Reward Neurocircuitry Predicts Longitudinal Changes in Alcohol Use Following Trauma Exposure

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Trauma is a risk factor for developing maladaptive alcohol use. Preclinical research has shown that stress alters the processing of midbrain and striatal reward and incentive signals. However, little research has been conducted on alterations in reward-related neurocircuitry post-trauma in humans. Neuroimaging markers may be particularly useful as they can provide insight into the mechanisms that may make an individual vulnerable to developing trauma-related psychopathologies. This study aimed to identify reward-related neural correlates associated with changes in alcohol use after trauma exposure. Participants were recruited from U.S. emergency departments for the AURORA study (N=286, 178 female). Trauma-related change in alcohol use at 8 weeks post-trauma relative to pre-trauma was quantified as a change in 30-day total drinking per the PhenX Toolkit Alcohol 30-Day Quantity and Frequency Measure. Reward-related neurocircuitry activation and functional connectivity (FC) were assessed 2 weeks post-trauma using fMRI during a monetary reward task using region of interest and whole-brain voxelwise analyses. Greater increase in alcohol use from pre-trauma to 8 weeks post-trauma was predicted by (1) greater ventral tegmental area (VTA) and (2) greater cerebellum activation during Gain>Loss trials measured 2 weeks post-trauma and (3) greater seed-based FC between the VTA and lateral occipital cortex and precuneus. Altered VTA activation and FC early post-trauma may be associated with reward-seeking and processing, contributing to greater alcohol use post-trauma. These data provide novel evidence of neural correlates that underlie increased alcohol use early post-trauma that may be targeted via early interventions to prevent the development of maladaptive alcohol use.