



Singapore Journal of

Scientific Research

ISSN: 2010-006x

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Emotional Signals Are Chemically Encoded in Tears, Researchers Find

Emotional crying is a universal, uniquely human behavior. When we cry, we clearly send all sorts of emotional signals. In a paper published online January 6 in Science Express, scientists at the Weizmann Institute have demonstrated that some of these signals are chemically encoded in the tears themselves. Specifically, they found that merely sniffing a woman's tears - even when the crying woman is not present -- reduces sexual arousal in men.

Humans, like most animals, expel various compounds in body fluids that give off subtle messages to other members of the species. A number of studies in recent years, for instance, have found that substances in human sweat can carry a surprising range of emotional and other signals to those who smell them.

But tears are odorless. In fact, in a first experiment led by Shani Gelstein, Yaara Yeshurun and their colleagues in the lab of Prof. Noam Sobel in the Weizmann Institute's Neurobiology Department, the researchers first obtained emotional tears from female volunteers watching sad movies in a secluded room and then tested whether men could discriminate the smell of these tears from that of saline. The men could not.

In a second experiment, male volunteers sniffed either tears or a control saline solution, and then had these applied under their nostrils on a pad while they made various judgments regarding images of women's faces on a computer screen. The next day, the test was repeated -- the men who were previously exposed to tears getting saline and vice versa. The tests were double blinded, meaning neither the men nor the researchers performing the trials knew what was on the pads. The researchers found that sniffing tears did not influence the men's estimates of sadness or empathy expressed in the faces. To their surprise, however, sniffing tears negatively affected the sex appeal attributed to the faces.

To further explore the finding, male volunteers watched emotional movies after similarly sniffing tears or saline. Throughout the movies, participants were asked to provide self-ratings of mood as they were being monitored for such physiological measures of arousal as skin temperature, heart rate, etc. Self-ratings showed that the subjects' emotional responses to sad movies were no more negative when exposed to women's tears, and the men "smelling" tears showed no more empathy. They did, however, rate their sexual arousal a bit lower. The physiological measures, however, told a clearer story. These revealed a pronounced

tear-induced drop in physiological measures of arousal, including a significant dip in testosterone -- a hormone related to sexual arousal.

Finally, in a fourth trial, Sobel and his team repeated the previous experiment within an fMRI machine that allowed them to measure brain activity. The scans revealed a significant reduction in activity levels in brain areas associated with sexual arousal after the subjects had sniffed tears.

Sobel said, "This study raises many interesting questions. What is the chemical involved? Do different kinds of emotional situations send different tear-encoded signals? Are women's tears different from, say, men's tears? Children's tears? This study reinforces the idea that human chemical signals -- even ones we're not conscious of -- affect the behavior of others."

Human emotional crying was especially puzzling to Charles Darwin, who identified functional antecedents to most emotional displays -- for example, the tightening of the mouth in disgust, which he thought originated as a response to tasting spoiled food. But the original purpose of emotional tears eluded him. The current study has offered an answer to this riddle: Tears may serve as a chemosignal. Sobel points out that some rodent tears are known to contain such chemical signals. "The uniquely human behavior of emotional tearing may not be so uniquely human after all," he says.

The work was authored by Shani Gelstein, Yaara Yeshurun, Liron Rozenkrantz, Sagit Shushan, Idan Frumin, Yehudah Roth and Noam Sobel, was conducted in collaboration with the Edith Wolfson Medical Center, Holon.

Prof. Noam Sobel's research is supported by the James S. McDonnell Foundation 21st Century Science Scholar in Understanding Human Cognition Program; the Minerva Foundation; the European Research Council; and Regina Wachter, NY.

Source: Science, 6 January 2011 DOI: 10.1126/science.1198331