

The importance of being stable and balanced – a therapy inspired network approach

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Thank you for your attention

“The Self” by High functional autistic individual

“ ... the **self** is not at all based on physical sensations or any relations with objects and individuals.

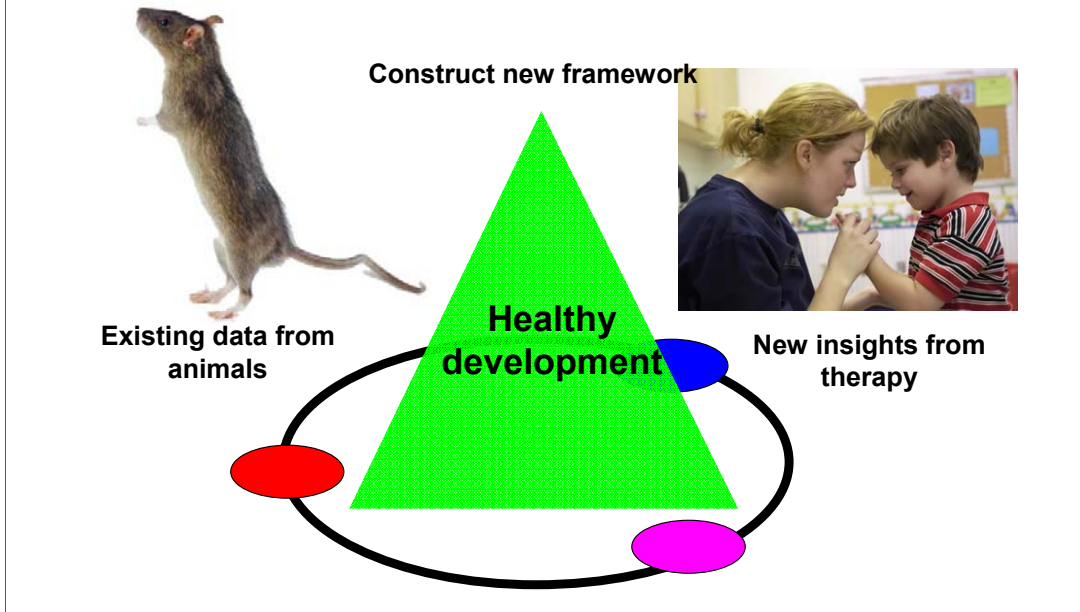
...it is *nothing* ... not any thing...

....and only a thing can be replaced...reason for incapacity to pretend ... “

Pablo Frank

To get a feeling of this, here is a quote from an adult with high functional autism : the self in autism is not at all based on physical sensations or relations with objects and other individuals, it is a “nothing”, “not anything” ..it therefore cannot be replaced, explaining the incapacity to pretend for example

New framework constructed from recent insights in the field of Autism

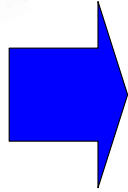


In this talk I will first tell you briefly about some interesting existing animal data that are pushing aside traditional views of autism. Then I will present new data that we have extracted from new therapies for autism that are pushing aside traditional therapies. Finally I will use insights coming from both existing and new source of data to construct a framework that defines the dynamics and connectivity features of the basic components essential for normal development and how they give rise to disordered development

Animal data from Autistic Rats



- Hyper-reactivity
- Hyper-plasticity
- Hyper-perception
- Hyper-fear
- Hyper-attention
- Hyper-memory



**Imbalance:
parameters tuned
to max of range**

Markram et al., 2007

Data that has been coming in from chemically induced autistic rats is calling into question the traditional views of autism as being a deficit in isolated functions like mind-blindness. Autistic rats? Well yes, these rats seem to answer the criteria of the psychiatric manual for autism – they display a wide spectrum of autistic **symptoms** such as **decreased social interactions and increased repetitive behavior**.

Hyper-reactivity and hyper-plasticity in local neuronal circuits and hyper-perception, fear, attention and memory at the behavioral level indicate that in autistic rats there is great imbalance, meaning the parameters of many systems are tuned to maximum range. This means that these rats have to deal with a very intense and painfully perceived world.

Is autism due to severe imbalance?

- Great imbalance
- Experience aversive, intense world
- Does it apply to humans????
- Difficult to test!!



So animal data suggests that autistic rats suffer from a severe imbalance. But does it also apply to human? Unfortunately, testing directly very young infants, is a very hard, sometimes almost impossible task.

Our starting point: New data from transitions in therapy

New

“Regulation” methods

Aim at basic sensory, emotion and motor functions simultaneously

Goal: Return development to normal course

Implementation: regulation of imbalance

Old

Traditional behavioral methods

Aim at isolated cognitive functions

Goal: Reduce symptoms

Implementation: conditional learning



We therefore decided to search for data and clues in the field of therapy, where therapists are actually dealing with normalizing of autistic behavior. We found that traditional methods are being pushed aside in favor of more novel methods that are stressing the need for regulation of an imbalance in basic functions rather than the targeting and enhancement of isolated cognitive functions. In addition these methods are aiming, not only in reducing symptoms but at returning the development of a child diagnosed with autism back to normal course.

Therapist reports: great imbalance. parameters tuned to extreme range

- hyper and/or hypo sensitivity to sensory input (95% of children)
- hyper or hypo muscular tension
- hyper emotional levels

It turns out that already for about 15 years these therapists, working in the regulation methods, have been reporting very interesting and overlooked observations of great imbalance and extreme sensitivities in the children they are working with. They are reporting hyper/or hypo sensitivity to sensory input, hyper or hypo muscular tension and hyper emotional levels

Therapist reports – fluctuating, instable world

In the same individual:

- Fluctuation in severity of autistic state
- Fluctuation between extremes of hyper - hypo sensitivity in sensory, motor, emotional modalities.
- Extreme fluctuation of motivation states.

In addition to being tuned to the extremes it seems that there can also be fluctuations between these extremes. Therpaist are reporting a picture of great instability, in which in the same individual even the severity of the autistic state can fluctuate and occur between the hyper- and hypo sensitivities of the differnet modalities.

Therapists conclude:

Extreme autistic behaviour – result of being overwhelmed or under responsive to incoming stimuli.

Deficit is primarily a deficit in

- Sensory**
- Emotional**
- Motor regulation**

In agreement with rat data

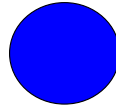
Based on these observations these therapists conclude that the extreme autistic behavior is the result of being overwhelmed by- or under responsive to incoming stimuli. And that the main *Deficit in autism is not a social one but rather a deficit in sensory, emotional and motor processing and regulation.*

Notice that this reminds us of understandings that came from the rat data

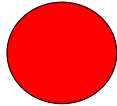
We have gone through many case studies and descriptions of successful therapy intervention and have extracted the basic steps that help rebuild a more healthy “self”.

Model for the rebuilding of the self based on therapy in practice

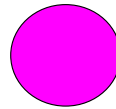
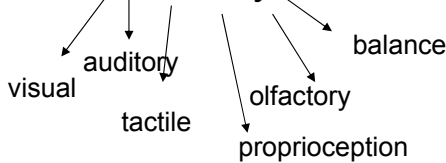
Evaluation: what is the tuning level-
hyper? hypo?



Motor



Sensory

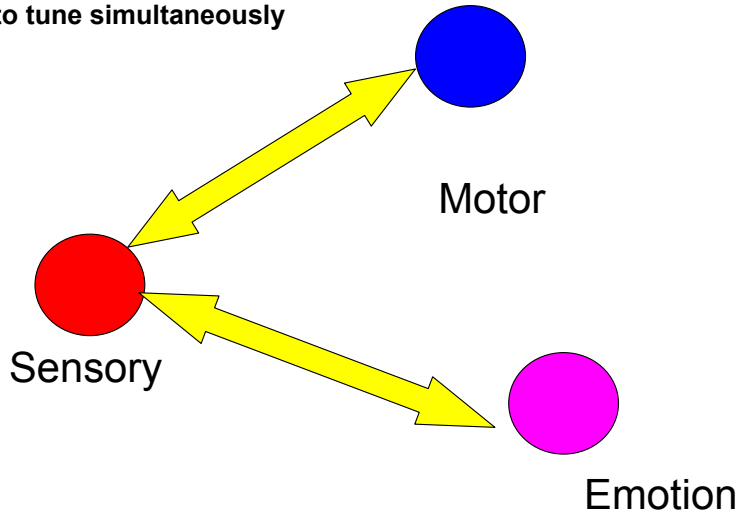


Emotion

Lets work with one example one of child that avoids interactions, lies for hours on the floor constantly rotating objects. The first step is to evaluate the tuning level of his sensitivities. So for example the child may be auditory, visually and tactile hyper sensitive, and very emotionally reactive, meaning he experiences an intense and aversive world which he tries to avoid by focusing on a repetitive activity which he can expect and gives him pleasure, he may also have hypo muscle tone so the floor is helping him support his body.

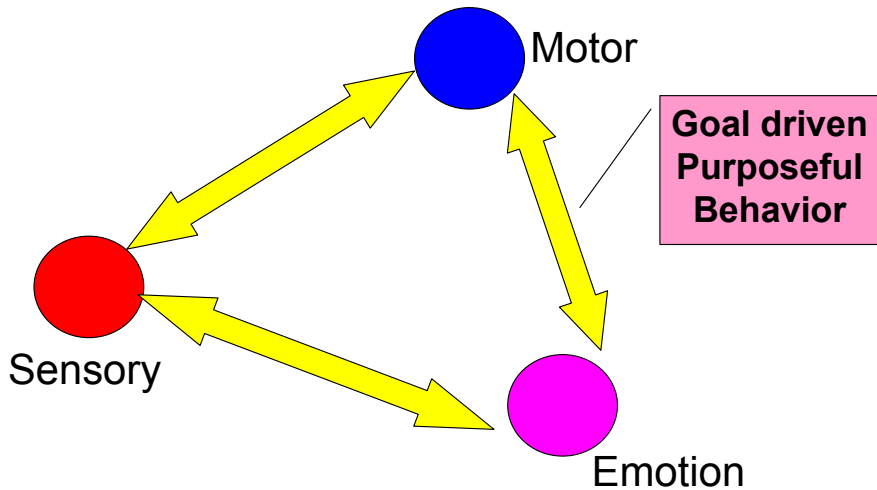
Therapy in practice

- Need tuning
- Tuning impacts other modalities
- Need to tune simultaneously



The next step is to help the child be in a more tuned state. So to continue the previous example, this can be achieved by putting the child in a bath full of small balls in a room with little visual stimuli and talking to him in low calm voice. Since the sensory system modulates emotion and motor function and vice versa, it is important that the tuning be done simultaneously.

Making a new connection : Emotion-Motor = purposeful behavior

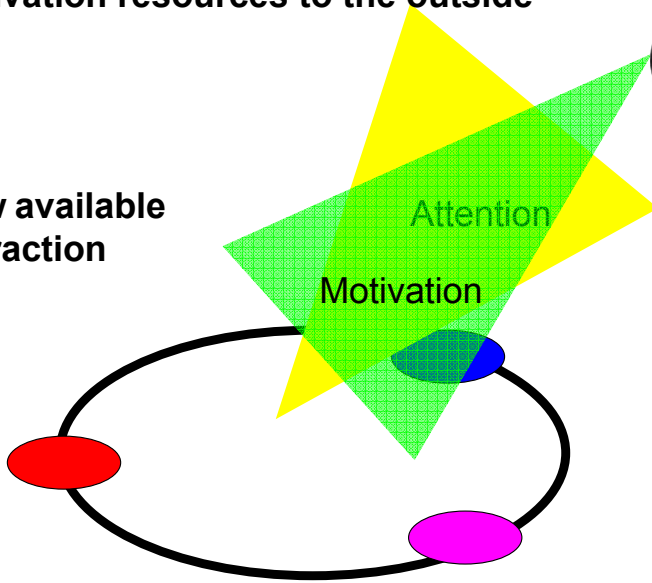


The next step is to create a connection between feelings and motor output, a connection that is essential for the development of goal driven purposeful behavior, which is the basis for a purposeful self, for language and communication. this is achieved by treating even the most aimless behavior as having a goal. For example, by joining the child with rotating objects on the floor, his repetitive behavior becomes part of a mutual play and is given a purpose.

Regulated network can allocate attention and motivation resources to the outside world:



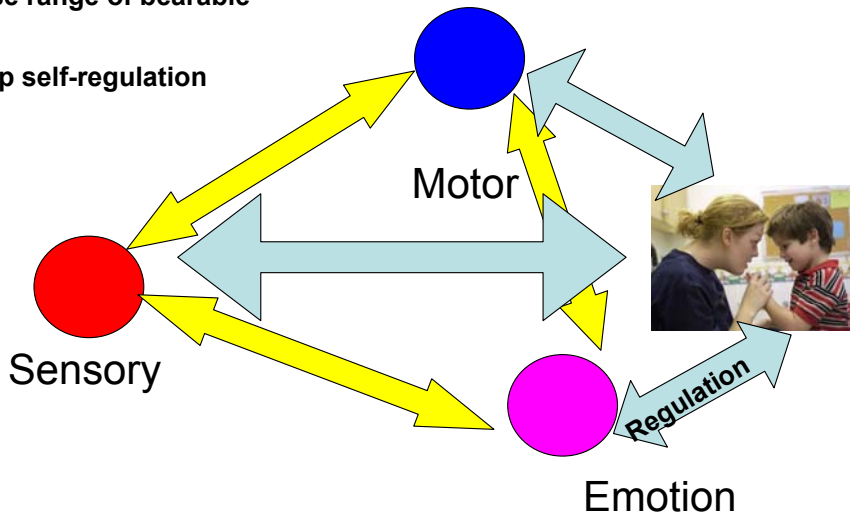
it is now available for interaction



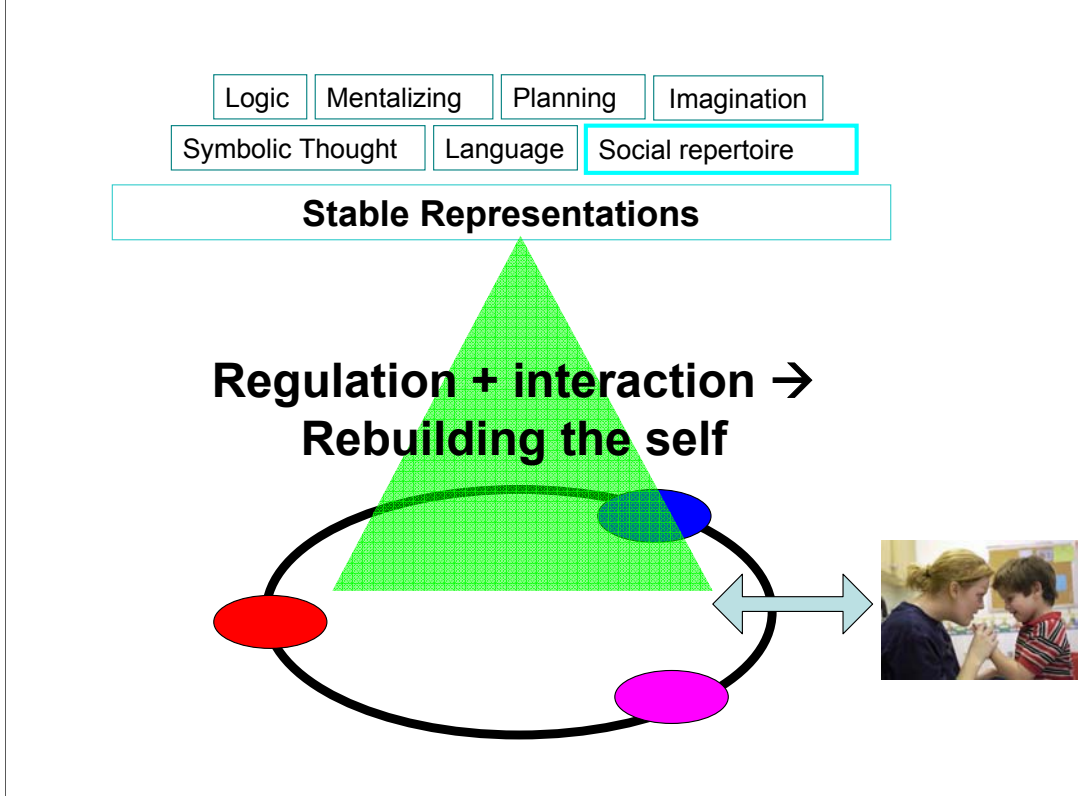
when the network is in a regulated state, attention and motivation resources can now be allocated towards the outside world and especially towards interaction with caregivers and therapists.

Secure interactions serve as external regulators of the network components

- Increase range of bearable stimuli
- Develop self-regulation

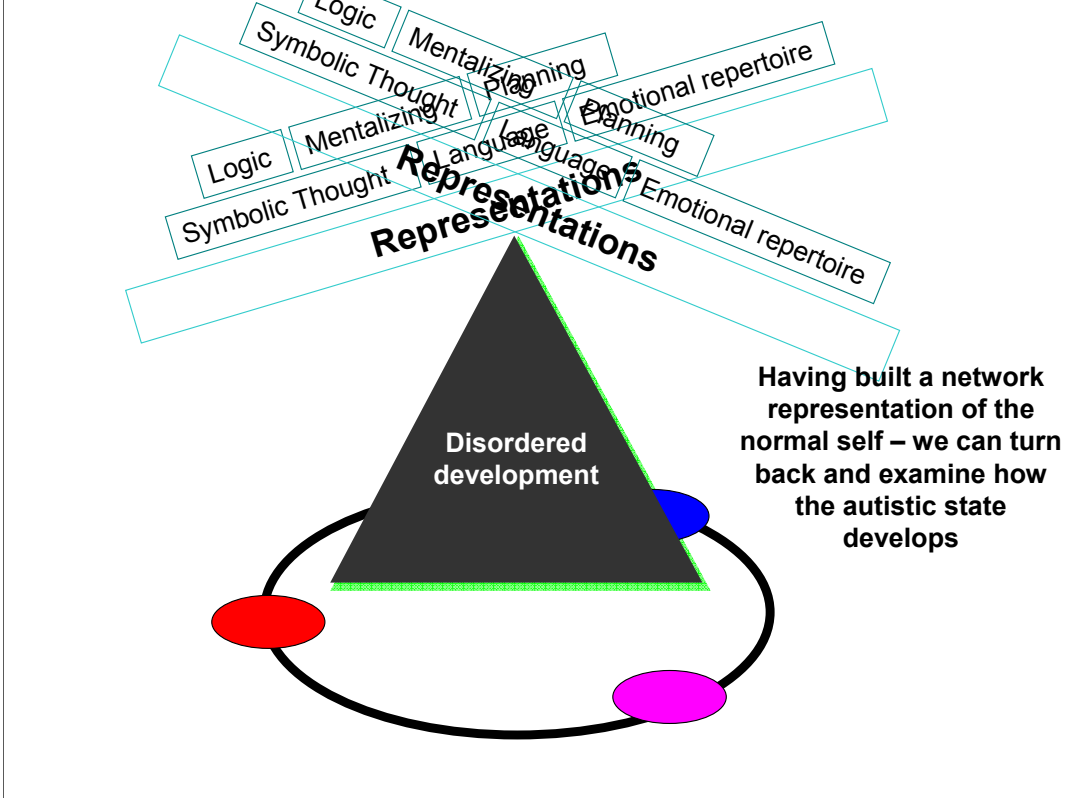


therapists and parents can now use these secure interactions to serve as external regulators of the child's system, helping him increase the range of stimuli that he could bear and develop self regulating abilities. The constant maintenance of a pleasant sensory-motor-emotional state enabled him to begin feeling pleasure with intimacy and engage in mutual attention.



So we see that once the system is regulated, it can be available to explore the world, and participate in activities and experiences that will expand the repertoire of representations that will be encoded in the developing brain. Basic representations of emotions, symbols, visuo-spatial cues, motor plans etc will serve as the building blocks of complex representations such as symbolic thought, language, and logic. Many social interactions with adults and children, in the beginning mediated by a therapist – help expand the representations of social repertoire.

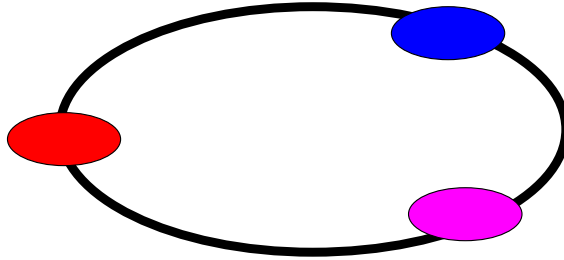
A stable sense of self is thus enabled.



However, if the basic network is unbalanced and unstable, fluctuating between extreme values, unstable or partial representations, lacking sensory, emotional or motor dimensions will be created. These will not be available for subsequent retrieval and use - on such fragile basis a stable sense of self cannot develop

Network dynamics view

- In line with growing understanding of importance of **networks**, **connectivity**, **interactions** and **dynamics** to high order functions of the brain.



Indeed this network view is in line with the growing understanding of the importance of networks and their dynamics to high order functions of the brain.

Need to identify mechanisms of imbalance and instability

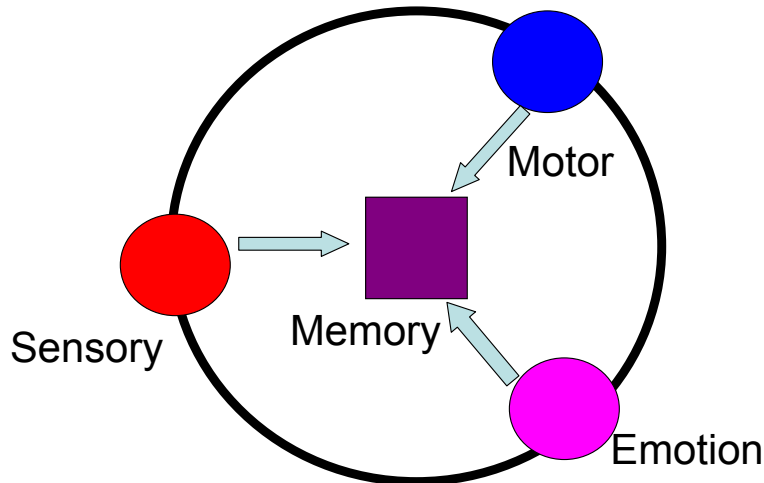
Candidates:

- hyper-reactivity and hyper-plasticity in local circuits (Markram et al, 2007)
- Network effect - inhibitory/excitatory feedback amplification

Many reasons can contribute to the suggested instability and imbalance in the autistic network, and probably data coming from the rat model, along with understanding of network dynamics will help elucidate them.

Expanding the model:

Low Functional Autism – hypo memory

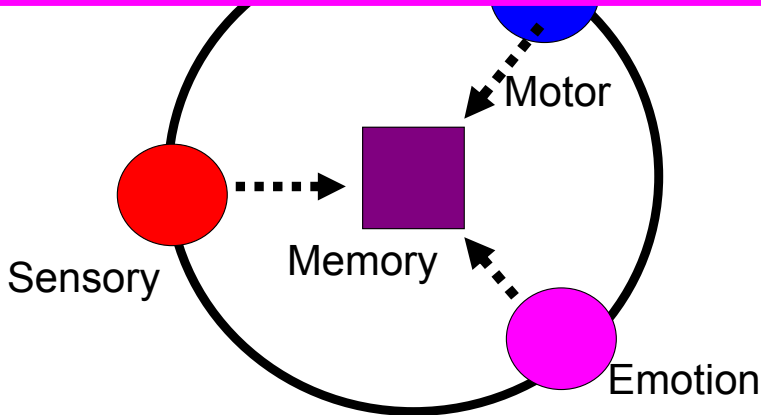


The model that emerges by translating the therapeutic work into the brain can now be expanded to account for the heterogeneity of the autistic condition. This can be done if we take into account the memory system and assume it also can be hyper- or hypo –active.

In the case that the memory system is hypo-active only very salient experiences will enter encoding, resulting in a too high threshold for learning. This will result in a low-functional state of autism.

Expanding the model: High Functional Autism – hyper memory

Hyper-linguistic but
unable to use this language in social context ...



However, if a hyper active memory system is the case, even experiences that have low saliency and are unimportant will be encoded in memory leading to hyper-learning. But the unstable emotional, sensory and motor systems are causing an unstable encoding. Thus although much information is encoded, a great deal of it lacks the emotional and sensory dimensions that are crucial for social context retrieval. David is a good example, although he is hyperlinguistic with a vast and rich vocabulary it did not serve him when he needed to communicate realtime in social context.

Sensory sensitivity observed in:

- All developmental disorders: PDD, ADHD, language disorders etc
- Schizophrenia

**Sensory sensitivity
an observable marker for
network instability**

Finally, I would like to point out to a very interesting observation: it turns out that most if not all developmental disorders are characterized by extreme sensory profiles. Moreover, the onset of schizophrenia, a disorder attributed to a breakdown of global connectivity is characterized by breakdown in sensory regulation

Thus I want to suggest that sensory sensitivity is a marker of global network instability and thus of its vulnerability to develop into disordered states.