Do spiders use their vibration-sense to hunt and catch crickets?

Jarie H., Kadrin G., Aryca K., Jacobi K., A. Sarafian, Margaret E., Bryan P., Mitchell, Kyle, Britney, Adelyn, Julie, Jordan J. Samuel, Jackson, Anna B., Avery M., Caden, Joey M., Caleb S., Liam, Ella, Lori S., Jaxon, Hannah, Lane M., Reese B., Ethan F., Molley N., Clara N., Ari F., Logan P., Asher F., Garrison L., John D., Cynthia L., Carlin, Tyler P., Riley P., Brandy W., Elijah W., Alie B., Audry B., Jacob H., Chelsea, Zyne, Imani, Tommy, Joel, Alison L., Karin R., CJ W., Lindsey Z., Mike E., Olivia M., Sarah M., Austin B., Allison B., Torsten B., Vivian H., Rowan, Olivia U., Cara U., Malea, Kathy B., Hannah M., Marty R., Jordyn V., Yulian I., Wolfgang N., Amber O., Shanley S., Abby C., Maggie N., Makenzie M., Ayden S., Brandon F., Cate B., Oriana H., Matt, Monty M., Andrew Y., Emma R., Derek R., Tyler, Ava F., Trey I., Lilly, Suzy H., Gabe, Tara, Sarah E., Aaron B., Ella F., Parker B., Ross B., George D., Rebecca D., Nolan P., Anne D., Joseph L., Axel M., Tommy L., Harper, Scott H., Bella, Isla B., Joycelyn T., Benjamin B., & Oliver B.

Introduction (What is our question?)

Wolf spiders are known to use vibrations to communicate. Males produce seismic “songs” that the females use decide whether or not to mate. Because the seismic displays are so important to these spiders, they are amazingly sensitive to all substrate-borne vibrations.

Figure 1. Male *Schizocosa floridana*

Wolf spiders are also efficient foragers, stalking and eating small prey like crickets. We know they use their vibration sense to communicate. Do they also rely on their vibration sense when foraging?

For this experiment, we used *Schizocosa floridana*, a species of wolf spider from central Florida. *S. floridana* has a particularly complex vibrational display, and is therefore well suited to address this question. We expect that if *S. floridana* uses its vibration sense to locate and catch prey, it will be able to catch prey more quickly when the substrate transmits vibrations than when it doesn’t.

Methods (What did we do?)

To test whether spiders use their vibration sense to catch prey, we caught spiders using headlamps and used these spiders in an experiment. The vials we caught spiders in had a colored sticker on the top. If the sticker was blue, we put the spider in an arena with a granite substrate that did not transmit vibrations. If the sticker was green, we put the spider in an arena with a filter paper substrate that did transmit vibrations. We let the spider get used to the new environment for 2 minutes, then added a cricket and started a stopwatch. We stopped the stopwatch as soon as the spider attacked the cricket. We recorded the data from the stopwatch, recaptured the spider, and cleaned out the arena.

Together we caught and collected data from *one hundred* spiders! We observed fifty-three spiders hunting crickets on granite and forty-seven spiders hunting crickets on filter paper. Everybody's data was entered into the computer, and we used this information to calculate the average amount of time it took spiders to catch their crickets. We then compared the average amount of time it took the spiders on granite to catch their crickets to the average amount of time it took the spiders on filter paper to catch their crickets.

Results (What did we find?)

On average, it took 63.6 seconds for the spiders on granite to attack their crickets. On filter paper, it took 58.5 seconds. The filter paper average is smaller than the granite average, but as **Figure 2** shows, the two numbers are very close. We can use statistics to test whether the two averages are significantly different. In this case, a statistical test called a **T-test** shows us that these two groups are **not** significantly different.

Discussion (What does it mean?)

We hypothesized that wolf spiders use vibrations to locate their prey, and we predicted that if this were the case, spiders on filter paper (which transmits vibrations) would attack their prey more quickly than spiders on granite (which does not transmit vibrations). Although we found that the average time to attack on filter paper was five seconds shorter than on granite, this difference was not big enough to be significant. So, given the results of this study, we cannot support our hypothesis.

Does this mean that *S. floridana* does not use vibration cues when hunting? Maybe. It is possible that the lack of a significant difference between the two treatments is due to the fact that the spiders do not locate their prey via vibrations.

However, after any experiment, it is important to look at what worked and what didn't. It is possible that there were sources of **error** that we did not anticipate. For example, some of our researchers noticed that the spider, the cricket, or both would crawl under the filter paper. Obviously this would have an effect on our findings. Several of our experimenters suggested using filter paper that reaches all the way to the edge of the arena to fix this problem. Other experimenters noticed a problem with some of the stopwatches; there were a few

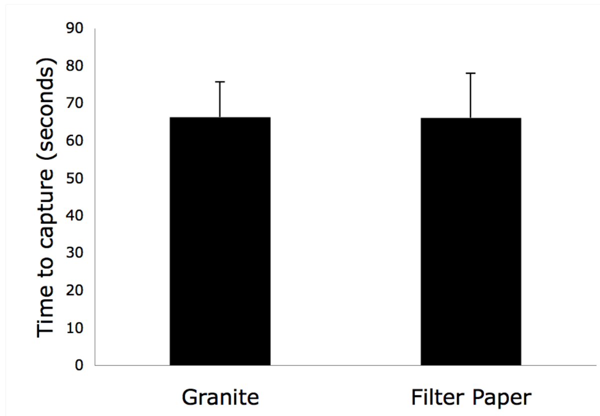

Figure 2. Average Capture Times

that didn't reset after each experiment. Fixing the stopwatch problem would cut down on measurement errors. Finally, many experimenters noted that the cricket often wandered around the arena until it actually hit the spider. This means that the time until attack was affected by the behavior of the cricket, not the spider. It is not clear how this problem can be solved, but it should be addressed in future experiments.

In conclusion, although we did not find support for our hypothesis, we learned something about spider (and cricket) behavior, and we gathered valuable information that will allow us to perfect the design of this experiment in the future.