AUTISM in CONTEXT

from neurodiversity to neuroharmony

SIKON 2026

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Autism, the predictive brain and well-being

PETER VERMEULEN

1

Predictive coding framework

Redefining ADHD in the Light of Predictive Coding and Active Inference: A Neurodevelopmental Perspective

Richard Murdoch Montgomery *

‣ Front Hum Neurosci. 2022 Mar 3;16:787495. doi: 10.3389/fnhum.2022.787495

A Predictive Coding Framework for Understanding Major Depression

Jessica R Gilbert [1,*], Christina Wusinich [1], Carlos A Zarate Jr [1]

‣ Biol Psychiatry. 2018 Nov 1;84(9):634–643. doi: 10.1016/j.biopsych.2018.05.015

The Predictive Coding Account of Psychosis

Philipp Sterzer [a], Rick A Adams [c], Paul Fletcher [e,f], Chris Frith [d], Stephen M Lawrie [g], Lars Muckli [h], Predrag Petrovic [i], Peter Uhlhaas [h], Martin Voss [b], Philip R Corlett [j,*]

‣ Front Psychol. 2017 Oct 17;8:1840. doi: 10.3389/fpsyg.2017.01840

Predictive Processing and the Varieties of Psychological Trauma

Sam Wilkinson [1,*], Guy Dodgson [2], Kevin Meares [2]

2

Sensory issues

Social challenges

Communication difficulties

3

ARTICLE

emotion review

Emotion Review
Vol. 14, No. 1 (January 2022) 15–30

ISSN:1754-0739
DOI: 10.1177/17540739211063851
https://journals.sagepub.com/home/emr

The Predictive Dynamics of Happiness and Well-Being

Mark Miller
Center for Human Nature, Artificial Intelligence and Neuroscience, Hokkaido University, Sapporo, Japan
Center for Consciousness and Contemplative Studies, Monash University, Melbourne, Australia

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Department of Psychiatry, Amsterdam UMC – Location AMC, Amsterdam, the Netherlands

Erik Rietveld
Department of Psychiatry, Amsterdam UMC – Location AMC, Amsterdam, the Netherlands
ILLC/Department of Philosophy, University of Amsterdam, Amsterdam, the Netherlands
Department of Philosophy, University of Twente, Enschede, the Netherlands

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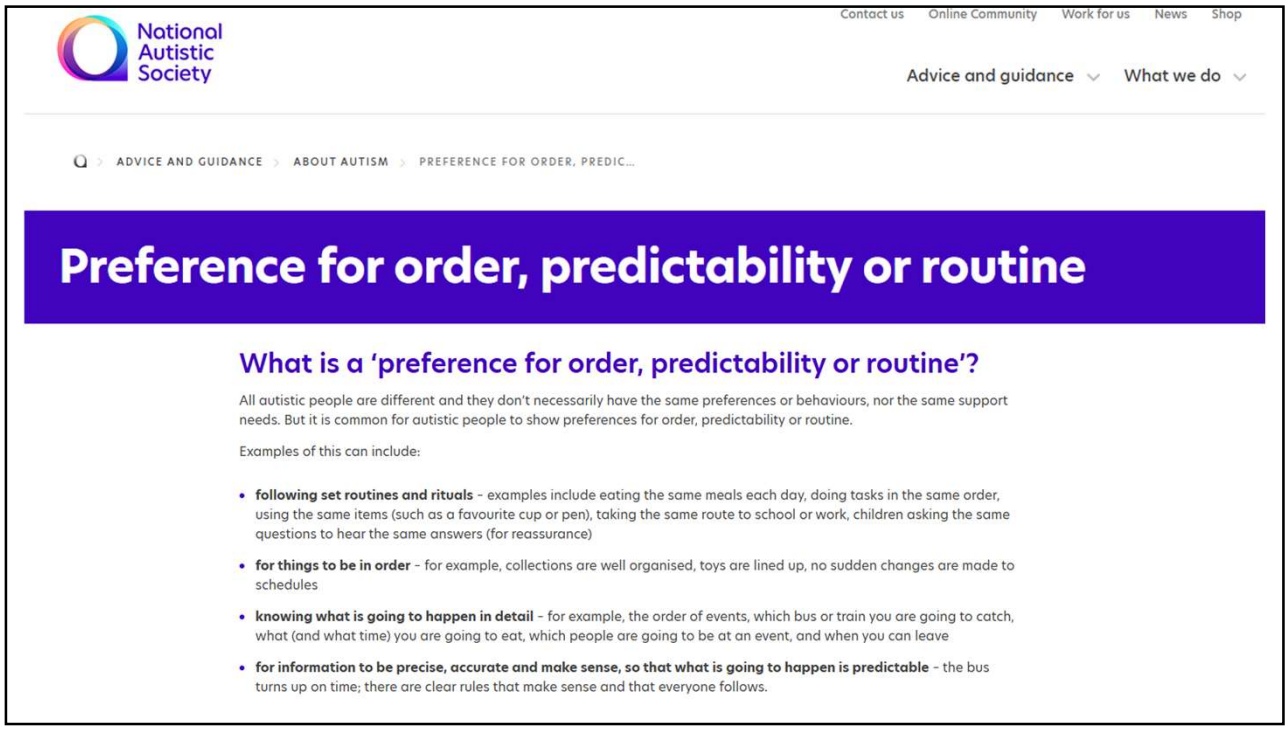
National Autistic Society
Contact us
Online Community
Work for us
News
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Advice and guidance
What we do
ADVICE AND GUIDANCE
ABOUT AUTISM
PREFERENCE FOR ORDER, PREDIC...
Preference for order, predictability or routine
What is a 'preference for order, predictability or routine'?
All autistic people are different and they don't necessarily have the same preferences or behaviours, nor the same support needs. But it is common for autistic people to show preferences for order, predictability or routine.
Examples of this can include:
following set routines and rituals - examples include eating the same meals each day, doing tasks in the same order, using the same items (such as a favourite cup or pen), taking the same route to school or work, children asking the same questions to hear the same answers (for reassurance)
for things to be in order - for example, collections are well organised, toys are lined up, no sudden changes are made to schedules
knowing what is going to happen in detail - for example, the order of events, which bus or train you are going to catch, what (and what time) you are going to eat, which people are going to be at an event, and when you can leave
for information to be precise, accurate and make sense, so that what is going to happen is predictable - the bus turns up on time; there are clear rules that make sense and that everyone follows.

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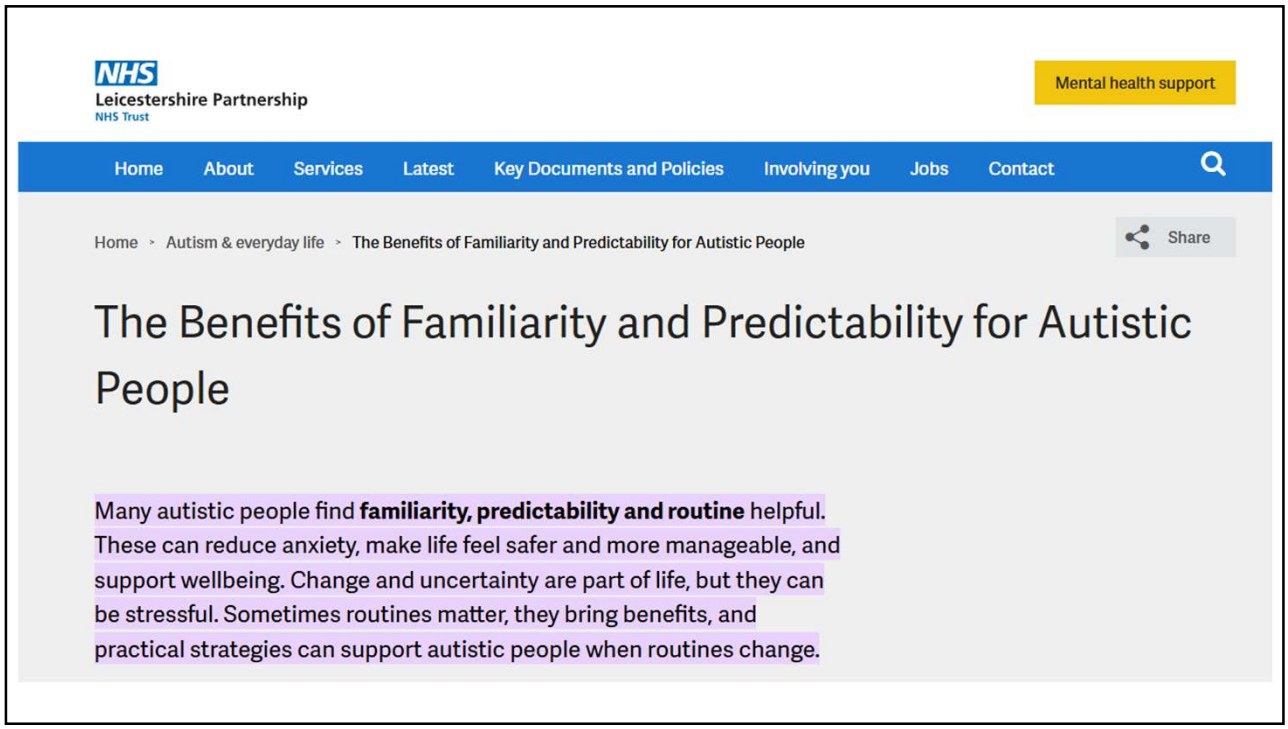
NHS
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Home
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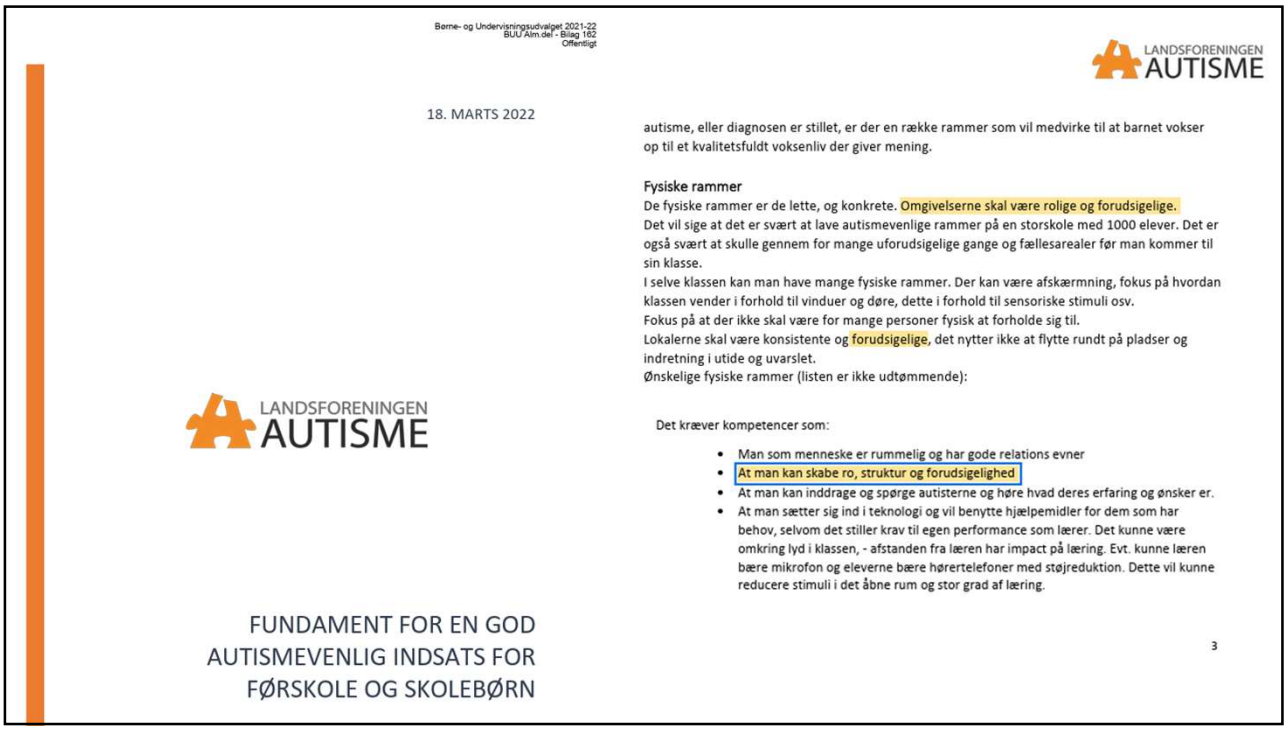
Key Documents and Policies
Involving you
Jobs
Contact
Home > Autism & everyday life > The Benefits of Familiarity and Predictability for Autistic People
Share
The Benefits of Familiarity and Predictability for Autistic People
Many autistic people find familiarity, predictability and routine helpful. These can reduce anxiety, make life feel safer and more manageable, and support wellbeing. Change and uncertainty are part of life, but they can be stressful. Sometimes routines matter, they bring benefits, and practical strategies can support autistic people when routines change.

6



Børne- og Undervisningsudvalget 2021-22
BUU Alm.del - Bilag 162
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18. MARTS 2022

LANDSFORENINGEN AUTISME

FUNDAMENT FOR EN GOD AUTISMEVENLIG INDSATS FOR FØRSKOLE OG SKOLEBØRN

LANDSFORENINGEN AUTISME

autisme, eller diagnosen er stillet, er der en række rammer som vil medvirke til at barnet vokser op til et kvalitetsfuldt voksenliv der giver mening.

Fysiske rammer

De fysiske rammer er de lette, og konkrete. Omgivelserne skal være rolige og forudsigelige.
Det vil sige at det er svært at lave autismevenlige rammer på en storskole med 1000 elever. Det er også svært at skulle gennem for mange uforudsigelige gange og fællesarealer før man kommer til sin klasse.
I selve klassen kan man have mange fysiske rammer. Der kan være afskærmning, fokus på hvordan klassen vender i forhold til vinduer og døre, dette i forhold til sensoriske stimuli osv.
Fokus på at der ikke skal være for mange personer fysisk at forholde sig til.
Lokalerne skal være konsistente og forudsigelige, det nytter ikke at flytte rundt på pladser og indretning i utide og uvarslet.
Ønskelige fysiske rammer (listen er ikke udtømmende):

Det kræver kompetencer som:

- Man som menneske er rummelig og har gode relations evner
- At man kan skabe ro, struktur og forudsigelighed
- At man kan inddrage og spørge autisterne og høre hvad deres erfaring og ønsker er.
- At man sætter sig ind i teknologi og vil benytte hjælpemidler for dem som har behov, selvom det stiller krav til egen performance som lærer. Det kunne være omkring lyd i klassen, - afstanden fra læren har impact på læring. Evt. kunne læren bære mikrofon og eleverne bære hørertelefoner med støjreduktion. Dette vil kunne reducere stimuli i det åbne rum og stor grad af læring.

3

7

Copernican revolution in brain science: the stimulus-response model is wrong

- 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)
- So, the brain does not compute, It guesses, it anticipates the world
- This is known as: **the predictive mind**

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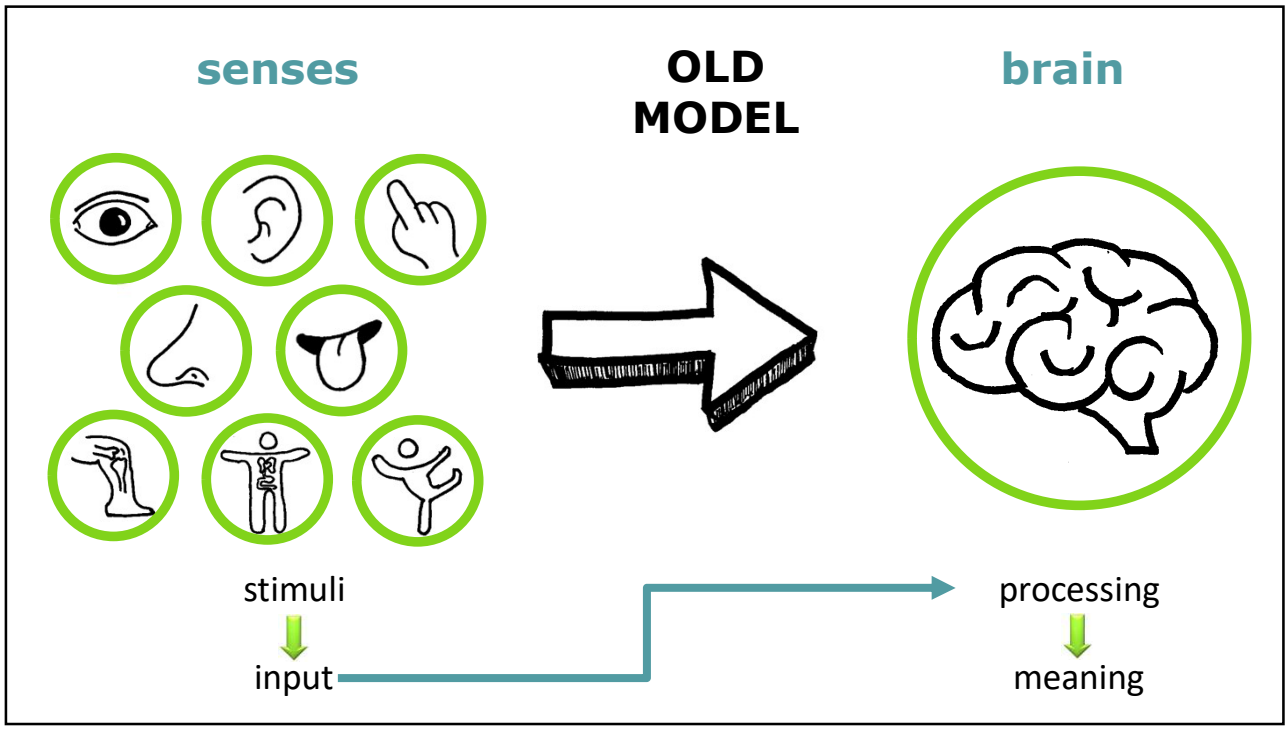
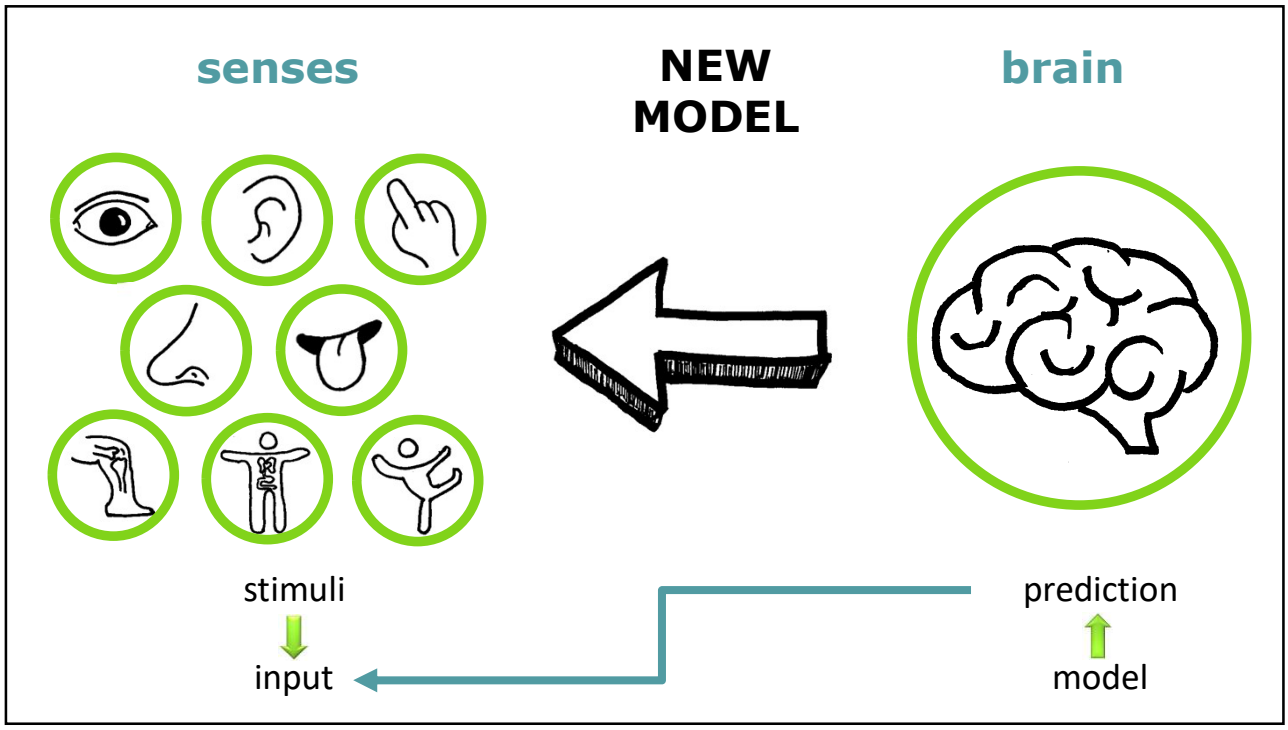

senses
OLD MODEL
brain
stimuli
input
processing
meaning

9


senses
NEW MODEL
brain
stimuli
input
prediction
model

10

The brain predicts the world based on internal and external context

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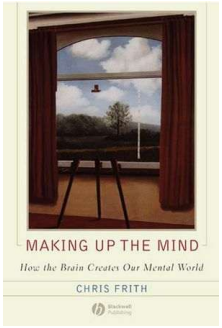
Perception is controlled hallucinating.

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.



But not always….

Chris Frith

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Prediction errors

- The brain has only one goal:
  helping us to survive by minimizing prediction errors
- The brain doesn't like prediction errors (they cause stress)
- The brain knows it cannot avoid all prediction errors. Therefore, it uses **a variable precision** in handling prediction errors

Depending on the **context** the brain will treat a prediction error as noise (irrelevant) or signal (relevant)

- If relevant, this leads to learning or action

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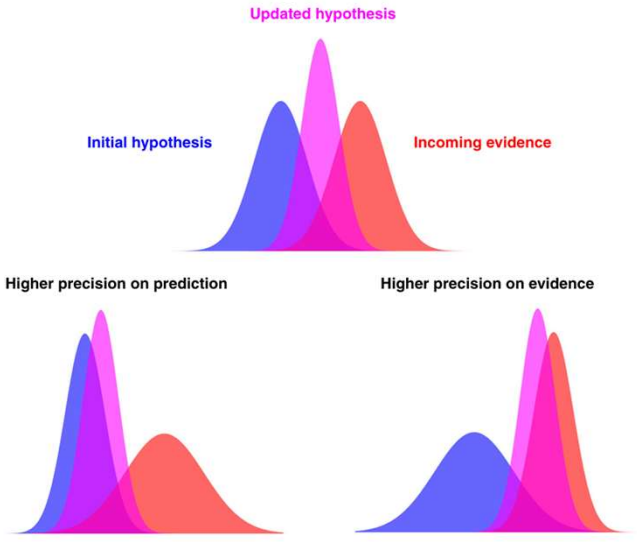
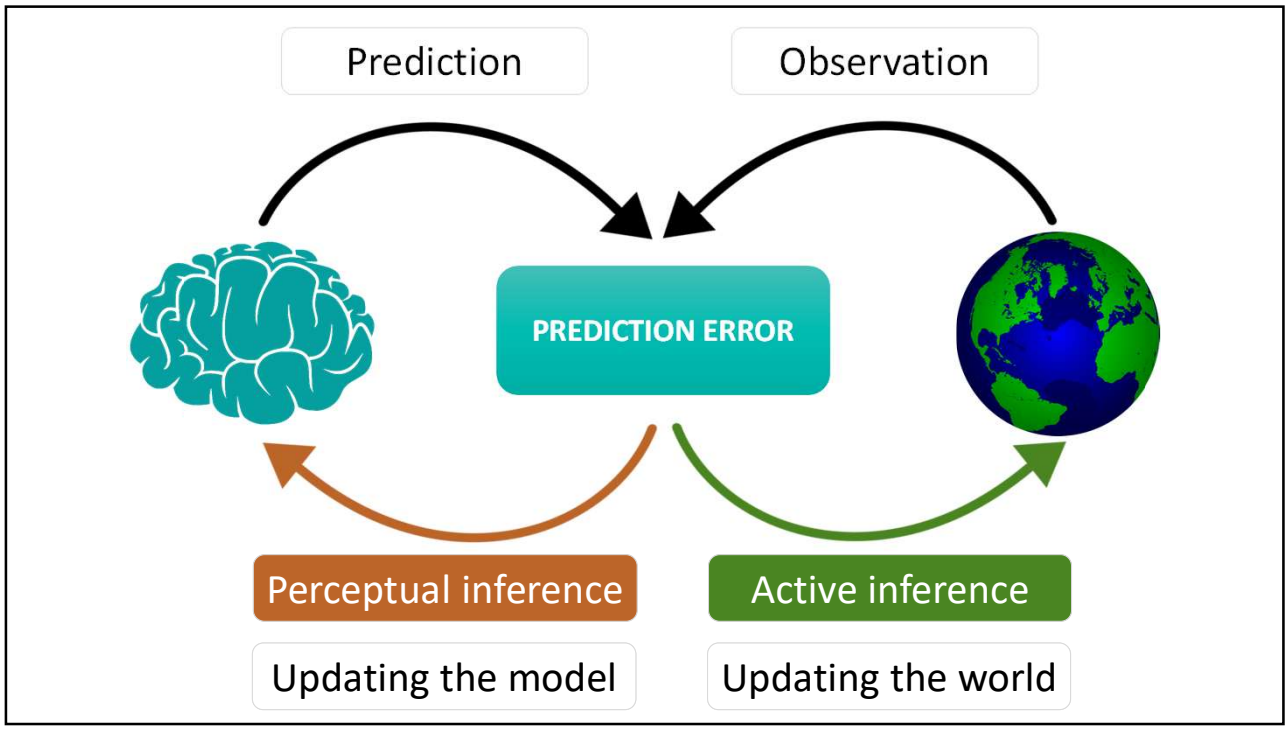
Prediction error management



Yon, D., Heyes, C. & Press, C. Beliefs and desires in the predictive brain. *Nat Commun* **11**, 4404 (2020).

14



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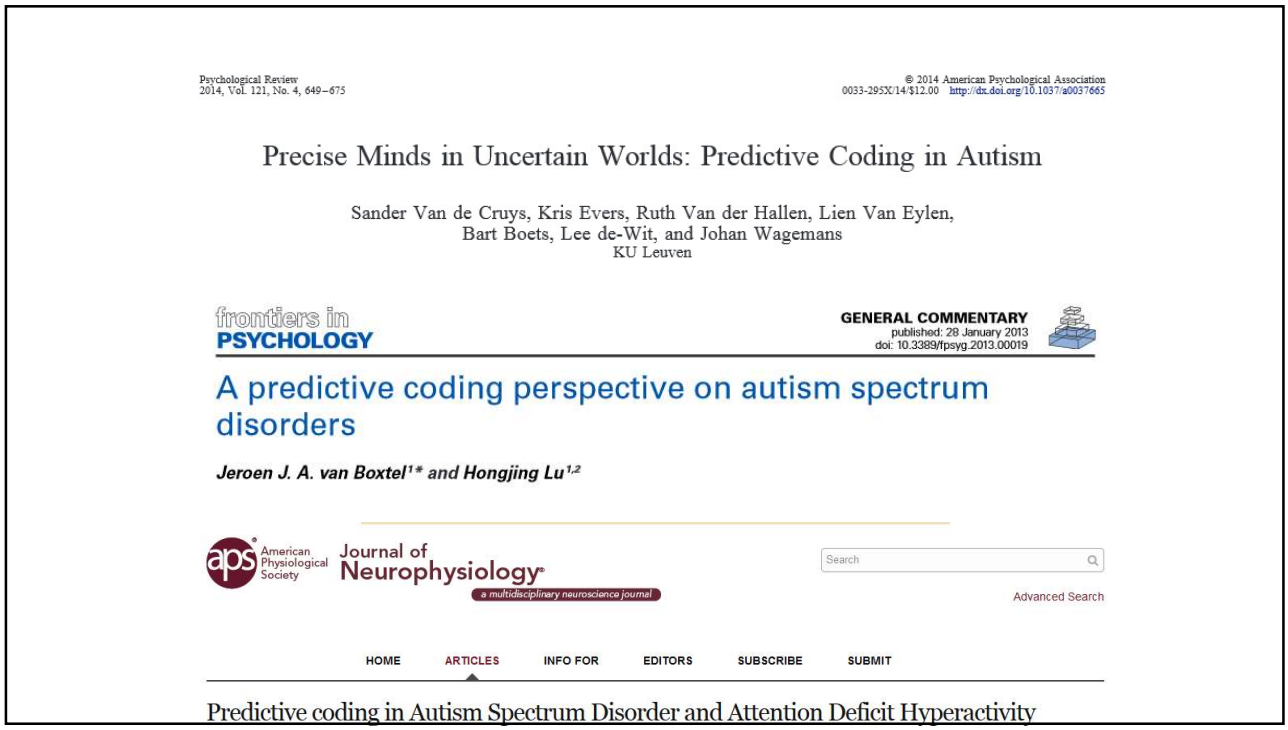

Psychological Review
2014, Vol. 121, No. 4, 649–675

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

frontiers in PSYCHOLOGY
GENERAL COMMENTARY
published: 28 January 2013
doi: 10.3389/fpsyg.2013.00019

A predictive coding perspective on autism spectrum disorders

Jeroen J. A. van Boxtel[1]* *and Hongjing Lu*[1,2]

aps American Physiological Society Journal of Neurophysiology
a multidisciplinary neuroscience journal

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Predictive coding in Autism Spectrum Disorder and Attention Deficit Hyperactivity

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Autism and the predictive brain

HIPPEA:
High, Inflexible Precision of Prediction Errors in Autism
(Van de Cruys a.o., 2013, 2014)

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

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

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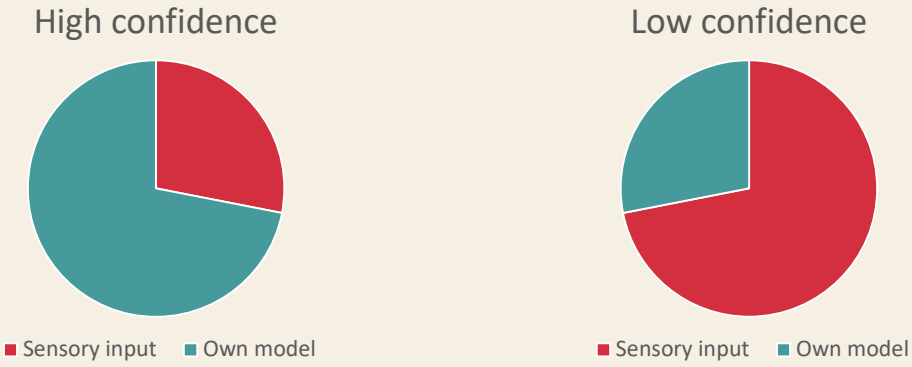
The weight given to sensory input or own expectations depends on the context



How much weight you give to a prediction error depends on **how certain** (or confident) you are about your model of the world and the predictions based on that model (Lawson, Mathys & Rees, 2017)

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Main source of distress in autism

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

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

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KU Leuven

Absolute thinking in a highly unpredictable world

confusion – uncertainty - anxiety

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Review

autism

The relationship between intolerance of uncertainty and anxiety in autism: A systematic literature review and meta-analysis

Richard Jenkinson[1], Elizabeth Milne[1] and Andrew Thompson[2]

Autism
2020, Vol. 24(8) 1933–1944

DOI: 10.1177/1362361320932437
journals.sagepub.com/home/aut
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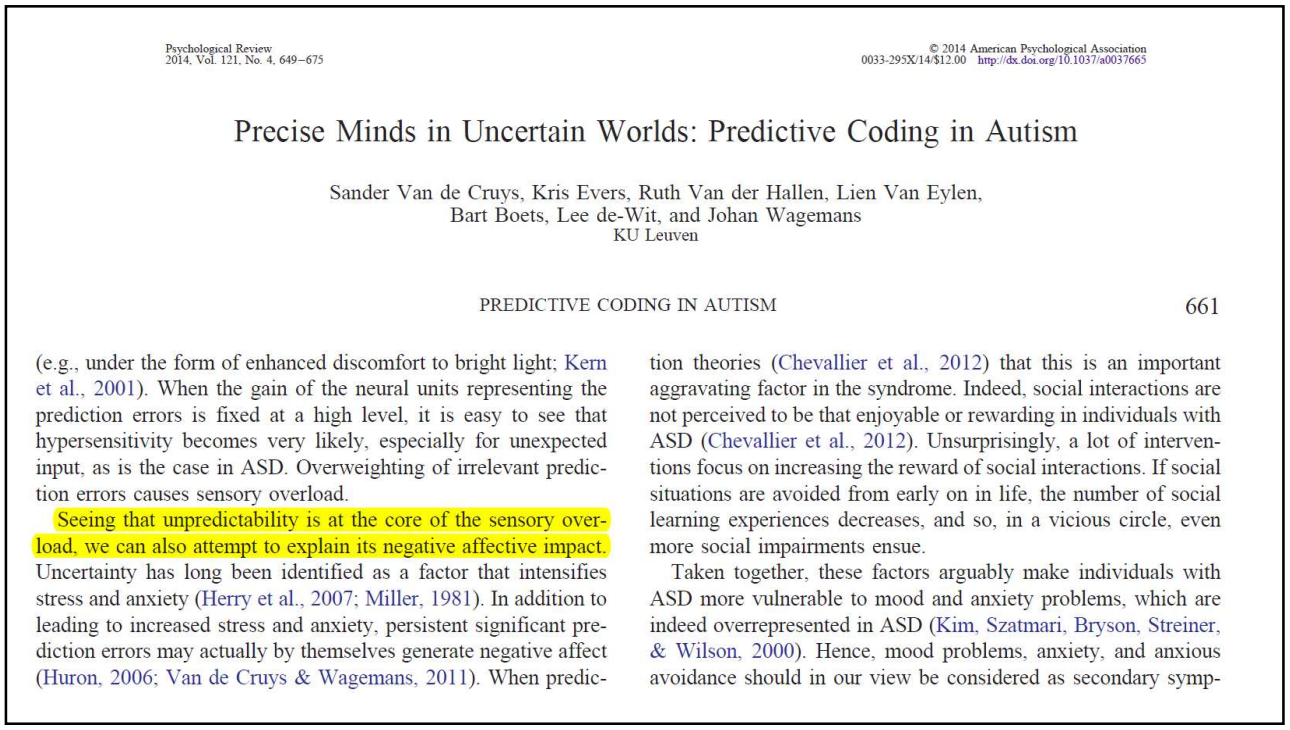

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(e.g., under the form of enhanced discomfort to bright light; Kern et al., 2001). When the gain of the neural units representing the prediction errors is fixed at a high level, it is easy to see that hypersensitivity becomes very likely, especially 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-

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SPECTRUM 1

Sensory overload in autism may stem from hypervigilant brain

BY NICHOLETTE ZELIADT
29 JULY 2019 | 5 MIN READ

Spectrumnews.org

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

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)

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

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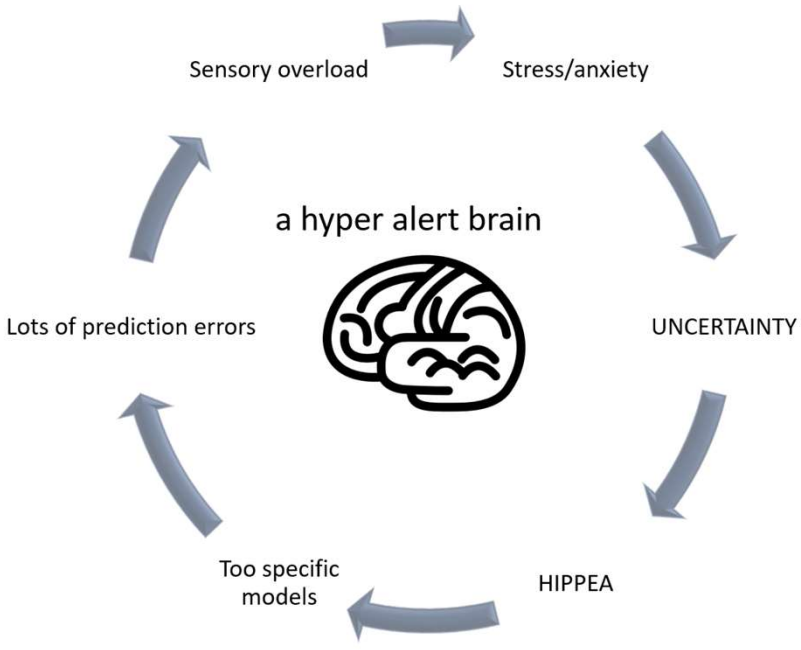

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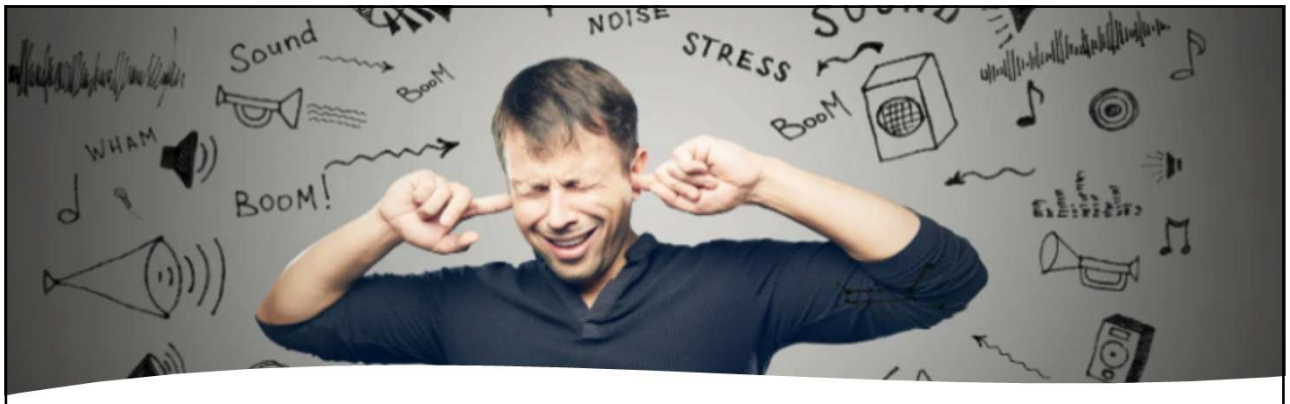

Strategies to reduce sensory stress

- Tackle the prediction errors: predictability in the sensory environment
- Give control
- Address the limbic system: good feeling

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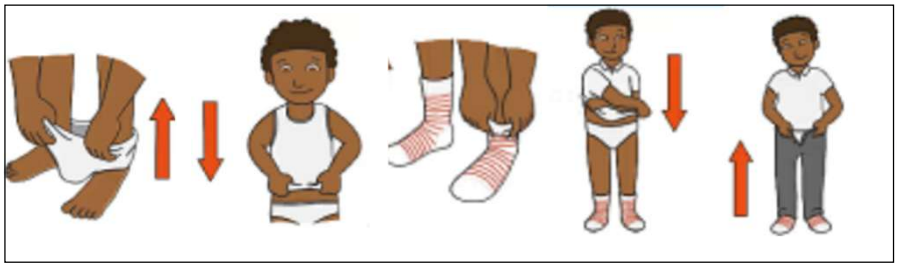
Predicting the most unpredictable of all...



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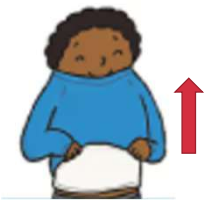

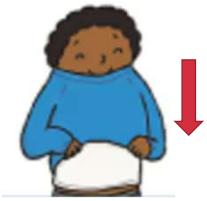

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Addressing uncertainty in autism

Certainty perceived control	Teaching contextualized models
Good feeling	A predictable environment

A relaxed and certain brain

H.A.P.P.Y.

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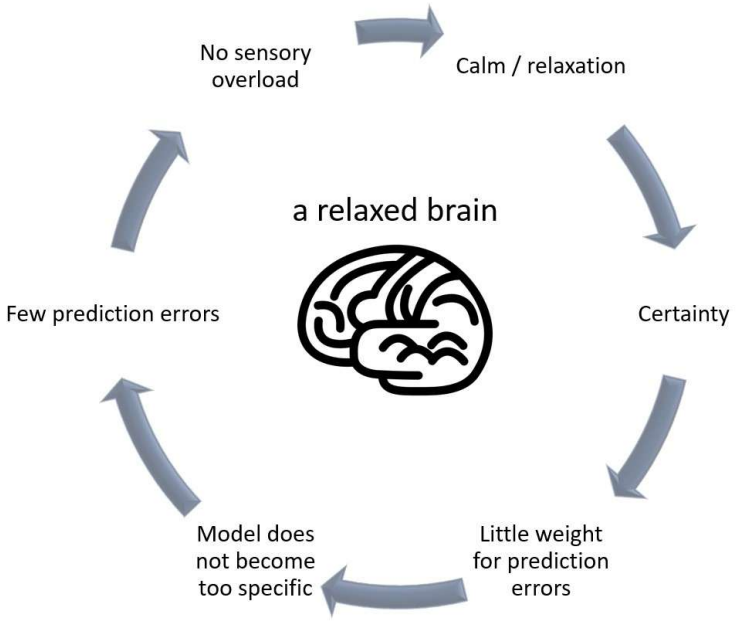

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Create islands of control in the ocean of uncertainty

Routines are good for the mental health of children

Published in final edited form as:
J Abnorm Child Psychol. 2011 January ; 39(1): 83–94. doi:10.1007/s10802-010-9447-5.

Family Routine Moderates the Relation Between Child Impulsivity and Oppositional Defiant Disorder Symptoms

H. Isabella Lanza and
Department of Psychology, Temple University, Philadelphia, PA, USA; Integrated Substance Abuse Programs, Semel Institute for Neuroscience and Human Behavior, University of California, Los Angeles, 1640 S. Sepulveda Blvd., Ste. 200, Los Angeles, CA 90025, USA

Deborah A. G. Drabick
Department of Psychology, Temple University, Philadelphia, PA, USA

Feature Articles

Why Routines Matter: The Nature and Meaning of Family Routines in the Context of Adolescent Mental Illness

Femke Koome MHSc, Clare Hocking PhD & Daniel Sutton PhD

Pages 312-325 | Published online: 19 Sep 2012
Download citation https://doi.org/10.1080/14427591.2012.718245

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Recommended strategies

- Good planning and/or predictable routines for:
  - Breaks
  - Eating and drinking
  - Use of toilet
  - Going to bed in time

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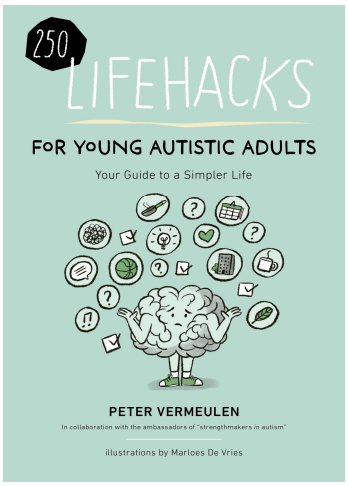
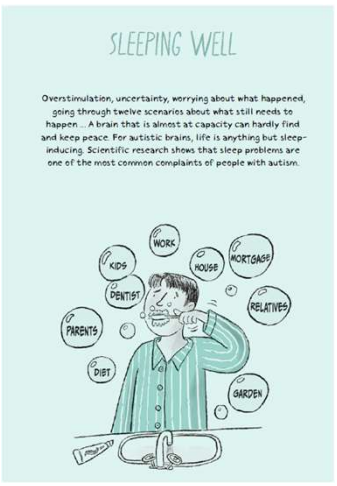
Tips for energy, eating and sleeping





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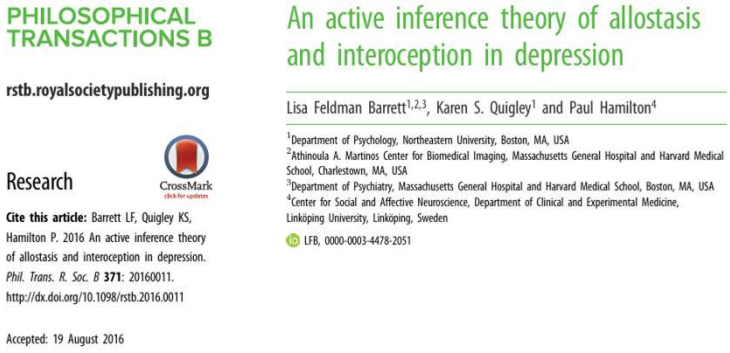
Uncertainty management

Unexpected uncertainty (***volatility***) → negative value

Sustained exposure to ***volatility*** is associated with ***chronic stress***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rstb.royalsocietypublishing.org
Research
Cite this article: Barrett LF, Quigley KS, Hamilton P. 2016 An active inference theory of allostasis and interoception in depression. *Phil. Trans. R. Soc. B* **371**: 20160011. http://dx.doi.org/10.1098/rstb.2016.0011
Accepted: 19 August 2016

An active inference theory of allostasis and interoception in depression
Lisa Feldman Barrett[1,2,3], Karen S. Quigley[1] and Paul Hamilton[4]
[1]Department of Psychology, Northeastern University, Boston, MA, USA
[2]Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital and Harvard Medical School, Charlestown, MA, USA
[3]Department of Psychiatry, Massachusetts General Hospital and Harvard Medical School, Boston, MA, USA
[4]Center for Social and Affective Neuroscience, Department of Clinical and Experimental Medicine, Linköping University, Linköping, Sweden
LFB, 0000-0003-4478-2051

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Contextualized scripts

- Mommy is going to pick me up at school at 3.30pm
- I wait for mommy at the school gate.
- If traffic is very busy, mommy could arrive later than 3.30.
- If mommy is not at school at 3.40pm, then I go back in and I go to the group room. I take my Gameboy and play until mommy comes in to pick me up.

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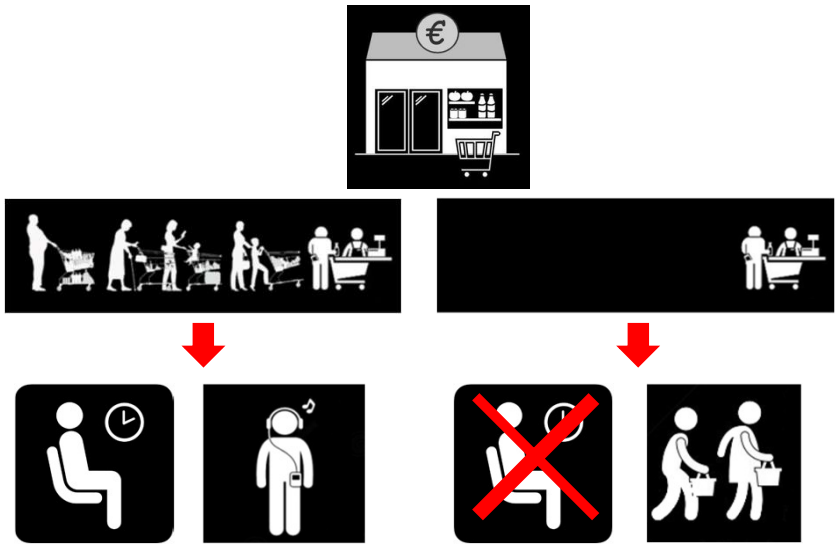
Contextualized scripts



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H.A.P.P.Y.
Happiness in Autism Personal Project for Young people
www.petervermeulen.be

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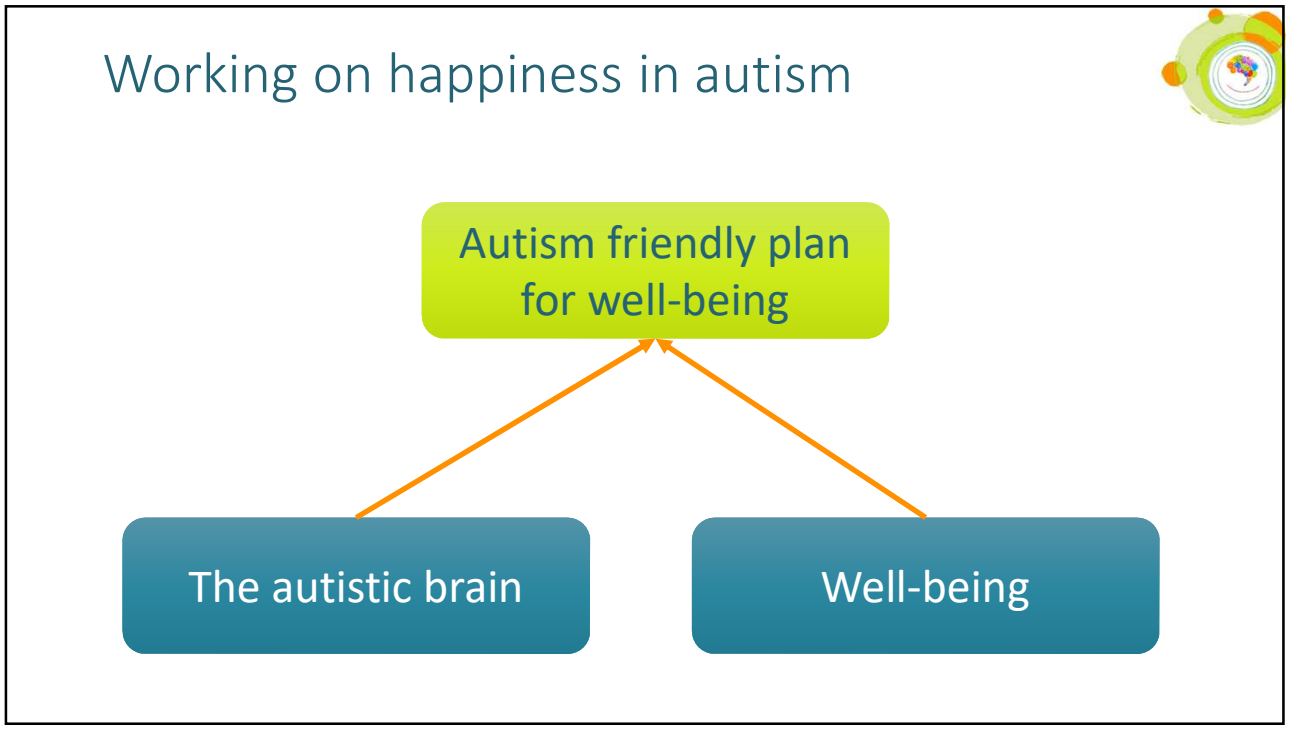
Working on happiness in autism
Autism friendly plan for well-being
The autistic brain
Well-being

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H.A.P.P.Y.

Happiness in Autism Personal Project for Young people

Strategies that address uncertainty

Accepting and loving yourself

1. Good Feeling toolbox
2. **Flow activities**
3. Physical exercise
4. **Routines**
5. **Resilience paradox**
6. Relaxation / mindfulness / breathing
7. Positive thinking
8. Gratitude
9. Kindness
10. Personal projects: learning something new

AUTISM in CONTEXT from neurodiversity to neuroharmony

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UNCERTAINTY

↓

WORRYING

Tip!

Don not ask about worries / emotions.

Ask what questions the person has about something.

AUTISM in CONTEXT from neurodiversity to neuroharmony

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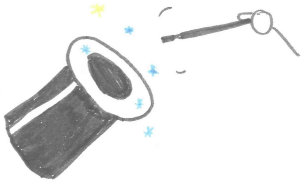
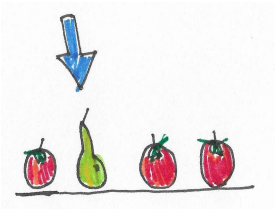
Solution focused approach

Magic wand questions



Exception questions



Scale questions

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Managing your worries

- Organize the worry-time
  - A planned time and place
  - A worry-box
  - Contextualize to counterbalance

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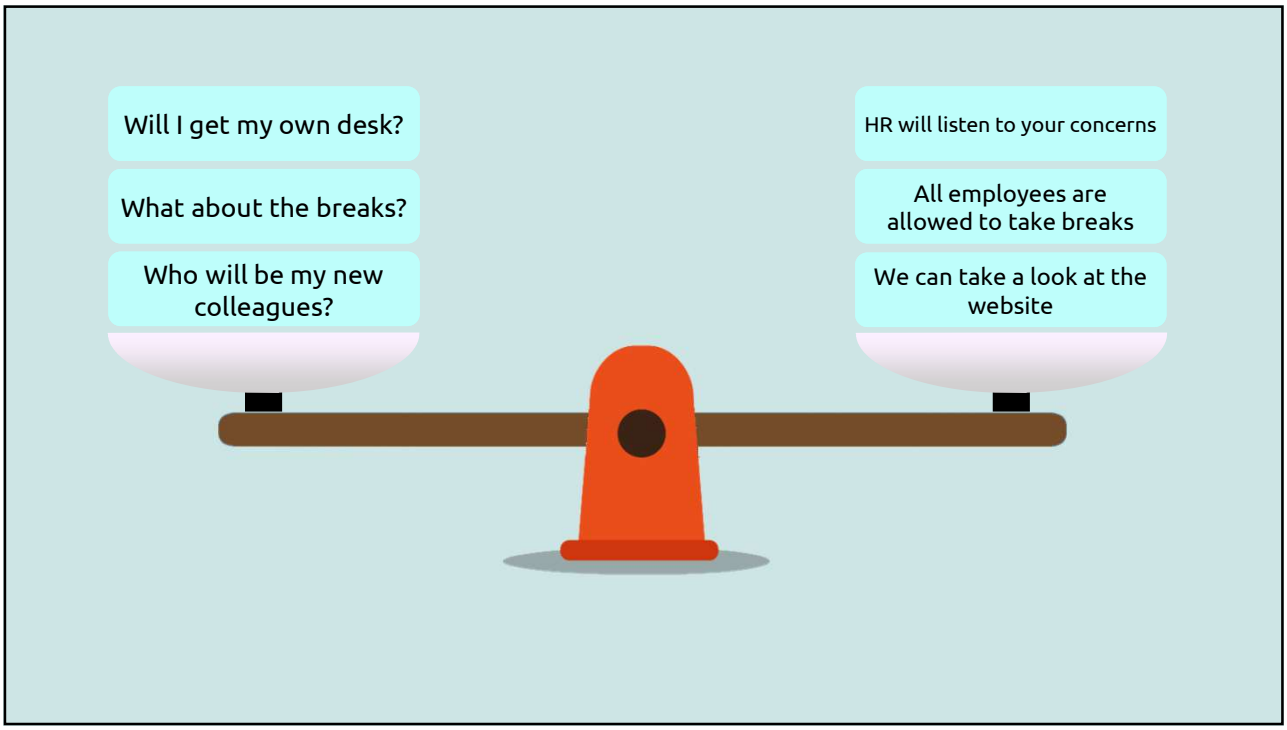
Will I get my own desk?
What about the breaks?
Who will be my new colleagues?
HR will listen to your concerns
All employees are allowed to take breaks
We can take a look at the website

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What do we NOT know?
Who will be my staff in the supported living
How will my room look like
How often and when will my parents visit me
What DO we know?
That there will be support for me in my daily activities
That I will have my Ipad and other things I like to have with me
That I will be able to call my parents to ask them when they will come

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HIPPEA requires pointing out the ***similarities***

- There will be many new things in my new school
- But many things will also be the same:
  - There will be teachers
  - There will be lockers
  - There will be toilets
  - There will be breaks
  - There will be lunch time
  - School will be closed during holidays
  - There will be sanitizing hand gel

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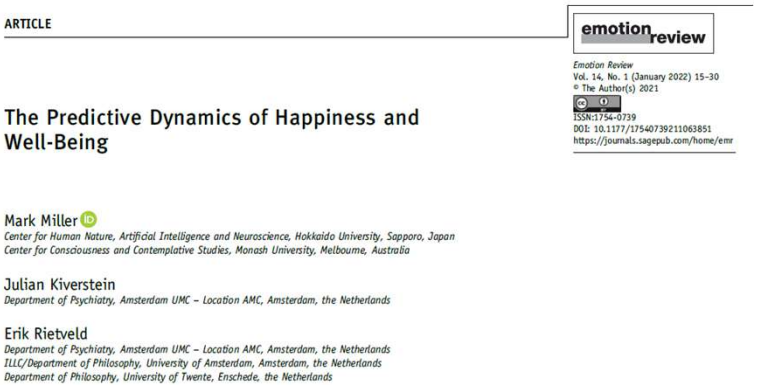
Positive embracing of uncertainty

Having predictive models that succeed in minimizing prediction errors is no guarantee of optimal psychological functioning (p. 21)



ARTICLE

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The Predictive Dynamics of Happiness and Well-Being

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Brain fitness requires…challenges

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The balance of well-being

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Playful approach to life makes uncertainty more familiar

NEUROSCIENCE of Consciousness

Neuroscience of Consciousness, 2023, 2023(1), 1–10
DOI: https://doi.org/10.1093/nc/niad024
Research Article

Special Issue: Experiencing Well-Being

Playfulness and the meaningful life: an active inference perspective

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Research Article

Playfulness in the early stimulation of children with autism spectrum disorder: a systematic review

Gabriela Garcia de Carvalho Laguna, Ana Luiza Ferreira Gusmão, Letícia Defensor da Silva Santos, Gabrielle Silva Sousa, Diana Calhau Barbosa, Marina Garcia Lorenzo Aguiar & ...show all

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ABSTRACT

The aim of this study was to describe systematically playful strategies and their benefits for the early stimulation of autistic children. This is a systematic review, registered on the PROSPERO platform (ID: CRD42024522420) and guided by the PRISMA protocol (2020) criteria. The databases searched were: Web of Science, Scopus, Pubmed/Medline, Latin American and Caribbean Literature in Health Sciences (LILACS), and Scientific Electronic Library Online (SciELO); original articles published between 2018–2023 were included. Eighteen articles that met the eligibility criteria were selected from the 1,043 studies located. The population sample included 822 children (94% with ASD, along with paired neurotypical children) from 8 countries, and most studies applied standardized scales to define and/or confirm the diagnoses. The main benefits of playfulness in the stimulation of these children were: improvement of social and socio-emotional aspects, social engagement, development of symbolic and narrative play skills, engagement in pretend play, as well as improvement of motor skills and executive functions, which reflect in autonomy for daily activities. The importance of playful interventions in promoting the cognitive, social, and emotional development of children with ASD is highlighted.

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Teach the brain to like surprises

Controlled and predictable small variations in routines and habits

48

Humour: prediction errors that give pleasure and fun

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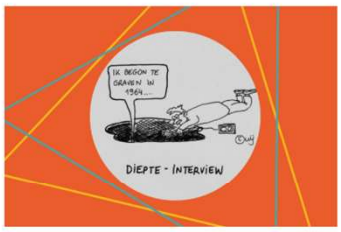

sterkmakers *in* autisme

Mag je lachen met autisme?

23/10/2025 - 19u00 tot 21u00

Panelgesprek

Theater Scala (Dendermondsesteenweg 163, 9000 Gent)

€ 15,00

Humor speelt een belangrijke rol in ons dagelijks leven. Het helpt ons te verbinden, stress te verminderen en plezier te ervaren. Maar hoe zit dat bij mensen met autisme? Is er een link tussen autistisch denken en humor? Omdat ze de wereld anders ervaren kunnen mensen met autisme wel eens reacties vertonen die net als de pointe in een grap onverwachts zijn. En dus soms grappig. Mag je dan lachen daarmee, en bij uitbreiding: mag je lachen met mensen met autisme en grapjes maken over autisme? En hebben mensen met autisme een gevoel voor humor? Hoe gaan zij om met humor in het algemeen en grapjes over autisme in het bijzonder? Welke vorm(en) van humor appreciëren ze? Deze vragen worden vaak gesteld, en het is belangrijk om hier open en respectvol naar te kijken.

Tijdens deze avond gaan we in gesprek met een panel, waarbij mensen met autisme centraal staan. Een open en respectvol gesprek over humor en autisme - kom luisteren en meedenken! De panelleden zijn enkele ambassadeurs van sterkmakers *in* autisme en auteur, cartoonist en theatermaker Mario De Koninck.

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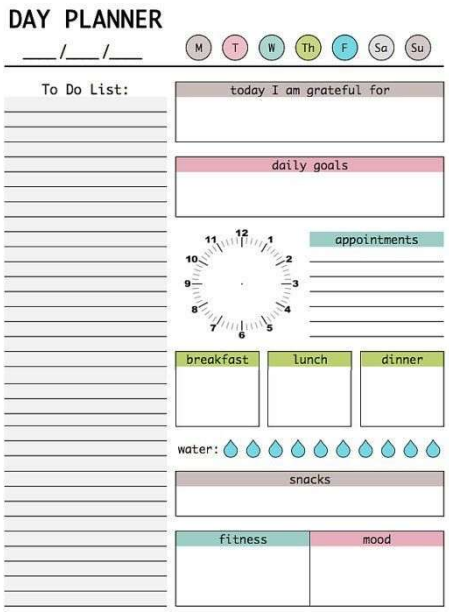
Plan the well-being activities

- The positive thinking
- The flow activities
- The worry time
- When to check things
- **The surprises**



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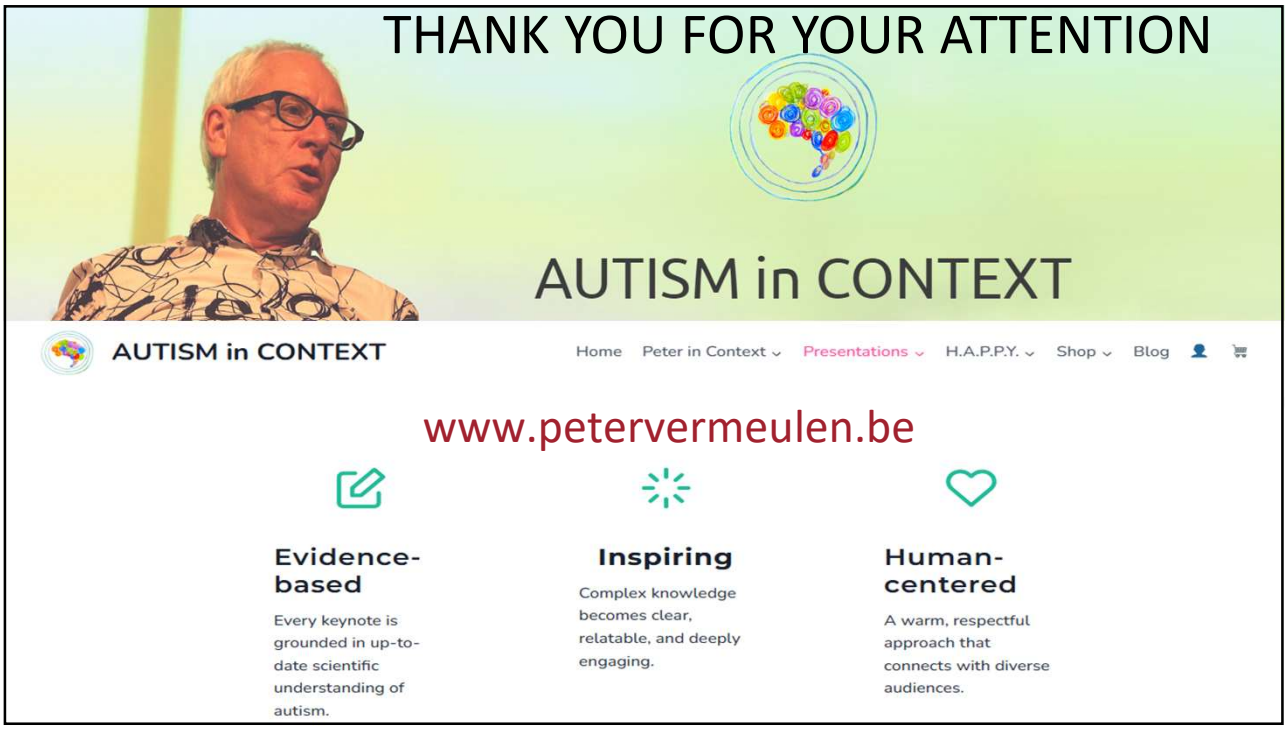

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