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Undergraduate

ROBERT LEVENSON: EMOTION AS PSYCHOLOGICAL STATE

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Professor Robert Levenson received his bachelors in psychology from Georgetown University and subsequently received his masters and Ph.D. in clinical psychology from Vanderbilt University in 1974. He has been a professor at Cal since 1986 and has published on the physiological, cultural, and psychological components of emotion and marriage. He is the director of the Berkeley Psychophysiology Lab and sat down with Berkeley Scientific Journal to discuss his research on emotions, specifically how they can affect our daily lives and how they are affected by neurodegenerative disorders.



BSJ: Are there clearly identifiable physiological states or parameters that are associated with emotions and what might they be?

Levenson: There are some physiological differences that are associated with a small set of what people call basic emotions like anger, fear, sadness, and disgust. The idea is that these things have happened to humans throughout their evolutionary history so the most effective responses when dealing with these types of things are the ones that have already been worked out. It's useful for us to have a mechanism by which our bodies make the adjustments necessary to do the kinds of things we're most likely to do when we have these challenges or emotions. To be more concrete: when you're angry probably what you're going to do is to fight for what is yours. Thus, it would make sense that you body would prepare you; to put you in a state where you would have lots of resources available to try and take back what it yours. Now for sadness, it's very different. You're not going to fight, you're going to mourn and be more still than active. Things happen that might put you in a state where you would be more receptive to being comforted.

That's the idea that these physiological states served us well throughout our evolutionary history until all of the sudden we ran up against modern times. In modern times, when somebody takes something from you that's yours it's not always adaptive to have your body be in that raging fighting state. In fact, a lot of times it's very non-adaptive. Take, for example, the situation in which the person who took something from you is a parent, a loved one, or somebody who has power over you. We have this kind of residue of our evolution where our bodies get all "dressed

up" and then they may have nowhere to go because of the culture and society we live in. In those situations, it's really important for us to regulate our emotions, rather than express them in their unadulterated primitive form.

BSJ: How did you become involved in this field or what struck your interest when you were younger?

Levenson: I've always been interested in the relationship between the body and the mind. When I was an undergraduate, I was interested in the philosophy of the mind-body issue. It turned out as I got toward the end of my undergraduate years, I became aware that there was a field of research devoted to this that was called psychophysiology. At the time, most psychophysicologists were interested in stress. They wanted to know how these kinds of difficult situations in life activated our bodies and ultimately made our bodies more prone to disease. What I learned once I started my own laboratory was that different people respond to difficult situations in quite different ways. When we did a stress study in my laboratory for example, we showed people a film that was supposed to be stressful. What I observed was that some people looked afraid, some people were laughing, and some people seemed disgusted during the test. I realized that thinking about stress, as a universal response, was rather misguided. What was really interesting were these differences is how people responded. I decided that that I wanted to learn more about that.

BSJ: From this initial interest, you went and studied neurodegenerative disorders. How did you make that transition?

Levenson: The thing that got me interested in that was that I heard a talk by a neurologist at UCSF who was talking about a group of patients he was working with clinically who appeared to have lost their emotions. They had stopped responding to people in caring ways, and they became very cold, distant, and emotionally flat. Most organic brain disease affect your ability to remember things, your ability to make choices, and martial your resources what we call executive functioning, but here was a disease that left these functions alone and focused on the emotional system. This provides a tragedy for the people who have it but provides a great opportunity for scientists. If we can say exactly what part of the brain is damaged and determine what changes in emotion accompany this damage, then we have a very powerful tool for understanding how quite complex behaviors are organized in the brain. That really appealed to me. I got interested in that as a way of studying psychology and physiology, but now with a focus on the brain.

BSJ: What changes in emotional regulation and reactivity and whether or not those changes are consistent across the patients who have lost the ability to generate emotions normally?

Levenson: In a way that's what we're trying to understand. If you think of emotion as just one type of global, undifferentiated entity, then you're lost. It would be as misguided as thinking about cognition as one thing. We know now that short-term and long-term memories are handled by quite different circuits in the brain. The same is true for emotions. It may well be that our ability to have an emotion is organized quite differently in the brain from our ability to control an emotion or the ability to know the emotion that someone else is feeling. Thus, for example, you might be very good at getting sad, but very bad at knowing that your loved one is sad. You could, and in fact, in this disease that we're studying, you, I wouldn't say be very good at getting sad. We have some evidence that these patients can get sad but are not very good at telling that other people are sad.

There's also some evidence that particular emotions can be damaged. For example, in Huntington's disease, which is another neurodegenerative disease, research indicates that patients lose the ability to feel and recognize disgust, but other emotions are unaffected.

I'll give another example. With frontotemporal dementia patients, if you tell them, "OK, now in 10 seconds, you'll hear a really loud noise, and what I want you to do is try

not to let your emotions show. When you hear the noise, don't react." They can do that. However, if you put them in a situation where you and I would naturally try to regulate our emotions, the patients can't do that. They can't do the computations that involve looking at the social world, thinking about what they should do, looking at themselves, seeing what they are doing, and controlling their behavior. That's an important insight, and we can eventually figure what circuits in the brain are responsible for a range of fairly complex emotional behaviors.

BSJ: So when you look at these emotions in the laboratory, what physiological parameters do you choose to look at and how do you decide which are most important or most pertinent in a situation?

Levenson: That's a good question. Emotions are very important, and because they're so important, they are manifest in multiple ways. One way that emotions are manifest is through our subjective feelings. We become aware at some level that we are angry and can even rate the intensity of that anger.

Another channel that emotion is expressed is through our bodies. Our faces and our posture can express the emotion. Our physiology, our autonomic nervous system (e.g. our hearts and lungs) are involved as well. Some of those physiological systems actually produce cues that enable us to know what other people are feeling. So I could have an angry facial expression, but I can also have a vein protruding from my forehead, or turn very red with embarrassment. These appearance changes are produced by our autonomic nervous system. Language is also important. When someone is angry, they might say, "I'm about to explode." People use bodily metaphors, for example, metaphors of heat and pressure for anger. Part of what we do in our lab is to study all of these manifestations of emotion and look for convergences between the signals. So when somebody feels angry and they're using angry metaphors, and their heart's racing, and their brow is lowered, and their eyes are wide open, then we think that they are really angry.

But what's also very interesting is when one system indicates anger but another system indicates happiness. We see have that kind of thing all the time. Some humans show social smiles where they're actually afraid; or they're disgusted but they're smiling. It's a challenge to say what the true emotion is. How do we know what people really feel? So you want to measure a lot of things, kind of like



Figure 2. Examples of the many emotions, expressed together in a "multiplexy" of different forms.

taking a poll and seeing which emotion gets the most votes.

BSJ: In your test you measure things like heart-rate, sweat...

Levenson: Yes, we usually measure twelve physiological functions from people.

BSJ: Do you ever go into biochemistry and check?

Levenson: We don't, partially because what we're interested in primarily are these short-lived emotions that last only a few seconds. It's hard to relate these to something like cortisol or endorphins, which tend to be related to much longer lasting states, such as moods.

BSJ: We were wondering about fleeting emotions, like for the people who are able to control such emotions, are you able to detect that? Is there any sort of slight reading that can bring their emotions into control?

Levenson: Often there isn't. We did a series of studies in which we examined emotion regulation using experimental paradigms where we asked people to regulate their emotions. When we do that kind of thing, saying, "OK, we want you to look at this film and not react, or when you hear this loud noise, don't let it show," the physiological response turned out to be twice as large as when participants just had the emotion. In the case of holding back an emotion, you actually get more of a physiological response than if you let it out naturally, and for some physiological measures, they stay elevated for quite a long time. So it's actually very costly to exert that kind of control over your emotions.

BSJ: We were also looking at how emotions change over time, like with aging. In your studies, have you seen certain emotions that seem to become more regulated or more common with age?

Levenson: We just did a couple of studies and a couple of papers on that question. There are two questions that you may ask. (1) Are there emotions that become more powerful at different stages of life and (2) are there emotions that become more adaptive and are more useful at different stages of life.

We have done a couple of studies showing that older people are more likely to respond with sadness to themes of loss. Older people are also more likely to have a compassionate response to those in distress. In another study, we asked whether there are different emotions that are associated with well-being in different stages of life.

At your young age, it doesn't matter. There's no particular emotion that seems to be useful when you are young. I guess you can just be any way you want, and you will be fine. In middle age- so these are people forty to fifty- anger. The more anger that came out in a very ambiguous situation where we showed people a kind of a neutral film, the happier these people were with their lives. We think that is because in middle age, you are really taking control of the environment, and you're building your career, and you are making things happen. Your ability to take charge and keep what's yours is really important. Then in late life, it's sadness that's most useful. The greater capacity for sadness you have, the happier you are with your life. It might seem almost counter-intuitive at first to have sadness associated with being happy with your life. Dealing with loss, however, is an important part of late life and thus the capacity to express sadness becomes increasingly adaptive.

BSJ: We're also wondering if there're other factors, like outside of the self - maybe environment factors - that could have affected certain changes of emotions.

Levenson: Well I think the big one people look at is culture. Is that what you're asking about?

BSJ: Yes, culture, and also more concrete stimuli, such as music.

Levenson: One of the things that is interesting about emotion is that it can be produced by stimulation of any of the senses. When we think about the ways the emotions are usually generated, we think about interactions between individuals and environment, and individuals

and other people. Most of the anger of our lives is produced by other people. And most of the fear is produced by other people. We're not living on the savanna, and being afraid that tigers and lions are going to jump out. But we are afraid that we are going to fail life, and disappoint our parents and things like that. So, we have very complicated sources of emotions. But it is also the case that our emotions are sitting there and very very amenable to being stimulated in a lot of different ways.

Music plays an important role in our emotional lives in contemporary culture. We can have responses to music, but many people try to manage their emotions by listening to particular kinds of music. People use music to make themselves feel calm, excited, or romantic. Smell is another source of emotion that has not been well-studied. A former colleague of mine in psychology, Noam Sobel, has done pioneering work showing how odors can cause emotional responses.

And, of course, factors like age, culture, and gender can influence your emotions. If I ask you, based on your cultural experience: who's more likely to express sadness, men or women, what would you say?

BSJ: Women.

Levenson: If I said anger?

BSJ: Then probably the men.

Levenson: The point is that we have ideas like this. Where do they come from? They're either built into our nervous system or they're cultural conventions that we have learned. Gender influences all kinds of expectations about emotions. For example, we might believe that "grown men can't cry."

We conducted research on culture and emotion in my lab about a decade ago. One of the papers that we wrote compared Mexican Americans and Chinese Americans, what we termed cultures of expression and control. The idea was that in the Chinese tradition, moderation of emotions is really important, because by the Confucian ideals. The Mexican tradition values free expression. So if I ask you a hypothetical question, like: "who is going to have bigger emotions, an Italian or a Swede?" You would have an idea about that, right? We think Mediterranean people have these big emotions and Nordic people don't. We have these ideas. Now, is any of this true?

In the study I mentioned, we exposed Chinese Americans and Mexican Americans to a number of different emotional stimuli. What we found was that, for a given inten-

sity of emotional stimulus, Mexican Americans reported feeling more emotions than Chinese Americans. That matches the stereotype, but if you look at their physiology, whether it is their behavior or their autonomic nervous system, there was no difference. I left that research area convinced that the largest influence of culture is on what we say we're feeling, and not so much of the biological response.