

## **Exploring variability in stress-induced persistent physical activity: an examination of individual and sex differences**

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A sedentary way of life significantly contributes to chronic and metabolic illnesses, carrying substantial economic implications for healthcare systems worldwide. Although psychological stress exposure is recognized as a risk factor for sedentary lifestyles, there is limited knowledge regarding how stress influences physiology in ways that render individuals more susceptible to chronic inactivity, even long after the stressor has ended. To bridge this knowledge gap, we utilized a rodent model involving voluntary wheel running (VWR) to examine the effects of acute stress on physical activity. In our study, young adult rats subjected to 100 tail-shocks exhibited a prolonged reduction in daily VWR distance for weeks following the stressor, persisting beyond the period of anxiety and depression-like behaviors. Notably, there was a wide range of variation in wheel running distance due to individual differences in stress responses. Additionally, intriguing sex differences were observed, with female rats showing no or a milder detrimental effect on VWR following the same stressor. Depending on the types of running wheels, the stress even led to an enhancement of VWR activity, particularly among low-running females, suggesting a potential protective role of estrogen against stress-induced physical inactivity. To further delve into these findings, we are currently investigating estrogen and estrogen receptor-dependent molecular processes in brain regions linked to exercise motivation and execution. Understanding the physiological mechanisms underlying individual and sex differences is essential not only for comprehending the lasting impacts of acute stress on physical activity but also for identifying innovative interventions to combat sedentary lifestyles.