But Why: A Podcast for Curious Kids

Why Do We Need To Sleep?

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[Child 1] Why do people need to sleep?

[Jane] This is But Why: a podcast for curious kids, from VPR. I'm Jane Lindholm. On this podcast, we take questions from kids just like you all over the world and we find answers. We've heard from a lot of you who listen to podcasts when you're winding down and getting ready for bed. So it makes sense that a lot of you are inspired to send us questions about sleep.

[Child 2] Why do people toss and turn when they're asleep?

[Child 3] When you're getting into the deepest sleep, your body somehow wakes you up by kicking and it feels like you jump really high?

[Child 4] Why is that, I don't want to get out of bed in the morning and when it's nighttime I don't want to go to bed?

[Jane] In this episode we are answering your questions about sleep.

Did you know there are doctors who focus specifically on helping kids sleep better? We found one of them at National Jewish Health. That's a hospital in Colorado.

[Lisa] My name is Dr. Lisa Meltzer, and I am a pediatric sleep psychologist, which means I work with kids to help them sleep better.

[Jane] Do you feel like you sleep pretty well? Do you think, "Oh yay!," when the adults in your life tell you it's bedtime? Or do you struggle to get ready for bed and maybe even struggle to go to sleep or to stay asleep. Dr. Meltzer says there are a few things that all of us can do to help us on the path to good sleep.

[Lisa] Kids have a very consistent bedtime and wake times, so that means you go to bed about the same time every night and wake up about the same time every morning. We recommend things like not having any screens in your bedroom, having a bedroom that's nice and cool and dark in a place that you like to sleep, things like that that are very consistent — what we would call "sleep health".

[Jane] Well let's jump right into some of our questions because we have a lot of kids who have sent us questions about sleep, but we're going to start with the basics.

[Ira] Hi my name is Ira, and I live in South Orange, New Jersey. I'm seven. And my question is, "why do people need to sleep?" Thank you. I like your show.

[Jane] Similarly, from Jordan in Vermont...

[Jordan] Why do we really need to go to sleep?

[Jane] Here's one from Morila.

[Morila] I'm five years old, and I come from Ottawa, Ontario, and my question is, "why do people need to sleep?"

[Jane] And we also got this from five year old Aiden in McKinleyville, California.

[Aiden] Why do you have to sleep? Because I don't really like it, and, but I do like it when my mommy sleeps with me and she reads me a book.

[Jane] That sounds like a lovely way to fall asleep, Aiden. So, Dr. Meltzer, why do we need to sleep?

[Lisa] These are great questions that scientists are spending a lot of time trying to better understand, and we don't have one particular answer, but we have a lot of different reasons that people think are important for why we sleep. The first one goes back to how humans have developed. So there was a time when humans didn't live in houses, but lived out in caves or lived out in the wild, and at night, when they would sleep they were inactive. And that made them vulnerable so that, that predators—the big animals—might come and attack them during the night. So you sleep to stay away from those animals that might come and harm you in the middle of the night. In other words, people were possibly safer tucked up in a cave or shelter, sleeping through the night instead of being out and about in the dark when there were big animals with better eyesight also roaming around. But being asleep doesn't mean your body shuts down completely. You can still be somewhat alert to danger. When you're sleeping, you do notice a little bit of the world around you. You can hear certain sounds and things like that. And it's same thing back in those times where you would want enough of a consciousness—enough of awareness—of what's going on around you to protect you from those predators. So we call that the evolutional theory of why we sleep. So another theory why we sleep is to conserve our energy. I mean we use a lot of energy during the day when you're running and you're playing. When you sleep, these things change: the number of calories that you need reduce, your temperature drops down. Your body is basically given a time to rest and relax, so that conserves your energy while you're sleeping. And along those lines, that allows your body to restore itself. So again, you're working your muscles, all these types of things when you're awake. And when you rest, it allows them to heal. Sort of like when you get a cold at night, it allows your immune system to fight off those bad germs to help you get better again. Really interesting, one of the first things that happens when you fall asleep is growth hormone is released, and growth hormone helps you grow, so you literally grow in your sleep. So that's another reason why sleep is important.

[Jane] I knew it! I knew I felt taller when I wake up in the morning. OK, maybe it doesn't work that way for adults, but that's pretty cool, isn't it? You grow while you're sleeping. Kind of makes sleep sound more appealing, more like something you might want to do, doesn't it? But it's not just your body that gets to rest and recover and rebuild from a busy day of running around. Your brain also need sleep to stay at peak performance.

[Linda] We know that children's brains develop in different ways as they get older. So in very young children, the areas around language and vision are the parts that are the most active during sleep, because that's the part of you that is developing during the day. And when you're in school age, the parts of your brain that start learning all the different things like math and reading, those parts of your brain start to develop. Then when you become a teenager, the front part of your brain that helps you with decision making and keeping your mood nice and calm—that's the part of your brain that's most active during sleep. So your brain is also developing during sleep.

[Jane] Here's something else you might like to know: sleep helps you remember what you've learned. You take in information while you're awake, but it sets in your brain while you're sleeping. So if you're studying for, say, a vocabulary test, you want to go to sleep after you've studied because it will help your brain remember those words in the morning. Same goes for all kinds of memories and other things you might want to be able to repeat, like that funny joke your friend told you that you can't wait to tell someone else.

[Zorin] Hello my name is Zorin. I live in San Diego. My question is, “Why does sleeping get rid of toxins in your brain?”

[Jane] “Why does sleeping get rid of toxins in the brain?”

[Linda] It's a great question. So again, during the day our brain is really busy with everything that we have to do to help us get through the day. But when we're sleeping, our brain is less busy with all of those activities, so it has time basically to clean itself out, and the toxins build up as we're active and doing all the things that we're doing. So sleep gives a time for the brain to relax and sort of take care of itself.

[Jane] I like picturing little cleaners with brooms and stuff inside my brain going in and sweeping and scraping things off that don't need to be there.

[Linda] That's perfect! I mean it really is a time. It's kind of like when you leave school overnight they come in and they clean all the rooms and they get it ready for the next day. It's the same kind of thing going on in your brain.

[Jane] We have some questions for you, Dr. Meltzer, about movement and sleep.

[Emily] Hello. My name is Emily, and I’m from Brisbane, Australia, and I’m seven. And my question is, “When you sleep, when you’re getting into the deepest sleep, your body somehow wakes you up by kicking and it feels like you jump really high.” That’s what I want to know.

[Linda] So this is something called a hypnic jerk, or a sleep twitch.

[Jane] A hypnic jerk?! Sleep twitch?! I love that name! Do you ever have a hypnic jerk happen to you? You're just falling asleep, and then aah! you feel like you're falling and your body twitches and it wakes you right up.

[Linda] If you watch babies, they do this all the time when they're falling asleep. As you get older, you tend to do it a little bit less. And there's again multiple reasons why people think this happens. One of the reasons is that as you're falling asleep all of your muscles start to relax and your brain may think “Uh-oh! Those muscles are relaxing; they must be falling!” and it kicks you awake, and that causes you to jerk or jump high into the air and maybe even scare you, that feeling of falling. Other times it's just a reaction; perhaps you've been really active in exercising a lot close to bedtime and so your muscles are just sort of twitching and trying to relax and unwind. So there's a lot of different reasons when you're falling asleep why you might be moving. But definitely you can feel that happening.

[Jane] So you could think of it as a battle between your awake brain and your asleep brain when you're in that in-between stage. Other scientists have speculated that it's a reflex left over from way, way back in our evolutionary history before we were human. And that part

of your primate brain thinks you might be falling out of a tree, so it jerks you awake. By the way, if you want to learn more about evolution and how we became human, go back and listen to our episode called “Who Was The First Human?” Here are two more questions about movement while we're asleep. But listen to these questions. They're kind of the opposite of one another, and yet, they're both right.

[Ned] Hi my name is Ned, and I live in Northfield, Vermont. And my question is, “Why do humans not move when they’re asleep? Bye!”

[Sophie] Hi, I’m Sophie. I am 6 years old and I live in Vancouver, Canada. My question is, “Why do people toss and turn when they're asleep and not just stay still and not move?”

[Linda] So they are both right, which is kind of funny because those are opposite things. So when we sleep, we have different stages of sleep. So during the night our brain does different things. So you know that you have very light sleep where you can wake up very quickly and easily, and you have your deep sleep where it's sort of hard to wake somebody up. And then, you have a part of the night called REM—rapid eye movement—or dreaming sleep, and different things happen in each of these stages. So people move a lot during different stages of sleep, in particular, your light or your dreaming sleep. You might toss or turn trying to get comfortable. At the end of each of these sleep cycles, your brain actually wakes up very briefly. So everybody wakes up during the night— two, three, four, five times at the end of every sleep cycle—and then you go right back to sleep. You may not even remember that you've woken up, and those may be some of the times where you toss and you turn and you pick your pillow up from the floor, you take a sock off, and you don't really remember doing those movements during the night. When you hit your REM or you're dreaming sleep though, your body basically becomes almost paralyzed; it keeps you from moving a lot. And that's because you don't want to act out your dreams, and so your body becomes in this state where it's very hard for it to move, and so you're almost not moving while your brain is dreaming.

[Jane] So if somebody wakes you up while you're in REM sleep, is that going to make you feel more startled to wake up because your body was in such, sort of a quiet state?
[Linda] It can be, you know, and some kids even have that feeling where they wake up and their brain is fully awake, but their body is still paralyzed. That's this transition from sleeping to wakefulness that sometimes kids experience and that's totally normal. It just, like you said, you're being woken up at a time where your brain still wants to be sleeping or you haven't been getting enough sleep it causes that to happen.

[Julia] Hi my name is Julia and I'm eight years old and I live in the known universe. And my question is “Why do you go to sleep and when you wake up, it feels like you’ve been sleeping for only a second?”

[Linda] The reason behind this is that, you know, you have to be aware of time passing, and so you think of different ways where time is passing. So you go on a car trip with your family, and like, after 10 minutes, you're like “Are we there yet?” and you keep asking because it feels like time is moving really slowly because you don't have a lot to do. But when you're really busy, like you're at a birthday party and you're having a lot of fun, time just flies by, and that's because you're sort of keeping track of what's going on around you. When we go to sleep, our brain doesn't quite keep track of time. That part of our brain shuts itself off for a little while. So it's not counting the minutes or it's not watching the clock so to speak to notice how long it is that you're sleeping. So you close your eyes, that

part of your brain turns itself off, and when you wake up in the morning, it feels like time just flew by because you haven't been keeping track of it while you're asleep.

[Jane] That can be kind of disorienting sometimes. You know, especially if you fall asleep maybe when you're not in your bed, and then you wake up and you think “What time is it and where am I? And what's been happening? I don't even know what happened while I was asleep!”

[Linda] Yea, especially if you haven't gotten enough sleep, you'll wake up and feel very disoriented because your brain is sort of confused about where it should be and what it should be doing.

[Jane] There's still more to come in our episode all about sleep, like how does your body actually put itself to sleep? and if it's not someone shaking you awake, how does your body wake you up? Plus, lots of us think it would be more fun to stay awake all night, but not getting enough sleep is dangerous. You're listening to “But Why: A Podcast for Curious Kids”. I'm Jane Lindholm, and today I'm putting your questions about sleep to pediatric sleep psychologist Dr. Lisa Meltzer. She's a doctor who helps kids sleep better.

[Paul] I am Paul. I am five. I live in Chicago, Illinois. And my question is, “Why do you close your eyes at night time?”

[Jane] Why do your eyes need to be closed while you're sleeping? or do they?

[Lisa] There is a very small percent of people who sleep with their eyes open, but most people sleep with their eyes closed. One of the reasons behind that is you need darkness to help you sleep because darkness tells your brain to make a very special hormone called melatonin, and melatonin helps you sleep.

And when you have too much light, that light keeps your brain from making melatonin. So in closing your eyes you block out potentially any light that could be keeping you from sleeping. So I think that's one of the reasons.

[Jane] Well melatonin, as you said, is really an important part of getting you to sleep and getting your body ready for sleep. Is that one of the areas where people like you, who think about sleep, are worried that kids and adults who use screens that that process of getting that right nighttime light and getting prepared for sleep is sort of being interrupted by bright lights and screens?

[Lisa] Absolutely. And we have science now showing this, that for example, if you spend two hours in front of a tablet that's at its normal brightness, that's going to keep your brain from making melatonin which will make it hard to go to sleep. So we recommend dimming screens or preferably not using them at all. But after dinner making sure that all the overhead lights in the house are turned off, all the screens are set down to their very dimmest settings—so a lot of phones and tablets have, like, a night mode that you can turn on—and making sure you really limit light to help your brain prepare for sleep. And so one of the easiest things is to make sure that all technology is turned off at least 30 or 60 minutes before bed. That includes computers, phones tablets, even television.

[Jane] So it's not just your parents telling you to turn the TV off. It's actually science and doctors who say this is really important to get to sleep.

[Linda] Absolutely. Your parents are telling you the right thing, just like they tell you to exercise and eat fruits and vegetables. Turning off those screens and going to bed is really important to keep you healthy.

[Jane] All right, so that's about going to sleep. We have a couple of questions about waking up.

[Leilani] Hello, my name is Leilani. I'm from Plant City, Florida. I was wondering, "How do we go from being awake to being asleep?"

[Toby] My name is Toby. I'm six years old. My question is, "How does your body fall asleep?"

[Lisa] When you're transitioning or when you're going from being awake to going to sleep, it doesn't happen just suddenly, like you turn your light switch off and the lights go out. It's very simple. But our brains have more like a dimmer switch—you may have one of these in your house—where you turn it slowly and the lights go down slowly. That's what happens to your brain. So when you first fall asleep, it slowly transitions from being awake to being asleep. It takes a little while. So you may have that experience where as you're falling asleep you still hear some stuff going on around you and you sort of remember it and you sort of don't. But it takes a while for your brain to transition until it fully disconnects, in that your body totally relaxes. So it's a process in those first few minutes as you're trying to fall asleep.

[Jake] Hi my name is Jake. I'm 7 years old, and I live in Ellicott City, Maryland. My question is, "How does your brain know when to wake you up?"

[Lisa] So your brain knows when to wake you up because—last I talked about those different sleep stages—you have to get a certain amount of each of those stages during the night. And each of your sleep stages last probably about an hour, maybe an hour and 30 minutes. And at the end of each stage, your brain briefly wakes up, and then you go into the next stage of sleep. And when you've had enough of those stages of sleeping your brain has done everything it needs to do during the night, then it wakes you up and gets you ready to start your day.

[Jane] You talked about when we were early humans—so before we had big cities and stuff—how we needed sleep as part of a way to stay away from predators or that's one of the theories. If we were still living like that and we didn't have school and sports and things that we had to get to, our body would naturally regulate to a sort of a normal sleep schedule that wouldn't require alarm clocks or parents to shake us out of bed in the morning?

[Lisa] Definitely, so they did this really cool study here. University of Colorado scientists took a group of students backpacking, which means they went camping out in the woods. They didn't have any technology and they just had the sun going up and the sun going down to tell them what time it was and to keep their sleep schedule on track and found that all of these students were sleeping more than they would have if they were back in their houses and with their lights and their technology and all those types of things. So having that natural rhythm helps to keep your sleep consistent.

[Bryan] Hi, my name is Bryan. I'm 7 years old and I'm from McLean, Virginia. And my question is, "Why, when you wake up, you were still tired?"

[Jane] Why, when you wake up, are you still tired?

[Lisa] So when you wake up and you're still tired, that can be for a couple of different reasons. The most obvious reason is you didn't get enough sleep. So if your parent has to come in and wake you up in the morning and really wake you up and you just feel like “ugh, I didn't get enough sleep last night,” you probably didn't. If you wake up on your own, you should feel pretty refreshed and ready to go. But that doesn't always happen either; you wake up on your own and it takes about 10 or 15 minutes to get going. That's something called sleep inertia, and inertia is not moving, right? So when you wake up, it feels like you can't move. This isn't the paralysis; this is just, you're still a little bit tired. And the reason why again it takes your brain, you think about that dimmer switch. We can't just flip the switch on in the morning, the same way we can't just flip it off at night. So when you wake up, it takes time for your brain to basically warm up the same way it takes time for, you know, technology to sort of get itself started in the morning, and then the other reason again we've talked about the melatonin. It's still there when you first wake up until you expose your eyes to bright light to help your brain to stop making the melatonin and help you get going.

[Jane] I always feel like if I take a nap—even if I'm getting extra sleep—that's when I feel the most tired, as if I've taken a nap I can't wake up.

[Lisa] Yes, sleep inertia almost always happens after naps, and it's because you're sleeping at a time when you're normally awake. And so your brain again is sort of confused about what time it is and what it should be doing. So waking up from naps can be very disorienting and tired. The good part about taking a nap, though, is an hour or two later you will feel more awake and alert than had you not taken that nap. And so that can be really helpful if you haven't been getting enough sleep. Or some kids just still need naps every day to help them do their best.

[Jane] This last question I love because it's both about sleep and science, but also just about how complicated we are as people.

[Nisha] Hello my name is Nisha. I live in Dublin, Ireland and I am 9 years old and my question is, “Why is that I don't want to get out of bed in the morning, and when it's nighttime, I don't want to go to bed?”

[Jane] “Why is it that I don't want to get out of bed in the morning and when it's nighttime I don't want to get into bed?”

[Lisa] This is a great question. So, you know, nighttime, you have to stop what you're doing. And there are so many fun things to be doing every day that it's hard to shut it down and get into bed. And a lot of people think sleep is a waste of time and feel like “I wish I didn't have to sleep,” but sleep is so important. It is one of the most important things you can do to keep yourself healthy. So at night time it is hard to sort of stop all the things that you're doing and you get excited thinking about what you might be doing the next day. And there's also this funny period right before bed where your brain actually wakes itself up just a little bit to keep you awake, because as the day goes on, you get more and more and more tired, right? And that gets closer to bedtime you're really tired but you still have to make it just that last a little bit until you actually go to bed and so you actually wake up a tiny bit right before you should be going to sleep. So that's one of the reasons it's hard to go to bed at night. And then in the morning, again, if you haven't been getting enough

sleep it's really hard to wake up. If it's cold, nobody wants to get out of bed in the morning when it's cold and you're nice and warm and snuggled in. And so I think those things all work together to make it hard to get out of bed in the morning and get your day started.

[Jane] Is there anything else that you think is super cool that you've learned in researching sleep that you think we should know about?

[Lisa] Everyone sleeps. Every animal sleeps. I mean you have to sleep. It's really that important. You have to breathe. You have to eat. You have to sleep. You cannot go long periods of time without sleeping. Your body will not allow it, and it will make you feel absolutely terrible. But every animal and every species has a different way of sleeping. For example, dolphins only sleep with half their brain at a time because they need to still be breathing as they're in the water. So half the brain alternates when they're sleeping. Sea otters or river otters: they wrap seaweed around their arms and they hold hands basically while they're sleeping to keep them from floating away while they sleep. And so every animal has its special way of sleeping. As humans, we tend to sleep laying down in our beds, and that's a great way to do it. But sleep is a huge part of your life. By the time you turn 18 years old you will have spent 40 percent of your life sleeping. It's a huge part of what you do every day. So making sure that your sleep is as healthy as possible is really important.

[Jane] I think we all understand now that getting a good night's sleep can really help you do great things while you're awake. But it might also help you to understand what happens to you if you don't get enough sleep.

[Linda] When you don’t get enough sleep, every aspect of your functioning deteriorates. So, your mood, it's hard to remain happy and positive; you get very angry and cranky when you don't get enough sleep. Your immune functioning—so that's the thing that fights off colds and illnesses—that works while you're asleep. So if you're not getting enough sleep, you're more likely to get sick. Your weight. So I talked about how growth hormone is released when you sleep so you grow in your sleep. That's really a good thing. But also when you don't sleep enough, you're going to eat more food and you're not going to eat apples and cheese sticks. You're going to eat cookies and potato chips and you're going to gain weight when you don't get enough sleep. We know that over the long term, people who don't get enough sleep have more problems with their heart. It doesn't work as well. And so that can be very problematic in terms of their overall health.

[Jane] OK. OK. Yeah. Go to sleep! Fine! We're not trying to scare, you but sleep is really, really important. It might feel cool to have a late bedtime, but it not only affects your learning, it also affects your health. So get enough sleep. make going to bed early. cool! Thanks for your great questions all about sleep and muchisimas gracias to Dr. Lisa Meltzer for sharing her knowledge with us. Now I know some of you like to listen to podcasts, maybe even this one, around bedtime to help you wind down, and that's great if it helps you relax. But make sure you're not looking at a screen while you listen. Put that screen away and just let whatever you're listening to enter your brain through your ears. That's a better way to help your body get ready for bed time. OK. That's it for today. But wait! We didn't talk about one of the coolest things that happen while we sleep: dreams. Well don't worry. We'll be back in two weeks with an all new episode about dreams. You can tell us your favorite dreams if you want. Or maybe draw a picture of what you imagine while you're sleeping. You sent us some really awesome pictures of flags after hearing our last episode that talked about why each country has its own flag. And we've been putting your pictures up on the “But Why Kids” Facebook page.

So send us pictures of your dreams or tell us about your dreams, and if this episode has made you sleepy and you're starting to yawn, you might be interested in going back and listening to our episode that answers the question “Are yawns contagious?” Now if you have a question about anything or want to tell us about your dreams, have an adult record you using a memo function on a smartphone.

Tell us your first name, your town and how old you are, and then have your adults send your question to questions@butwhykids.org.

We're also still collecting your favorite jokes too. We've gotten some already that are really making us chuckle. But why is produced by Melody Bodette, and me, Jane Lindholm at Vermont Public Radio. Our theme music is by Luke Reynolds.

Special music this episode from Podington Bear. We'll be back in two weeks. Until then stay curious.