

Investigating Interoception
and **body awareness** in adults with and
without **Autism Spectrum
Disorder**

Lisa Fiene

Fiene, L. and Brownlow, C. (2015), Autism Research. doi: 10.1002/aur.1486

- Overview of interoception
- What if this system goes awry?
- Details of research findings
- Significance and future directions

Interoception

Air hunger

Thirst

Hunger

Satiety

Heartbeat Perception

Temperature

Pain

Itch

Gustation

Muscular ache

Visceral sensations

Vasomotor activity

Affective Touch



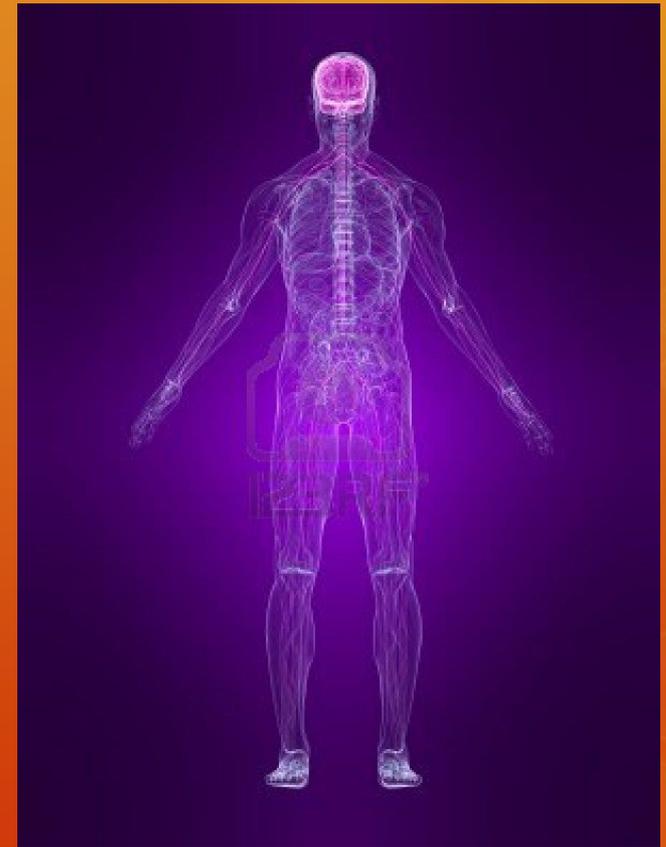
Felt Valence

Level of arousal

Homeostatic emotions

What if this sense was interrupted, or inaccurate in some way?

Air hunger
Thirst
Hunger
Temperature
Heartbeat perception
Satiety
Pain
Itch
Gustation
Vasomotor activity
Muscular ache
Visceral sensations
Affective touch



What would this be *like*?

How could a disrupted/inaccurate interoceptive sense affect behaviour?

- Unusual eating and drinking behaviours.
- Unusual voiding behaviours
- Unusual pain related behaviours (hyper-hypo reactivity, SIB).
- Poor homeostatic self-regulation/thermo-regulation
- Unusual breath holding, swimming underwater behaviours.
- Unusual sensations and perceptions of affective/affiliative touch.
- Difficulties with self/other processing

Autism Spectrum Disorder

- Often have unusual perceptions of sensory stimuli e.g. sights and sounds
- Either a hyper-reactivity or hypo-reactivity to stimuli (or a combination of both).
- DSM-5 sub-criteria for diagnosis
- Unusual behaviours
- Di Martino's meta-analysis of fMRI's (2009) (hypo-activity). Ebisch (2011) (hypo-connectivity).
- Little empirical research on how *internal* stimuli is sensed and perceived.



Hence our research.....

- 74 adults with ASD (36 males, 38 females).
 - 128 controls (53 males, 174 females, 1 unspecified – age matched).
1. Body Awareness Questionnaire
 2. Thirst Awareness Scale
 3. Self-reported average non-alcoholic fluid consumption over a 24 hour period.



Body Awareness Questionnaire

- Limited to *aspects* of interoception only.
- Good for identifying subtle homeostatic cues.
- Reliable and valid.

- **Body Awareness Questionnaire** (Shields, Mallory & Simon, 1989)
- Instructions:
- Listed below are a number of statements regarding your sensitivity to normal, nonemotive body processes. For each statement, select a number from 1 to 7 that best describes how the statement describes you and place the number in the box to the right of the statement.
- Not at all true of me Very true of me
- 1 2 3 4 5 6 7
- 1. I notice differences in the way my body reacts to various foods.
- 2. I can always tell when I bump myself whether or not it will become a bruise.
- 3. I always know when I've exerted myself to the point where I'll be sore the next day.
- 4. I am always aware of changes in my energy level when I eat certain foods.
- 5. I know in advance when I'm getting the flu.
- 6. I know I'm running a fever without taking my temperature.
- 7. I can distinguish between tiredness because of hunger and tiredness because of lack of sleep.
- 8. I can accurately predict what time of day lack of sleep will catch up with me.
- 9. I am aware of a cycle in my activity level throughout the day.
- 10.* I don't notice seasonal rhythms and cycles in the way my body functions.
- 11. As soon as I wake up in the morning, I know how much energy I'll have during the day.
- 12. I can tell when I go to bed how well I will sleep that night.
- 13. I notice distinct body reactions when I am fatigued.
- 14. I notice specific body responses to changes in the weather.
- 15. I can predict how much sleep I will need at night in order to wake up refreshed.
- 16. When my exercise habits change, I can predict very accurately how that will affect my energy level.
- 17. There seems to be a "best" time for me to go to sleep at night.
- 18. I notice specific bodily reactions to being overhungry.

Thirst Awareness Scale (Fiene & Brownlow, 2015)

- I notice distinct body reactions when I am thirsty
- I notice specific body reactions when I am no longer thirsty
- I notice specific body reactions when I have drunk too much fluid.

Table 1**Means, 95% Confidence Intervals, Standard Deviations and Reliability Coefficients of BAQ Scores for Control Group and ASD Group, by Gender**

Group	Gender	M	CI	SD	α
Control	Male	87.57		17.27	
	Female	84.98		17.25	
Total Control^a		85.59	[83.35,87.84]	17.21	.90
ASD	Male	58.94		22.86	
	Female	64.76		22.33	
Total ASD^b		62.16	[56.94,67.38]	22.52	.90

Table 3**Means, 95% Confidence Intervals, Standard Deviations and Reliability Coefficients of TAS Scores for Control Group and ASD Group, by Gender**

Group	Gender	M	CI	SD	α
Control	Male	15.09		3.30	
	Female	14.22		3.70	
Total Control^a		14.42	[13.95,14.89]	3.62	.67
ASD	Male	10.08		5.27	
	Female	10.76		4.03	
Total ASD^b		10.43	[9.35,11.51]	4.65	.68

Findings:

Adults with ASD reported a clinically significant lower body and thirst awareness compared to the control group, and this was a large effect (BAQ; $d = -1.26$, $P < 0.001$; TAS; $d = -1.02$, $P < 0.001$).



Future directions

Working with the Brain and Mind Research Institute,
Sydney University.

- Meta-analysis of all case-control research
- Signal Detection?
- Signal Identification? (Asymbolia, dyssymbolia)
- Sensory Filtering/Sensory Integration?
- Exploring how these physiological processes may be contributing to behaviours we see in people with ASD.

Why? We need to ascertain to be able to eventually
target interventions.

References

ASPELL, J. E., HEYDRICH, L., MARILLIER, G., LAVANCHY, T., HERBELIN, B. & BLANKE, O. 2013. Turning body and self inside out: visualized heartbeats alter bodily self-consciousness and tactile perception. *Psychol Sci*, 24, 2445-53.

Couto B, Adolphi F, Sedeño L, Salles A, Canales-Johnson A, Alvarez-Abut P, Garcia-Cordero I, Pietto M, Bekinschtein T, Sigman M, Manes F and Ibanez A (2015) Disentangling interoception: insights from focal strokes affecting the perception of external and internal milieus. *Front. Psychol.* 6:503. doi: 10.3389/fpsyg.2015.00503

Craig, A. D. (2003). Interoception: The sense of the physiological condition of the body. *Current Opinion in Neurobiology*, 13, 500-505. doi:10.1016/s0959-4388(03)00090