

# Treating Trauma Master Series

## How Trauma Impacts the Major Brain Networks (and How This Affects Our Clients)

a Bonus Session with

Ruth Lanius, MD, PhD and Ruth Buczynski, PhD

National Institute for the Clinical  
Application of Behavioral Medicine





## Treating Trauma Master Series: Bonus Session with Ruth Lanius, MD, PhD

### How Trauma Impacts the Major Brain Networks (and How This Affects Our Clients)

**Dr. Buczynski:** One of the most devastating consequences of trauma is the way it can change someone's brain.

Now as we've heard in the series, trauma affects ALL areas of the brain.

But right now, we're going to do a deep dive on how trauma impacts the brain's three major networks: the **default mode network**, **the salience network**, and **the executive network**.

Let's start with the default mode network . . .

"The **default mode network** is the major resting state network of the brain."

**Dr. Lanius:** The **default mode network** is the major resting state network of the brain. So, when you're at rest, when you're just idling like a car in neutral, this is the brain network that's most active.

**Dr. Buczynski:** So even when it's at rest, the brain is still active. This makes trauma's impact on the default mode network even more important than we may have once thought.

So, to understand more clearly how trauma affects this specific brain network, let's dig deeper into its parts.

The default mode network is composed of three brain regions.

**Dr. Lanius:** One is called the **posterior singulate cortex** which is at the back of the brain, sort of in the middle. That's an area that helps us to figure out what's self-relevant or not.

Again, we can think about our trauma patients who often don't know what's self-relevant.

For example, if someone was raped in the forest and then goes back to a forest years later, they may think they're going to be raped again because they think the forest is self-relevant even though it isn't at all.

Then the second part of the default mode network is called **the dorsal medial prefrontal cortex** and that's an area of the brain at the front in the middle.

"The **dorsal medial prefrontal cortex** helps us to know what we feel and figure out what's going on emotionally inside."

That's an area of the brain that really helps us to know what we feel. It helps us to know our internal emotional life, so really to figure out what's going on emotionally inside.

Again, when we think about our trauma clients, they have great difficulty from that, doing that. They're very much disconnected from their internal emotional life.

Then the third area of the brain that's part of the default mode network is in the **lateral parietal cortex**. That part of the brain really allows us to have an embodied sense of ourselves in space.

“Our traumatized clients don't know where their body starts and where their body ends.”

Again, when we think about our traumatized clients, often they don't know where their body starts and where their body ends. They're so disconnected from their own body and how their body relates to the environment.

**Dr. Buczynski:** These three parts are most active when the brain is at rest. When the brain is engaged in thinking or planning, these three areas quiet down.

And when someone experiences trauma early in life, these three areas get so disrupted that they don't connect at all. This disconnect often has major implications for some of our clients.

**Dr. Lanius:** So, one thought is that the disruption in the default mode network may be very important in the disruption of the sense of self often seen as a result of trauma.

**Dr. Buczynski:** Ruth and her colleagues hypothesize that this brain network may give us a window into a client's sense of self.

“When trauma disconnects these three areas, it can have a significant impact on how our clients understand themselves.”

When trauma disconnects this network, it can have a significant impact on how our clients understand themselves.

**Dr. Lanius:** The whole function of this network is engaging in self-reflective functions – so, figuring out what's self-relevant and knowing our internal emotional life. It really reflects the fact that our patients aren't able to do this very often.

If you don't know what you're experiencing emotionally, if you're disconnected from your body, if you don't know where your body begins or ends, if you can't recall memories appropriately, if you can't look into the future, your sense of self is going to be very much affected.

We know that trauma very much affects the sense of self.

**Dr. Buczynski:** To get a better read on just how much trauma impacts the default mode network, Ruth and her colleagues looked into how this brain system develops in the first place.

So perhaps the first thing to note is that it develops over time and it isn't fully developed until late adolescence.

The second thing to note is - what does this network look like in an adult who experienced trauma in childhood?

**Dr. Lanius:** What we found was that the default network of chronically traumatized people in childhood actually looks like the default network of a 7-9-year-old. It's possible that chronic childhood trauma and abuse really affects the development of this network.

**Dr. Buczynski:** So, trauma can damage the default mode network significantly. And this can give rise to a number of difficulties for anyone who's experienced childhood trauma.

Let's look at two issues in particular . . .

**Dr. Lanius:** Emotions at the time of trauma were useless. It didn't matter whether they wanted to run away or whether they were angry and wanted to fight. Those emotions were useless, so they disconnected really from their inner emotional life.

“Emotions at the time of trauma were useless, so they disconnected really from their inner emotional life.”

This is reflected in the disconnection of the default mode network. That's one area of disruption.

The second difficulty is really recalling past memories – past autobiographical memories, memories of yourself.

The third area of difficulty is future-oriented thinking – not being able to see yourself in the future.

**Dr. Buczynski:** Overall, these disruptions can wreak havoc on a person's ability to build a sense of self.

**Dr. Lanius:** Having a sense of self really depends on seeing yourself in context with the past and with the future. The default mode network

“Trauma can wreak havoc on a person's ability to build a sense of self.”

is also very important in recalling memories of your life and looking into the future.

Not having the proper connections in the default mode network really prevents you from seeing yourself in

“In order to have a strong sense of self rooted in the present, you have to see yourself in the context with the past and future.”

context with the past and with the future. It affects higher areas of consciousness and your sense of self. Because in order to have a strong sense of self rooted in the present, you really have to see yourself in the context with the past and with the future.

**Dr. Buczynski:** Okay, so now that we've covered the default mode network in depth, let's move on to the executive network. Like the default mode, this network is also adversely impacted by trauma.

**Dr. Lanius:** The **central executive network** is in the upper part of the brain and it contains the front part of the brain and the parietal cortex part of the brain. It's an area of the brain that's absolutely critical in helping us think and plan.

It's really important in short term memories – remembering phone numbers or names. It's also really important in helping us sustain attention, and really focus on something.

**Dr. Buczynski:** So, what does damage to the central executive network look like in our traumatized clients?

**Dr. Lanius:** They can't sustain attention; they have huge difficulties with short-term memory and planning is often difficult for them as well.

The more a person dissociates or zones out and is not present, the less able to function that central executive network seems to be.

“Our traumatized clients can't sustain attention.”

**Dr. Buczynski:** So what can we do to determine if our client has problems with their central executive network?

**Dr. Lanius** I think that's something to be aware of when we take a history – how much is the person dissociating?

Ask them, "Do you lose chunks of time? Do you zone out? Do you have difficulty being in the present?" Then ask them about central executive network functions such as, "How's your short-term memory? How's your ability to focus? How's your ability to plan?"

**Dr. Buczynski:** Now finally, the third network of the brain is the salience network.

**Dr. Lanius:** The **salience network** is a really important network in the brain that helps us figure out what's most important – both in the environment and internally.

That helps us to guide our behavior.

For example – if I decide what's most important right now is that there's a guy standing there that's about to break into my house, all my behaviors will be guided towards getting myself into safety.

The salience network is really important in that.

It includes the amygdala which is part of the emotional part of the brain. It also includes the anterior singular cortex that modulates heart rate responses and also figures out whether there are errors that we have to sort out. The insula is also part of the salience network and that part of the brain really helps us to be aware of what we feel inside.

**Dr. Buczynski:** When a person experiences trauma, the salience network goes offline. And that can happen in two different ways.

**Dr. Lanius:** When we're really hyper-aroused and really hyper vigilant, the salience network can actually be

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overactive, but the salience can also be underactive. When we disconnect and when we numb out, the salience network can actually be underactive.

**Dr. Buczynski:** So our task is often to balance this network and find the client’s optimum window of tolerance- where our client isn’t too revved up or too dulled down.

Ruth has experience with this in her own work. Here, she shares the story of a client whose salience network was way out of balance.

**Dr. Lanius:** For example, I had a person once who was always hyper vigilant. She always thought, at any second, she would be attacked. Her salience network was going crazy because she was incredibly hyper-vigilant to the point of being paranoid.

But as we discovered – she didn't disclose this right away – her perpetrator was still very much in her life. The perpetrator was her father. He was coming to her house, driving by, dropping things off. At first, she was too

ashamed to disclose this.

**Dr. Buczynski:** Once the client shared that the threat was still very real for her, Ruth was able to help her explore ways to create more safety.

**Dr. Lanius:** Once she was able to disclose that this was still happening in her life, we developed some plans that could help resolve this issue.

One was putting a restraining order against her past perpetrator. She was able to do that. It took, obviously, a number of months because she had this victim/perpetrator relationship with her father.

Knowing that if he were to come by her house, he would be arrested – you could see her level of hyper-vigilance, and her salience network, relax and calm down. Her whole life situation now had changed. She no longer needed to be hyper-vigilant all the time because he was no longer in her life.

**Dr. Buczynski:** After taking steps to exercise control, Ruth's client was able to begin restoring the broken connections in the salience network - that part of her brain that's involved in understanding her environment and her behavior.

So - the default mode network, the executive network, and the salience network - we've now seen how trauma impacts all three of these brain systems.

But we've also looked at some effective ways to work with the damage.

So I hope you've heard something here that's useful, and that you can use in your work with clients.

Thanks for watching.



## About the Speakers . . .

**Ruth Lanius, MD, PhD** is a professor of Psychiatry and the director of the PTSD Research Unit at the University of Western Ontario. She established the Traumatic Stress Service and the Traumatic Stress Service Workplace Program, both specializing in the treatment and research of PTSD and related comorbid disorders. She currently holds the Harris-Woodman Chair in Mind/Body Medicine at the Schulich School of Medicine and Dentistry at the University of Western Ontario.

She has authored more than 100 published papers and chapters in the field of traumatic stress, regularly lectures on the topic of PTSD nationally and internationally, and has published *Healing the Traumatized Self: Consciousness, Neuroscience, Treatment*, together with Paul Frewen.



**Ruth Buczynski, PhD** has been combining her commitment to mind/body medicine with a savvy

business model since 1989. As the founder and president of the *National Institute for the Clinical Application of Behavioral Medicine*, she's been a leader in bringing innovative training and professional development programs to thousands of health and mental health care practitioners throughout the world.

Ruth has successfully sponsored distance-learning programs, teleseminars, and annual conferences for over 20 years. Now she's expanded into the 'cloud,' where she's developed intelligent and thoughtfully researched webinars that continue to grow exponentially.

