



“Spidey Senses”

That’s the Truth Episode #10 Backgrounder

TOPIC: Spiders “hear” through hairs on their body

CURRICULUM CONNECTIONS

Grade 1 Science Topic D: Senses

Grade 1 Science Topic E: Needs of Animals and Plants

Grade 2 Science Topic E: Small Crawling and Flying Animals

Grade 3 Science Topic D: Hearing and Sound

Quick Facts

- Although the specifics may be different for different spiders, spiders “hear” (sense vibrations) through hairs and tiny slits distributed over their body.
- Spiders can use this sensory skill to detect what type of prey falls into their web.
- They detect vibrations in the web to recognize their prey.
- Some spiders, like the jumping spider, have been shown to hear sounds in the air allowing them to, for instance, hear an incoming wasp. So it isn’t just the tactical sensing of vibrations in solid objects they are picking up, they are processing auditory data from vibrations in air molecules.

Discussion Questions

- Can spiders really “hear” in the same way that humans and other animals do?
- How do spiders “hear”?
- Why is it important for spiders to be able to detect vibrations?
- What do you know or want to find out about other “spidey senses”?
- What “spidey senses” does Spiderman have in the movies/comics? (See links below)
- Can you think of other examples of plant, insect, or animal senses that are similar to or different from human senses?

Activities & Resources

- Dig Deeper! Find out more about spiders and their senses
<https://www.spidersworlds.com/spider-senses/>
- Listen to a podcast for kids about spiders
<https://app.kidslisten.org/ep/Brains-On-Science-podcast-for-kids-Spider-sense>
- Fan of Spiderman? You are probably familiar with the phrase, “My spidey sense are tingling”. Discover the difference between Spiderman’s powers and those of real spiders

<https://blog.nwf.org/2012/06/spiderman-vs-the-real-deal-spider-powers/#:~:text=Spider%2DSense,-Spider%2DMan%20is&text=Spiders%20can%20detect%20danger%20coming,You%20probably%20expected%20that.&text=These%20hairs%20perceive%20even%20low,in%20the%20air%2C%20including%20sound.>

<https://www.theverge.com/2017/7/7/15937154/spiderman-homecoming-spidey-sense-trichobothria>
- Activate your own “Spider Senses” with this mini spiderman-themed yoga session
<https://www.youtube.com/watch?v=lx08FrWBp0g>

Source Articles & Links

Can Spiders Hear? How Do Spiders Hear?

Although the specifics may be different for different spiders, spiders “hear” (sense vibrations) through hairs and tiny slits distributed over their body. Spiders can use this sensory skill to detect what type of prey falls into their web. They detect vibrations in the web to recognize their prey. Some spiders, like the jumping spider, have been shown to hear sounds in the air allowing them to, for instance, hear an incoming wasp.^{[1][2]}

This may seem strange, but it isn’t much different than [how humans hear](#). As humans, we have tiny hair cells in our ears which help us pick up [sound waves \(vibrations in air molecules\)](#). The hair cells then work with our ear drums and other parts of our complex auditory system to translate those vibrations into sensory data that can be processed in the auditory centers of our brain.

A spider works much the same way, except they don’t have eardrums, have little hairs covering most of their bodies, and process vibrations using their unique sensory system.

TIP: Learn more about [how the senses work](#).

[Even without ears, jumping spiders can hear you](#). Spiders have excellent eyesight and can detect vibrations, but despite their lack of ear drums, some spiders can actually “hear” too. In the jumping spider specifically, it has been shown that the auditory areas of a jumping spider’s brain can receive signals from its tiny hairs. So it isn’t just the tactical sensing of vibrations in solid objects they are picking up, they are processing auditory data from vibrations in air molecules.

Can All Spiders Hear This Way?

All spiders can sense vibrations, but it is currently unknown if all spiders can “hear” vibrations in the air and processes that data in auditory centers of the brain.

According to [a 2016 study](#), the jumping spider (which is fairly hairy, see the image above) can sense sounds up to 3 meters away through the air.

It is possible other spiders rely more on direct [tactioception](#) (sensing vibrations through direct contact with objects like their webbing).

Still, if the jumping spider can hear you from across the room via their hair, it only makes sense that other spiders can also hear this way.^[3]

Learn more about [“spider senses” from the Smithsonian](#).

[Unlike Other Spiders, Jumping Spiders Can Hear](#).

FACT: As noted in the video above, spiders cannot hear like humans do. They do not have eardrums and instead use the hair on their legs to feel vibrations. However, Jumping spiders seem to be able to hear not only through vibrations in their webs or solid surfaces; they also have the capability of hearing sounds through the air up to 3 meters away. Scientists learned this by watching a jumping spider’s brain use auditory nerve cells. This is an impressive finding when we consider that a jumping spider’s brain is about the same size a poppy seed.^[4]

[Do Spiders Have Ears?](#) Spiders don’t have ears, but they can “hear.” They use the little hairs over their bodies to detect vibrations, which is essentially “hearing.” As this video shows, the spider is “hearing” through its web (if not hearing an instrument like the saxophone directly) as the saxophone is vibrating the air, which is vibrating the web, and we can see the spider reacting.

Conclusion

If we define hearing loosely, then all spiders can hear via the hairs on their bodies. If we define hearing as processing auditory data via vibrations in air molecules, then we can say we know for sure at least the jumping spider can hear. If we are very strict and say hearing only occurs when an ear drum is used to process auditory data, then an argument can be made that spiders can’t hear. All that said, one can easily make the claim “spiders can hear” and be correct.

Turns Out Spiders Can Hear You Across the Room

A new study has just revealed that spiders are even more impressive - or terrifying, depending on your point of view - than we'd ever imagined.

Arachnids don't have ears, but it turns out spiders can hear you talking from metres away - despite the fact that many researchers previously assumed they couldn't hear at all.

"Surprisingly, we found that they also possess an acute sense of hearing," lead researcher Paul Shamble from Cornell University told [Hannah Devlin from The Guardian](#).

"They can hear sounds at distances much farther away than previously thought, even though they lack ears with the eardrums typical of most animals with long-distance hearing."

Instead of eardrums, spiders use the tiny, sensitive hairs on their legs to detect noises, the new study suggests.

Although it was [previously known](#) that spiders' leg hairs were sensitive to airborne vibrations - such as sound waves - the assumption was that this only extended to sounds around a spider's body length or a few centimetres away.

And no one had thought the arachnids were then interpreting those vibrations into neural activity - which would mean they're actually 'hearing' those sound waves, rather than just sensing them.

But now new research based on spider brain patterns shows they can actually hear humans talking and clapping from up to 5 metres away.

Which is... great news... If you're listening, spider friends, I'm really happy for you :|

The research was performed on small [North American jumping spiders](#), *Phidippus audax*, and the coolest part is that the discovery was made purely by accident.

Shamble and his team were making neural recordings of the spiders' brains to find out how they processed visual information.

"One day, [co-researcher Gil Menda] was setting up one of these experiments and started recording from an area deeper in the brain than we usually focused on," Shamble [told Maarten Rikken over at Research Gate](#).

"As he moved away from the spider, his chair squeaked across the floor of the lab. The way we do neural recordings, we set up a speaker so that you can hear when neurons fire - they make this really distinct 'pop' sound - and when Gil's chair squeaked, the neuron we were recording from started popping. He did it again, and the neuron fired again."

That was surprising enough, but Menda and Shamble then started clapping at increasing distances to see when the spider would stop registering it. They got up to 5 metres away, and the spider was still responding.

"Based on everything they knew it shouldn't have been possible, but there it was," [said Menda](#). "It was just the beginning of months and years of work, but it was an incredible start."

To figure out exactly how the spiders were hearing them, the team then placed water droplets on their legs to dull the vibrations of the hairs.

When they did this, the auditory neurons in the brain stopped firing in response to sounds, suggesting that the spiders couldn't hear anymore.

Further experiments confirmed that, although the spiders responded to claps, they were most sensitive to low frequencies (about 80-130 Hz), which is around the frequency of the wingbeats of parasitoid wasps, which prey on jumping spiders. It's also around the pitch of a deep male voice.

But even though the spiders have acute hearing, it wouldn't necessarily sound the way it does to us, due to how their brains process it.

"It probably sounds like a really bad phone connection," [Shamble told The Guardian](#). "They probably can tell that you're talking from across the room, but they're certainly not listening to you."

The team is now investigating whether other spider species, such as wolf spider and fishing spiders, have the same ability.

Their research has been published in [Current Biology](#).

(Now let's all just sneak out of the room really quietly and hope they don't hear us.)

<https://www.sciencealert.com/spiders-don-t-have-eardrums-but-they-can-still-hear-you-from-across-the-room>

Other Sources:

<https://neuroscience.stanford.edu/news/can-jumping-spiders-hear-their-leg-hair>