



Logging In to the Brain's Social Network

October 18, 2013 12:00 PM

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Science Friday

24 min 46 sec

Does the pain we feel from rejection and loss have the same effect as physical pain? How does our brain respond to social interactions? In his new book *Social: Why Our Brains Are Wired to Connect*, social neuroscientist Matthew Lieberman describes the biology behind how our brains engage with the social world.

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JOHN DANKOSKY, HOST:

This is SCIENCE FRIDAY. I'm John Dankosky. Every day, maybe more times than you want to admit, you probably log onto Facebook, post an article you think your friends might find interesting or maybe you like someone's status. Maybe you notice a sick co-workers and ask how they're feeling. Our days are filled with these small social interactions. But have you ever stopped to think about how your brain is responding during these experiences?

There's a center in our brain for understanding what other people are feeling and why exactly their minds evolve this way. In his new book "Social: Why Our Brains Are Wired to Connect," neuroscientist Matthew Lieberman looks at how our brains are geared to solve one of the most complicated puzzles, human interaction. Matthew

Lieberman joins us now. He's director of the Social Cognitive Neuroscience Laboratory and professor of psychology at the University of California, Los Angeles. Welcome.

MATTHEW LIEBERMAN: It's a pleasure to be with you, John.

DANKOSKY: Now, if you have a question for Matthew Lieberman, you can join us at 1-800-989-8255, that's 1-800-989-TALK. You can also Tweet us @scifri. So you study social cognitive neuroscience, how our brains think socially. What exactly does all that mean?

LIEBERMAN: Well, you can't really go very far in life at all if you're not able to interact well with those around you. You can't really built a rocket ship or a radio station or really anything at all. And so our species has evolved to really master this feat of bringing us together and being able to work well together in teams. And we need mental machinery to be able to allow us to do this sort of thing. And that's what I and all the folks in my field tend to study in one form or another.

DANKOSKY: You write that mammals evolved a need for social connection. Can you explain how this worked evolutionarily?

LIEBERMAN: Sure. So mammals tend to have oversized brains compared to their bodies. And this creates a very difficult problem, which is getting that brain out of the birth canal. And the way evolution has solved that is by having a smaller brain come out of the birth canal and then continue to grow once it's out. The benefit of that is that you can then have that brain fine tuned by the culture or environment it is finished being built in. The downside of that is that all mammalian infants are incapable of taking care of themselves.

So we tend to think of people as needing food, water and shelter in order to survive. But if you're a mammalian infant, what you really need to survive is a caregiver who has an urge to connect with you so strong that when they hear you cry and smell the smells that come from babies, they actually go towards you instead of away from you.

DANKOSKY: So mammals can't really take care of themselves as they're growing up so they learn to rely on others. Now, this big human brain that we have, one of the things that we think about is we've got this big brain in order to help us with abstract reasoning. It's what sets us apart from the other animals. But you suggest that one of the things that our big brain does is help us to develop these social cognitive skills.

LIEBERMAN: Yeah, so the sort of long standing intuition is that our brain got larger over evolution to allow us to do very complex analytical things like math and calculus. And that's certainly consistent with data, but there's a really elegant theory from Robin Dunbar in England suggesting that the best predictor of why our brains are bigger than other primates' brains is actually it's letting us be able to connect and group with larger and larger numbers of other humans. And we seem to be much better at this than any other species, living in larger groups.

And living in larger groups means understanding the dynamics of the different people in the group. And that actually is why gossip turns out to be a really important function. It's how we communicate about our relative status with others in the group.

DANKOSKY: We're going to get some of your questions in a moment at 1-800-989-8255 or 1-800-989-TALK. One of the things that's most fascinating in your book is how you write about pain. And obviously we all know about physical pain but there's social pain, rejection, or when someone dies you feel pain. And we talk about it in those terms.

But one of the things that you've studied is that this pain is not just, as we say, in our head. It's real. We feel it. Maybe you can talk about some of this work you've done with social pain and how we actually feel it as humans.

LIEBERMAN: Sure. When we hear about someone saying that they're feeling social pain, the pain that comes from loss, death, rejection, things like that, we tend to think of the word pain as being used metaphorically. And about a dozen years ago, Naomi

Eisenberger and I decided to look into whether or not it was more than just a metaphor.

And so we had people play this little ball tossing game on the computer while they were laying in an MRI scanner. And you think you're playing with two other people who are also in scanners. And then at a certain point in the game we actually arrange it so that the other two players stop throwing you the ball. And so you get left out of the game for the remainder of the game. You're just sitting there waiting for the ball to come back to you.

And when we looked at the brains of these individuals who had just been rejected, we saw two fascinating things. The first thing we saw was that the same brain regions that registered the distress of physical pain were also more active when people were left out of the game compared to when they were included. And then the second thing we saw was that the people who told us they were more bothered by being left out of the game were the people who activated these brain regions the most intensely.

And then I think the finding that tends to really grab people after they hear these initial findings is much later work that shows that if you take Tylenol, it can actually make these effects go away.

DANKOSKY: My goodness. But - okay. These are people that don't know each other. This isn't like losing your girlfriend here. This is just a stupid ball-tossing game.

LIEBERMAN: No, that's right, it is. And I think that speaks to sort of how fundamentally it's wired into our operating system that even something as trivial as two strangers or two people you've only met for a few moments can produce this effect. Other work has actually looked at people thinking back on being romantically rejected and they see similar findings there as well.

DANKOSKY: Brian's on the line from Grand Rapids, Michigan. Hi, Brian. Go ahead.

BRIAN: Good afternoon. Speaking of social pain, when somebody

tells me a story of someone they know that has had a fall, like a trip or something, I almost immediately feel a cramp or like being punched in my gut. Why is that?

LIEBERMAN: Yeah, well, we're built to be an empathic species. And humans aren't the only species that feel empathy. But I think pain is actually a very strong example, at least physical pain, where when we see someone else in pain we actually show responses in the same body parts. You'll see changes in the electrical activity in the same body part in the person watching someone in pain as the person in. And I think this speaks to us being built to be deeply socially interdependent.

The fact that when we see someone in pain it motivates us to help them, makes us very different than the sort of selfish and self-interested creatures that I think we sometimes believe we are. But I think that's a mistaken belief about ourselves.

DANKOSKY: Before we move away from this idea of pain, I guess one question I'd have is, social pain - I guess I'm not sure what really it does for us. I mean, if we have physical pain, it might tell us to stay out of trouble. You know, you put a hand on a hot stove, you don't put it back there again. What exactly does social pain do for us as humans?

LIEBERMAN: I think it does the same thing that physical pain does. So, physical pain does two things for us. It turns our attention to the thing that's going on right now. So if your hand is touching a hot stove, it gets you to remove your hand very quickly from that hot stove. And then it teaches you a lesson. Don't put your hand there again. And I think when it comes to social pain, it does these two things and probably one more.

So it reorients our attention and says, okay, if I'm being rejected from a group, how do I need to change my behavior or what I say or think in order to not be excluded or rejected from that group? It teaches me lessons about how to behave differently in the future. And because we can imagine the future, we can also use that preemptively. We can feel social pain at the threat of being

excluded from a relationship or a group.

And so I think we often use that to manage our behavior prospectively before the bad events happen. The fear of that rejection can drive us to behave in more group-friendly ways.

DANKOSKY: We're talking with Matthew Lieberman. His new book is called "Social: Why Our Brains Are Wired to Connect."
Mackenzie's on the line in St. Louis. Hi, Mackenzie.

MACKENZIE: Hi, how are you?

DANKOSKY: Doing well. What's on your mind?

MACKENZIE: I was wondering how, like young children, how they're playing more on electronic devices. How is that impacting them with understanding emotions, like physical pain, those sorts of things, especially like really little kids around, like, two who are maybe living more experience with like tactile sort of sensory experiences because of things such as iPads.

LIEBERMAN: Yeah, you know, I think with any technology, going back to the ancient Greeks and the development of writing, there has always been a fear of us losing a part of ourselves and that the next generation isn't going to sort of be as good as we are. And I think the reality is more complicated. I think future generations always become different as they adapt to the technologies and opportunities they have. I think that technology, if you spend too much time away from social interaction, I think that can impair your social skills.

But I'm not sure what this will really shake out to be. I think that Facebook and Twitter and so-on have given us a new arsenal of ways to connect. And I'm not suggesting that they fully replace the other kinds, but they are different kinds that we really never had in the history of mankind. And I think it will be fascinating to see how those folks who are kids - I have a six-year-old. How will he look back and evaluate what has been good or bad about the life he has led as a result of this constant access to digital technology and all

the screens that we tend to be in front of?

DANKOSKY: Over a longer period living in front of these screens with a different sort of social interaction, do you expect that it would change us biologically if our brains have evolved this way so far to interact face to face? Over time, do you think that that changes us?

LIEBERMAN: You know, I think we're always going to be brought back to things that are fundamental needs. You can't away from things like the urge to eat and to be warm or cold, or whatever it is. And I think that when it comes to social connection, I think we have basic biological needs that are wired into us because of the purposes they serve. And so the question will be: Are those needs being served?

And if they aren't being served, I think people will disengage and say, you know, I need to create more space in my life for a different kind of social connection that my old fogey parents and grandparents keep telling me that I need, even though I, you know, ignored them for the last 20 years. Or, maybe they'll say: You know what? This really satisfies me in a way I wouldn't have guessed, and they'll look back and say they just didn't get it.

And I think we won't know until we get there. But I suspect it won't necessarily change us at an evolutionary level, because I'm not sure that these are the kinds of things that would really change who's going to be successful at reproducing or not.

DANKOSKY: You studied grief, as well, and that it can actually trigger our reward system, which sounds a bit counterintuitive. What did you find about this?

LIEBERMAN: Yeah. I just had a minor role in a study that was published a number of years ago, and the strange thing is if you look at the folks who are experiencing normal grief, you'll see activity in the pain distress regions of the brain. But if you look at folks who are experiencing chronic grief, where they don't seem to recover - my grandmother, I think, went through this when my grandfather passed away.

She spent 15 years really in a true grief state, for the rest of her life. When you look at these individuals, in addition to that social pain response in the brain, you will also see a reward response that's also being activated, a little bit like someone who would, say, like to quit drugs, but still finds those things rewarding because there is an addiction to those things that are bad for us.

And so I think that that was what differentiated folks who couldn't recover, is that there was still something rewarding about staying attached to this memory in a way that other folks seem to - little by little, seem to let go of their tight clinch on.

DANKOSKY: Interesting. You mean hanging on to these even painful memories.

LIEBERMAN: Yeah. Absolutely. Yeah. I think that - you know, we do all sorts of things that are good and bad for us at the same time, where we're trading off a temporary positive thing for something that, in the long-term, might be better if we chose a different course of action. I think that's a human duality that plays out through lots of decisions and behaviors we engage in.

DANKOSKY: I'm John Dankosky, and this is SCIENCE FRIDAY, from NPR. Let's go to Megan, who's calling from Ames, Iowa. Hi, Megan. Go ahead. You're on SCIENCE FRIDAY.

MEGAN: Hi. Afternoon. I had a question about empathy, since that was topic. Everyone knows a sensitive soul. Is there a biological basis for people who are better at empathizing than the rest of the population? Is that purely social, or is there a biological reason for that?

LIEBERMAN: Well, as a social neuroscientist, I guess I would never say something is purely social or biological. I think that almost everything biological is shaped by social factors, and social events are always rooted in our biology, as well as the environment we're in. But to speak to your question, there are certainly individual differences in empathic ability.

They are rooted in a number of different brain systems. So, empathy is kind of the perfect storm of different capacities we have as social creatures, coming together. It relates to an ability to kind of resonate with what we see going on with others, to hear stories about people being fired or winning a gold medal, and being able to then translate that into feelings of concern or celebration with those around us.

And then there's a very ancient part of the brain involved in caregiving, called the septal region of the brain. And that seems to translate these feelings into an urge to actually help assist or do something that aids the other person, and not so much focus on the consequences for ourselves. Empathy with someone on TV who's suffering that gets us to change the channel isn't very functional.

But when we empathize and it gets us to pick up the phone and make a donation or go volunteer, that's something that I think really is a magnificent part of what this orchestrated difference that our brain networks can do for us.

DANKOSKY: On the flip side, what can you tell us about people with conditions like autism, where empathy, the ability to connect with others, is limited in some way?

LIEBERMAN: Yeah. I mean, some say that autism is sort of the perfect storm of things not going right in the social brain. When I was looking into autism when I was writing my book - because I don't actually study autistic individuals myself - when I was looking into it, I was fascinated to find that autism, in many ways, seems to be perhaps the opposite of some of our intuitions about it.

We think of the autistic individual as sort of disengaged and really just preferring their own company and not really sensitive to the social world. But when you look even at one year old infants who are destined to become autistic, what you see is that they are coping with a social world that's too overwhelming for them, that some of their social emotional machinery is actually too sensitive. They're too sensitive to the social world.

And so what these autistic individuals or future autistic individuals are doing when they're one years old is what a lot of do when we're in the movie theater and the sound check comes on and it's too loud. We cover our ears, and we turn away. And these infants and then toddlers seem to be turning away from a lot of the social experiences that would train the social brain to become the social experts that we become by the time we're, you know, teenagers and young adults.

And one fascinating group that helps demonstrate this is individuals who are born deaf. So these individuals have no cognitive impairments, no brain impairments in most cases, and yet they show the same delay in being able to think socially, because when they're young, they're missing a lot of the sort of social lessons we get from seeing and hearing other people use social language and engage in social topics.

So it's not just that the autistic individual's brain is less interested in the social world. It seems to be something where they cope at a young age, and then this leads to a difference long-term. There's a beautiful quote from Jay Johnson, an autistic blogger, where he basically said: For me, looking at other people's faces, looking them in the eye is like putting my hand in a fire. It's just too intense. And I think that's a very different picture of autism than the one we usually have.

DANKOSKY: We're talking with Matthew Lieberman, whose book is "Social: Why Our Brains Are Wired to Connect." We'll be right back after this short break.

(SOUNDBITE OF MUSIC)

DANKOSKY: This is SCIENCE FRIDAY, from NPR.

(SOUNDBITE OF MUSIC)

DANKOSKY: This is SCIENCE FRIDAY. I'm John Dankosky, and we're talking about how our brains interact with the social world. My guest is Matthew Lieberman, director of the Social Cognitive

Neuroscience Laboratory, professor of psychology at University of California, Los Angeles, and he's the author of a new book called "Social: Why Our Brains Are Wired to Connect."

One of our listeners emailed us and asked: So how does all of this explain bullying in our culture?

LIEBERMAN: Oh. Well, bullying is a complex issue that has to do with status, and often the bullies themselves are, in a sense, acting preemptively, because they are worried about being rejected, as well. But, I mean, bullying in general is obviously an increasing issue for our children, especially now that it's cyber-bullying as well.

We see these tragic cases every few months now of a 12 or 13-year-old taking their own lives because they say that the pain of this experience is worse than anything they could imagine. Now, that doesn't make a whole lot of sense, unless you take this idea of social pain being a real kind of pain seriously. But once you do, it makes sense, and there's data that suggests that this is also really directly going to affect academic achievement in the classroom, even though that's where the bullying is taking place.

DANKOSKY: Let's go to Alex who is calling from St. Mary's, Georgia. Hi, Alex. Go ahead.

ALEX: Oh, thanks for taking my call. I'm just wondering what the overriding position, I guess the predominant theory is on whether social mores and expectations are something like object permanence that we learn and stay with us in our minds for the rest of our lives, or something that's constantly changing and shifting through social situations.

LIEBERMAN: Oh. Well, I'm afraid the answer won't be very satisfactory, because I think the answer is it's a bit of both. I think that, you know, we are evolved over time to have morals that, you know, serve the group well and help us live successfully as groups and discourage certain kinds of bad behaviors.

But there are certainly norms that change from culture to culture.

There are norms that change from different ideologies within a culture. So I'm sorry that's not a, you know, more precise answer.

DANKOSKY: One of the things you write about is this ability that we have to gauge what someone else is thinking. It's almost like mind reading. And you write about a mentalizing system. Maybe you can explain what you're talking about.

LIEBERMAN: Yeah, sure. So I sometimes describe this as one of our social superpowers. So, we have the ability - and we use it countless times each day, so often we probably don't recognize it - where we can sort of peer into the minds of those around us and imagine how they're currently responding to some situation, what their thoughts and feelings are, or what their response would be to some novel situation.

And we can use that to then interact more successfully with those people, to advance shared goals or try to do nice things for other people, because we can appreciate their point of view. Now, the thing that makes this system, I think, really interesting is that thinking about other people and their thoughts and feelings doesn't feel that different than other kinds of thinking, but it turns out that there's a different network in the brain for thinking socially and for thinking non-socially.

And these two networks are not only separate, but they tend to act a bit like a neural seesaw, so that when you see activity in one go up, the activity in the other tends to go down. And I think the last important thing to know about this is that our brains are wired such that whenever we finish doing some kind of analytic thinking, this network for social thinking almost immediately and spontaneously pops back up.

And that's a pretty big sort of decision for evolution to have made over time, that this is the single thing that our brain seems to get ready to do every time there's a break in the action. It gets ready to see the world socially, and that suggests that it really has a place of great importance in the success of our species.

DANKOSKY: You call it a default system, essentially.

LIEBERMAN: Yeah. That's what it's been called over time. It's both a default system, because it comes on by default, but it's also a kind of mind-reading system, because largely these regions are involved in reading the minds of others and trying to understand what's going on with them.

DANKOSKY: Before we run out of time, I have to ask about self-control and how it's used not necessarily just for individual good, but for the greater good, the social good that you write about.

LIEBERMAN: Yeah, sure. So, you know, most of the self-control that we engage in, it may or may not benefit us, but it almost always benefits society. In a classroom, the teacher is always happy when you engage in self-control. You might not be, but the teacher certainly will be. And I use the example of doctors. There was a recent poll suggesting that most doctors would choose a different career if they had it to do over.

Now, doctors go through an incredible amount of self-control to get to the point in their career where they are, from the tests they have to take, all the training they get. And they may not be very happy with the outcome of all of that, but we as a society are spectacularly happy that lots of people engage their self-control to become doctors and make the rest of us healthier. So self-control seems like something that is there to help us move our own agenda forward, but a lot of time self-control is really serving to move the group's agenda forward and serve the group. So it's a much more social factor than I think we usually consider.

DANKOSKY: What's the next big thing you're looking at?

LIEBERMAN: Well, I'm really interested in how these types of things play out in the real world. So we're doing a lot of work right now on education and how you could think differently about education and learning once you take into account what we know about the social brain. One of the things that we and other labs have found, is that if you give people social motivations to learn instead of the motivation

to just take a test, they learn better.

And when they learn better, they do it using the social brain rather than the traditional brain regions involved in trying to memorize material. And because of that neural seesaw when we use that traditional analytical brain from memorizing, we're actually turning off the social brain that may have an especially good way of learning material.

And so we're looking at what happened when you have people, instead of learning for a test, they are learning the material in order to teach the material to someone else. And we think that learning in order to teach may actually be one of the secrets to improving learning for that teacher. And the sort of upshot of that is that if someone isn't doing well in a class, the goal should be to put them in the role of teaching.

Maybe teaching someone a few years younger who they'll feel autonomy and authority helping out this younger student, but they'll also engage the social brain which seems to be a really good system for getting new knowledge into our brains.

DANKOSKY: Matthew Lieberman is director of the Social Cognitive Neuroscience Laboratory, professor of psychology at the University of California, Los Angeles, and the author of this interesting new book "Social: Why Our Brains Are Wired to Connect." Thanks so much for joining us.

LIEBERMAN: Oh, thanks for having me.

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