Another day, another round of uncritical media coverage of an empirical study about circumcision and sexual function. That's including from the New York Times, whose Nicholas Bakalar has more or less recycled the content of a university press release without incorporating any skeptical analysis from other scientists. That's par for the course for Bakalar.

The new study is by Jennifer Bossio and her colleagues from Queen's University in Ontario, Canada: it looked at penile sensitivity at various locations on the penis, comparing a sample of men who had been circumcised when they were infants (meaning they had their foreskins surgically removed), with a sample of men who remained genitally intact (meaning they kept their foreskins into adulthood).

What did the researchers discover? According to a typical headline from the past few days:

"Circumcision does not reduce penis sensitivity."

But that's not what the study showed. Before we get into the details of the science, and looking just at this claim from the "headline" conclusion, it might be helpful to review some basic anatomy.

**Genital Anatomy 101**

Lesson #1. The foreskin is part of the penis. It is made up of sensitive tissue (more on this below); so if you remove it, the penis loses sensitivity by definition. Specifically, it loses all of the sensitivity experienced in the foreskin itself, along with all subjective sensations that are unique to having a foreskin.

Chief among these sensations is the feeling of rolling the foreskin back and forth over the head of the penis--the "glans"--during sex, foreplay, or masturbation (see this NSFW video to get the idea): that specific feeling does not exist without a foreskin.

Lesson #2. Imagine a study that claimed to show that removing a girl's labia minora--her vaginal "lips"--did not reduce the sensitivity of the vulva.

"That doesn't make any sense," you might say. "The labia are part of the vulva!" Quite right. And just like the foreskin, they are richly supplied with nerve endings, blood vessels, and sebaceous glands that provide natural lubrication during sexual activity.

Depending on one's sexual preferences, the labia can be tugged, stretched, sucked on, and otherwise "played with" as a part of one's sexual experience; the same thing is true of the foreskin.

So if a girl has her labia removed (which is a federal crime in most Western countries), or if a boy has his foreskin removed, neither one will be able to experience any of the subjective sensations that go along with those specific activities when they grow up and become sexually active.

They also won't be able to "compare" their sexual experiences with a version of themselves from an alternate universe in which their genitals had been left intact when they were children: this point will become important later on.

Lesson #3. The United States is the only developed country that practices routine circumcision on a majority of newborn boys for non-religious reasons. Circumcision in this context is often described as "just a little snip," and the foreskin as "a tiny flap of skin." I won't go into the details of what a circumcision surgery actually involves (here is a video for those who are not too squeamish), but "little snip" is not an accurate description.
As for the foreskin itself, it is not a "flap of skin," but rather a double-layered, retractable, invertible sheath of tissue that functions seamlessly with the rest of the penis (here's another video); and it's only "tiny" when it's connected to a baby. The adult foreskin has on average 30 to 50 square centimeters of tissue surface area (roughly the size of a credit card), with numerous specialized nerve endings that respond to tactile stimulation.

**Another (rough) analogy**

So let me try another analogy. Saying that removing the foreskin "doesn't reduce penis sensitivity" is a bit like saying that removing the pinky finger doesn't reduce hand sensitivity. What you *really* mean is that removing the pinky finger (which is part of the hand) doesn't reduce sensitivity in the remaining fingers—although, as we'll see, it's not even clear that this part of the analogy holds up in the actual study.

In other words, it's an odd way to frame the hypothesis. To continue the analogy, my guess is that most people—if faced with the claim that removing the pinky finger doesn't reduce sensitivity of the hand—would say, "But what about the pinky finger itself?!"

And they would be right to say it. The only reason you wouldn't think to ask a similar question about the foreskin—vis-à-vis the rest of the penis, of which it is a part—is if you lived in a country where it had become the habit to cut this tissue off at birth, making it seem like something disposable. But that is not how the foreskin is treated in most developed countries, and that's not how it seems to most men who possess one.

**Returning to Bossio et al. study**

Now that we have some idea of what we are talking about, let's take a look at the actual study. The researchers recruited 62 men, of whom 30 were circumcised and 32 were intact. The age range of participants was 18 to 37 years, which means that older men—including those ages 40 and up—were excluded. This is a little bit strange from a sampling perspective, since problems with penile sensitivity (and general function) start to pick up around that age: if you're trying to detect a difference due to circumcision, it is likelier to be more pronounced in older, rather than younger, men.

Participants were also pre-selected to be free of sexual dysfunction. So if foreskin removal causes sexual dysfunction (on a statistical basis) then this study cannot find it, by design.

Right out of the gate, then, we have a couple of limitations: (1) we don't know if the results of the study—whatever they turn out to be—apply beyond the age of 37, and (2) we don't know if they generalize beyond men without any sexual problems (which is the very group of men you would think we'd be interested in, given the hypothesis).

Another limitation is the size of the sample: it's small. Too small. As a statistician would say, it's "underpowered." Simply put, the study didn't have enough power to detect a difference between the circumcised vs. intact men (even if one existed) across all of the different tests that the researchers used.

What that means is that the absence of a measurable effect for sensitivity doesn't tell us very much. It would be like attempting to tell the difference between two photographs printed at a horrible resolution (say, 10 pixels), when the differences—if they existed—would be completely obvious at a higher resolution (say, 1000 pixels). You don't run a "10 pixel" study and conclude "the photographs are identical."

As it happens, the researchers actually used a computer program to calculate exactly how many participants they would need to detect an effect of circumcision status on penile sensitivity: for their "pain threshold" test (I'll say more about this later), they found that they would need 122 participants to detect an effect; and for their "warmth detection threshold" test, they found that they would need 238 participants to detect an effect.

So they had about half as many participants as they needed for the first test, and about a quarter as many participants as they needed for the second test.

Here's the bottom line. If you don't recruit enough participants to detect the effect you're looking for (in this case, a difference between circumcised men and intact men in terms of their penile sensitivity), it is misleading to say "there isn't an effect."

But actually, there's more to the story. Somewhat confusingly, immediately after explaining that 238 participants would be needed "to obtain a significant effect" on the warmth detection test—which, again, the researchers didn't have (they had 62 participants)—the authors went ahead and reported a statistically significant effect of $p = .02$.

What could be going on here?

**Surprising findings**

To understand the meaning of this "effect" (I'll say what it was in just a moment), you have to remember that there are two different comparisons the researchers were interested in. The first comparison is between circumcised and intact men—in terms of their respective sensitivity—at each location on the penis being tested. For this comparison, you needed 238 participants.
The second comparison is between different locations on the penis itself—in terms of their respective sensitivity—collapsing across the circumcision status of the men. For this comparison, you can get away with fewer participants.

Now, there were four different locations on the penis that the researchers tested: two on the shaft (same location for both circumcised and intact men), one on the head of the penis (same location for both circumcised and intact men, but with the foreskin rolled back in the intact group), and one on the foreskin (intact men only).

Just to clarify: the researchers tested one spot on the outside of the foreskin, versus three spots on the rest of the penis. Previous research suggests, however, that different parts of the foreskin have different distributions of nerve endings, and that it is the inside of the foreskin (the part that becomes exposed when the foreskin is rolled back, like it does during sex) that is especially sensitive.

The researchers didn’t test this part, which means that their study design was stacked against the sensitivity of foreskin from the get-go.

So what did the researchers find? Given what I’ve just said, and given the way this study has been written up in the media so far, you will be surprised to learn that the "statistically significant finding"—comparing all of the penile locations just mentioned—was actually still in favor of the foreskin: the part of the penis removed by circumcision.

Specifically, the foreskin was found to be (significantly) more sensitive to warmth than the head of the penis, regardless of circumcision status, and (numerically) more sensitive than all other testing sites including the forearm, which was used as a "control." Take a look at Figure C from the study (reproduced below), and remember that a lower bar means more sensitive. What do you notice?

A similar result was found on a "tactile threshold" test. For this test, the researchers applied a series of thin filaments to different parts of the penis (the same four locations described above), and wrote down how much pressure was needed before the participants could actually feel the stimulus (see here for a video demonstration).

Again, you will be surprised to learn—I am quoting directly from the paper now—that "Tactile thresholds at the foreskin (intact men) were significantly lower (more sensitive) than all [other] genital testing sites" including the sites in circumcised men (emphasis added).

Let me just repeat this: for the one test the researchers used that measured actual tactile sensitivity (which is what most people think of when they hear the word "sensitive" in this context), they found that the foreskin was more sensitive than any other part of the penis, including all parts of the penis that remain in circumcised men.

This is consistent with a previous finding by other researchers from 2007, who concluded that "Circumcision ablates [removes] the most sensitive parts of the penis."

Take a look at Figure A, below (again, the lower the bar, the more sensitive):
Mystery conclusion

So how do we get from a finding, replicating previous research, that the foreskin is the most sensitive part of the penis to tactile stimulation, as well as a new finding showing that it is more sensitive to warmth than the glans ... to the conclusion that circumcision (which removes the foreskin) “does not reduce penis sensitivity”?

I reached out to Jennifer Bossio to ask for clarification. As far as I can tell, her conclusion is based on the fact that the foreskin was not shown to be “more sensitive” than other penile sites on two additional tests her group used: (1) a “heat pain” test (this is the same as the “warmth detection” test, only turned up until it got hot enough to hurt), and (2) the underpowered “pain threshold” test that I already mentioned (which is the same as the “tactile threshold” test using the filaments, just pressed down harder until the participant felt pain).

But I still don’t see how the conclusion follows. It sounds like the foreskin is acutely sensitive to the lightest and most gentle of touches (as well as to mild sensations of warmth), while being somewhat less sensitive to outright pain. Is that supposed to count against the foreskin?

Misleading headlines

“Circumcision does NOT reduce sensitivity of the penis” (Daily Mail); “Study finds no difference in sensitivity between circumcised versus non-circumcised men” (Northern California News); “Foreskin doesn’t make a man more ‘sensitive,’ study finds” (Vox); “We finally know whether or not being circumcised affects sexual pleasure” (Elite Daily).

Who wrote these headlines? They are all false. What the study actually showed was that the average foreskin of a small, non-representative sample of men from Canada, was more sensitive to light touch and mild warmth, and somewhat less sensitive to outright pain, than other parts of the penis. How those differences go on to “affect sexual pleasure” (to jump to the last headline) is a complicated question, and it probably depends on the situation of each individual. Relevant factors would include how he likes to be touched, what kinds of sexual activities he enjoys, and whether those activities are even possible without a foreskin.

Notice the word “average” in the previous paragraph. The individual sensitivity scores for each man’s foreskin (in response to the different types of stimuli) were made invisible due to group averaging. And yet it is likely that some men’s foreskins are more sensitive than others, and vice versa--everybody’s different. What that means is that circumcision will affect different people differently: a man with a particularly sensitive foreskin has more to lose by cutting it off, and that’s something you can’t know in advance when you’re looking at an infant.

Concluding thoughts

Jennifer Bossio and her colleagues are to be commended for trying to “objectively” study a complicated issue (although the way they reported their results was woefully misleading). But at the end of the day, sexual experience is largely subjective: different people prefer different things when it comes to sex, and a lot of sexual enjoyment comes down to psychological factors, not penile anatomy.

That is why there is a growing movement to leave the “circumcision decision” to the individual who will be affected by it, so that he can decide--when he’s old enough to understand what’s at stake--if he’d rather experience sex and masturbation with an intact penis (however sensitive his particular foreskin turns out to be), or with a modified one (if he wants to go for surgery).
With respect to the specific question of "sensitivity," the latest findings are a lot less definitive than media reports are making them out to be (and they don’t even all point in the same direction as those reports are suggesting). As Bossio and her colleagues state at the end of their paper, "replication of this study is warranted with a larger sample size" and "associated conclusions should be interpreted as preliminary."

In the meantime, a precautionary approach suggests that we should leave boys’ penises alone until they can assess the sensitivity of their own foreskins as compared to other parts of the penis—as well as their role in sexual experience more generally—in light of their own considered sexual preferences and values.[6]

About the author

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Notes

1. See Bakalar’s equally rote coverage of another paper on circumcision from 2014 written by a controversial Australian researcher; critical perspectives would not have been hard to come by. For more on sloppy science reporting at the New York Times, see "The New York Times Should Seriously Consider Not Writing About Science Anymore." Or you can read my take here.

2. It is probably worth noting that this second group of men is considerably more representative on a global scale: North America has an unusual (and somewhat unsettling) history in adopting male circumcision as a cultural norm—although it appears to be fading away as the years go by—as the science writer Matthew Tontonoz has recently explained in a reader-friendly primer.

3. Please note that this would qualify as "female genital mutilation" or "FGM." For a discussion of the similarities and differences between male and female forms of non-therapeutic genital cutting, let me recommend a popular article I wrote on the subject for Aeon magazine (by way of a brief introduction), or else a formal paper covering the same ideas (if you have more time).

4. For the sake of this discussion I am going to set aside a rather heated debate about whether "p" values should even be used to make statistical inferences; suffice it to say that a lot of statisticians disagree with this whole approach.

5. Remember, they didn’t even test the most sensitive part of the foreskin, so this is a conservative comparison.

6. In this article, I’ve focused just on the issue of penile sensitivity, in response to one recent study about circumcision that’s been getting some of traction over the past few days. But there’s a lot more to circumcision than the question of sensitivity. Some readers who are new to this debate—especially if they are thinking, "But what about health benefits? Aren’t there all sorts of health benefits to circumcision?" As it happens, I’ve written a lot about that question in other contexts, but let me refer you to a nice, accessible summary of the relevant data by Morten Frisch. The upshot is that the balance of medical opinion, on a global scale, is that infant circumcision in developed countries—as opposed to, say, adult circumcision in Sub-Saharan Africa—does not confer any net health benefits, when you take into account the countervailing risks and harms. See here for further discussion.

Target article


Additional key references (including footnotes)


**Additional references from the author and further related reading**


Earp, B. D. (2015, September 28). *1 in 4 women: How the latest sexual assault statistics were turned into click bait by the 'New York Times'. The Huffington Post*.


