Cognitive scientists discover new perceptual illusion

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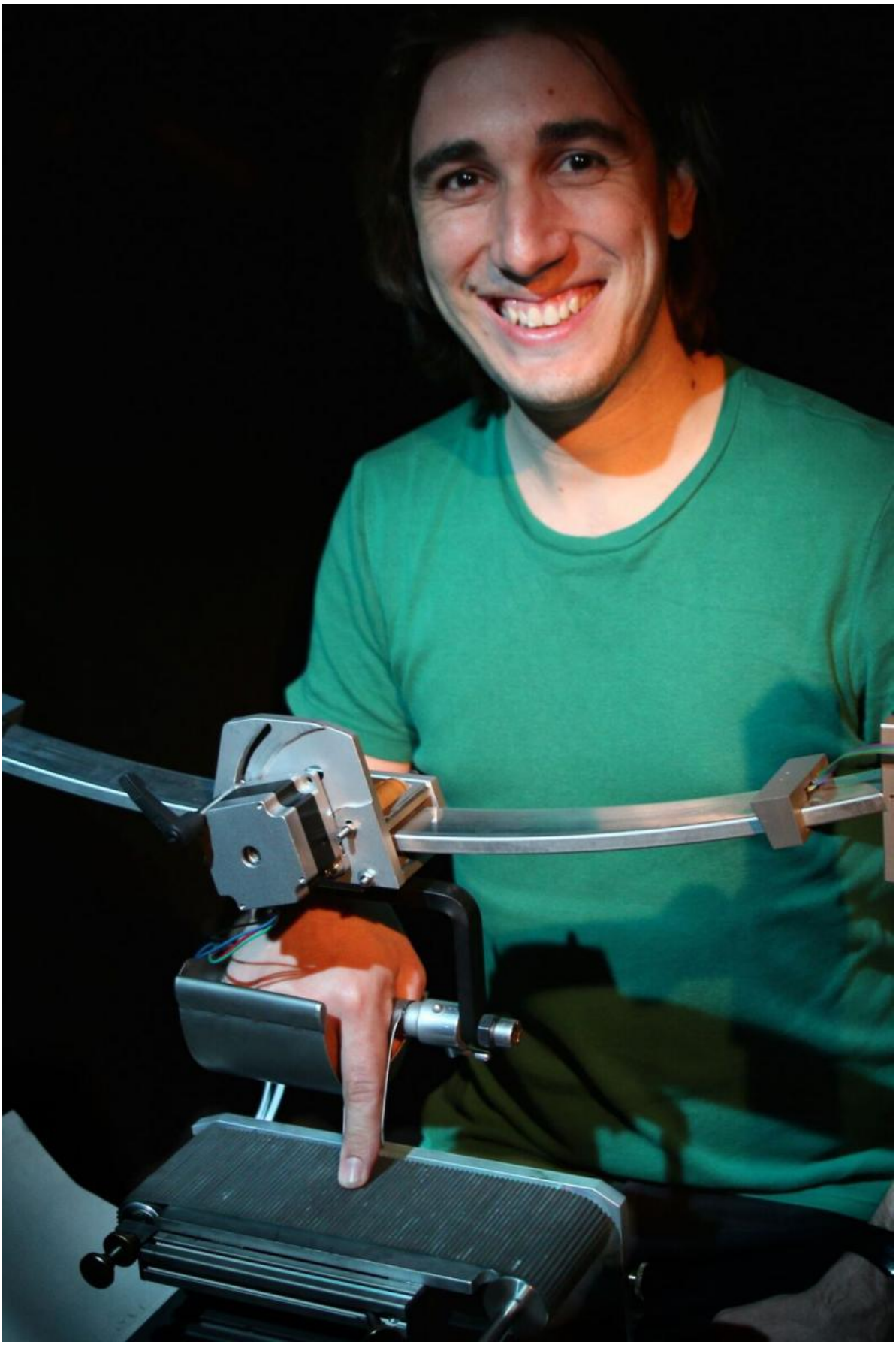

With a custom-designed apparatus, CITEC researcher Dr. Alessandro Moscatelli and his colleagues are testing how people perceive touch and their own bodies. Credit: CITEC/Bielefeld University

Fingers are a human's most important tactile sensors, but they do not always sense accurately and can even be deceived. Researchers at the Cluster of Excellence Cognitive Interaction Technology (CITEC) of Bielefeld University demonstrated this in a new study in which they 'outwit' human perception. Test subjects placed their index finger in an apparatus and touched an object whose softness changed at random without the person noticing. While touching the object, the test subjects were under the illusion that it was the position of their finger that changed, not the softness of the object. The curious thing here was that the test subjects felt an "illusory" finger displacement, much larger in extent than the actual, "real" displacement. The researchers published their findings this Thursday, 7 April in the scientific journal *Current Biology*.

Developing a virtual sense of touch is the long-term aim of Professor Dr. Marc Ernst, who headed the Cognitive Neurosciences research group in Bielefeld until the end of March 2016. On the EU research project "WEARHAP," Ernst is working with colleagues from all around Europe to achieve this goal. "We now have a better understanding of how we can virtually convey the impression of whether an object feels soft or hard," explains the neuroscientist. "In the future, this should help in developing a virtual sense of touch with which one can 'touch' things across distances, such as how a sweater or another product feels while shopping online."

"A fundamental question in this project is what role haptic stimuli play in perception," says Ernst. With the term 'haptic stimuli,' the cognitive scientist is referring to the sensations that arise from touch. "A special feature of our finger pads is that they are fleshy – they can 'deform' by giving way when touching something," says Marc Ernst. For instance, when a person touches a sponge, she feels its composition and consistency through the tactile sensors in her skin.

For their experiment, the researchers constructed an apparatus at the end of which an elastic fabric strap was stretched horizontally. The tightness of the strap was adjustable. The test subject laid her hand and lower arm in the guiding casing of the apparatus. The person was instructed to say when they thought their finger was bent more. In reality, the position of the finger did only change a little – only the tightness of the elastic band did. "Astonishingly, all study participants estimated their finger to be most bent when the elastic band was loose. This is apparently because the loose band has comparatively more contact area with the skin," explains Dr. Alessandro Moscatelli, who performed the experiment.

"The key here is how much surface area of the object comes into contact with our skin. The greater the area of contact, the closer the object seems to be, and therefore, the more the finger appears to be bent. Why is this finding significant? "If we were not to know exactly how our body is positioned, we would not be able to grasp or catch, and therefore could not interact with objects or other people," explains Marc Ernst.

More information: The Change in Fingertip Contact Area as a Novel Proprioceptive Cue. DOI: dx.doi.org/10.1016/j.cub.2016.02.052

Provided by Bielefeld University

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