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An interview with Dr. Robert Sapolsky

Robert Sapolsky, Ph.D. and Marcia Reynolds, Psy.D (c)M.

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Zebras and Lions in the Workplace

An interview with Dr. Robert Sapolsky

BY ROBERT SAPOLSKY, PH.D. AND MARCIA REYNOLDS, PSY.D (C)M. . . .

When it comes to understanding why people do what they do, we cannot ignore the biological reasons for behavior. Leaders need to take into consideration physiological responses both in the environments they create and the requests they make to individuals within the organization. This interview explores the effects of stress on productivity and learning. It includes what are optimal levels of stress, how to create a “benevolent environment” that encourages risk-taking and innovation, and how to deal with our mental wiring that promotes the resistance to change. As a result, coaches can help their clients “re-create” their organizations to be more successful and more humane.

Marcia Reynolds: *Thank you so much for speaking with me and sharing your work with our audience of organizational coaches. Today I would like to focus on a few of our concerns, including the effect of stress on productivity, your research in adult learning and how we can maximize learning at work, especially how we can best help people get through change and apparent chaos at work.*

First, one of the things that most fascinates me is your research and writing on the effects of stress on learning and memory. Can you give us an overview of your findings?

Dr. Sapolsky: When you’re talking about what most people attribute to “memory,” such as explicit memory (declarative, such as facts and descriptions) and implicit memory (procedural such as reflexive, motor actions), you get this sort of inverse pattern. First, a little bit of stress does wonders for enhancing memory. A little bit of stress increases glucose and oxygen delivery to the brain, strengthens synaptic communication, and finally increases the occurrence of LTP (i.e. Long-Term Potentiation - the phenomenon that describes the synapses learning and is strengthening). Short term stressors that are not too severe make that sort of learning mechanisms work better. We remember those things that excite the brain. For under about two hours or so stress is therefore beneficial.

By the time it’s gone on for four hours, you’re pretty much back to base line. Once it goes beyond four hours, and for some people constantly for up to 70 years, everything goes in the opposite direction. The learning capacity gets worse; less glucose and oxygen are delivered to the brain. Neurons in the hippocampus can actually be damaged and shrivel up. You stop making new neurons in that part of the brain.

So you’ve got this classic inverse relationship. You don’t want to get rid of stress. You want to have just transient moderate stressors, which we call stimulation. What’s most striking about that is how transient, moderate stressors, not only do all those do good things, they make you feel great. They cause the brain to release dopamine in a region where that chemical has a lot to do with pleasure and anticipation. But again, once it turns into chronic stress, the dopamine levels get depleted, which means loss of pleasure, depression and worse.

So what winds up being the relevant question is calibration: what is one

person's stimulation is another person's depression. Where are the limits? How much stress should someone welcome into their day, and when do they turn it off?

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On the other hand, let's look at implicit anxiety-related learning, such as learning fear responses. In that realm, we are looking at a different part of the brain - the amygdala. Here, every type of stress makes that part of the brain work better, faster, and grow new connections, as the synapses are more excitable. That's the case with trauma, that's post-traumatic stress disorder; you show someone subliminal pictures (ones that don't even register in the cortex) and the metabolic reactions light up. When you have a person with post-traumatic stress disorder, the light stays on. Because what stress does is cause that part of the brain to work better than it's supposed to. It doesn't get damaged. People don't forget what they fear. The brain is very efficient at remembering fear. This is a different response than the regular learning of knowledge and skills —where a little stress is great but a lot is awful. But it is unpredictable what can activate this type of memory, even in the workplace.

Marcia Reynolds: *Let's say a company has a big lay-off, or even just talking about it, or there's a merger coming up and people become paralyzed and can't work. What is the damage from this type of fear? What do these events create in terms of people's ability to accept change or not, or even to do their work well at all?*

Dr. Sapolsky: What's really interesting is there are some studies showing that the increase in blood pressure you get when people are getting laid off, doesn't come when people are actually getting laid off. Instead, it comes with the first threat of it. So the damage comes when people are marinating in anticipation, in the threat menace, which can last for months or years. It's the anxiety over the future that has the worst effect. You don't just turn on your stress response when you've been slashed by a predator, or when you've lost your job. For physiologically irrational reasons, you turn it on at the first hint that something is up. The menace of occupational stressors is as bad as and as overwhelming to the physiology of the body as the disasters themselves.

Marcia Reynolds: *This seems to relate to the memory of fear. People go through this type of threat and menace, even if it is just gossip, and have a strong stress response that is lodged in the amygdala. And then anytime their brain perceives that this may happen again in their company, or any other company, anything that their boss might say that could possibly indicate that this could happen, the message triggers the stress response again. So executives and managers must consider the emotional fall-out of their communications at all times, even through email. There is no "rationality" to this. If the brain anticipates the threat, it reacts and impedes productivity.*

Dr. Sapolsky: Yes, we are dealing with the amygdala, with fear and anxiety, or what is called the limbic structure or emotional part of the brain. Then you've got the frontal cortex, which has this huge job of regulating the amygdala (managing our responses), making executive decisions. There is a huge inhibitory projection from the frontal cortex to the amygdala. So during stress, both hippocampal function and pre-frontal cortical function are impaired, including neurons, which are then susceptible to structural atrophy.

So what you've got then is a frontal cortex that's not as good at doing its job directing the amygdala, managing our emotion reactions. One of the consequences is that - no surprise! - people under stress make dumb-ass decisions as to what

counts as a good idea at the time. That is the result of the frontal cortex not having the reins on the amygdala. Translated, I think, in the cognitive behavioral therapy world, that's a cognitive distortion. Normally, we have the frontal cortex doing its job signaling and saying, "Yes, you, the Amygdala, are hysterical and hyperactive at this time because of the trauma. But you know what? This is not the same situation. This is not so bad." Instead, the brain concludes, "Because I was abandoned once, I'll always be abandoned." Or "That way always produces a disaster." We over-generalize stuff, and it makes sense at the time—at least in that context.

Marcia Reynolds: *Then we spend our energy rationalizing the "dumb-ass decisions" to try to lesson the possibility of another stress-creating situation.*

Dr. Sapolsky: Yes, because not only does the frontal cortex have a lot to say to the amygdala, the amygdala has a lot to say to the frontal cortex. And what's happening there is a boosting of the emotional response. You've just tilted the see-saw, totally in the direction of emotion-driven decision-making and some pretty unconstrained, unrealistic emotion, even by the most "logical" people.

Marcia Reynolds: *I would like to look a little deeper at learning and emotions. In the book, Why Zebras Don't Get Ulcers, you indicated there must be emotions for learning to occur; that the brain has to feel that something is worthy of being remembered for the potentiation to happen. So, on the other hand, are there are good emotions we can tap into that do not cause long-term stress when dealing with learning and memory, correct?*

Dr. Sapolsky: Absolutely, this goes back to stimulation. Someone who just found out that their whole family just got killed in a car accident and someone who just found out that their cancer was misdiagnosed and is going to live... their hearts are going to do similar things in both cases. The physiology of extreme arousal is the physiology of extreme arousal. So stress hormones couldn't care less what your heart's beating faster about. T, their job is to make sure your heart doesn't run out of energy in order to deal with the situation.

Marcia Reynolds: *What about in the classroom. It seems that people might respond positively, saying, "This is great stuff," but then nothing happens afterward. Part of our quest is to learn under what circumstances does what we hear imbed in memory. In organizations, can we help people to learn and grow without creating stressful situations?*

Dr. Sapolsky: No matter what, you have to have active participation to create the stimulation necessary for learning. It's going back to John Dewey, in terms of learning and active processing, There is the classic study in the 60's that showed when you raise rats in an enriched environment with other rats, their brains develop better and they learn better as adults. Their cortex and neurons are better developed. Then, they put a rat in that same environment but in a little cage, suspended in there, so it doesn't get to do the stuff with other rats. There is no active participation. The rat only gets to watch. You don't get the neuron changes in this case! Apparently, it's the active participation that creates that.

I think this also helps us understand why learning in artificial role playing settings is silly. It is so artificial that you don't get much of a response out of it.

Marcia Reynolds: *Sounds like people need to feel as if they are a part of the action, that they are in the game, for learning to occur.*

Dr. Sapolsky: Yes, but I think this activates their stimulation, which makes

what they are doing count. That's where you get the curve optimized. You have to experience both moderate stressors and transient ones to stimulate learning. Again, the problem is that most people experience moderate and steady stressors. Compare that to roller coaster rides: for good reason they are designed to be pretty intense and short. That's not by accident.

Put in more mechanistic terms, it is a very cool thing how the brain pulls off learning. There are glucocorticoids, hormones that mobilize energy during stress—actually two different receptor systems in the brain, and one of them is ten times more sensitive than the other. The more sensitive one mediates the good stuff, growing connections and making things happen. It gets filled up really quickly. Then the less sensitive receptor system is designed to mediate recovery from stress. Mechanistically, it is a beautiful system. However, it then works too well when overloaded with stress, causing damage to the neural network.

Cognitively turning moderate transient stressors into an actual setting, I think would translate to what is called a “benevolent setting,” where the dominant feeling is “maybe.” People are actively exploring new possibilities where they are not certain things are going to work out but they’re not feeling hopeless, ever.

Cognitively turning moderate transient stressors into an actual setting, I think would translate to what is called a “benevolent setting,” where the dominant feeling is “maybe.” People are actively exploring new possibilities where they are not certain things are going to work out but they’re not feeling hopeless, ever. There is always a good possibility of success. The resources are available and there is a pretty good chance you are going to pull it off. It's going to take some effort though, and it is not guaranteed. Even on a bad day where it doesn't look like it will happen at all, you know that the see-saw on the fulcrum will tilt your way at some point.

I know educators call this the $x+1$ rule. We take kids wherever they are now (level x) and then challenge them with x plus 1, not x plus a thousand. There has to be a good chance of success from the beginning.

However, you still need to modulate the possibility of success so it is not “too” certain. There was an amazing study a couple of years ago, that was looking at the correlation of dopamine and reward. What everyone originally thought was that after an animal gets its reward, up goes dopamine. That's not what happens. Suppose you establish a testing protocol where a light comes on, signaling that a certain task is due now: the animal pulls the lever so many times, and then waits ten seconds and gets a reward. What the study found was that it wasn't the reward that caused the spike in dopamine. The rise came when the test animals are just starting the process. When they felt pretty confident of the results - “I'm on top of this, this is going to be great, I've got this under control” - that's when the rise in level occurred. So it's the stimulus is the anticipation of reward, not the reward itself.

There was this brilliant follow-up study done. Now, instead of the monkey doing tasks and then getting a reward, it does the task and only gets the reward 50% of the time. The relevant part of the brain dumped out dopamine levels like no one has ever seen in the business, because you've introduced that element of “maybe.” Shift the reward rate from a 50% likelihood to either a 75% or 25% likelihood of reward (these are diametrically opposite, one of them “the world is getting more reliably better”, the other is “the world is getting more reliably worse”) and with either condition, you don't get as much of a rise in the dopamine. Above or below 50% and the world is getting more predictable (positively or negatively) and you don't get as much of a rise in dopamine. 50% is right at that fulcrum of maybe.

People who think of psychological stress carry on endlessly about how a lack of control is extremely stressful, and an assembly line of workers who have no autonomy can't function well. But you see here, a lack of control with some predictability is incredibly pleasurable.

What is the difference? That's where the benevolence comes in. The difference concerns in the context in which the activity is embedded.

Lack of control in a malevolent setting, this is going to lead to a bad diagnosis. People don't know what is going to happen, and it is not likely to be good. Contrast this with a lack of control in a benevolent setting and you have people feeling: "this roller coaster ride is going to be scary and unpredictable but we're not anticipating being decapitated during it." In a benevolent setting, the unpredictability is sheer stimulation and excitement.

Marcia Reynolds: *What you're saying is that within the bubble of the organization, leaders set challenges for people that have some degree of possible failure, but everything is available to create success. And as they are risking, exploring, and learning, they do this without fear of being criticized or punitively blamed for mistakes.*

Dr. Sapolsky: Exactly. What is predictable is the benevolent setting. In that setting, you allow the unpredictability.

That's essentially what animals do when they play. They signal to each other that, "I am willing to make myself vulnerable right now. I'm going to crouch down or roll on my back and display my throat and my genitals; we have this agreement that all will be okay. I don't know if you're going to lunge at my throat, but I won't die. And sometimes I get to do it to you." That's what play is.

Marcia Reynolds: *In essence, then a work environment has to allow for some vulnerability, which includes both risk and failure. In other words, leaders can't be sending the message for people to do it right all the time. If you did it right all the time, you would not be challenging yourself and would lose motivation. There has to be a 50/50 chance, which means sometimes things don't work out right. And all of that is perfect.*

Dr. Sapolsky: Yes, the 50/50 chance in a benevolent setting. This is where coming up with a crackpot idea that turns out to be wrong is viewed as a good thing in your business. You can encourage craziness 50% of the time because all we need is the other 50% to be phenomenal. That's where failure occurring in a benevolent setting is stimulating as hell.

Obviously out in the real world, it's hard to know where the middle of the scale is – 50% may not be the right point. There has been some work like Martin Seligman's "Learned Optimism." Seligman studied insurance people who do cold calling, and many of the agents get said "no" to 99% of the time, but the one that gets 'no' said to him 98% of the time is the most accomplished person in that field. His "maybe" range is just enough to keep him optimistic. There they are dealing with how the scale is set in a particular setting. But then you have people's personalities that can skew the scale one way or another, so it's almost as if you have to find out what works for each person within a particular range.

This might be hard to apply out in the world. I think what workplaces can do is shift the current one way or the other – towards more challenge or more risk tolerance.

But whatever they do, it has to be created with the feeling of sincere benevolence.

It strikes me that a place like Las Vegas is brilliant at taking unpredictability in a highly malevolent setting (you could lose your livelihood) and through brilliant psychological engineering they make you think it's unpredictability in a benevolent setting. There's benevolence for you in particular because we upgraded you at the hotel, gave you free drinks and cheap food—whatever tricks they have to make you feel cared for. That's just brilliantly engineered to make unpredictability benevolent even though it is incredibly malevolent.

So the ideal setting is somewhere in-between the loss of hope and surety. But in-between is a setting where failure is recognized as a valid effort, and success is not viewed as something we will now exploit by upping the expectation to ever-increasing levels.

Marcia Reynolds: *Looking at change in organizations, why is there always this huge resistance to change, period?*

Dr. Sapolsky: Response: I don't know if you saw a piece in the New Yorker five or six years ago, as to why people get less open to novelty as they get older. I did a sort of impromptu study to see at what age people start eating sushi or at what age people stop listening to new music, which prompted me to explore the concept of novelty where we are open, or not, to new experiences.

I think what workplaces can do is shift the current one way or the other – towards more challenge or more risk tolerance. But whatever they do, it has to be created with the feeling of sincere benevolence.

There's one element in terms of resistance to change that is very common with aging. Take a lab rat. It doesn't like new foods when it's a kid. Then right around adolescence it loves trying new foods, but then at early adulthood it's closed to food novelty. You look at that in non-human primates, where one of them invents a new type of tool and no adult primate ever learns how to use it. It's always juveniles who discover it and then spread it laterally and to younger

animals. There's a lot of human, psychological and cultural baggage that goes into this closing oneself to novelty. It seems to be basic to our wiring. This is something that naturally we have to work to overcome. We must, or at least be conscious to what is really going on, instead of looking to make it seem right (rationalization).

But then we have to define what novelty is. What people have shown in studies, when you look at highly accomplished people who get closed to novelty as they get older, the big factor is not their age but how long they've been in that particular business. People who shift disciplines reset their clocks. People who stay in one place too long get entrenched.

The problem is that highly accomplished people are likely to stay within their discipline. They get eminent, at least in their own little world, so why should they do anything new for the rest of their lives? All something new will do is knock you back on your butt. So the eminence of the highly accomplished is a huge thing adding to the resistance to change.

Marcia Reynolds: *So then maybe mediocre people who move around can deal with novelty better than accomplished people. So in truth, in corporations, the resistance to change is about trying new things, not fixing what is broken. And that resistance might even be greater at the higher, more accomplished levels of the organization.*

Dr. Sapolsky: No doubt. I see this playing out in the higher corporate levels. It's really difficult to recognize that something is going wrong and needs to be changed. But I think it's a thousand times harder to recognize that something's right but nevertheless, it's time to make a change.

For a lot of more moderate challenges, the most common solution is to do what you usually do, but you are expected to do it faster or harder or more times. Thus, when a real disaster comes along, people are accustomed to doing things a thousand times more or faster than usual, instead of the leaders realizing it's time for a different approach. And then in the corporate world, if you make a mistake, you bleed into the water and the sharks will smell it and eat you alive.

Marcia Reynolds: *Thus taking away any sense of benevolence.*

Dr. Sapolsky: Exactly. And so we have resistance to change.

Marcia Reynolds: *I can imagine too that with a successful executive, there would be no incentive to say "let's try some new things for the hell of it," even if that stimulates creativity and innovation. So what we have are people becoming more and more protective and closed to new ideas the higher they go up the ladder.*

Dr. Sapolsky: Yes, just out of necessity. With certain exceptions, highly eminent, entrenched people have to fully believe or be convinced that the change is needed. But by then, the intuition or the rhythm of seeking new stuff has been lost; thus, you get a totally mechanical algorithmic way of doing something new. The leader keeps looking for a way to re-invent what worked before instead of embracing innovation. Even with aging radicals, they get very mechanical about trying to maintain the tumult in most cases, I would think.

I think it's a thousand times harder to recognize that something's right but nevertheless, it's time to make a change.

Marcia Reynolds: *Sounds like what we call crisis managers also fall into this trap. They keep the pot stirred, but in a way that they get to constantly look like the hero. They keep re-creating the same problems so they can show off the same skills over and over. Their value is to put out fires instead of inspiring creativity.*

I'm noticing the time, so let me just ask one more question. You talk a lot about the evils of Type A behavior and workaholics with their never-ending to-do lists. However, you can't tell someone to just stop being that way, especially in a culture that condones that level of work. In our society, we compete for who has had the busier day. "You think your day was bad, let me tell you about mine." But you said that this behavior has a huge cost, right?

Dr. Sapolsky: We talked about the optimal point, neurologically speaking, where stress overloads. But creativity in particular has this inverse u-curve. You can't bull-doze your way through creativity. The problem is that there are so many settings where you get rewarded for overdoing. In my world you have to have great postgraduate degrees, long CV's, and that is what takes priority.

Marcia: *With production moving out of this country, we have to focus more on innovation and creating intellectual property. However, most organizations are fear-based, not creativity based. Or, in your words, they are malevolent, not benevolent, which limits discovery and risk-taking. How do you make the switch from an efficiency-based model to one that is creativity based? One thing you would suggest is to create a benevolent environment. Is there anything else you see that could*

promote creativity instead of honoring how we are working ourselves to death?

Dr. Sapolsky: One factor is recognizing there is significant transitional cost to doing that. Making these changes takes time. It will take time and money, though the payoff is clear if organizations make this investment. Also, they have to accept that innovation takes a huge ratio; there are usually many stupid dead-ends before finding the big one that pays off.

The problem is, this rarely happens. We see this where it takes a generation to die out before new ideas take hold. Like with Darwin, no one his age became Darwinists. It was the younger generation that flocked to his ideas. It can be discouraging to be the first in anything.

Marcia Reynolds: *I've often felt that the hope for our corporations was with the younger generation, but if what you say is true, when they reach eminence, the cycle continues. Sounds like we have to find some way to let young minds have more of a voice on a continuous basis.*

Dr Sapolsky: There's a great book by Frank Sulloway, called "Born to Rebel..." He's a science historian. He spent 27 years working on this book. He took something like 30 scientific controversies from the last 400 years, such as the ideas of Copernicus, Galileo, and Darwin, but also nonsense stuff like phrenology and cold fusion. He did intensive research on the lives of four thousand or so scientists who played principal roles in these controversies, trying to come up with variables that could predict who were the intellectual radicals that embraced these new movements and who were the conservatives who fought against it. He found about 9 variables which collectively gave him about 85% predictability. In particular, birth order was most critical, with first-born children more likely to be conformists while the later-born ones tended to be more creative and more likely to reject the status quo. The relationship with their father made a difference. For example, if the father was just a "swell guy," the son, especially a first-born, was unlikely to ever have an intellectually creative thought. Independent of how you got along with your parents, were they socially progressive? If they were Socratic or Abolitionists, they were more likely to produce an intellectual radical. Had they spent a significant amount of time outside their culture when they were growing up? If we put all of these things together, we can predict intellectual creativity.

Marcia Reynolds: *I wish we could know more about people's histories when hiring them, if a corporate culture wants to nurture this intellectual radicalism.*

Dr. Sapolsky: Yes, but you have to be careful when charging such people with a lot of responsibility. Really young people might enjoy throwing everything up in the air every three hours.

Marcia Reynolds: *We want some control over the chaos, or a method for our madness. We need young minds but we also need the wisdom that comes with experience.*

Dr. Sapolsky: Overall, there's got to be a more insightful way to do things, and I believe age and experience can give you that. Maybe people just have to do it for themselves, through their own consciousness. People can catch themselves before they become mechanical and make sure they change jobs or change their routine. Maybe the executive decides that every few years you leave a company and start a new one. It's not really clear how we can manage this, but I think if people are aware of what is going on, they can make better decisions to keep their creativity alive.

Marcia Reynolds: *These are important insights. There are a lot of radical shifts that need to be made in our organizations, in both the processes and in the cultures that establish how work gets done. I believe your work can provide invaluable information for those of us who coach our clients to “re-create” their organizations to be more successful, if not more humane. Thank you so much for taking the time to share your work and ideas with us.*

ENDNOTE

1 Robert Sapolsky. Open Season, The New Yorker, March 30, 1998. pg 57

2 Frank Sulloway, Born to Rebel. Pantheon, 1996.

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