Contribution ID: **499** Type: **Mini-talks**

From Structure to Behavior: Hypothalamic Subregions Volumes Predict Childhood Conduct Issues

Thursday, September 11, 2025 3:30 PM (10 minutes)

Introduction: The hypothalamus is central to neuroendocrine, emotional, and behavioral regulation. While its role in stress and aggression—e.g., HPA axis—is established, its structural involvement in childhood conduct problems remains underexplored. This study examined whether hypothalamic subregions show volumetric differences in adults with a history of such problems and whether these features support predictive modeling.
Methods: Structural MRI data of 630 adults (mean age ≈ 29, 290 males) from the HCP Young Adult dataset were analyzed. Volumes of 10 hypothalamic subregions and whole hypothalami were extracted using FreeSurfer7.2. Participants were classified based on the presence (n = 221) or absence (n = 409) of childhood conduct problems. These were assessed via a SSAGA item asking whether, before age 15, individuals frequently got into trouble for behaviors like lying, stealing, skipping school, or fighting. Statistical comparisons were followed by logistic regression and penalized models, adjusting for age, sex, and intracranial volume.
Results: Individuals with conduct problems showed larger volumes in the left tubular inferior and posterior, right tubular superior, and bilateral hypothalami ($p < .05$). The logistic model achieved an AUC of 0.715 (sensitivity ≈ 69%, specificity ≈ 66%), with sex as the strongest predictor (OR = 4.93). LASSO identified left anterior inferior, left posterior, and right tubular superior as informative.
Conclusions: These findings suggest that hypothalamic subregions linked to arousal, motivation, and autonomic control are structurally altered in individuals with childhood conduct problems. Future studies should investigate broader brain networks and environmental factors to elucidate the origins of early conduct disturbances.

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Session Classification: Emotions and motivation 1

Track Classification: Emotions and motivation