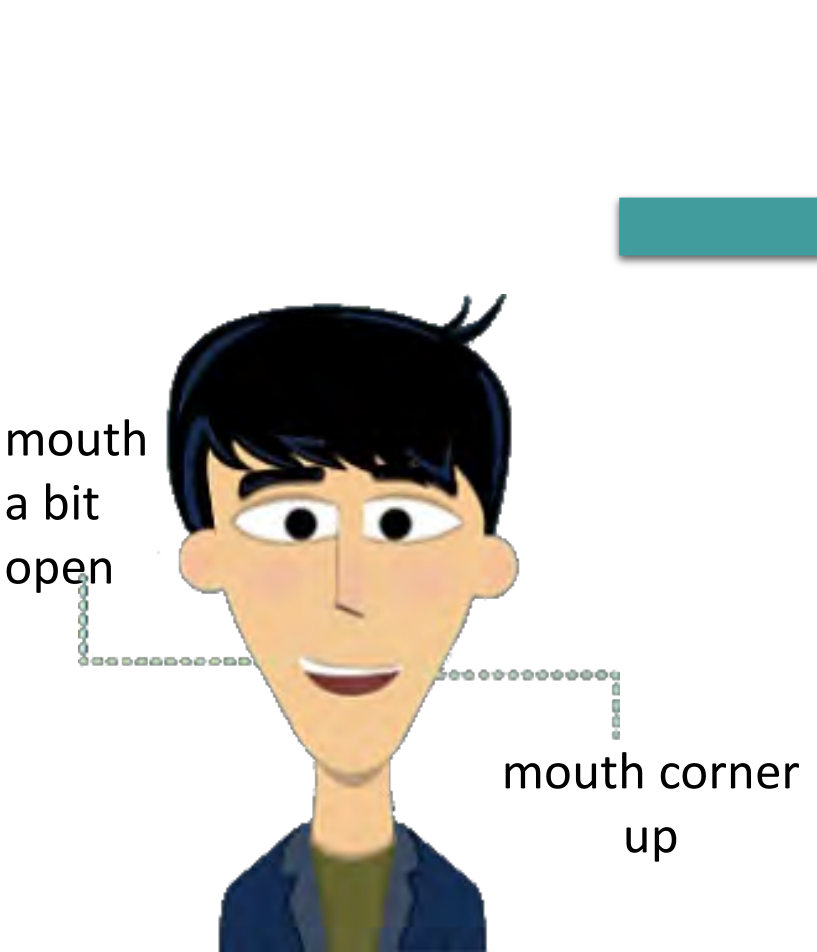
But people with autism rely on the face, not the context!



Tell & Davidson (2014)

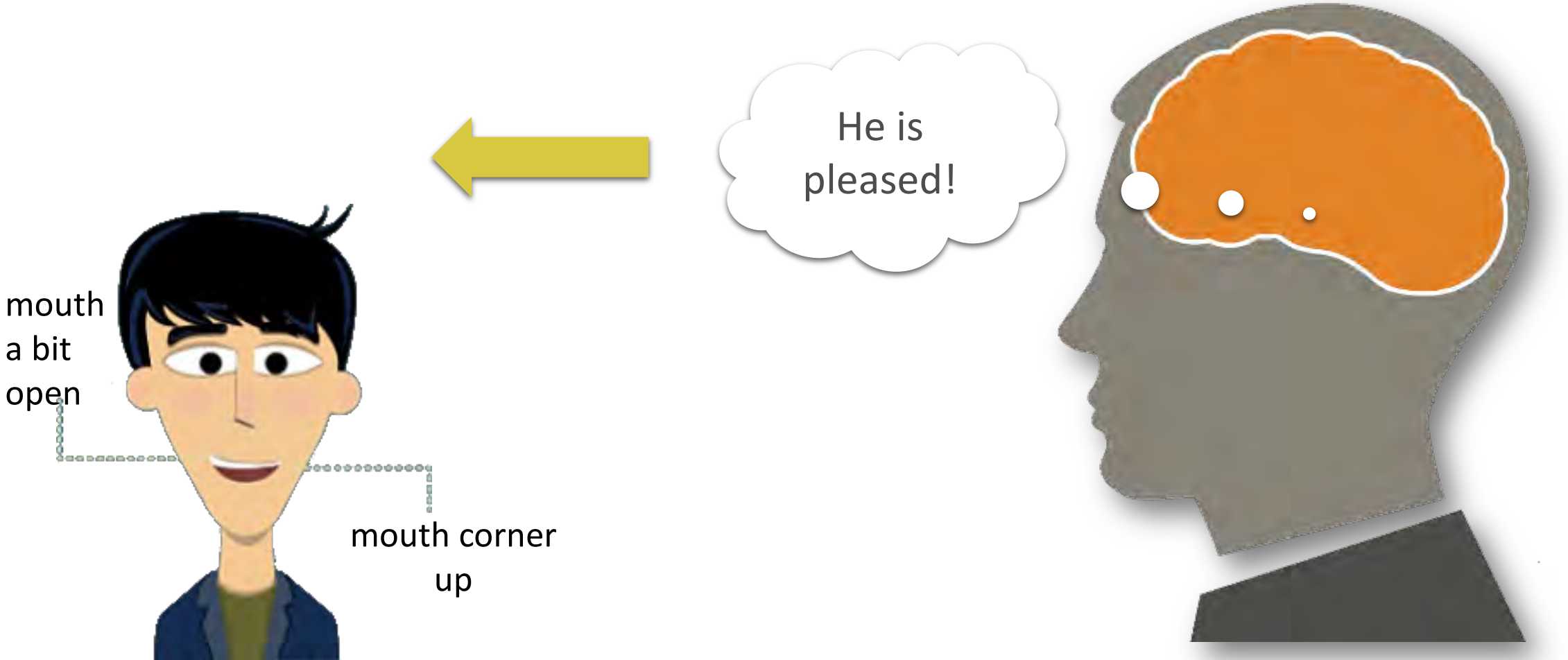
So, we thought emotion recognition went like this:

Reading emotions FROM faces



But it actually goes like this:

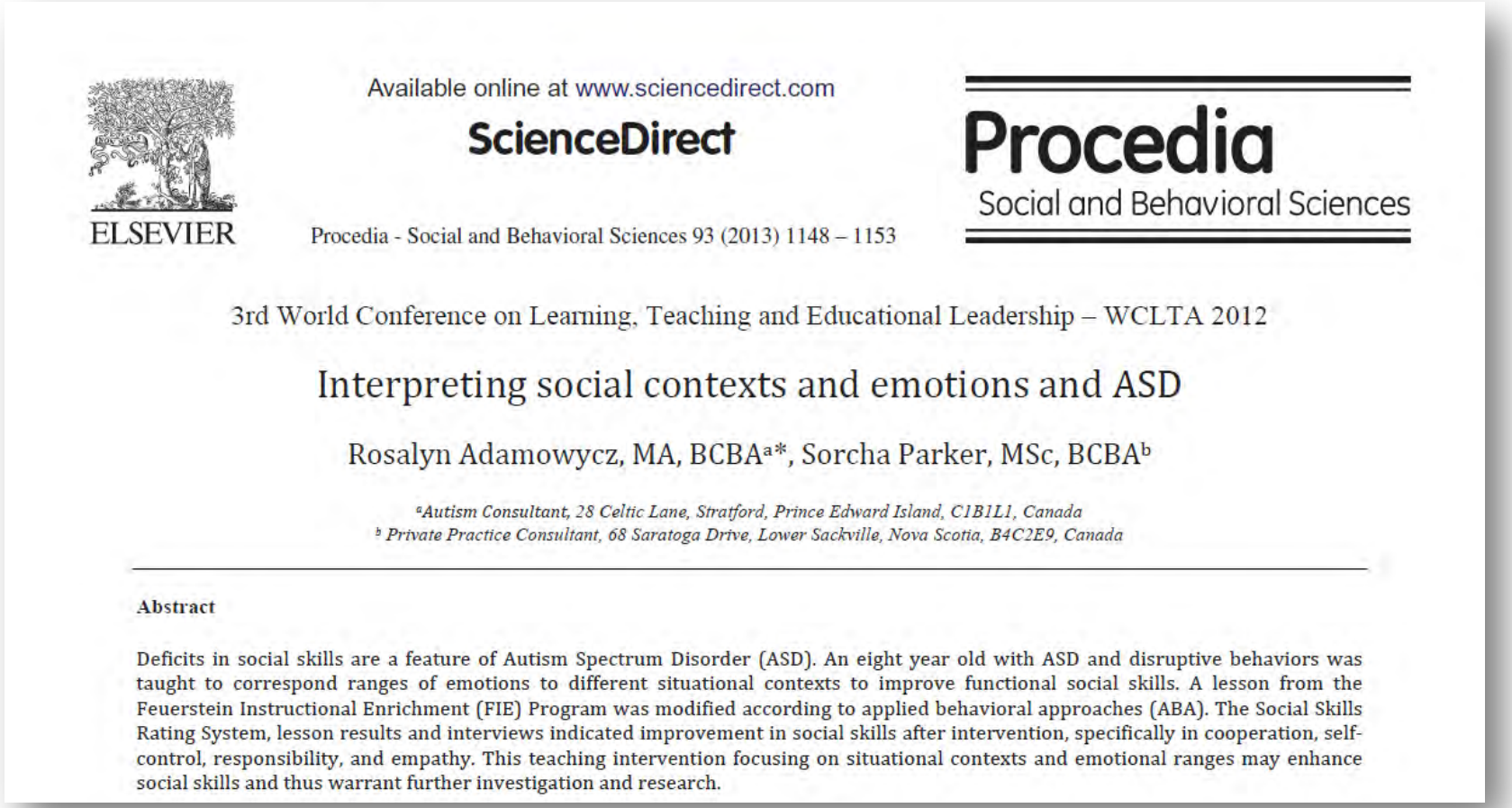
Reading emotions INTO faces



So we should teach people with autism to PREDICT emotions, using context, not faces

Link emotions to context

Start from contexts!



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Procedia - Social and Behavioral Sciences 93 (2013) 1148 – 1153

Procedia
Social and Behavioral Sciences

3rd World Conference on Learning, Teaching and Educational Leadership – WCLTA 2012

Interpreting social contexts and emotions and ASD

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[b] *Private Practice Consultant, 68 Saratoga Drive, Lower Sackville, Nova Scotia, B4C2E9, Canada*

Abstract

Deficits in social skills are a feature of Autism Spectrum Disorder (ASD). An eight year old with ASD and disruptive behaviors was taught to correspond ranges of emotions to different situational contexts to improve functional social skills. A lesson from the Feuerstein Instructional Enrichment (FIE) Program was modified according to applied behavioral approaches (ABA). The Social Skills Rating System, lesson results and interviews indicated improvement in social skills after intervention, specifically in cooperation, self-control, responsibility, and empathy. This teaching intervention focusing on situational contexts and emotional ranges may enhance social skills and thus warrant further investigation and research.

Predictive mind, context and social interaction

Action perception is not simply a reflection of what happens, but a projection of what will happen next.

(von der Lühe e.a., 2016)

Predictive coding explains social deficit in ASD

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Research

Cite this article: von der Lühe T, Manera V, Barisic I, Becchio C, Vogeley K, Schilbach L. 2016 Interpersonal predictive coding, not action perception, is impaired in autism. *Phil. Trans. R. Soc. B* **371**: 20150373. http://dx.doi.org/10.1098/rstb.2015.0373

Interpersonal predictive coding, not action perception, is impaired in autism

T. von der Lühe[1,†], V. Manera[2,†], I. Barisic[3], C. Becchio[4,5], K. Vogeley[1,6] and L. Schilbach[1,7]

[1]Department of Psychiatry, University Hospital Cologne, 50937 Cologne, Germany
[2]CoBtek Laboratory, University of Nice Sophia Antipolis, 06103 Nice, France
[3]Cognitive Science Department, ETH Zürich, 8092 Zürich, Switzerland
[4]C'MON Cognition Motion and Neuroscience Unit, Fondazione Istituto Italiano di Tecnologia, Genova, Italy
[5]Department of Psychology, University of Turin, Turin, Italy
[6]Research Centre Juelich, Institute of Neuroscience and Medicine (INM-1), 52428 Juelich, Germany
[7]Max Planck Institute of Psychiatry, 80804 Munich, Germany

LS, 0000-0001-5547-8309

This study was conducted to examine interpersonal predictive coding in individuals with high-functioning autism (HFA). Healthy and HFA partici-

Despite intact Theory of Mind difficulties predicting what other people will do

Cognition 160 (2017) 17–26

Contents lists available at ScienceDirect

Cognition

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

Original Articles

Reduced sensitivity to social priors during action prediction in adults with autism spectrum disorders

Valerian Chambon [a,b,*], Chlöé Farrer [c], Elisabeth Pacherie [a], Pierre O. Jacquet [d], Marion Leboyer [e], Tiziana Zalla [a,*]

Context and social cognition

Social cognition in ASD only impaired when context is involved
(Baez, Ibanez et al., 2012; 2014)

frontiers in
NEUROSCIENCE

FOCUSED REVIEW
published: 03 September 2014
doi: 10.3389/fnins.2014.00270

The effects of context processing on social cognition impairments in adults with Asperger's syndrome

Sandra Baez*[1,2,3] *and Agustin Ibanez*[1,2,3,4,5]

[1] *Institute of Cognitive Neurology (INECO) and Institute of Neuroscience, Favaloro University, Buenos Aires, Argentina*
[2] *UDP-INECO Foundation Core on Neuroscience (UIFCoN), Diego Portales University, Santiago, Chile*
[3] *National Scientific and Technical Research Council (CONICET), Buenos Aires, Argentina*
[4] *Universidad Autónoma del Caribe, Barranquilla, Colombia*
[5] *Australian Research Council, Centre of Excellence in Cognition and its Disorders Sydney, NSW, Australia*

Context and social cognition

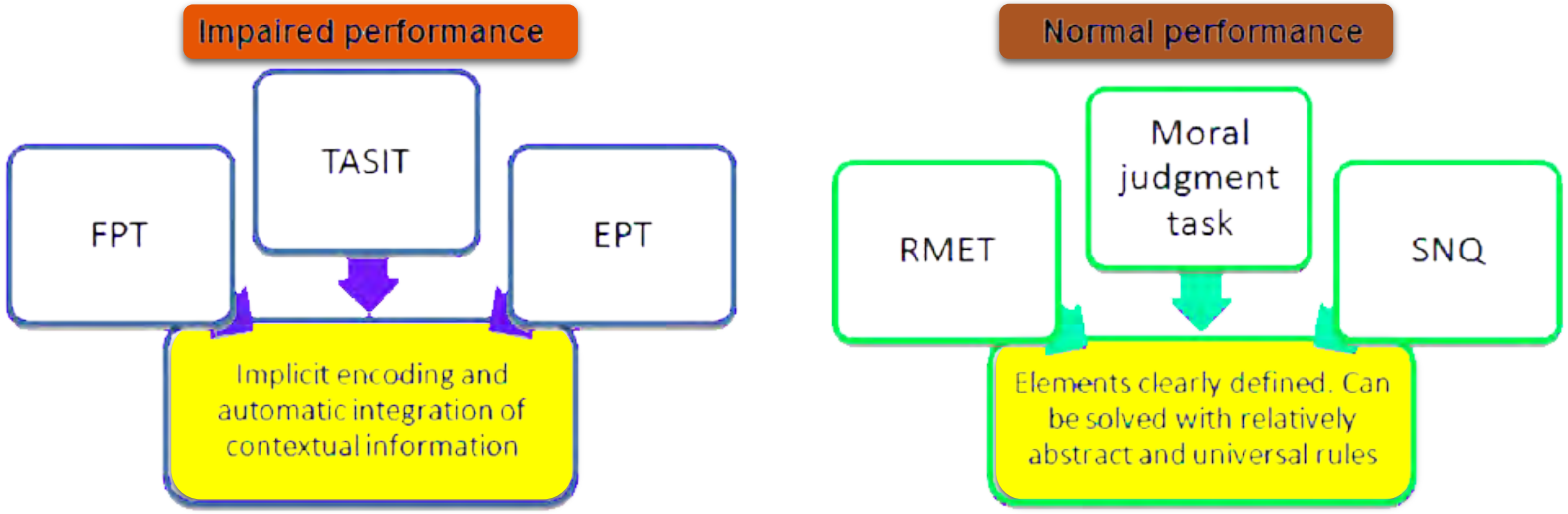
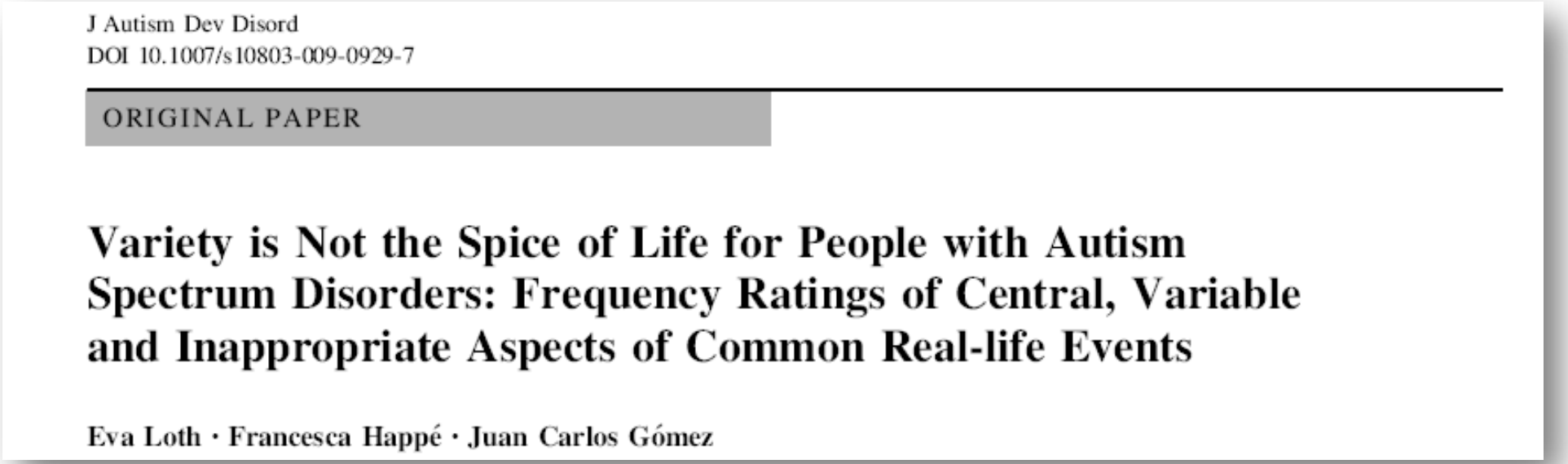


FIGURE 2 | Pattern of performance of adults with AS in social cognition tasks. Adults with AS were impaired in tasks that involved implicit encoding and automatic integration of contextual cues to interpret a given social situation. Conversely, they performed as well as controls in tasks which featured well defined-situational elements and could be solved by using relatively abstract, universal rules. FPT, Faux Pas Test; TASIT, The Awareness of Social Inference Test; EPT, Empathy for Pain Task; RMET, Reading the Mind in the Eyes Test; SNQ, Social Norms Questionnaire.

Source: Baez & Ibanez (2014)

Loth a.o. (2010)



J Autism Dev Disord
DOI 10.1007/s10803-009-0929-7

ORIGINAL PAPER

Variety is Not the Spice of Life for People with Autism Spectrum Disorders: Frequency Ratings of Central, Variable and Inappropriate Aspects of Common Real-life Events

Eva Loth · Francesca Happé · Juan Carlos Gómez

Contextual variations are often seen as central or as fixed rules, even in those who pass high level ToM tests

e.g. having a dessert when going to a restaurant

Context and social competence

- The biggest problem in ASD is not social skills (knowing ***what*** and ***how*** to do)

- The biggest problem in ASD is knowing ***where*** and ***when*** to do it and where and when **not**

Social competence requires contextual sensitivity

Contextualized teaching

- Do not use decontextualized materials
- Do not teach ‘skills’ but start from contexts
- Link behaviours always to contexts

Starting a conversation

Teaching: traditional approach: generic skills

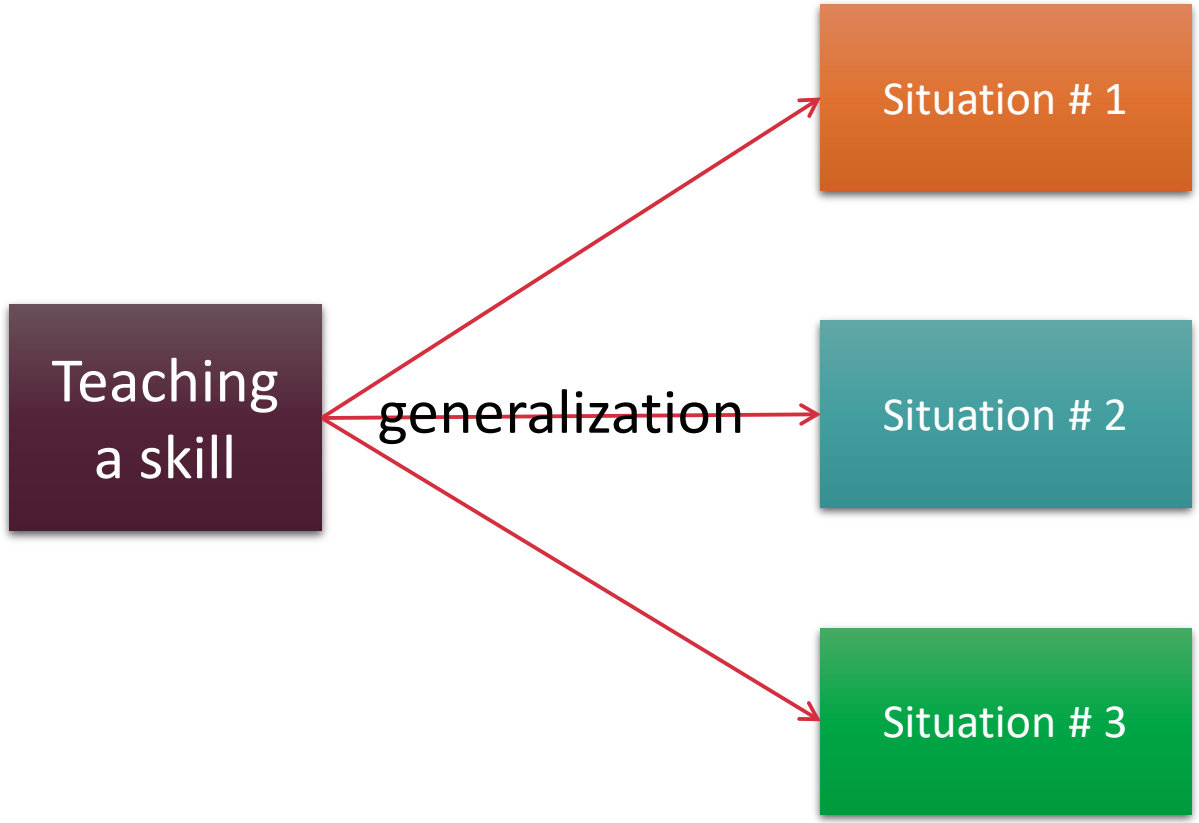
Starting a conversation

Step 1: Think of what you'd like to say

Step 2: Make sure you have the other person's attention. Look at the person.

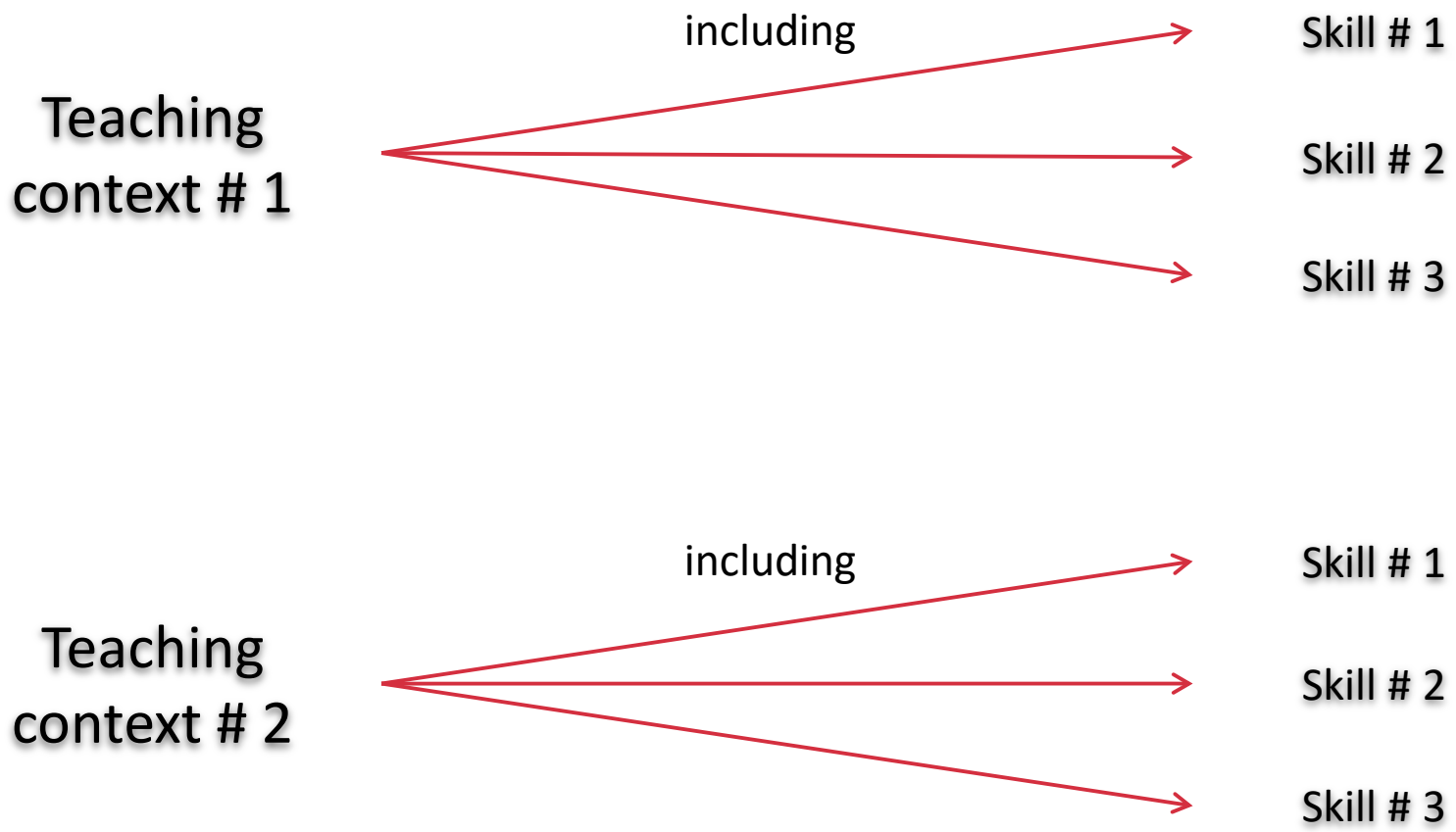
Step 3: Ask a question or make a comment.

Step 4: Listen carefully while the other person responds.



Contextualized teaching

Does not start from skills but from contexts



Contextualized teaching

Teaching and clarifying context:

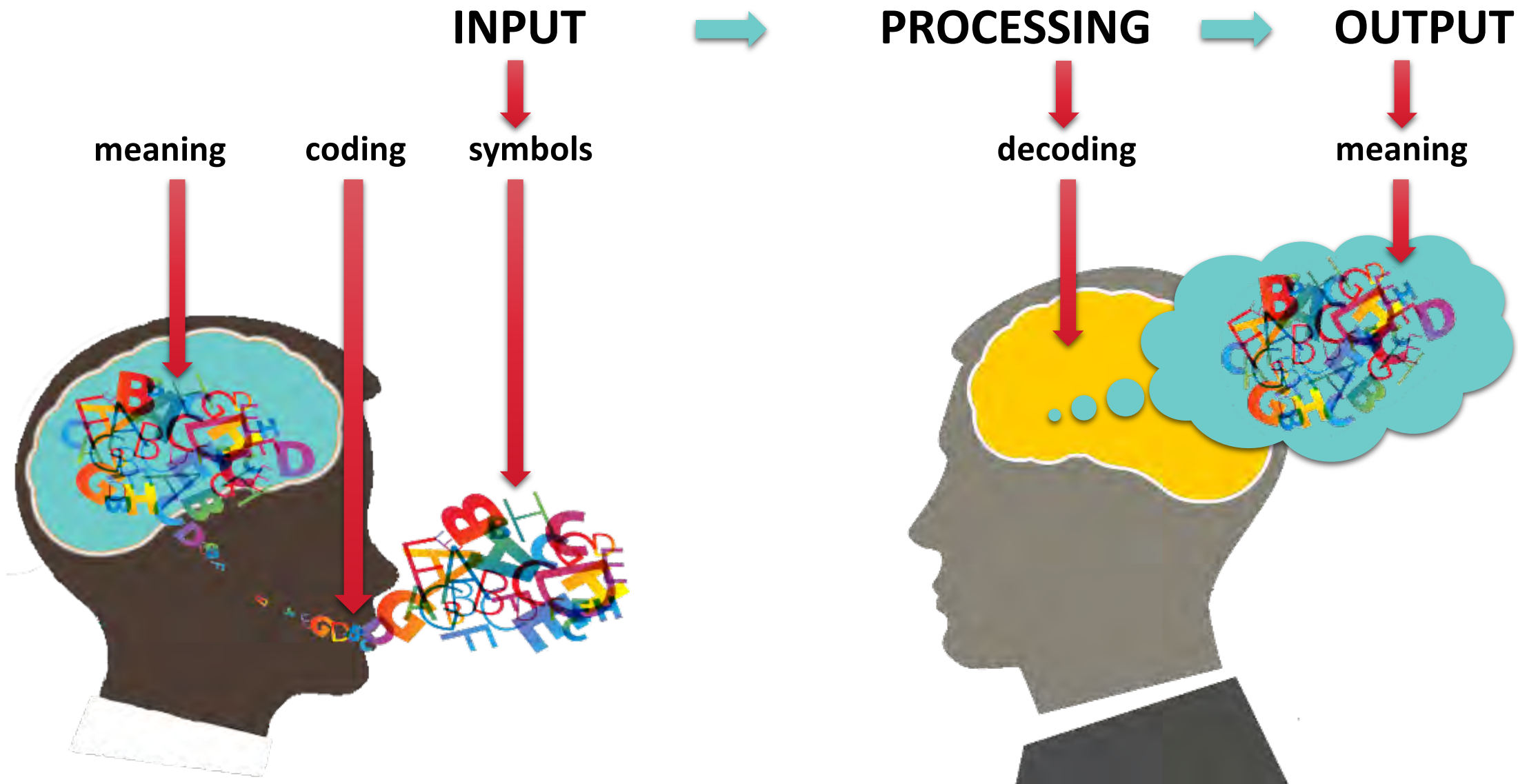
- ✓ What can happen in that context?
- ✓ What can you do in that context?
- ✓ What can you say in that context?

Contextualized scripts

Welcoming someone at your home:

- *<u>When the person wears a coat</u>,*
  you ask "May I take your coat?".
- *<u>If the person says "no",</u>*
  invite him/her to come further in.
- *<u>If the person says "yes",</u>*
  wait until he/she gives you the coat and hang it on the coat rack.
  <u>If you don't have a coat rack ,</u>
  hang the coat carefully over a chair.

Understanding language and communication: old model



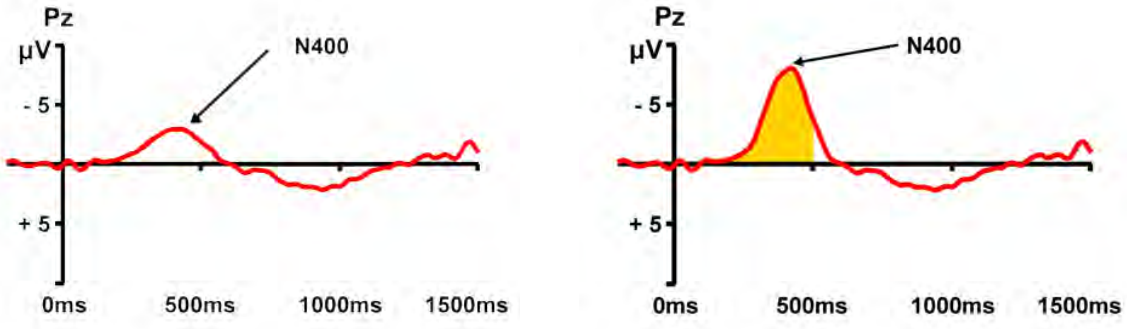
Understanding language and communication: new model

stimulus ⇄ **prediction error** ⇄ **prediction**

Context and predicting language and communication

The brain makes quick guesses about what someone is going to say or show, based on context

- N400
- **Lexical priming**



Jan eet friet met mayonaise

Jan eet friet met schoen.

- N400 lower in people with autism (Pijnacker e.a., 2010)

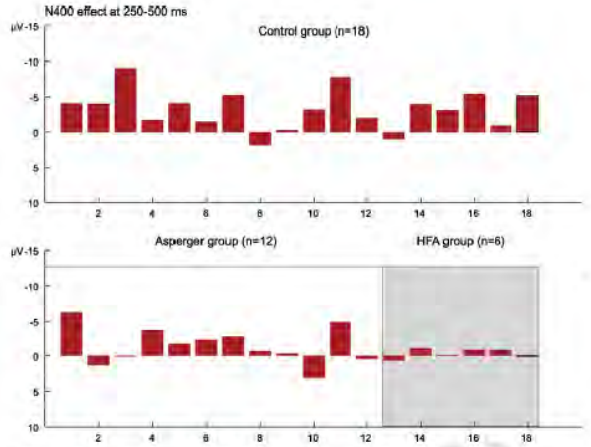
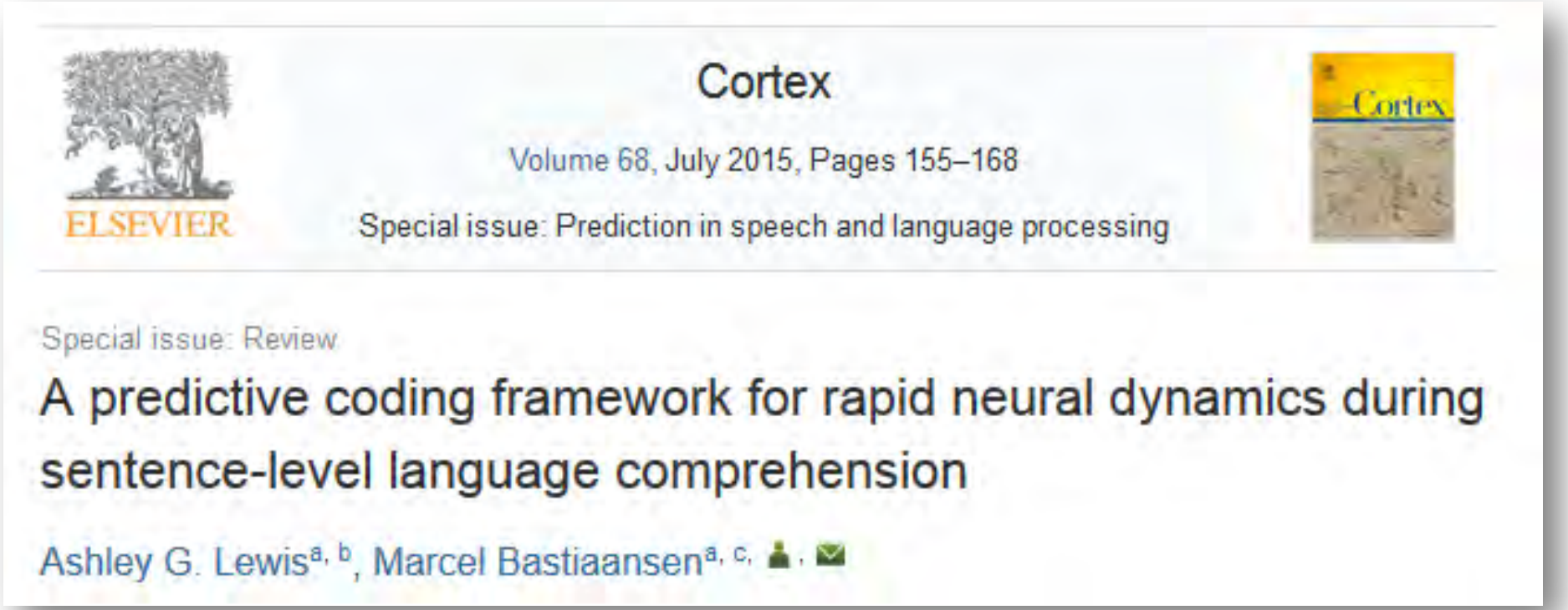


Fig. 4. Mean amplitude of the N400 effect (incongruent condition minus congruent condition in latency window 250–500 ms averaged over FCz, Cz, and Pz) for each individual participant. Negative values are plotted upward.

Special issue Cortex, July 2015



Understanding language = predicting language!

Context and communication

Nothing has an absolute meaning, remember?

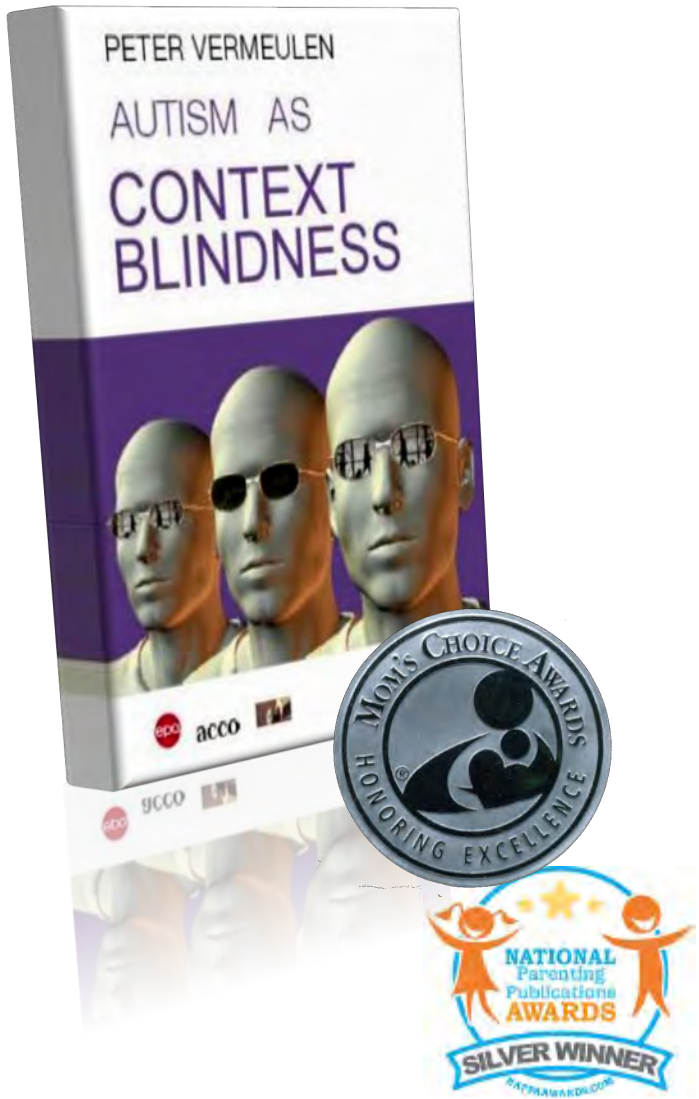
So, whatever we use to communicate…

…their meaning is never fixed, but depending on the context

Context and communication

What is difficult for people with ASD, is to find out what something (a word, a sentence, a gesture, a picture etc.) means ***in this context***

Context helps predicting communication



If your brain is *context blind*, it will have difficulties predicting (and hence understanding) communication

Pushing the context button in communication

I will now ask
you something
about
yesterday

And now
something
about the actors
in the movie

OK, Let’s
now move
on to
question #2.

Pushing the context button helps to ‘predict’ an uncertain world with all its ever changing meanings

Contextualizing the concept of free time

- How much free time do I have?
  - < 15 min.
  - 15-30 min.
  - 30-60 min.
  - > 1 hr
- Do I want to do something together with someone?
  - No
  - Yes
- Where can I do an activity?
  - Inside
  - Outside

Choosing a free time activity

Hopefully you could put all the information *in context*…

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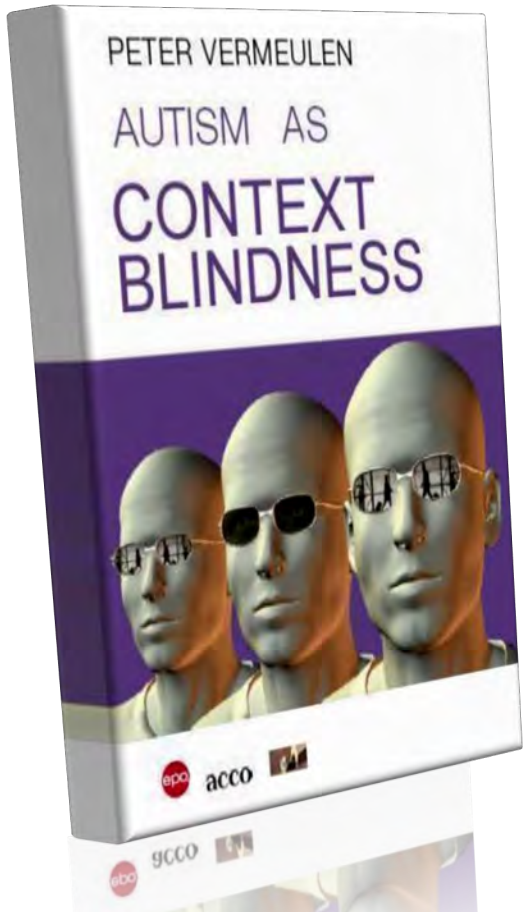

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