The science of tickling

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Anticipating our own touch - for example in tickling oneself - reduces its impact, says Queen's psychologist Dr. Randy Flanagan, a member of the university's Centre for Neuroscience Studies. This is evidence of an important human adaptation that helps us interact with objects in our environment.

An expert in eye/hand movement, Dr. Flanagan is part of an international team exploring sensory attenuation - the way that we filter out or "cancel" unnecessary information from the world around us.

Their study appears on-line today in the international journal Public Library of Science (PloS) - Biology. Led by Paul Bays of University College London, the team also includes Daniel Wolpert of Cambridge University.

"It's well-known that you can't tickle yourself," says Dr. Flanagan. "One explanation is that since all the sensations are completely predictable, we do 'sensory attenuation' which reduces our touch perception." Because people continually receive a barrage of sensory information, it's necessary to distinguish between what is caused by our own movements and what is due to changes in the outside world.

"If we try to deal with all the sensory information directed at us at any given time it's overwhelming," explains Dr. Flanagan. "We can't focus attention on crucial changes in our environment that aren't a function of our own motions." Animals in the wild, for example, use sensory cancellation when looking for prey and avoiding predators. They do this,

in part, by blocking out changes in sensation that occur because of their own movements.

To study this phenomenon in humans, the research team used a task in which participants tapped, using one (active) index finger on a force sensor located just above the other (passive) index finger. A small motor delivered a tap to the passive finger that occurred at the same time as a tap of the active hand - which simulated tapping onto one's own finger through a solid object.

Previously the team had shown that people judge self-administered taps to be weaker than those not linked to their own motion.

On unexpected "catch" trials the force sensor was removed, so subjects didn't hit anything with the active finger. However, they still received a tap to the passive finger. And in these trials, attenuation or cancellation still occurred.

This suggests that sensory cancellation is based on predictive rather than "postdictive" mechanisms, the researchers say. In the catch trials, the brain predicts that a tap will occur and sensory cancellation takes place even though the active finger fails to deliver the tap.

"If sensory cancellation were postdictive and based on an analysis of sensory events after the tap, we would not expect cancellation in the catch trials," he explains. "The brain is constantly predicting the sensory feedback it's going to receive from our fingertips as we touch things in the world and act on that information."

Research has suggested that a breakdown in this predictive mechanism may underlie certain delusions in schizophrenia. If people fail to adequately filter sensory information arising from self-motion, they may erroneously attribute it to external causes, says Dr. Flanagan.

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