DACARI: You're listening to *Brains On!* where we're serious about being curious.

SUBJECT 1: *Brains On!* is supported in part by a grant from the National Science Foundation

[MUSIC PLAYING]

MOLLY BLOOM: This is *Brains On!* from American Public Media. I'm Molly Bloom. Today we're talking about anger. Now, there are a lot of reasons people feel angry, and right now many people are angry because of injustice. Injustice is a word we use when something is wrong or unfair.

For a long time, people have been treated unfairly because others don't like the color of their skin. Sometimes this means they're in danger, but it can also mean they don't get the opportunities or services they need. That's called racism. It's not right, and we're angry about it, too.

[MUSIC PLAYING]

Just about a year ago, we did a whole series on feelings-- happiness, nervousness, sadness, and anger. We covered a lot in those episodes, like how emotions affect your body, why we have these feelings in the first place, and how being aware of them can help you calm down when your emotions are too much to handle. There's a lot to process in the world right now. So we thought it would be helpful to get back to some parts of that series today with injustice in mind.

But first, let's hear from Jamilah Pitts. She's a teacher who helps other teachers talk about racism and justice with their students. We spoke to her this week.

JAMILAH PITTS: Anger is a part of us being human, and we are allowed to feel that way.

MOLLY BLOOM: Even though it's normal to feel this way, Jamilah says anger, especially when it comes from seeing or experiencing injustice, still takes some work to handle.

JAMILAH PITTS: It's important to know and to recognize and to name when we feel angry. And I think it's equally important to understand why we are angry and where that anger comes from.

MOLLY BLOOM: Usually, before you can understand a feeling, you have to get it under control because, as we'll talk about in a bit, anger can be intense and make it hard to think clearly.

JAMILAH PITTS: One of my favorite things to do when I'm really angry is to write it down. And so sometimes it can be writing a letter to myself or writing a letter to someone, or drawing pictures, or listening to music, or creating something that allows me to understand why I might be angry.

MOLLY BLOOM: And if we can sit with our anger and decide how to act, we might find ways to help, maybe by saying something when we see injustice happening.

JAMILAH PITTS: If you hear someone or you see someone saying or doing something that is wrong, speaking out against that, not choosing to remain silent even if you think that it is going to get you into trouble, it is really important for children, for young people to understand the power of their voice, the power of them speaking up, and the power of them doing something to change the world.

MOLLY BLOOM: You can help fight racism and injustice in all kinds of situations, not just when you're angry.

JAMILAH PITTS: It may be talking to our parents or our family members about what racism is and about what we can do to end something like racism. It may be reading books and learning about racism and learning about people who have worked in the world to bring an end to racism.

[MUSIC PLAYING]

There have been many examples in history where children have played a really important role in helping the world be a better place, in helping the world end injustice.

[MUSIC PLAYING]

MOLLY BLOOM: Fighting for justice is a big job, and it can feel overwhelming. But Jamilah says it helps to remember you're not alone. Lots of people are with you working to make the world a better, fairer place.

JAMILAH PITTS: It is powerful for one person to do something and to speak out against something like racism or injustice. But solidarity means not just one person and not just two people, but a lot of people come together. And they connect around an issue like racism or different types of injustices, and they work towards making it better together.

[MUSIC PLAYING]

I think it's important to know that you are loved, that you are cared for, and that there are so many people around the world who are working to make sure that the world that you grow up in is a much better place.

[MUSIC PLAYING]

MOLLY BLOOM: Now let's look at what happens in our bodies when we feel angry. You're about to hear part of our series on feelings. My cohost, DaCari, and I helped tackle these listener questions.

BENNETT: My question is, how do people get angry?

MARION: Why is it that when you're mad, your brain goes crazy, and you do stuff you know you're not supposed to?

LUCAS: Is there a good evolutionary reason for getting angry, and how does it help us?

MOLLY BLOOM: That was Bennett from Richmond, Ontario, Marion from Atlanta, and Lucas from London, England. So when we're angry, it's often because our brain sees something it thinks is a threat.

DACARI: After all, one of the brain's main jobs is to protect us from danger.

MOLLY BLOOM: Right. If your brain interprets something as potentially dangerous, it gets ready for action.

[MUSIC PLAYING]

[WHISTLES]

[SNIFFING]

BRAIN: This brain smells danger [SNIFFING] and Thai food, but mostly danger.

DACARI: We call this fight, flight, or freeze.

MOLLY BLOOM: Because in a threatening situation our bodies get ready to try to do one of those things.

DACARI: You can fight to defend yourself.

BRAIN: Hands, get ready for action.

[MUSIC PLAYING]

HANDS: Yes, sir, Brain, sir.

SUBJECT 2: Just as soon as we--

HANDS: Make this last--

HANDS AND SUBJECT 2: Goal! New high score! High five!

[SLAP]

HANDS: Ow!

SUBJECT 2: My face.

HANDS: Why do we do that?

MOLLY BLOOM: You can take flight by running away.

BRAIN: Feet, be ready to run.

[MUSIC PLAYING]

FEET: Yes, sir. We're standing by. Or as we call it, just standing.

DACARI: Or you can freeze. You feel so threatened that you want to hide, or you're not sure what to do next.

MOLLY BLOOM: This fight, flight, or freeze reaction involves natural chemicals inside your body that tell it what to do*Brains On!* Producer Menaka Wilhelm is here to break it down for us.

MENAKA WILHELM: Hi, Molly. Hi, DaCari.

DACARI: Hi.

MENAKA WILHELM: So the fight, flight, or freeze mode is kind of like a reflex.

[MUSIC PLAYING]

It might happen before you even realize what's going on, like sometimes, you know, if you touch a really hot pan, you pull your hand away before you even feel any pain. Emotions can be a little like that, too.

[MUSIC PLAYING]

So when your brain sees a threat, it reacts fast. It sends a message to glands right behind your stomach, above the kidneys. It tells them to make hormones, specifically adrenaline and cortisol. Adrenaline and cortisol are very powerful hormones. And during fight, flight, or freeze, our bodies get a jolt of both of them. They sort of supercharge us.

URAINA CLARK: We'll be able to run faster and farther, and act quicker, and see more, and pay attention to things better, and remember things better.

MENAKA WILHELM: That's Uraina Clark. She studies how stress affects our brains at the Icahn School of Medicine at Mount Sinai. She says adrenaline and cortisol play slightly different roles in the body.

URAINA CLARK: Adrenaline's like, here we go. We're going right now. Go, whereas cortisol is like, I will keep you going. You're going to keep going.

MENAKA WILHELM: So when we're in fight, flight, or freeze mode, certain things actually change in our bodies.

[MUSIC PLAYING]

Our hearts will speed up, we'll take deeper breaths to get more oxygen, and that will bring more blood to our heart, lungs, and limbs. Our blood sugar also rises, which means more fuel for our muscles and our brains, too. Our bodies basically become like a coiled spring, ready to fight or to run far, far away. Or we might freeze, feeling scared but not sure what to do.

[MUSIC PLAYING]

Uraina says it can be overwhelming.

URAINA CLARK: It's so automatic, we don't even know it happens. Before you even realize that there was a threat, you are ready to fight it. You're ready to flee it. Your fight or flight response has already begun.

MENAKA WILHELM: It's an important response, but it can be a lot to handle. When I'm feeling overwhelmed, I like to pause for a second, take some deep breaths, [EXHALES] and count to 10. Then I feel more ready to think about what I want to do next.

MOLLY BLOOM: Thanks, Menaka.

MENAKA WILHELM: My pleasure. I'm going to leave now but, I'm not fleeing-- just normal, average paced walking away.

DACARI: Bye.

MENAKA WILHELM: Bye!

[MUSIC PLAYING]

DACARI: Some feelings like anger can come on really quickly. It can be overwhelming, but the feeling of anger isn't a big, bad thing that you have to avoid or ignore.

KAZ NELSON: It is healthy to feel anger and healthy to notice that signal.

MOLLY BLOOM: That's Kaz Nelson. She's a doctor whose specialty is feelings and mental health at the University of Minnesota. She told us the key is noticing those feelings.

KAZ NELSON: What you want to do is catch it and maybe bring down the intensity of that anger if it's not going to be an effective tool in meeting your goals, or it might hurt somebody. That's when we have to bring down the intensity of anger.

DACARI: But once you handle your anger, it can also be useful in some cases.

KAZ NELSON: If you see someone else getting hurt, for example, or someone hurting another person, that might make you feel angry on behalf of that person. And it might be justified at that point to use that anger to help fix a system or to correct an injustice that might be happening. So please know that anger is a flag and a signal, and you have to use it carefully. But it's not necessarily a bad emotion that has no use.

[MUSIC PLAYING]

There may be times where you feel kind of overstimulated or upset or feel a feeling. And you say, you know what, I'm just going to go and watch TV for a couple of minutes or go sit in my room and read a book. And those are ways of modulating one's emotion-- taking a warm bath, taking a cold bath, getting some intense physical exercise, smelling something that smells good. There's a lot of things, even cuddling an animal, that you can do to change and influence your emotional system.

[MUSIC PLAYING]

[MUSIC PLAYING]

MOLLY BLOOM: At *Brains On!,* our mission is to help answer your questions, big or small. And we know at this time, you might have more questions than usual. We are here to listen and do our best to come up with fact-based answers. If you want to send us a question, or a drawing, or a mystery sound, even if you just want to say hi, you can do that at brainson.org/contact.

DACARI: That's how we got this question.

LOGAN: My name is Logan from Mount Holly, New Jersey. My question is, what happens when lightning strikes water?

MOLLY BLOOM: We'll have the answer to that question during our Moment of Um at the end of the show.

DACARI: Keep listening!

[MUSIC PLAYING]

Welcome back to *Brains On!* from American Public Media. I'm DaCari.

MOLLY BLOOM: And I'm Molly. We have some important business to attend to.

[SHHHH]

[DING]

CHILD: (WHISPERING) Mystery Sound.

[DESCENDING WHISTLE]

MOLLY BLOOM: Are you ready for the Mystery Sound, DaCari?

DACARI: Yes.

MOLLY BLOOM: All right. Here it is.

[DING]

DACARI: It sounded like a bell.

MOLLY BLOOM: It definitely sounds like something ringing. We're going to give you another chance to guess, and we'll reveal the answer a little bit later in the show.

ROBOT: Brains, brains, brains.

[FIZZLE]

MOLLY BLOOM: All of us get angry, but we don't necessarily get angry in the same ways. We asked you to tell us how it feels in your body when you get angry. And here's what you had to say.

SUBJECT 4: When I get angry, my body feels like it does not want to talk, and I just want to walk away and be alone for a little while.

SUBJECT 5: It feels like I need a volcano to slow down my body.

SUBJECT 6: When I'm angry, I feel like my fists are crunched up inside my body and brain.

SUBJECT 7: I also feel like energy builds up inside me, and I feel like I could go really fast or really strong.

SUBJECT 8: I feel overwhelmed.

SUBJECT 9: I just feel like I want to punch somebody.

SUBJECT 10: I feel like someone shook up a fizzy water inside my body, and it wants to explode.

SUBJECT 11: When I'm mad and sad, I whine a lot.

SUBJECT 12: Sometimes I play on my keyboard. I start with the low notes, and I play out my emotions. And when I get more calmer, I play out calmer songs that I make up myself. And when I'm calm enough, most of the time I'm able to talk out how I'm feeling.

[MUSIC PLAYING]

MOLLY BLOOM: Thanks to Liam, Eve, Beckett, Jack, Kathy, Jack, Josie, and Ava for sharing those answers with us. Different brain chemicals help create feelings like happiness, sadness, anger, or nervousness. We all have the same chemicals, but we have them in different amounts, and they affect us in different ways. We call this mix your emotional thermostat.

[MUSIC PLAYING]

(SINGING) Ooh, emotional thermostat.

DACARI: And everyone's mix is a little different.

MOLLY BLOOM: Just like no two people look exactly the same, our brains don't work exactly the same either.

DACARI: Some people feel happy pretty easily. But for others, it might take more to make them smile.

MOLLY BLOOM: The same goes for other emotions, too. It's kind of like each of us has our own thermostat set for what it takes to feel certain feelings.

DACARI: You know a thermostat is that thing that controls the heat in your house.

MOLLY BLOOM: Exactly. This metaphorical thermostat controls your moods.

DACARI: An emotional thermostat. And this emotional thermostat is set by your genes.

MOLLY BLOOM: Not your pants. Those are jeans with a J. These are genes with a G. They're the instructions that tell all the cells in your body how to be. You inherit them from your parents. And this emotional thermostat is also set by experiences you have.

[MUSIC PLAYING]

(SINGING) Ooh, emotional thermostat.

MOLLY BLOOM: OK. Let's get back to that Mystery Sound. Here it is again.

[DING]

Before you take another guess, I'm going to give you a clue. You might hear this in a yoga class. Any new ideas?

DACARI: It sounds like you're hitting something.

MOLLY BLOOM: Definitely. Here is the answer.

DIMAUN COLEMAN: And it's a sound bowl, an Asian yoga tool. But this is what it sounds like.

[DING]

MOLLY BLOOM: That was Mr. Dimaun Coleman. He's a yoga teacher who works with kids in Baltimore. When you do yoga, you move your body through poses, like Downward Dog or Happy Baby, while focusing on your breath. Yoga originally comes from India and is thousands of years old. Mr. Coleman uses the sound of the bull to get his class's attention and get them to focus.

[BELL RINGS]

DIMAUN COLEMAN: My name is Mr. Coleman. I'm at Dallas F. Nicholas Elementary School. I am the yoga teacher for the school, the yoga and mindfulness practitioner. And this is my yoga class.

Everybody say sunrise.

STUDENTS: Sunrise.

DIMAUN COLEMAN: This is a full body exercise. So what that means is you're working every muscle in your body that you use every day, from your toes to the top of your head. So everybody, breathe in.

I've been doing yoga since middle school. It really enforces the importance of self and breathing.

Every time you breathe in, I want you to see yourself pull in positive energy, like happiness and joy. Every time you breathe out, I want you to see yourself pushing out any negative energy, like sadness or anger. If anything made you sad and angry at school today, just breathe it out. Realize that it's not happening right now, and focus on the present moment. What we are doing in this present moment is relaxing.

STUDENT 1: I like it because I bring in that energy and happiness. And then sometimes when I'm sad, I just breathe out.

DIMAUN COLEMAN: Everybody say Tree Pose.

STUDENTS: Tree Pose.

DIMAUN COLEMAN: Balance Pose.

STUDENTS: Balance Pose.

DIMAUN COLEMAN: Mountain Pose.

STUDENTS: Mountain Pose.

STUDENT 2: My favorite pose is the Mountain Pose because when you put your arms up, it looks like a mountain was formed.

STUDENT 3: My favorite pose is the Tree Pose.

STUDENT 4: Tree Pose.

STUDENT 5: The Tree Pose.

STUDENT 6: Tree Pose.

STUDENT 7: The Balance Pose.

DIMAUN COLEMAN: Last breath we're going to take together. Breathe in, and breathe out.

[BELL RINGS]

MOLLY BLOOM: For some people, like the students in that class, yoga is a way to get in touch with their bodies and their feelings. So, DaCari, have you ever done a class like that?

DACARI: Yes. When I first started, when I saw people doing these weird pose-- I was like-- I'm like, what are they doing? It looked just so weird to me. Then when I've tried it, I thought it was really fun. So I wanted to stay in it.

MOLLY BLOOM: So you started taking these classes through the Holistic Life Foundation, which is an organization that teaches young people all about yoga and mindfulness. And now you're a mentor in the program. What kind of classes have you done as a mentor?

DACARI: We have done classes for the little kids. We teach them the basics. Then as the kids get older, we tell them more and more.

MOLLY BLOOM: So you're a teacher.

DACARI: Yes.

MOLLY BLOOM: That is so cool. So can you tell me a little bit about what you tell the little kids? First of all, how old are the kids you're working with?

DACARI: Three to five.

MOLLY BLOOM: What do you tell them?

DACARI: I tell them when we first start, we have to stretch out our bodies, so you don't get hurt. Then after we stretch out, we do the first pose, which is the Downward Dog. You get on your feet, on your hands, and you put your legs up, and you just sit there for like five seconds. Then when you exhale, you go down.

MOLLY BLOOM: So you use your breath to move through these different yoga poses?

DACARI: Yep.

MOLLY BLOOM: So when you're teaching them, is the purpose of the class sort of helping to control your emotions, or does it have a different purpose overall?

DACARI: It helps with emotions and behavior.

MOLLY BLOOM: How do you think it helps that?

DACARI: It helps them with calming down more, and not more explosions happen.

MOLLY BLOOM: Do you meditate and do yoga, or do you just do yoga?

DACARI: I do both.

MOLLY BLOOM: So do you find that when you do those that it helps you control your emotions?

DACARI: It helped me by making me a calmer person. It helps you if your anger problems or anything you need to be helped on.

MOLLY BLOOM: How old were you when you started doing it?

DACARI: I was five years old when I started. And when I first started, it was weird to me, but it grew on me.

MOLLY BLOOM: That is so cool. Well, for people who have never meditated before, meditation can help you quiet your mind. In some meditations, you focus on your breathing. In others, you notice your thoughts. Some people call this mindfulness, which means being aware of what you're doing and thinking and feeling. That can help you listen to the logical part of your mind instead of just the automatic, emotional side.

OPERA SINGER: (SINGING) *Brains On!* [COUGHS]

DACARI: Meditation helps a lot of people pause when they have a big feeling.

MOLLY BLOOM: Right. But in terms of what meditation exactly does to us, it's actually a tough question to answer. Does it change our brains? Here's Alea Skwara who studies meditation at the University of California, Davis.

ALEA SKWARA: Meditation does change your brain, but so does literally anything else you do. So does going for a walk. So does practicing an instrument. Anything you do in the world changes your brain. Your brain is very plastic. It's a learning machine, especially kids.

MOLLY BLOOM: Alea and other scientists have a lot of questions about how meditation and mindfulness affect us.

DACARI: And it's kind of tricky to measure the answers to those questions.

ALEA SKWARA: If I want to see how tall someone is, I can use a measuring tape. If I want to see how mindful someone is, there's no direct way to measure that. We're measuring things that go on inside someone.

MOLLY BLOOM: That doesn't mean it's impossible to understand how meditation works. It just means there are lots of things left to learn about meditating.

DACARI: Researchers like Alea are hard at work. They're starting to see, when you meditate--

ALEA SKWARA: There do seem to be differences in your ability to maintain your attention over a period of time, to keep your attention on whatever it is that you're choosing to keep it on.

MOLLY BLOOM: Meditation helps you practice noticing things, like your breath, small details in the world around you, and even feelings. And that seems to help when you have a big feeling like anger.

ALEA SKWARA: So you're able to see it as a reaction. Instead of feeling like (LOUDLY) I am my anger, being able to feel like I am the space around the anger, and I'm feeling this anger come up.

MOLLY BLOOM: When you meditate, you practice noticing things without jumping to act. So you might start using that skill when you have a strong emotion, too.

ALEA SKWARA: And so it's not to reject it and not to push it down. But instead, because you are not the anger, being able to then make a choice on how you want to express that feeling.

DACARI: That way, it's up to you what you do next. Your anger doesn't get to pick for you.

[MUSIC PLAYING]

MOLLY BLOOM: Is there anything that you do that helps you when you feel angry, DaCari?

DACARI: I just close my eyes and go to my happy place and pretend I'm the only one there. It helps me every time.

MOLLY BLOOM: That is really great. Can I ask you, what is your happy place?

DACARI: My happy place is full of LEGOs.

MOLLY BLOOM: Oh, yes! That's awesome. What kind of stuff do you like to build with LEGOs?

DACARI: I build cities, houses, cars, airplanes, and helicopters.

MOLLY BLOOM: Yeah. When I am angry, I take deep breaths. That helps me a lot. But now I think I might start imagining a LEGO room. I think that would really help me, too. And Mallika Chopra has another idea of what to do when you're angry.

DACARI: She's a meditation and mindfulness expert.

MOLLY BLOOM: She wrote a book called *Just Breathe,* which is a guide to meditation for kids. Here's what Mallika suggests for big, angry feelings.

[MUSIC PLAYING]

MALLIKA CHOPRA: When we get angry, you can often feel it in your body. So you may feel that your face gets red, you clench your hands, your heart starts beating really fast, and you may even feel like hitting something or shouting out loud. So your body reacts to anger.

So when we are angry, what I suggest is an exercise called STOP, S-T-O-P. So S is for stop what you're doing. T is take three breaths because breathing helps us slow down. So take three breaths in and out.

O is observe what's happening in your body. So like I said, it's normal for your heart to start beating or your hands to start sweating or get clenched, your face to get hot. And so just observe what's happening while you're taking those breaths. And then P is for proceed. And what this does is it just helps your anger get more in control so that you feel like you can make good decisions and not angry decisions.

[MUSIC PLAYING]

[MUSIC PLAYING]

MOLLY BLOOM: It's totally normal to feel angry. Injustice is definitely one reason to get mad. But if you can understand your anger, you can use it to fight for fairness.

DACARI: We evolved to sometimes want to fight and respond to a threat.

MOLLY BLOOM: And part of that response to a threat is your body releasing chemical signals called hormones.

DACARI: Adrenaline and cortisol are key hormones in our fight, flight, or freeze response.

MOLLY BLOOM: But if you pause to realize what's happening to your body, you can calm down and think about what to do next.

DACARI: Scientists are still trying to understand exactly how meditation affects us. But so far, it seems to help people pause and pay attention better. That's it for this episode of *Brains On! Brains On!* is produced by Marc Sanchez, Sanden Totten, and Molly Bloom.

MOLLY BLOOM: This series was also produced by Menaka Wilhelm and Sam Choo with support from Call To Mind, APM's mental health initiative. We had production help from Hannah Harris Green, Kristina Lopez, Elyssa Dudley, Stel Kline, and Emily Bright. We're edited by Phyllis Fletcher. We had engineering help from Veronica Rodriguez, Bob White, and Cameron Wiley. Special thanks to [LISTING HONOR ROLL].

DACARI: Now, before we go, it's time for a moment of um.

[INTERPOSING VOICES]

SUBJECT 13: What happens when lightning strikes water?

[MUSIC PLAYING]

JONATHAN SMITH: So lightning has a very unique behavior when it strikes the water. I'm Jonathan Smith. I am a assistant research scientist at the University of Maryland focusing on the Geostationary Lightning Mapper.

[MUSIC PLAYING]

So we often think of cloud-to-ground lightning strike as just that-- electric discharge hitting the ground. But it's actually a meeting in the middle of an electric flash from the ground or the surface of the water and an electric flash from the cloud. At that point of contact with the water, you have charge that builds up right along the surface of the water.

The charge moves from that point of contact in a circular sort of fashion. I don't know if you could imagine like a pebble being dropped in water. You see the circles. It's sort of like that, how the electric charge along the surface moves.

So you might be curious as to what happens beneath the surface of the water. Well, studies have shown that really there's no impact to sea life that are below the surface of the water because that charge stays right along the surface. It's important to not be near water when there's thunder and lightning.

SUBJECT 14: Um.

SUBJECT 15: Um.

SUBJECT 16: Um.

MOLLY BLOOM: We'll be back soon with more answers to your questions.

DACARI: Thanks for listening!