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Wheel-running decreases binge-like drinking in a genetic mouse model of risk for drinking to intoxication

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Keywords

Physical Activity, alcohol, genetic animal models

Abstract

Maintaining healthy levels of physical activity (PA) is a noninvasive, clinically proven means of reducing the onset of >40 chronic diseases and may provide a strategy for managing harmful alcohol use. Studies indicate a positive relationship between PA levels and alcohol intake in moderate drinkers, while heavy drinkers tend toward less physical activity. This suggests healthy PA levels may promote moderate alcohol intake and therefore harm reduction. Wheel-running (WR) – a well-characterized rodent model of voluntary PA – is known to reduce self-administration and craving for many drugs of abuse; however, its effects on alcohol intake are mixed. This work tests whether WR reduces chronic binge-like ethanol drinking in a genetic model of risk for drinking to intoxication, the inbred High Drinking in the Dark (iHDID-1) mice [DID – model of binge-like drinking; 4 days/week (2-hour access on days 1-3, 4-hours on day 4)]. Mice (n = 8/fluid type/wheel-condition/sex) underwent 4-weeks of 20% ethanol or water DID in addition to receiving a locked running wheel (a novelty control). To determine the effects of WR on binge-like drinking, half the mice had open wheel access (WR) for 2-weeks, while the other half maintained locked wheels (WL). Mice underwent an additional DID during the second week of WR or WL. WR reduced binge-like ethanol intake in female and male iHDID-1 mice [$F(1,30) = 8.87$; $p < 0.001$]. In the water control group, there was a sex x wheel-condition interaction on day 4 of DID [$F(1,30)= 6.91$; $p < 0.05$]. There were no differences in daily running distance between the first (no DID) and second (with DID) week of WR. These results suggest ethanol drinking and WR are not competing behaviors. Together, our findings demonstrate an important role of PA in decreasing binge-like ethanol drinking in iHDID-1 mice. Future work will delineate neural circuitry underlying these findings.