A Decade of Uncovering Physiological Responses in ASD: What it Tells Us & Where to Go from Here

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<th>TITLE</th>
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<td>Respiratory sinus arrhythmia: A marker for positive social functioning and receptive language skills in children with autism spectrum disorders</td>
<td>186</td>
<td>2013</td>
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<td>MA Patriquin, A Scarpa, BH Friedman, SW Porges</td>
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<td>Developmental psychobiology 55 (2), 101-112</td>
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<td>Neuroanatomical and neurofunctional markers of social cognition in autism spectrum disorder</td>
<td>134</td>
<td>2016</td>
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<td>MA Patriquin, T DeRamus, LE Libero, A Laird, RK Kana</td>
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<td>Human brain mapping 37 (11), 3957-3978</td>
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<tr>
<td>The neurobiological mechanisms of generalized anxiety disorder and chronic stress</td>
<td>90</td>
<td>2017</td>
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<td>MA Patriquin, SJ Mathew</td>
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<td>Chronic Stress 1, 2470547017703993</td>
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Autonomic response in autism spectrum disorder: Relationship to social and cognitive functioning

Michelle A. Patritiun, Elizabeth M. Hartwig, Bruce H. Friedman, Stephen W. Porges, Angela Scarpa

Published: 03 July 2013

Relationship Between Respiratory Sinus Arrhythmia, Heart Period, and Caregiver-Reported Language and Cognitive Delays in Children with Autism Spectrum Disorders

Michelle A. Patritiun, Jill Lorenz, Angela Scarpa
The biopsychology of autism spectrum disorder: Theory, methods, and evidence

Bruce H. Friedman, Angela Scarpa, Michelle A. Patriquin
Evidence-based treatment and conceptualization of autism spectrum disorder: Emotion regulation, social impairment, and anxiety as targets

Michelle A. Patriquin, PhD, ABPP

The goal of this special issue is to highlight innovative evidence-based treatments and conceptualizations of emotion regulation difficulties, social impairment, and anxiety in autism spectrum disorder (ASD). The issue is organized into these three highly linked constructs. Targeting these constructs effectively will help to ensure positive outcomes for youth and adults with ASD. It is clear that continued research is needed that creatively addresses emotion regulation problems, social impairment, and anxiety in ASD. (Bulletin of the Menninger Clinic, 83[3], 199–204)
“Much of our time in the broader world is lived with a certain amount of fear. Day-to-day life in a world built for neurotypical people can be like walking in a minefield. There are a lot of social rules that we don’t understand, and tremendous consequences inflicted on us for violating them.”

-Ari Ne’eman, First Presidential Appointee with Autism
First description of ‘autistic’ disturbances by Leo Kanner (1943):

“Everything that is brought to the child from the outside, everything that changes his external or even internal environment, represents a dreaded intrusion”
The biopsychology of autism spectrum disorder: Theory, methods, and evidence

Brook, H., Friedmann, S., Angela, Giorgi, Michelle, A. Petrie

ASD. By developing an understanding of neurophysiological differences in ASD, it is our hope that researchers, teachers, parents, and peers can use this perspective to appreciate the internal challenges individuals with ASD face and therefore provide opportunities to better reach and support individuals with ASD.
FIGURE 1 Change over time in respiratory sinus arrhythmia (RSA) and heart period.
Repetitive Behaviors in ASD: Neurovisceral Integration

+ Heart + Brain = Happy Face

Condy et al. Biological Psychology (2019)
Repetitive Behaviors in ASD: Neurovisceral Integration

• Biological flexibility
  • Inflexible behaviors and cognition across ASD, OCD, and Tourette’s/tic disorder

• Inflexibility within central and peripheral nervous system may be related to poorer outcome

• More biological inflexibility will be related to more restricted and repetitive behaviors

Condy et al. *Biological Psychology* (2019)
Biological Flexibility & Potential Outcomes

Condy et al. Biological Psychology (2019)
Developmental Trajectory of Autonomic Function

Deficits in social engagement that emerge in ASD during the infant/toddler period may be related to emotion regulation and stress response growth.

Slower growth/development of RSA (HRV) compared to TD controls.

Differences in physiological regulation may develop with age in ASD.

Slowed HRV growth in ASD was most evident after 18 months – a time when symptoms become more prominent.

Developmental Trajectory of Autonomic Function

RSA = measure of functioning; biological and emotional/behavioral
RRB & Cardiovascular Activity

RRB & Cardiovascular Activity

• RRB core diagnostic feature

• Homeostatic regulation function?

• HR changes occur with both repetitive body rocking and hand flapping in children and young adults with ASD

• Repetitive behaviors have cardiovascular coupling that occurs

RRB & Cardiovascular Activity

Heathers et al. Biological Psychology (2019)
Synchronization of Physiological Response

- *Physiological linkage*: synchronization of physiological responses between interacting partners
  - Foundation for social reciprocity, a difficulty characteristic of ASD

Synchronization of Physiological Response

- Individuals with ASD do not show physiological linkages with their TD peers.

- Establish a novel way to examine the biology support relationship dynamics and one that does not rely on observation and increases temporal specificity.

- Adapting to others on a physiological level could impact social attunement and social relationships.

Less physiological activation

More physiological activation

Fewer emotional & behavioral difficulties

More emotional & behavioral difficulties

Relevant for ASD, as well as potentially other diagnoses (e.g., anxiety)

FIGURE 1. Potential novel treatments and treatment targets under investigation in autism. ASD, autism spectrum disorder; E/I, excitatory/inhibitory; RNAi, RNA interference.
Getting at the heart of autism

Cardiac activity could reveal autism's physiology and confirm a hunch many clinicians share: that people with autism experience great stress.
“If a man does not keep pace with his companions, perhaps it is because he hears a different drummer.” – Henry David Thoreau (1854/1908, p. 245)