Social transmission of negative valence in prairie voles using a new behavioral assay that assesses social learning

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Background: Autism Spectrum Disorder (ASD) is a neurodevelopmental condition marked by notable deficiencies in social interaction, social communication, and repetitive behaviors. The intricate nature of these behaviors and the underlying molecular basis of ASD remain challenging to comprehend. A lack of behavioral assays that assess social learning deficits in animal models is one of the biggest challenges in the field.

Objectives: The study aims at developing a new behavioral assay in prairie voles, an animal model that exhibits prosocial behaviors, that aims to measure social learning aptitudes based on the observation of subtle social cues in their stressed partners following a fear conditioning paradigm.

Methods: Same-sex adult pairs of prairie voles (housed together since weaning, ntotal = 50, two groups) were tested on the newly developed paradigm called social transmission of negative valence in voles (STNV), which is an adaptation of a previous paradigm (1). STNV is a two-day behavioral paradigm that consists of fear conditioning demonstrators on day 1 to the tone, by associating 15 tones (30s, 6KHz) to 15-foot shocks (1s, 1mA) or no shocks (in the control group). Next, the partner (observer) is brought to the experimental cage to observe demonstrators (through a clear barrier) freeze to the tone during a fear memory recall task. On day 2, we measured freezing behavior in observers during the re-introduction to the experimental cage. Social learning was assessed by the percentage of observers' freezing, rearing, self-grooming, and by ultrasonic vocalizations they exhibit in both groups (fear conditioned demonstrators and control demonstrators). Rodent ultrasonic vocalization serves as an indicator of social communication and conveys their emotional state (2).

Results: We found a significant increase in freezing behavior in observers in the experimental group as compared to the control group ($p < 0.05$). Also, observers showed a significant increase in self-grooming, and rearing behaviors in the experimental group as compared to the control group ($p < 0.05$). Ultrasonic vocalizations also show a significant increase in frequency of calls in experimental observers (56-95 kHz) compared to controls (20-45 kHz, $p < 0.05$).

Conclusion: STNV yields promising outcomes as a social learning paradigm, offering insights into how these rodent species learn through social transmission of subtle cues. Future directions consist of investigating the neural correlates of social learning and the effects of targeted drugs on social behavior.

References

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