The Neuroscience of Psychotherapy

A Teleseminar Session with
Louis Cozolino, PhD
and Ruth Buczynski, PhD

The National Institute for
the Clinical Application of
Behavioral Medicine

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A complete transcript of a Teleseminar Session
featuring Louis Cozolino, PhD and conducted by Ruth Buczynski, PhD of NICABM

The Neuroscience of Psychotherapy

with Dr. Ruth Buczynski and Dr. Louis Cozolino

Ruth Buczynski: Hello everyone. I'd like to get started, but first I'd like to welcome everyone on the call tonight.

I'm Dr. Ruth Buczynski, president and co-founder of the National Institute for the Clinical Application of Behavioral Medicine. We would like to welcome you to our sixth and final call on our series on *The New Brain Science-Compelling Insights for State of the Art Practice.*

It's been a great series and tonight we'll be focusing on the application of many of the things we've talked about. We're specifically going to look at the application of neuroscience to psychotherapy.

My guest tonight is Dr. Louis Cozolino. He's a clinical psychologist in Los Angeles and professor of psychology at Pepperdine University, and an adjunct clinical professor of psychiatry at UCLA. He's the author of several wonderful books…*The Neuroscience of Psychotherapy, The Making of a Therapist, The Neuroscience of Human Relationships*, and other texts on the aging brain… Lou, welcome to the call.

Dr. Cozolino: Thank you Ruth. It's good to be with you.

Dr. Buczynski: It's good to talk with you again. We've got to dive right in because we have a very packed agenda. I'd like to get started by focusing on the social brain. Why do you consider the brain to be a social organ?

The Social Brain

Dr. Cozolino: Well, primarily the brain is an organ that has evolved, especially in humans, as well as other animals such as dogs, primates, whales, elephants, etc. There are certain animals where evolution has taken their brains to be more and more connected to other brains in their species, and so I think of brains as social organs. I also think pretty much the way the old systems theorists, such as Marie Bowen, thought. They thought of people as being parts of larger systems.

Dr. Buczynski: Let's talk a little bit about how experience actually becomes neurostructure.

Dr. Cozolino: One of the things I always ask is *how does love become flesh*. In other words, how do early relationships shape the brain?

We learn more and more everyday about this process called *epigenetics*. Epigenetics is the impact of experience on how our DNA gets activated, and becomes used as template to be able to generate protein structures that become parts of our brains.

"Through epigenetic processes, the experiences we have determine which genes are turned on or off, and which ones are used as templates for protein construction."

Through epigenetic processes, the experiences we have determine which genes are turned on or off, and which ones are used as templates for protein construction. Those protein structures end up becoming structures of our neural systems, or our neurons, and the neural networks throughout our brains. So when we're having a relationship, especially when we're raising children, the way we respond and are responded to become translated through epigenetics into the actual structure of our brains.

Dr. Buczynski: Let's talk a little about maternal nurturing and how that fits into brain development. I know you have some thoughts on rats and some of what we watch when we see maternal care and what it has been shown to do.

Dr. Cozolino: Well, I think we know a lot about how the brain develops early in life because of rats. Their brains are similar to ours, although nowhere near as complex.

The mothers behave in all sorts of ways that are very maternal: they nurse, they lick, and they retrieve their babies when they roll out of the nest or wander away. They have behaviors that are parallel to what human mothers do in less sophisticated forms.

What we find is the more attention a pup receives, the more likely their brains are stimulated to grow in a manner which enhances their well being and their ability to tolerate stress.

"The more attention a pup receives, the more likely their brains are stimulated to grow in a manner which enhances their well being and their ability to tolerate stress."

We also find that having a baby, not only giving birth, but raising a child changes the brains of mother rats in ways that allow them to be more attentive, to find more food, and to be more present and available for their young. Relationships stimulate everyone's brain, including the mother. It changes the mother's brain as well.

Dr. Buczynski: I think I read that you were even talking about how maternal care actually enhances metabolism.

"Relationships stimulate everyone's brain."

Dr. Cozolino: In humans we've seen that stimulating eye to eye contact… peek-a-boo, for example, a very popular activity for parents and their small children… the eyes are very powerful stimulators of brain activity because they're a main source of information intake in humans.

Those reciprocal interactions, where the baby smiles and the mother smiles, go back and forth. And as they have these escalating emotions and crescendos, that actually stimulates the metabolic processes in the brain that allow for more growth and development, not just in the brain, but in the entire body.

The opposite of this we see in children who were abandoned and neglected. Their behaviors get curtailed, and their brain development and body growth in a sense goes into hibernation.

If you look at the brains of children who are three years old, some of whom are neglected and some of whom are from more natural or healthy environments, the (brains of those in a less nurturing environment) can be up to half the size of children who develop in reciprocal and stimulating environments.

"The (brains of those in a less nurturing environment) can be up to half the size of children who develop in reciprocal and stimulating environments."

It's another piece that goes back to your first question of the brain being a social organ. Just like individual neurons: if you don't simulate a neuron and it doesn't connect with other neurons, it withers, dies, is cleaned away. That same process, I think, and is also true for humans: If we don't connect or have relationships, we start to atrophy.

Dr. Buczynski: There was another idea I thought was interesting in your book. You have some thoughts about the compromises or short comings in the brain.

Dr. Cozolino: There are lots of them. The brain is an incredible evolutionary accomplishment on the one hand, but it has a number of things that have evolved over hundreds of years that make us very vulnerable to psychological stress.

"If we don't connect or have relationships, we start to atrophy."

There's a metaphor that I like to use. We have a brain that's similar to taking a very cheap and small economy car, and putting a race car engine in it.

And the metaphor is that the race car engine would be our cortex. So what we have is a definite mismatch between these primitive parts of our brain that we share with reptiles and lower mammals and this incredible, highly evolved cortex…that is…very much mismatched.

"We have a brain that's similar to taking a very cheap and small economy car, and putting a race car engine in it."

One of most interesting phenomena to me is that one of the things that happens when we're traumatized is that we tend to decrease our ability to produce language, and research has shown that people with post-traumatic stress are in a highly aroused state.

What you find is there's an actual inhibition of Broca's area in the left hemisphere. Broca's area is the area where semantic language is generated. This is just a hypothesis because we can't go back in time and chart evolution, but my thought about this is that it's just like the startle response, where we freeze to avoid detection until we figure out where danger is coming from.

As we evolved the cortex and the possibility of language, one of the things that was conserved and moved forward up into the cortex was the inhibition of language under high levels of stress.

"People can survive just about anything if they're connected with other people and they're able to talk it through."

That makes sense when you think historically into the future. It was, perhaps, evolution's best guess as to how to keep the organism safe. Frozen silence was a way that had worked for so many years. As we see now, what happens with trauma is that one of the things that we need to do is stay conscious, aware, and to talk through what's going on with us in connection with other people.

People can survive just about anything if they're connected with other people and they're able to talk it through and discuss it. What happens in trauma, especially with children who are traumatized by caretakers and were told not to say anything to anyone, is that there's a dissociation that occurs and it continues into adulthood and can continue throughout life.

Just this one evolutionary conservation of the inhibition of sound becomes the inhibition of language, but now we so much depend on language to keep our brains integrated—to keep emotion and cognition integrated—that in the absence of language, people that are traumatized and dissociated really suffer, and that suffering can go on throughout their entire lives.

"In the absence of language, people that are traumatized and dissociated really suffer, and that suffering can go on throughout their entire lives."

Dr. Buczynski: And Lou, just before we go on, what are some of the other compromises and short comings?

Dr. Cozolino: Another important one is the fact that we have two hemispheres that are quite diverse. For many animals, both hemispheres are identical; they take turns sleeping, waking, and handling things.

"In order to get more complex functioning, the human cortex is really differentiated."

In order to get more complex functioning, the human cortex is really differentiated. We have two cortices. The right hemisphere is more connected with the body and emotion, and the left hemisphere controls more of the semantic processing and linear thought and our social presentations.

They are very vulnerable for dissociation. We can develop splits between our inner and outer world because these two hemispheres, capable of their own consciousness, diverge and inhibit each other. In a sense, it's another form of dissociation.

Another thing is that we have two systems of learning. One system of learning is the more primitive system and is our fear circuitry. The fear circuitry is geared toward protecting us—never forgetting anything negative that happened, holding on to that information, and generalizing it to other situations.

If we become frightened in a particular situation, our brains are likely to generalize to similar or past situations, which is why we so often see a panic attack or a phobic reaction expand to a generalized anxiety, or people who begin by having a panic attack outside of the house and then can't leave their house, or can't stop washing their hands.

"The bias of the brain is to never forget negative things, and new learning is much more fragile."

The bias of the brain is to never forget negative things, and new learning is much more fragile. We don't experience new learning with as much power as the primitive systems get activated with fear.

Dr. Buczynski: We'll talk more about learning in just a little bit. I also read in your book about the damaging effects of stress hormones.

Dr. Cozolino: Cortisol is the main stress hormone. It's designed evolutionarily to get secreted in highly stressful situations. It stops protein synthesis and it gears us up as part of the fight or flight reaction in the moment.

For animals in nature, the predator appears and the prey is either eaten or escapes—either way the problem is over. It's a rapid onset and the body mobilizes for that, safety is achieved, and then the body goes back to resting state. The stress hormones come and go.

Because the cortex is so complex, we've been able to not only create a stressful society to live in, but we're also capable of being afraid of things happening, and even things that can't happen and aren't even going to happen. The primitive brain doesn't know the difference.

All of our stressing about things, even if they're silly things, results in the secretion of stress hormones. Our brains are bathing in these things that are catabolic, which means they break down protein, and stop protein synthesis, and that breaks down the brain.

"All of our stressing about things, even if they're silly things, results in the secretion of stress hormones."

If you stop protein synthesis, you stop brain growth and immunological functioning. Our immunological system depends on the construction of proteins into things like killer cells and T cells. So, that's another really bad design flaw in how the brain is organized right now.

Dr. Buczynski: Let's move on into the psychotherapist as neuroscientist. Certainly when I was trained, that isn't something that was discussed at all, and yet I think it's a really important concept. In terms of neuroscience, where is psychotherapy successful?

The Psychotherapist as Neuroscientist

Dr. Cozolino: I think most generally, psychotherapy is a learning experience. You go to therapy expecting to change some thing about your life, your thinking, or your feeling that's dysfunctional. It's successful when you change, and change is possible only if there's some type of neuroplasticity.

"Therapy is successful to the degree that therapists are able to create an experience that results in neuroplasticity."

We have to assume in order for change to occur, something about the brain has to change. Therapy is successful to the degree that therapists are able to create an experience that results in neuroplasticity, which is why it's easy for me to conceive of psychotherapists as neuroscientists.

I think it's the humanity that's the active ingredient in the treatment, but I think if you look under the surface, scientifically what's happening is that you're actually stimulating neuroplasticity.

"Plasticity is a very general term. It's basically used now to apply to all the ways in which the brain is flexible and can process information in different ways."

Dr. Buczynski: That leads me right into my next question, which is a model for possible neurobiological mechanisms underling how people change. Is that neuroplasticity that we think of when we're thinking about people changing in a neurobiological way?

Dr. Cozolino: Well, plasticity is a very general term. It's basically used now to apply to all the ways in which the brain is flexible and can process information in different ways.

We can think in terms of stimulating new neurons, helping existing neurons to grow and branch out and connect, and also having existing neural systems connect with each other in new and creative ways that support mental health.

"Brains evolve to connect and learn from one another. It's not an accident that therapy developed as relationship based."

The next question would be how does it happen and how do you trigger those mechanisms? I think the most important element in psychotherapy is the relationship and I think that's what I get from most of the psychotherapy outcome literature.

Why is the relationship so important? I think it goes back to the first question you asked me, Ruth. The brain is a social organ. Brains evolve to connect and learn from one another. It's not an accident that therapy developed as relationship based.

I don't think it's something you can do by letting someone read general notes on a blackboard. Its idiographic, it's special and specific, and it works to the individual person. It's just like as we talked about with the mother rats: there's an element of psychotherapy that really is a re-creation of a bonding relationship.

"There's an element of psychotherapy that really is a re-creation of a bonding relationship."

There's a stimulation of metabolic processing, and there's probably activation through epigenetics of the client's brain being stimulated to grow in the context of a safe relationship. I think that is a key component of it.

"The brain only has the optimal place or sweet spot of plasticity at moderate ranges of arousal."

Another component related to that is that the brain only has the optimal place or sweet spot of plasticity at moderate ranges of arousal. At low levels of arousal, interest, or motivation, the brain shuts down because it takes a lot of metabolic energy to learn.

At very high levels of arousal when people are terrified or frightened, they don't learn because of their high cortisol and high levels of protein synthesis, and really it's a fight-flight mode. This isn't the time to learn. It's the time to fight or get the heck out of here.

Experimental researchers a long time ago thought, when training rats to go through a maze, that the more stress you gave a rat, the better it would learn. They were surprised to find that at low and high levels they didn't learn very well. It was in that sweet spot—the moderate level of arousal, and now we have a lot of neurochemistry to back that up.

We see that the neuronal growth hormones and a lot of the processes that stimulate plasticity turn off at low levels, turn on moderate levels, and turn off again at high levels. What therapists do instinctively, and I think every good teacher or parent does, is when they're trying to teach something, they try to create an experience with that level of balance and support. That's what therapists are doing and that's what educators do.

And underneath the surface, what you'll notice intuitively is that it's all reflective of the underlying neurochemistry. That's where people learn. And I think therapists use the caring relationship as a way to modulate arousal. On the one hand, you support your client, and on the other hand, you challenge them.

"We see that the neuronal growth hormones and a lot of the processes that stimulate plasticity turn off at low levels, turn on moderate levels, and turn off again at high levels."

You're pushing them into arousal by making interpretations or challenging them, but with your presence and the dosing of interpretations and balancing with support, you're using your intuition and your resonance with the client in that way to figure out how to keep them in that sweet spot.

Dr. Buczynski: You refer to the dosing of interpretations which would come from practitioners' operating out of a psychodynamic perspective, but really if you think of a takeaway from what you're saying, it would be in managing the experience or environment for the patient, making sure it's not too stimulating, but that it's not so safe that learning isn't taking place.

Dr. Cozolino: Right. I can't imagine a form of treatment, everything from psychoanalysis to equine therapy to sensory integration, where the practitioner doesn't have some practical sense of how to modulate that for the person they're working with. My perspective doesn't at all rest on a psychoanalytic or a psychodynamic form of treatment. This is true for any form of treatment.

Dr. Buczynski: We'll get more into clinical application toward the end of our call. I'd like to lay a little bit more foundation and talk about mirror neurons.

How the Cultivation of Neuroplasticity is Essential for Psychotherapy

Dr. Cozolino: Mirror neurons are neurons that are found in areas of the frontal lobes and the parietal lobes that become active when we're watching someone else do something or engage in some behavior, and then we engage in those behaviors ourselves.

Mirror neurons link our sensory systems with our motor systems. I think evolutionarily the purpose in this was as we're watching someone do something, the motor areas of our brains are actually practicing what it is we're watching. It creates an internal working model of what we're watching. And it's a wonderful way to explain one-trial learning, which baffled behaviorists for seventy-five years.

That's the bedrock of mirror neuron research—the connection between sensory and motor processing. As time has gone by, both theoretically and with some research, we find these same types of neurons not only linked to our sensory and our motor regions, but also linked to our sensory with the biserial and emotional regions of our brain.

"Mirror neurons link our sensory systems with our motor systems."

The first examples were if we're watching someone else peel a banana. We have mirror neurons that fire specifically when the hand is peeling the banana at a certain angle because in our brain, we're learning how to peel that banana.

Say for instance, we're looking at someone who is hungry or in pain; we have the sensory and the motor experiences of that, but also other parts of our brain like the cingulate and other areas having to do with emotion and biserial feelings get activated as well.

"Mirror neurons lay down an internal representation within our brains, and maybe even our bodies of what we're seeing other people doing."

I guess the broadest explanation of it is that mirror neurons lay down an internal representation within our brains, and maybe even our bodies of what we're seeing other people doing.

Dr. Buczynski: Essentially you're saying that cultivating neuroplasticity is essential for psychotherapy?

Dr. Cozolino: Yes… any form of education.

Dr. Buczynski: Okay, let's talk about the opposite. Let's talk about thwarted neural growth. Is that a way of describing mental illness?

Why Thwarted Neural Growth is Another Way of Describing Mental Illness?

Dr. Cozolino: Well, I think you can look at mental illness in lots of ways. The way that DSM does is by observing and listing symptoms.

I think from a neuroscientific perspective, during development, hundreds of systems have to develop adequately, and they also have to integrate with one another in a seamless way and in a sense, the brain functioning has to become invisible to us so that we can be conscious of our environment, connect with other people, and in another sense be completely unconscious to the fact that our brains even exist. Those are all accomplishments of a normal brain.

One way to look at mental distress or mental illnesses is that one or more systems don't develop adequately and/or there's a lack of integration between some subset of symptoms or systems that make people experience life in different ways or behave in different ways.

For example, one of the things that happens is that the right and left hemispheres have their developmental periods. The right hemisphere has a critical period during the first year and a half, and they go back and forth during development and it seems they even out around ten to twelve years old.

"A proper mood requires a proper development and balance of both left and right prefrontal regions."

We know that in order to have a balanced mood, both the right and left hemispheres have to be actively involved in an equal or democratic way and reciprocally balance each other.

If you have too much activation of the right side of the prefrontal cortex for example, you'll have an over-abundance of depression and shame. If you have too much activation of the left side of the prefrontal cortex, you'll tend to have euphoria, mania, etc. A proper mood requires a proper development and balance of both left and right prefrontal regions.

Dr. Buczynski: What affects that activation on the left or right side? You said if you had too much activation, but what kind of things or environments affect that?

Dr. Cozolino: I think for example, during the first year and a half, one of the major goals of the brain is to link with the people in our lives: the mothers, fathers, or caretakers. And so we're developing our attachment schemes during that first year and a half or two years.

Connected with that is emotional regulation because attachment really is a use of proximity to regulate fear. We move toward and away from our caretakers to help make ourselves feel calm.

Another aspect of that is having the experience of caretakers caring for us, which then evolves into our self- esteem. The opposite of that is shame.

One of the things that happens to a lot of the people I work with in psychotherapy is that they get some message within those first couple of years or later that they're not valued. That seems to develop the right hemisphere in a way that shame and negativity seem to become predominate.

When it's the left hemisphere's turn to grow, get connected with other people and develop positive coping strategies, the shame and negativity force those aspects of brain functioning. So with children early on, if there's a lot of shame or sadness present, the development of their brain will skew in this right biased way.

"With children early on, if there's a lot of shame or sadness present, they become more focused on these negative internal states, or low self-esteem, and that shapes their development."

They become more focused on these negative internal states, or low self-esteem, and that shapes their development. Also interesting, it makes them a lot more vulnerable to paranormal beliefs and paranormal thinking. So there's this connectivity to primary process or dream states, in combination with the fact that they're less successful socially out in the world. So they retreat more to this early stage of development of magical thinking.

Dr. Buczynski: Let's get into psychotherapy and how it targets the activation and integration of neural networks.

How Psychotherapy Targets the Activation and Integration of Neural Networks

Dr. Cozolino: One of the ways in which psychotherapy works is against the dissociation of emotion and cognition, or against the dissociation between more left hemisphere and right hemisphere by its neural networks.

And I think the therapist intuitively senses whether a client is much more in their head versus in their emotions or their bodies. We try to create experiments with them where we stimulate them to either feel more or think more; we do that in a sense, to simultaneously activate both sets of networks, and to integrate them eventually, and I think that's a key element to psychotherapy.

Another element is co-creating a narrative or story about the client's life, about psychotherapy, about what mental health and mental illness are, and how the client can work in their own life to keep themselves on a steady course and improve their lives.

I think most clients who come out of therapy and have a positive experience and result have those narratives. They also have the inner-voice of their therapist, and they've embodied the experiences they've had.

"Most clients who come out of therapy and have a positive experience have those narratives. They also have the inner voice of their therapist..."

I think that's a key element of cognition and emotion, the integration of those two, and the memory of the relationship they've had with the therapist. All of those things stimulate plasticity, and if it's done well, will generate outside of therapy and into the future.

Dr. Buczynski: We're reading a lot nowadays about the hippocampus and how important that is. Can you lay out some of the information about the hippocampus; where it is, what it does…

Why the Hippocampus is so Important

Dr. Cozolino: The hippocampus is a primitive structure, and it's similar to the same structure in rats. It's located in the medial temporal area, and it's a fascinating structure. In animals, it contains a map of the environment.

"The hippocampus is very vulnerable to cortisol and to stress hormones. Anybody with a lot of stress has a significantly decreased hippocampal volume."

It's the same thing with humans. Research has shown that London and New York cab drivers have significantly larger hippocampi because they need a map and they use it more. That's a key element

throughout evolution that the hippocampus performs.

Another thing that the hippocampus is in charge of is new learning. The information that comes into the brain has to go through the hippocampus to get consolidated. It resonates in there for a couple of weeks, and if it stays in there long enough and it's important enough, the memory then gets distributed to long-term memory, which is then distributed throughout the cortex and throughout the brain.

If you have damage to the hippocampus, it will result in retrograde amnesia where you can't remember anything new having to do with episodes. You can learn procedural skills such as playing tennis or riding a bicycle, but you wouldn't remember having learned it.

"The hippocampus contains a map of the environment and is in charge of new learning."

So, you wouldn't remember the conscious narrative, but there are other memory systems that are in charge of physical movement and skill learning that are separate and don't require the hippocampus. But without the hippocampus, you won't remember ever learning it. Kind of like for many of us, if you learned how to ride a bicycle when you were three or four. You may not remember the experience of riding it, but your body is able to ride a bicycle.

Those are the two main things. Another thing about the hippocampus, too, is that it's very vulnerable to cortisol and to stress hormones. Anybody with a lot of stress has a significantly decreased hippocampal volume.

Manic depressives, schizophrenics, people that were abused in childhood, people with borderline pathology, anybody that lives with a lot of stress is going to have high levels of cortisol and a smaller hippocampus because it's so sensitive.

Dr. Buczynski: Somewhere in your book you were talking about hippocampal versus amygdale learning states.

How to Bias the Brain in Favor of Hippocampal vs Amygdala Learning States

Dr. Cozolino: As I said, the hippocampus is involved with new learning; the amygdale is as well. The amygdale is more involved with traumatic learning. You can think in terms

of the hippocampus being more connected with the cortex, and the amygdale is more involved with more primitive and subcortical brain regions.

"The amygdala is very happy letting the cortex and the hippocampus run things as long as there's no danger."

As I see it, the amygdala is very happy letting the cortex and the hippocampus run things as long as there's no danger. But when the amygdale detects danger, whether it be real, imagined, generated from the external environment, memory, or from the unconscious, it becomes activated, and the amygdala takes over.

We devolve from a human state to more of a reptilian or primitive mammal state where we're reacting based on our fear. Our cortex, Broca's area, language, and logic get shorted out.

I've had those moments as well where I've been so scared that I was frozen and didn't know what to do, or I acted in ways that were dumb in retrospect, but at the moment, I was acting out of reflex.

Dr. Buczynski: Right. You react in ways that aren't particularly helpful…out of complete fear…

Dr. Cozolino: Right. And in retrospect, you say, I know how to deal with this, why didn't I do that? I think the answer to that is that in a sense, your cortex wasn't engaged and you didn't have access to that information.

"You're using your cortex to sooth your amygdale, to keep yourself in as moderate a level of arousal as you can so that the amygdala doesn't short out the hippocampus and you start running around like a reptile."

Dr. Buczynski: So it would make sense that we might conceptualize it as if we're trying to bias the brain in favor of hippocampal learning versus amygdala learning.

Dr. Cozolino: Absolutely. I think that's a great way to put it.

Dr. Buczynski: Thank you. I think I copped that from you. So, if we conceptualize that as one of the things that we're trying to do in our treatment, how might we do that?

Dr. Cozolino: Well, I think in terms of what we've said already—the quality of the relationship, the soothing nature of the connection is one way to down regulate arousal.

Therapists really want to be amygdala whisperers, and so do all of us. We want to be able to be conscious of our amygdala activation and say don't worry, everything will be fine.

In other words, that's what a good enough mother is, and that's what a good enough mother is when we internalize it. This is kind of scary, this is going to be a challenge, but we will get through it and we will survive.

And so you're using your cortex to sooth your amygdale, to keep yourself in as moderate a level of arousal as you can so that the amygdala doesn't short out the hippocampus and you start running around like a reptile.

That's really the internalization. A lot of what happens in cognitive behavioral therapy, for example, is looking at your catastrophizing thoughts…all of those reflexes that go from zero to one hundred emotionally and you develop new language, skills, and new ways of thinking about them.

A real basic thing when you're working with someone with panic disorder, is when they start to get tensed and aroused and start to hyperventilate, you just have them imagine blowing on soup in a spoon, but not too hard so that it blows the soup out of the spoon.

This slows down their breathing and it decreases their oxidization, and it helps the body slow down. There are all sorts of skills and devices that can be used. Counting to ten is another example. You're using the cortex to deactivate yourself so that you can stay in your mind and not become a reptile.

Dr. Buczynski: Also we want to keep in mind the whole Yerkes - Dodson learning curve…having a moderate state of arousal as the best way to make an optimal learning environment.

Dr. Cozolino: Sure. We want to quiet the amygdala, and activate the hippocampus and our cortical areas. This is what meditation is about, and it's all about getting into that sweet spot where we can experience, feel, and learn.

"We want to quiet the amygdala, and activate the hippocampus and our cortical areas. This is what meditation is all about. "

Dr. Buczynski: Now another thing that I think you touched on and I thought it was really important was when you were talking about working against the ability of one hemisphere inhibiting the other by stressing the integration - when one hemisphere has been over-learned to the detriment of the other hemisphere.

Dr. Cozolino: Right. I think we have these two hemispheres that evolved in diverse directions and for the most part, the socially desirable thing to do is to have the left hemisphere inhibit the right hemisphere. But you can also get too good at that.

"You forget you're a person and you experience yourself as a machine going through the motions. "

In society, men are reinforced for not feeling either because they go to war, or they play sports, and they get rewarded for working all the time and not being aware of their feelings, or not letting their feelings get in the way.

You have all of these natural biological processes interacting with different social biases that lead us to get more and more out of touch with a balance of the external and the internal emotions and thinking and we forget that we have a heart and that we're in a body and that we're connected to one another.

We forget that we're social and we start experiencing ourselves as individuals fighting for survival.

"You have all of these natural biological processes interaction with different social biases that lead us to get more and more out of touch...we forget that we have a heart and that we're connected to one another."

I think about the higher level psychotherapy engagement which is, in my mind, very similar to a sort of spiritual path where you remember who you are in a deep way, and remember who you are laterally in connection with other people, and as they say in yoga, keep breathing and keep remembering who you are and try to stay mindful.

It was once said that the biggest challenge to the expansion of consciousness is simply remembering that you have a consciousness because the brain is geared to getting all wrapped up in the environment and doing one thing after another to survive, that you forget you're you. You forget you're a person and you experience yourself as a machine going through the motions.

Dr. Buczynski: A machine getting better and better, and performing more and more. Let's focus just a little bit on the maturing brain and how the brain changes as it matures.

The Maturing Brain

Dr. Cozolino: Well, certainly most of the knowledge we have about the brain as it matures has to do with the development of dementia because that's where most of the research money goes.

When I started to write my book, *The Healthy Aging Brain*, I wanted to understand what happens to healthy brains and what should happen to healthy brains. The perspective I took was thinking about the brain again as a social organ in a tribe of people through most of evolutionary history.

I pictured the brain going through different phases, similar to in Indian culture where you're a child, you're a student, you're a house holder, and then you're a wanderer… As in that last stage of life, you give up everything and you go to the woods to reflect and basically prepare for the next life.

"I think what we've got is this lock and key mechanism for the transmission of oral culture across generations. "

I was thinking of natural phases through life and how might the brain change.

What the available information did show me was that at around twenty years or so, we see that the brain is optimized for rapid responses based on partial information: to act, to be energetic, and to not be concerned with doubt or complexity.

And it makes sense when you think traditionally of a life expectancy from forty to fifty years. By the time you're twenty, you already have your children, and you're in the middle of your life.

"The brain doesn't decay with age—it's a mosaic—some things get worse, some things get better, and some things stay the same, depending on what the social requirements are. "

By twenty-five we see that those processes start to diminish. Sometimes they talk about the golden year of twenty-five where everybody gets maximized on all of these cognitive and memory tests kids do so well on or that young adults do so well on, and then our brains all start to decline a little bit. We see that our hippocampal function declines.

As a result, we start forgetting where we parked our car, where the car keys are, or names of people. The parts of the brain dedicated to remembering specific information start going downhill.

If you think about it, life was pretty much the same generation to generation. There wasn't a new electronic device out every year that we had to learn to use. As people got older, the brain's focus on new learning decreased.

What increases in healthy brains is the integration of both hemispheres; to be able to bring more information to bear on making a decision. The amygdala keeps functioning well in the things that it needs to do as far as connecting with other people, recognizing and evaluating facial expressions; but what we see is that normal brains are less driven by fear and anxiety.

"What increases in healthy brains is the integration of both hemispheres; to be able to bring more information to bear on making a decision. The amygdala keeps functioning well in the things that it needs to do, but what we see is that normal brains are less driven by fear and anxiety. "

Also, the brain is more driven to tell stories—you might notice this if you have older relatives. One of my students brought up a great point. Older people like to tell these stories over and over again, and its young children that like to hear them over and over again.

"If you can conceptualize someone's struggle in a way that they understand, it's a lot easier. "

I think what we've got is this lock and key mechanism for the transmission of oral culture across generations. As human brains age, the parts of the brain that are related to attachment and storytelling, analyzing complex information, and solving religious and social problems within the tribe are maintained and even improve.

The brain doesn't decay with age—it's a mosaic—some things get worse, some things get better, and some things stay the same, depending on what the social requirements are.

Dr. Buczynski: We don't have a lot of time left. So I'd like to spend just a little while focusing on the clinical application and how this applies to psychotherapy. One thing I want to ask: Do you think it's actually helpful to teach clients about the brain as a therapeutic tool?

Applications of Neuroscience to Clinical Work

Dr. Cozolino: I think it's very helpful, but you have to consider the client. Some clients are so intellectually defended, that any information you give them just becomes another layer of

defense against the work they need to do. There needs to be some clinical judgment in that, but I find that it's been incredibly helpful to me, especially in helping people that are more left hemisphere biased, or the more rational and logical folks.

In the past, I was only able to keep women clients because I would talk about feelings and they completely understood what I was talking about.

"The more you understand how the brain works, the more you're able to piece together a cohesive treatment plan that supports the overall balance and development of the brain. "

But then I would get men or these attorney or CEO type women who would say they didn't have time for that stuff. When I present the type of material we've been talking about today, if anybody is scientifically or logically minded; if you can present them a logical model, the science behind it makes sense. It's an incredible door that allows them to stay in the process long enough to where they can have the experience of the benefit.

Also, the brain has a lot of functional problems and if you can conceptualize someone's struggle in a way that they understand, it's a lot easier. Then the client also starts to view that as part of their narrative as an explanation of why they were vulnerable to certain behaviors, and you can use that as part of the treatment in a way where they can use that understanding to support their change. I think that's the number one best use of neuroscience as a clinical practitioner.

The second piece of it is if you take these general principles that we've been talking about, moderate levels of arousal, quality of the relationship, balancing affect and cognition, narrative, etc., it really helps me to conceptualize treatment from multiple dimensions because most of my clients need to do something with their bodies; they need to be physical in some way.

They need to have some type of spiritual outlet, or some way to express themselves in that way; they multiply things so that the brain has multiple avenues to it.

The more you understand how the brain works, the more you're able to piece together a cohesive treatment plan that supports the overall balance and development of the brain. I think that's probably the second most useful thing. I love thinking about this. When I started getting interested in neuroscience, it renewed my interest in psychotherapy.

Dr. Buczynski: I'd like to start to wrap up here. This is our sixth in our series on *The New Brain Science*, and it's been such a fascinating series.

We've gone all over the place beginning with the depression connection with Bill O' Hanlon, and then moving with Ron Siegel, to mindfulness and all of the neurobiology of mindfulness. With Dan Siegel we got into how we can change the wiring of our brain, and with Jeffery Schwartz how the mind changes brain and some about OCD, and then with Rick Hansen we were talking about Buddha's brain, and the practical neural science of happiness, love and wisdom.

And now, tonight, we've been talking about the neuroscience of psychotherapy. This has been an awesome series and I hope you've been able to participate in each one of the sessions.

Thank you everyone, and thank you Lou, and thanks for all that you've done.

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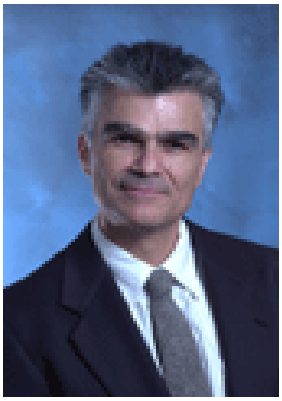
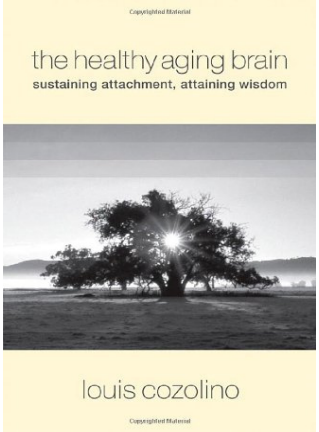


Louis Cozolino, PhD has diverse clinical and research interests and holds degrees in philosophy and theology, in addition to his doctoral in clinical psychology. He has conducted empirical research in schizophrenia, child abuse, and the long-term impact of stress.

Recently, his interests have turned to a synthesis of the biobehavioral sciences and psychotherapy. He is the author of *The Neuroscience of Psychotherapy*, as well as numerous articles and chapters on various topics. He maintains a clinical and consulting practice in Los Angeles.

The Healthy Aging Brain: Sustaining Attachment, Attaining Wisdom



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