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# Social Isolation Disrupts Autonomic Regulation of the Heart and Influences Negative Affective Behaviors

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### Background

There is a documented association between affective disorders (e.g., depression and anxiety) and cardiovascular disease in humans. Chronic social stressors may play a mechanistic role in the development of behavioral and cardiac dysregulation. The current study investigated behavioral, cardiac, and autonomic responses to a chronic social stressor in prairie voles, a rodent species that displays social behaviors similar to humans.

### Methods

Female prairie voles were exposed to 4 weeks of social isolation ( $n = 8$ ) or pairing (control conditions;  $n = 7$ ). Electrocardiographic parameters were recorded continuously during isolation, and behavioral tests were conducted during and following this period.

## Results

Isolation induced a significant increase in resting heart rate, reduction in heart rate variability (standard deviation of normal-to-normal intervals and amplitude of respiratory sinus arrhythmia), and exaggerated cardiac responses during an acute resident-intruder paradigm. Isolation led also to both depression-like and anxiety-like behaviors in validated operational tests. These changes in response to social isolation showed predictable interrelations and were mediated by a disruption of autonomic balance including both sympathetic and parasympathetic (vagal) mechanisms.

## Conclusions

These findings indicate that social isolation induces behavioral, cardiac, and autonomic alterations related to those seen after other stressors and which are relevant to cardiovascular disease and affective disorders. This model may provide insight into the mechanisms that underlie these co-occurring conditions.



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## Key Words

Anxiety; cardiovascular disease; depression; heart rate; heart rate variability; parasympathetic nervous system; prairie voles; sympathetic nervous system

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