

## "No Bones About It: Neolithic Women Were Very, Very Strong" Transcript

*Excerpt from [December 1, 2017](#) episode of Science Friday.*

**IRA FLATOW:** This is Science Friday. I'm Ira Flatow. Who are the strongest women you know? Well, for pure strength odds are athletes like Serena Williams or Ronda Rousey come to mind. In a new study out this week in the journal *Science Advances*, researchers say that by examining the humerus bone of prehistoric women, they have concluded that prehistoric women wielded the upper arm strength of today's elite athletes.

So how did these women get so yoked? Well, with me to explain is my guest Sabrina Agarwal, Associate Professor of Anthropology, University of California, Berkeley. And just to note, she was not involved with the research but she's certainly familiar with it. Dr. Agarwal, welcome to Science Friday.

**SABRINA AGARWAL:** Hi, Ira. Thanks for having me.

**FLATOW:** So who were these women and how would they have gotten so strong that if they were alive today they could have beaten or matched our modern athletes?

**AGARWAL:** So this study looked at women. They looked at human remains. They looked at the upper bones and the lower bones of the arms and limbs that were excavated from cemeteries all the way from the Neolithic-- so like 5,000 years ago BC-- to the medieval period, so about 800 years ago. So about 7,000 years of time, all from central Europe. So they were excavated from these different cemeteries. They looked at their bones, looking at them with what's called CT scans.

And while we can't tell exactly what activities they would have been doing, what it did show from the studies is that they were certainly doing very demanding manual labor that was repetitive and for long periods of time. And so these women looked even bigger than modern rowing women and elite athletes in terms of how big their upper arm humerus bones were.

So the types of activities we know they probably were doing were things that related to food production. The study notes things like grinding, but also things in the field like plowing, tilling, harvesting, livestock, all those types of activity. So we don't always know exactly what, but we certainly know that it would have been something they did for a long period of time over their life course.

**FLATOW:** Now I know you're a biological anthropologist. And that means, in English, that somebody who studies the morphology of ancient bones.

**AGARWAL:** That's right.

**FLATOW:** And I want to know how you can tell them from the bones why these women were so strong.

**AGARWAL:** Well skeletons and bones are really cool. We often think of them as being kind of these dried up things that we see in Halloween shops and things like that. But during life, the skeleton is actually really dynamic tissue. It's like an organ. It behaves like an organ. And during life, your bones change their shape. They change their size, depending on things that you do, and your diet, and different types of activities.

And certain bones, particularly the ones in the limbs, the arms and the legs, have a very direct relationship with mechanical loading and activity. And so if you do a lot of activity, you get bigger muscles. And bigger muscles make stronger bones and change the shape of the bones. And so we can kind of indirectly study that the size and shape reflects the amount of activity that someone would have had. So it's recorded in the skeleton long after death in ancient skeletons from all over the place.

**FLATOW:** That's quite interesting. I mean, so why are we only now, after all these years, as an anthropologist, finding out how strong these women were?

**AGARWAL:** Well, I think part of it is that there's a kind of persistent bias that we think of with males being the ones that traditionally did all of the manual work and all of the provisioning in early societies. And this idea goes back to even how we think about humans at the dawn of human origins, modern Homo sapiens. We often thought that modern humans maybe even started to walk and be bipedal because they needed to go and provide food for the females. It's actually called a male provisioning theory.

And I think that these types of bias, that it's males that did all of the manual work and females that basically stayed back and had lots of children persist all the way into what we think about happening at the transition to agriculture.

**FLATOW:** Interesting. Do you have the same kind of growth in upper arm strength around men at this time too?

**AGARWAL:** Well, this particular study didn't compare directly the humerus of the males to the females. What they did find is that males over long periods of time, over this period of 7,000 years, tend to continue to have really robust lower limb bones. And they see a very clear pattern. And females don't show the same pattern. And the males were also be big, but the patterns tend to be different.

**FLATOW:** It's interesting. If you had only found, let's say, the forearm bones, how would you know that they were from a woman's skeleton and not a male skeleton? And could they have been mistaken in years gone by for being men's bones?

**AGARWAL:** Well, that's an interesting question. So these skeletons were from bodies that had enough of the skeleton that they can determine age and sex. We're not able to determine biological sex with just one bone, like an arm bone. Even if a bone looks big, that's not an indicative of, oh, that it's a male or it's a female. You have to look at a lot of other indicators, mostly in the pelvis, that tell you that the morphology is what's likely to be a biological female.

**FLATOW:** So I guess my point is we could have discovered bones from before that we thought were male bones were actually female bones, if they didn't have the rest of the skeleton to look at.

**AGARWAL:** Yeah. Absolutely. And often in the past, early biologic anthropologist or kind of philosophers or people that were kind of a hobbyist interest in bones would pick up a bone and see it was really big and say, oh, this one's a male. Or pick up a really small bone that's light, and say this one must be a female. So that was kind of some of the biases that were taken in, that women must be the weaker sex.

**FLATOW:** Can you just look at a bone like a regular person and not wonder about its origin and everyday life? Or is that your business? I can't help myself.

**AGARWAL:** Yeah. That's kind of our business. I mean, I think certainly we always, when we look at these bones, do you think about the fact that they're people. They're people's mothers. They're people's sisters. They're people's wives. And they're doing things. And so I think the curiosity comes because we even when we look at one isolated bone, we're very curious to find out what was it like to be this person, to be alive during their time period.

**FLATOW:** I guess just the same thing about the dinosaur expert trying to eat a piece of chicken without thinking.

**AGARWAL:** Yeah, absolutely.

**FLATOW:** Sabrina Agarwal, Associate Professor of Anthropology at the University of California at Berkeley. She joins us via Skype. Thank you for taking time to be with us today.

**AGARWAL:** Thank you. Thank you for having me.

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