

The science of stress transmission

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The transmission of physiological states in the collective is a robust phenomenon that can be observed in humans and animals. Stress is a natural response most often caused by a potential threat to one's physical or psychological integrity.

Humans and animals as social beings often experience [stress](#) in groups: Humans for example in the context of work, both humans and animals in natural disasters, or animals when facing a predator. The [transmission](#) of

stress across members of the group can serve to facilitate a coordinated response, or better prepare individual members of the collective to cope with the threat.

Stress transmission

In experiments conducted at the University of Konstanz, biologists, psychologists and education scientists looked at the transmission of stress from an individual to a group, but also stress transmission within groups.

The psychologists Alisa Auer, Lisa-Marie Walther, and Petra Wirtz conducted studies on collective stress during written examinations and orchestra performances as well as at the workplace. They introduced a paradigm to "investigate stress transmission under standardized laboratory conditions while controlling for a multitude of potential confounders," reports supervisor Petra Wirtz.

Using this paradigm, the researchers found that some but not all stress systems are stress transmission-reactive. The stress transmission response resembles the response to own stress, but is less pronounced. In further studies, colleagues explore stress transmission among couples, in the situation of speed dating, and in school classes.

Stress transmission in animal groups

Doctoral candidates Dennis Horvath and Dennis Mink show with their experiment that mice that live together with stressed mice are more reserved and cautious whereas "normal" mice use running wheels, and explore their environment.

Similar strongly altered behavior when stressed has also been observed in

groups of birds: "Birds housed in colonies with stress-treated members exhibited strong changes in their activity," says Hanja Brandl, postdoctoral researcher at the Cluster of Excellence Collective Behavior.

"Particularly the time they spent moving was reduced, and breeding performance in colonies differed proportionally to the level of stress in their social environment. This demonstrates a strong impact that stressors can have not only on the directly stress exposed individuals but also on group members that never experienced a stressor first-hand," concludes the biologist.

Physiological synchronization

Not only can stress be transmitted collectively, there is also a psychological synchronization among group members—even between animals and humans, as shown in two other studies.

Another setting where physiological synchrony is observed is horse-assisted therapy. Jens Pruessner who led the studies says, "A major hypothesis of this project is that physiological synchronization is linked to symptom improvement over the course of the study."

First results can confirm this assumption, with heart rate variability synchronization of patient and horse becoming more synchronous within and across treatment sessions. Pruessner adds, "Interestingly, past traumatic experiences are adversely linked to synchrony, and the synchronization between therapist and horse seems to moderate the synchronization of patient and horse as well."

Based on the experiments, the researchers were able to demonstrate that stress transmission and physiological synchronization among [group members](#) take place. In the next step, they want to find out how exactly this happens.

More information: Overview of the related publications: [Behaviour Annual Report 2023, pages 48-59](#)

Provided by University of Konstanz

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