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The Mechanics of new media (science) writing

Articulation, Design, Hospitality, and Electracy

Student Video: Curious Case of Contagious Stress Transcript (Kate and Kelly)

Kate [00:06]**:** It's mid-October in St. Louis, Missouri. The fall colors are at their peak, and the Cardinals are in hot pursuit of 12 in 12. But around Saint Louis University, there are few who have time to enjoy these gifts of autumn. It's midterms week. Pius Library, usually sparingly filled, is packed with students trying to cram last minute for a test or finish that final paragraph of a midterm paper. Fall colors are experienced through a glimpse out a library window, and Cards baseball is a distant memory recalled by a fellow student in a Redbirds shirt. All over campus, the stress is palpable.

Kate [00:49]: Arguably, midterms is the most stressful time of year for a college student. Unlike finals exams, midterms do not signal the end of a semester and period of relaxation to come. Instead, they are a halfway point that reminds you of more hard work in the near future and how little time there is to catch up. Perhaps the best place this stress and tension can be felt is in the campus dorms.

Kate [01:15]: Although Kelsey doesn't feel stressed about her own classes, just being around her roommate makes Kelsey feel more stressed and anxious.

Kelsey [01:23]**:** Hi. I'm Kelsey, I'm a senior. I live in Coronado. I share a room with my roommate, and she's a biology pre-med major, so she works pretty hard. She has some pretty hard classes. But I guess she didn't do very well in one of her semesters her freshman year, so she feels like her GPA is not that great. And she's trying to get into med school, so she's trying really hard this semester to get it up for applications. But she's in, like, eighteen hours, and she is always stressed out, always telling me how stressed out she is. Like, that's pretty much all I ever hear from her. She's never in our room. She's always at the library. Like, gets up at seven and doesn't get home until I'm fast asleep at, like, eleven thirty or twelve. I don't know. That's, like, literally all we talk about. How much homework she has to do. How much stuff she has to do that's due at the end of the week. Even on the weekends she gets up at like seven o'clock in the morning to do her laundry because I guess that, like, she doesn't feel like she has time to do it during the week, but it's so annoying because I'm always fast asleep. I, like, love sleeping in on the weekends, and she's always up at seven, like, being loud and doing her laundry. But it really stresses me out to hear how stressed out she is. I guess my classes aren't really that stressful this semester, and I feel like I have pretty much everything under control, but because she's so stressed out it makes me really stressed out. And I haven't been freaking about finals really, but I guess she's been making me feel like I should be doing more.

Kate [02:47]: This story is all too common. Teresa has a similar experience with her roommate.

Teresa [02:45]: My name is Teresa, and I live in Griesedieck. I had a roommate that moved out and we got along really, really well and so I asked one of my other friends to move into my room, and we thought it was going to work out perfectly until she actually moved in. And she just never does any homework. And so I'm in there trying to focus, and she's just on her phone with her boyfriend talking, on the phone with her mom, back on the phone with the boyfriend. And playing games and Facebook chat. And she never turns her phone or computer on silent so I can just never focus. She stresses me out. And just, like, in living situations she stresses me out. And in academic situations

she stresses me out. And everything she does just drives me absolutely up the wall. I don't know what to do. Whenever I'm around her I don't know if I should talk to her about moving back out or what, but I don't know if I can live with her anymore.

Kate [03:48]: Talking to these students, it seems like stress is spreading faster than the flu. It's as if just being in the same room with someone who is stressed will cause you to catch Mid-Terms Mania. This description may sound overly dramatic, but in fact, it's not too far from the truth. Experimental Psychologist Dr. Tony Buchanan has found that stress *really is* contagious!

Kate [04:12]: Dr. Buchanan first observed this phenomenon while a graduate student at the University of Oklahoma. As part of the experimental psychology department, Dr. Buchanan frequently observed the Trier Social Stress Test, or TSST.

Dr. Buchanan [04:26]: The Trier Social Stress Test (TSST) is a laboratory stress test in which a participant is asked to give a public speech and perform a mental arithmetic task in front of at least one and usually several experimenters while they're watching them do the task.

Kate [04:47]: This explanation makes the test seem a little less stressful than real thing. This speech that Dr. Buchanan mentions isn't some speech a participant has prepared well in advance. What happens in the test is a mock job interview. A participant stands before a panel of interviewers and must give a speech about why they should get the job. Simple enough, right? Wrong. Remember that awkward silence after a joke bombs? Well, something similar happens here. The interviewers want the participant to speak for a total of five minutes, so if you stop short, they pause a few seconds, then inform you, "You still have some time; please continue." And people often run out of things to say. Michelle Hendricks, a graduate student in SLU's stress lab, explains.

Michelle [05:42]: You have to give this speech, and they often run out of things to say after about a minute or so, you know, a minute or two. Two if they're really long-winded. And so we have to, you know, we feel bad for them because, you know, we have to wait before we can… We can ask them questions to kind of make them talk the entire time, but we just… they can't stop the entire five minutes, so we've got to keep them talking. So it's very stressful for them because they have to try to think of stuff to say even though they've pretty much already said what they thought they wanted to say.

Kate [06:17]: If both participant and observer run out of things to say, the rest of the interview is dead silence until the time is up. Sounds pretty nerve-racking, right?

Kate [06:29]: Well, the stress doesn't end there. As Michelle explains, the observers are trained to be non-reactive.

Michelle [06:37]: The point as we watch these speeches is to kind of be stoic and judgmental, to not smile, to not to make body movements that would sort of make the person feel more comfortable, which is basically against all of our instincts as individuals. So, you know, just stand there very still and expressionless and not be friendly, basically. I mean, we don't want anybody to be unfriendly, but we don't want to make the person feel incredibly comfortable because the idea, of course, is to kind of stress them out.

Kate [07:08]: Yep, you heard that right. You're pretty much talking to a brick wall. Giving a five-minute speech to a deadpan audience is making us cringe just thinking about it! But if you're one of those rare human beings for whom public speaking is not a phobia, rest assured: experimenters still

have a way of stressing you out. At the end of this interview, you're also asked to do some serial subtraction. Again, let's turn to Michelle Hendricks.

Michelle [07:35]: And then we have them do mental arithmetic in front of us, so yeah, if the speech doesn't get them, usually the mental arithmetic will. And so they have to count back, I think it's from 1,022 in 13 number steps, or something like that, mentally. And so when people are doing, especially with the math, I can remember with a few people, you know… people don't like math. Some people aren't very good at doing mental arithmetic and they stand there and you can tell they're feeling really awkward. They're like, "10,020… ," they can't even get down to, like, a thousand. They're like, "10,010… ," you know, they're just going at it over and over in their heads, and you want to stop them and be, like, "Take your time" or, you know, "It's OK," or just do something to make them feel more comfortable, but you can't.

Kate [08:23]: For experimental psychologists, the TSST is probably the most effective way to replicate real life stress in the lab. So, while a member of the Stress Lab at the University of Oklahoma, Dr. Buchanan had sat in on hundreds of these tests. As an experimenter watching the participants of a TSST, Dr. Buchanan was affected by what he observed.

Dr. Buchanan [08:47]: So, working on various studies in which we did the TSST, I was the experimenter in many of them, so I've watched hundreds of people go through the TSST and go through stress and struggle with the speech and the math. And just as they were feeling stressed, I was feeling bad for them and that sort of kicked off the idea that maybe just being in the same room interacting with people under stress could lead to a similar stress response.

Kate [09:18]: Just like the college students we heard from at the beginning of the segment, Dr. Buchanan was catching the stress of the participants he watched in the TSST. He too became stressed and felt some of the anxiety they were feeling. And this got him thinking: what is going on in our bodies when we have an empathetic response to the stress of another?

Kate [09:40]: To find out the answer, Dr. Buchanan consulted a colleague, Dr. Stephanie Preston, who studies empathy. And like many genius ideas, this eureka comment came over a beer at a bar.

Dr. Buchanan [09:53]: Over the years we'd been, we'd talked about this, you know, I think at a bar in Madison, Wisconsin. It was at a conference. And we sort of said, "We should look at the stress responses of the experimenters actually doing this test."

Kate [10:10]: Armed with Dr. Buchanan's knowledge of stress and Dr. Preston's understanding of empathy, the two set off to examine human beings' empathetic response to stress.

Kate [10:20]**:** Whoa. Hold on a minute. We need to back up. We haven't really talked about what empathy *is* yet. In the simplest terms, empathy is the ability to understand and share the feelings of another person. It is the capacity of humans to understand, be aware of, be sensitive to, and vicariously experience the feelings, thoughts, and life of another person.

Kate [10:48]: But this simple definition of empathy can be a little misleading. Empathy is both a "cognitive, intellectual reaction" and a "visceral, emotional one." When you feel empathetic, you *understand* another person's perspective and *feel* their situation. It uses some combination of your head and your heart. And all humans don't share a standardized sense of empathy. Some have a hair-trigger response, while others seem unaffected by another person's distress. But why is there

so much difference? If you ask scientist Mark H. David, it has to do with your ability to do four things:

> #1: Perspective-Taking, which is your ability to adopt the psychological viewpoint of another person.
> #2: Fantasy, which is your ability to put yourself into the feelings and actions of characters in a book or movie.
> #3: Empathic Concern, which is your ability to feel sympathy or concern for unfortunate others.
> And #4: Personal Distress, which is how much your own situations make you feel anxiety and how uneasy you feel in tense interpersonal settings.

Kate [12:03]: These four components impact every person differently. Some are very good at perspective taking, but are less affected by empathic concern. So, just like fingerprints, every person has a unique formulation of empathy, resulting in our individual empathic response.

Kate [12:22]**:** So you're probably thinking, "OK, why does all this matter? Why should I care that I may be more prone to having an empathetic response to someone else's stress?" If stress is an occasional experience for you, it probably isn't something to be too concerned about. But if you experience stress chronically, as in over an extended period of time, it starts to wreak havoc on your body. This is because our bodies haven't evolved to cope with today's human stressors. Neuroscientist Robert Sapolsky knows this all too well. He's studied the biological impact of stress for most of his career. Check out his book, *Why Zebra's Don't Get Ulcers* (1994), for more information. But for now, let's turn back to Michelle Hendricks, to hear more about Dr. Sapolsky's findings.

Michelle [13:09]: It definitely talks about, you know, why study stress, and it definitely gives you the rationale for that. And I think a lot of the rationale is, you know, in our society our stress systems are activated all the time. So, you know, our stress systems were evolved to deal with sort of acute threats to our survival, and he [Dr. Sapolsky] talks about zebras. Zebras don't have to deal with sitting in cubicles all day. They don't have to deal with traffic. Zebras are kind of just, the only thing they have to deal with is a predator coming after them. So their stress responses are well suited to that kind of stressor. They have this very acute rise in all of these hormones and, you know, their heart rate goes up, allows them to run away, and it's very adaptive. But for us, our stress systems haven't evolved to deal with traffic or to deal with work problems, coworker problems, or even the social stressors (stressors in between and in our relationships, stressors with people at work that we deal with). So our stress response goes off, you know, constantly to all these things, and it really wasn't designed to deal with those sort of things. You know, if I have a conflict with my coworker, it's not adaptive for me to run out of the room. You know? That's just not, it's not adaptive for my heart rate to go up and for me to get all anxious, and so we're not designed to deal with our stressors. Our bodies aren't designed to deal with the stressors that we have. So it's important to study it just to understand… I mean, our understanding so far, of what constantly activating this stress will do to us in the long term. There's lots of chronic, long-term things that can happen. It's really detrimental to your health in the long term. It's detrimental to your cardiovascular health. It's detrimental to your mental health. It's detrimental… it can weaken your immune system. It can weaken your ability to deal with subsequent stressors. It can mess with your cholesterol levels. So, there's a lot of things that stress can mess with, I think, that we're seeing in society.

Kate [15:23]: It's difficult for human beings to escape the day-to-day stress of their own lives, let alone the stress of others. But it's rare that anyone exists in a world that is isolated from other

people. We are around families and friends, roommates and coworkers from the time we wake up until the time we go to bed. So if those people are stressed and we're around them, we're going to catch it. And the chronic effects of stress are going to take their toll.

Kate [15:50]: Given these detrimental effects of stress, it was important to Dr. Buchanan to find out how an *empathetic* response to stress would impact the human body. How similar is someone observing another person's stress, to the actual stressed person? While Dr. Buchanan got stressed out observing the TSST participants, was his body also experiencing the physical effects of stress? Was this empathetic response all in his head, or what it in his body too?

Kate [16:20]**:** To learn more about the effects of empathetic stress on the human body, Dr. Buchanan turned to physiology for clues. Physiology is the branch of biology that explores the organic processes or functions in an organism, like a human being, or in any of its parts. It's what happens inside our bodies in response to something we encounter. For experimental psychologists, this physiological response is really what *defines* stress. We turn to Michelle Hendricks, again, to explain.

Michelle [16:49]: Stress is usually defined as some sort of challenge to the organism. It can be good. It can be bad. But it usually results in a sort of characteristic physiological response. So, like, a rise in heart rate, a rise in arousal. And eventually, if it's prolonged enough or intense enough, an activation of the HPA axis that results in the release of cortisol. And so it's usually, from the perspective of a stress researcher, it's usually defined pretty physiologically. So we would say somebody has a stress response if these things occur. And it would be in response to some kind of stressor that we would introduce to them.

Kate [17:30]: Michelle used some pretty specific terms here, so let's take a minute to explain them.

Kate [17:35]: First, let's tackle what she calls "good" and "bad" stressors. Most of the time we think of stress in its bad connotations, like the stress caused by the death of a loved one or from a traumatic personal experience. But stress isn't always negative. Examples of good stress are the stress you feel anticipating a wedding or buying a house.

Kate [17:58]: Next, let's define this term "arousal." Get your mind out of the gutter—we're talking with scientists here. Arousal simply refers to a stir to action or a strong response. This can also be positive or negative, like good and bad stress.

Kate [18:14]: As for the HPA axis and cortisol Michelle refers to, let's table those topics until a bit later on. For now, let's dig deeper into our body's characteristic physiological responses to stress.

Kate [18:27]: As Michelle mentioned, a rise in heart rate is one way our body responds to stress, but it's not the only way. Pupil dilation and sweating are other ways our body physiologically responds to stress. Specifically, these are responses that occur because of our sympathetic nervous system.

Kate [18:44]: But the sympathetic nervous system is just one part of our physiological response to stress. In fact, two separate but overlapping systems activate when we encounter a stressful situation. Remember the HPA axis Michelle mentioned? Well, the HPA axis is the other system. For the purposes of his experiment, however, Dr. Buchanan was more interested in looking at our body's stress response resulting from the HPA axis, rather than the sympathetic nervous system.

You see, the sympathetic nervous system is a little too sensitive and may show a response to a situation that isn't really *that* stressful. Let's have Dr. Buchanan explain.

Dr. Buchanan [19:25]: The sympathetic nervous system is a very simple system in that it responds to any kind of change in arousal, or even just standing up you can get a sympathetic nervous system response. Your heart rate goes up; your blood pressure goes up because it has to send blood down to your legs in order to help you keep standing up. We wanted to measure both the sympathetic nervous system as well as the HPA system because the HPA system is really more specifically attuned to the stress response, incorporating the negative affect and uncontrollability that is essential for eliciting a stress response.

Kate [20:05]: Obviously, the stress of standing up isn't quite the same as the stress of the job interview scenario in the TSST. The HPA axis is a much better measure of the stress Dr. Buchanan was interested in.

Kate [20:19]: Why is the HPA axis better, you ask? Well, it has to do with cortisol.

Kate [20:25]: HPA is an acronym that stands for hypothalamic-pituitary-adrino-cortical axis. Essentially, this is how your brain works with your endocrine system to release the hormone cortisol. And, as Michelle mentioned earlier, cortisol is the crucial measure of a stress response. But, Dr. Buchanan can explain all of this much better.

Dr. Buchanan [20:48]: The hypothalamic-pituitary-adreno-cortical axis is the main hormonal axis of a stress response. That's abbreviated the HPA axis. So, the H stands for the hypothalamus and that's a small region at the base of your brain, and it is in charge of a lot of the basic drives that we and all other animals have. Seeking out food, seeking out drink, seeking out mates, etcetera. Very basic functions of the control of our bodies and behavior. The hypothalamus pumps out one hormone that then goes down to the pituitary gland, which is the P in the HPA axis. The pituitary gland then pumps out a hormone that goes into the general blood supply. That, in turn, floats down to your adrenal gland that sits atop your kidneys. So the adrenal gland, specifically the adrenal cortex, is the A part of the HPA axis, and that produces cortisol which is the hormone that we're interested in. Cortisol is released into the blood stream, and in response to that stress, what it's there to do is to provide you with the metabolic support you need in order to handle the stressor and then to repair your body after the stressor has ended.

Kate [22:15]: As you can tell, the HPA axis is much more complicated than that sympathetic nervous system. And as a result, it takes a lot more to activate it. You won't engage the HPA axis and release cortisol by just standing up, for example. The HPA axis requires a stronger stressor than the sympathetic nervous system to cause it to activate. There needs to be something uncontrollable about a situation to activate the HPA, making exercise an insufficient way of eliciting true stress, says Dr. Buchanan.

Kate [22:50]: Though it acts as a stressor and may activate both of our physiological stress responses, exercise isn't a trusty measure of stress. As Michelle said earlier, for a situation to be stressful for an experimental psychologist, the HPA axis needs to be activated, resulting in cortisol being released into the body. And that's not always true for stress induced by exercise. Which is why the Trier Social Stress Test is so great for stress research: the uncontrollability of giving a public speech and doing serial subtraction on cue engages both the sympathetic nervous system and the HPA axis. It elicits the kind of stress response that experimental psychologists want to observe.

Kate [23:36]: Now, we have one last item to explain: the perception action model, or PAM. Remember Dr. Buchanan's colleague, Stephanie Preston? The PAM is a big part of her research on empathy, but let's have Dr. Buchanan sketch out the PAM for us.

Dr. Buchanan [23:54]: The perception action model is kind of a wide-ranging model used in cognitive science. But it can be specifically applied to empathy in the sense that when I see another individual in distress, when I perceive them in stress, my brain and body put it into action. So, the perception-action… the perception of another individual under stress is put into action by my own brain and body to elicit a very basic physiological empathetic response to that individual's pain or distress. So, applying that model to this particular *social* stressor had never been done before, so that was what we were after in this particular application of the PAM model.

Kate [24:43]: The PAM helps us understand how our empathetic response to someone else's stress results in a stress response in our own body. By perceiving another person's stress, your body's stress responses are activated, and you in turn have a physiological response to stress.

Kate [25:05]: Whew! That was a lot of background knowledge. But understanding the sympathetic nervous system, the HPA axis, and the PAM are essential for understanding why Dr. Buchanan constructed his experiment the way he did. It explains why he measured heart rate and cortisol, why he used the Trier Social Stress Test instead of something else like exercise, and why we have an empathetic, physiological response to stress. But what exactly did Dr. Buchanan *do*?

Kate [25:30]: Since the TSST was what initially triggered his own empathetic response and it's super effective at eliciting stress, Dr. Buchanan decided to use this method to induce stress for the participants in his experiment. But he didn't stick with the same old TSST setup. Instead, he modified it a bit. Rather than it being a job interview scenario, this time, participants are accused of shoplifting and must argue their innocence in front of a store manager. Previous experiments had shown that the shoplifting scenario was a little better at eliciting a stress response from participants. Being accused of stealing is something tends to make everyone stressed out since they have to defend themselves against the threat of some unjustified punishment. A job interview doesn't have quite the same repercussions. Since the standard TSST was modified for their *empathy* experiment, Dr. Buchanan renamed his version of the test **e-TSST.**

Kate [26:31]: Aside from the change in the speech scenario, everything else stayed the same. The eTSST still requires the participant to speak for five minutes and the participant still has to do serial subtraction at the end of the experiment.

Kate [26:45]: By now, you're probably itching to see the awkwardness of the eTSST, right? Yea, we are too. Let's follow what happens to two participants as they go through the experiment. The first participant arrives at Shannon Hall and takes the elevator down to room 013, the Cognitive Neuroscience of Stress Lab. There, Experimenter A greets the first participant and assigns her a role: today, she is the Speaker in the experiment. Next, the Experimenter escorts the Speaker-participant to another room where her baseline, relaxed-state heart rate and cortisol levels are recorded. Electrodes are attached to her skin to measure her heart rate throughout the experiment. Her cortisol levels are obtained through a saliva sample. (Cortisol isn't just released in the blood; it's released in saliva, too). Up until now, the Speaker's job has been relatively easy, but that ends here. She is now given the instructions for the more nerve-racking part of the test: the shoplifting speech. She gets just *five minutes* to prepare her arguments, leaving her little if any time to relax before she must deliver her speech.

Kate [27:58]: Meanwhile, the second participant arrives. He is greeted by Experimenter B and is given the role of the Observer in the experiment. Like the Speaker-participant, the Observer-participant is also hooked up to electrodes and his baseline heart rate and cortisol are measured. But compared to the Speaker, the Observer's instructions are much simpler. All the Observer has to do is watch someone give a speech and to try not to give much of a response to that person. His job is pretty stress-free—no preparation is required. The only work he has to do in advance is get hooked up the heart rate monitor and sit behind a desk. With this complete, Experimenter B joins the Observer at the desk and the experiment is ready to begin.

Kate [28:45]: Now it's game-time for the Speaker. Her five minutes of prep time are up. Experimenter A guides the Speaker into the eTSST venue and instructs her to stand on an X on the floor. Next, Experimenter A connects the Speaker to the heart rate monitor in that room. And then, Experimenter B informs the Speaker, "OK, let's hear your speech."

Kate [29.09]: When all this stress and awkwardness is over, saliva samples are again obtained from the Speaker and the Observer. This is the last sample obtained in the test. From this point on, it's back to normal. The electrodes are removed from each participant and they're off on their merry way. The saliva samples are sent to another the lab to assess the cortisol levels and the heart rate figures are examined. When all the results are in, the experimenters analyze the Speaker's cortisol levels and heart rate and compare that to the Observer's values.

Kate [29:45]: And what did Dr. Buchanan and his lab discover? It turns out the Observer's cortisol responses actually mimic the Speaker's! They're not exactly the same, though. The Observer's responses are a little lower, but they rise and fall according to the stress response of the Speaker. This means that just by watching the Speaker get stressed out delivering their speech, the Observer, merely sitting in a chair, caught the stress of the person they were watching! What Dr. Buchanan observed in graduate school was true: we do have an empathetic, physiological response to stress. Stress really is contagious!

Kate [30:27]: As snow flurries begin to fly and the semester comes to a close, it's important to keep Dr. Buchanan's discovery in mind. Midterms Mania is quickly evolving into Finals Fever, and this contagion spreads like wildfire! If you want to protect yourself against its infection, try to remove yourself from the stressed-out people in your life. And if you're the stressed-out person, be kind to your friends and family by giving them a little space. Until our bodies evolve to handle that strenuous 90-minute finance exam or that arduous 15-page paper on St. Thomas Aquinas, we're just going to have to be aware of the pitfalls of our empathetic response to stress and do what we can to keep that stress in check. Otherwise, those devastating impacts of chronic stress are going to make our lives miserable!

[music outro: Queen. "Under Pressure (Live)." *Queen Greatest Hits*]