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Supplemental material

Intracranial subsecond dopamine measurements during a “sure bet or gamble” decision-making task in patients with alcohol use disorder suggest diminished dopaminergic signals about relief

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Individual					
Research ID	Total Trials	Number of Sure Bet Trials Chosen by Participant	Number of Gamble Trials Chosen by Participant	Number of 'Too Late' Trials	* Trials with no electrochemistry data
AUD1	249	158	85	6	2
AUD2	200	179	18	3	1
nonAUD1	182	96	83	3	1
nonAUD2	220	211	1	8	2
Group					
AUD	449	337	103	9	3
nonAUD	402	307	84	11	3

Supplemental Table 1: Number of trials completed by each individual (and group). The total number of trials per participant was limited by speed of participant response on each trial and time limit (30 minutes) for research portion of the surgery – participants who responded faster completed more trials. The software that collects the electrochemical data saves data every 10 minutes – during the end of an old and initiation of a new data file an inadvertent small gap in data collection occurs. Depending on the timing of this gap one or two trials may have a gap in corresponding electrochemical data. These trials were excluded from analyses.

CPE Comparisons

Sure Bet Group:	AUD					Non-AUD				
<u>Source</u>	<u>Sum of squares</u>	<u>df</u>	<u>Mean squares</u>	<u>F-value</u>	<u>Prob>F</u>	<u>Sum of squares</u>	<u>df</u>	<u>Mean squares</u>	<u>F-value</u>	<u>Prob>F</u>
Time	44.6535	9	4.9615	1.3661	0.1977	1.6061	9	0.1785	0.1522	0.9980
Counterfactual Prediction Error Valence	6.9681	2	3.4840	0.9593	0.3833	9.6312	2	4.8156	4.1066	0.0166
Time × Counterfactual Prediction Error Valence	160.5795	18	8.9211	2.4564	0.0006	5.8312	18	0.3184	0.2715	0.9990
Error	12021.2742	3310	3.6318			3529.6953	3010	1.1727		
Total	12209.6199	3339				3546.47	3039			

Supplemental Table 2: ANOVA Results for Sure Bet Dopamine

Post-Hoc Tukey Honestly Significant Difference Test for Gamble Dopamine						
Sure Bet Group:	AUD			NonAUD		
<u>Counterfactual Prediction Error Valence Comparisons</u>	<u>Difference in Means</u>	<u>95% Confidence Interval</u>	<u>P-value</u>	<u>Difference in Means</u>	<u>95% Confidence Interval</u>	<u>P-value</u>
Neutral: Positive				-0.2132	-0.3875 to -0.0388	0.0116
Neutral: Negative				-0.1859	-0.3685 to -0.0033	0.0449
Positive: Negative				0.0272	-0.0731 to 0.1276	0.8001

Supplemental Table 3: Post-Hoc Tukey Honestly Significant Difference Results for Sure Bet

Dopamine. Applicable post-hoc Tukey’s Honestly Significant Difference Results include

significant results only for the patients without a history of Alcohol Use Disorder (Non-AUD).

There were no significant differences by CPE-valence for the patients with a history of Alcohol Use Disorder (AUD).

CPE Comparisons

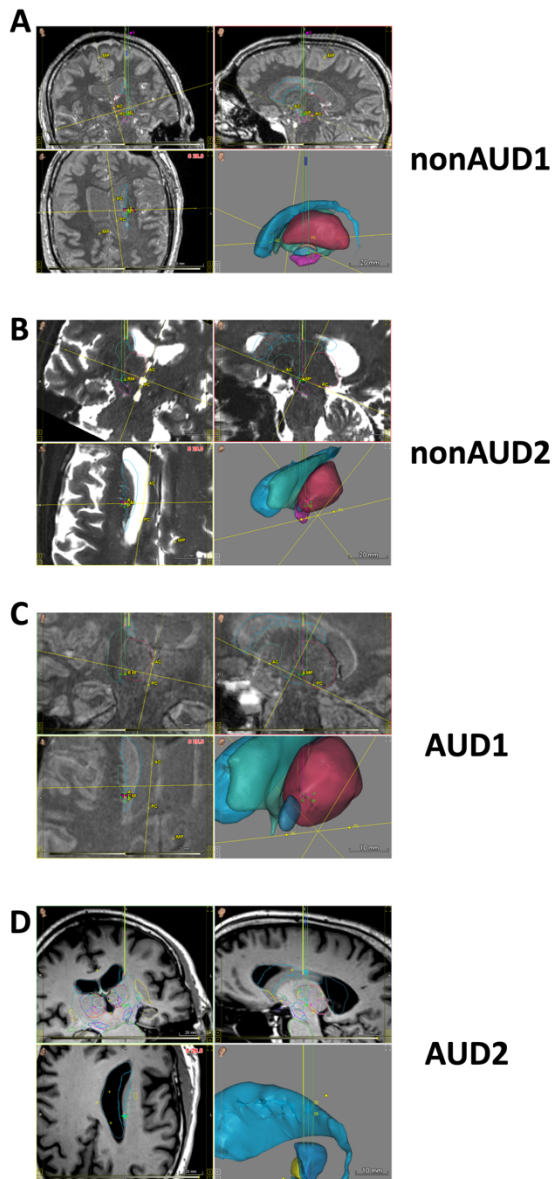
	AUD1					NonAUD1				
<u>Source</u>	<u>Sum of squares</u>	<u>df</u>	<u>Mean squares</u>	<u>F-value</u>	<u>Prob>F</u>	<u>Sum of squares</u>	<u>df</u>	<u>Mean squares</u>	<u>F-value</u>	<u>Prob>F</u>
Time	19.0949	9	2.1217	0.9544	0.4768	7.5824	9	0.8425	0.8179	0.5997
Counterfactual Prediction Error Valence	27.3291	2	13.6645	6.1467	0.0022	8.7605	2	4.3802	4.2525	0.0146
Time × Counterfactual Prediction Error Valence	23.4439	18	1.3024	0.5859	0.9113	4.4596	18	0.2478	0.2405	0.9996
Error	1822.9153	820	2.2231			824.0275	800	1.0300		
Total	1895.3096	849				850.5543	829			

Supplemental Table 4: ANOVA Results for Gamble Dopamine

Post-Hoc Tukey Honestly Significant Difference Test for Gamble Dopamine										
Gamble Group:	AUD1				NonAUD1					
<u>Counterfactual Prediction Error Valence Comparisons</u>	<u>Difference in Means</u>	<u>95% Confidence Interval</u>		<u>P-value</u>	<u>Difference in Means</u>	<u>95% Confidence Interval</u>		<u>P-value</u>		
Neutral: Positive	0.1145	-0.2354	to	0.4645	0.7232	-0.0397	-0.2806	to	0.2012	0.9209
Neutral: Negative	-0.3765	-0.8112	to	0.0582	0.1051	-0.2747	-0.5520	to	0.0027	0.0530
Positive: Negative	-0.4911	-0.8196	to	-0.1626	0.0013	-0.2349	-0.4366	to	-0.0333	0.0174

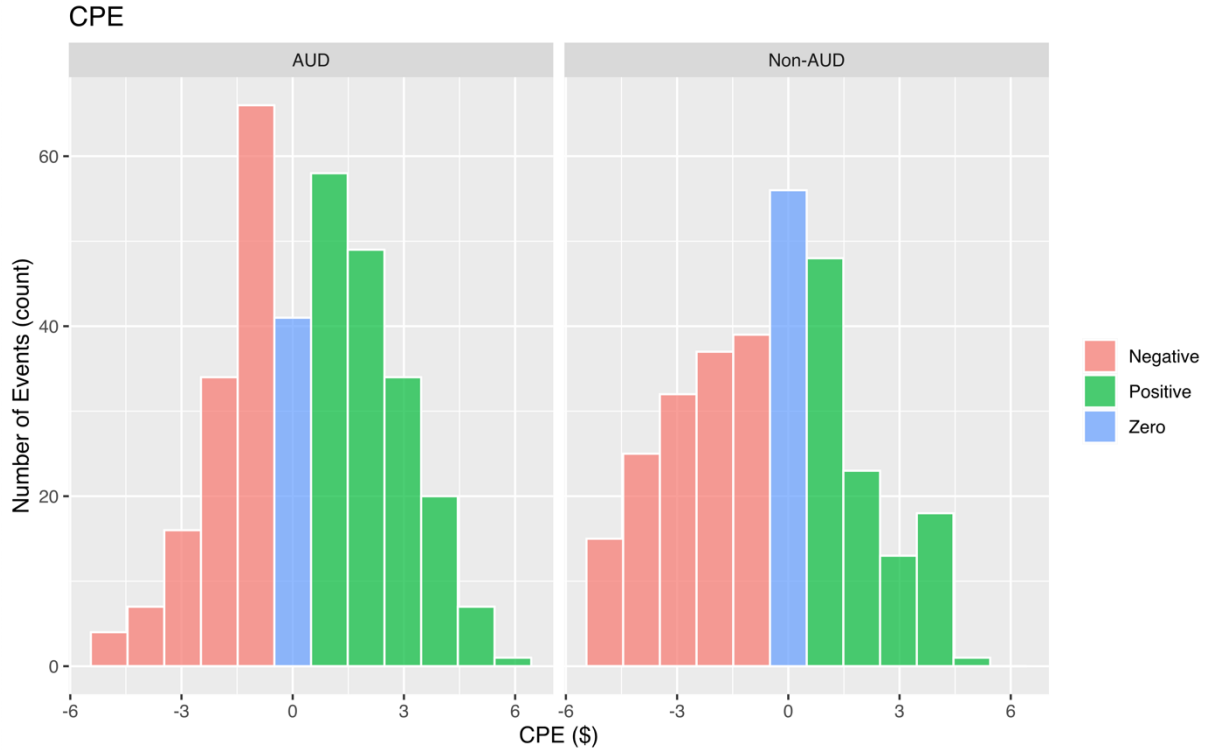
Supplemental Table 5: Post-Hoc Tukey Honestly Significant Difference Results for Gamble

Dopamine. Applicable post-hoc Tukey’s Honestly Significant Difference Results include significant results for the patients with a history of Alcohol Use Disorder (AUD) and without a history of Alcohol Use Disorder (Non-AUD).

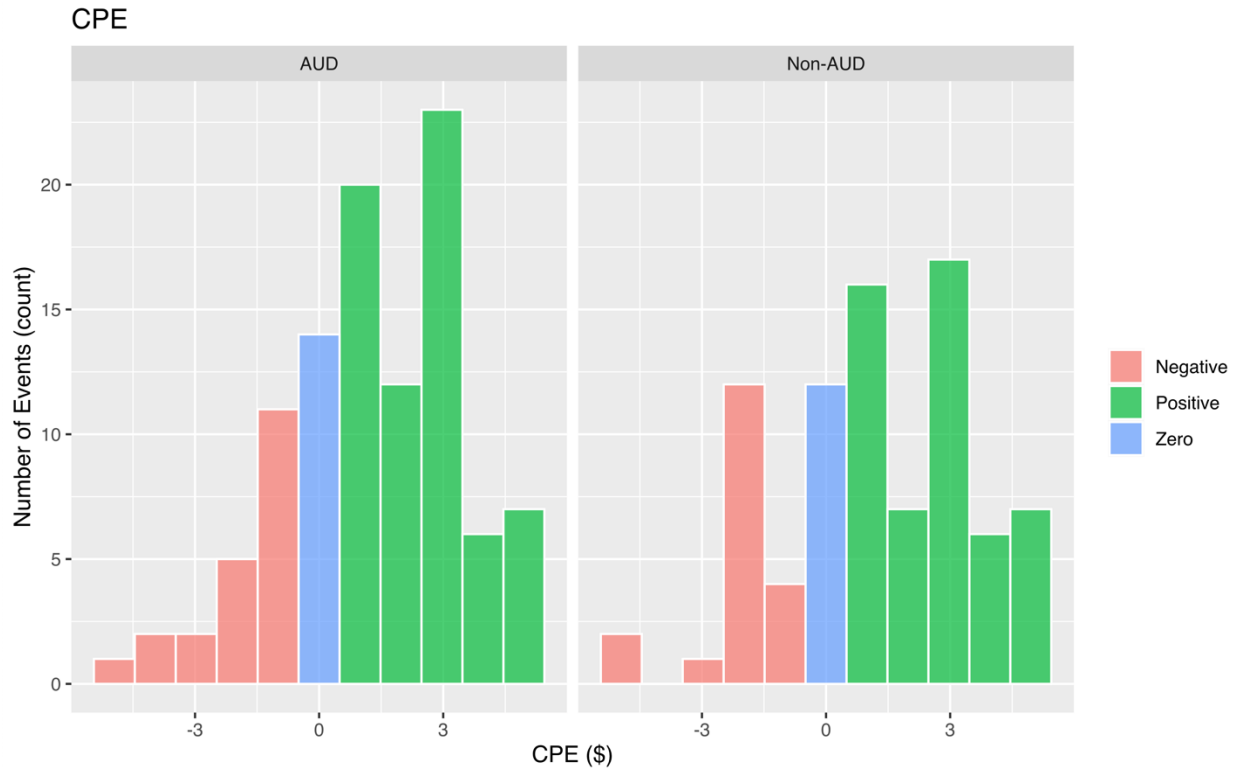


Supplemental Figure 1. Research and clinical electrode trajectories. (A) Research electrode trajectory and recording location shown by yellow trace and red crosshair terminating in the caudate. Possible clinical electrode trajectory shown in green, with clinical target (in the STN) shown with green cross hair. Views are in plane with the electrode trajectory. (B) Research electrode trajectory and recording location shown by yellow trace and green crosshair terminating in the caudate. Possible clinical electrode trajectories shown in green, with clinical target (in the STN) shown with a green cross hair. Views are in plane with the electrode trajectory. (C) Research electrode trajectory and recording location shown by yellow trace and green crosshair terminating in the caudate. Possible clinical electrode trajectory shown in green, with clinical target (in the VIM) shown with green cross hair. Views are in plane with the electrode trajectory. (D) Research electrode trajectory and recording location shown by yellow

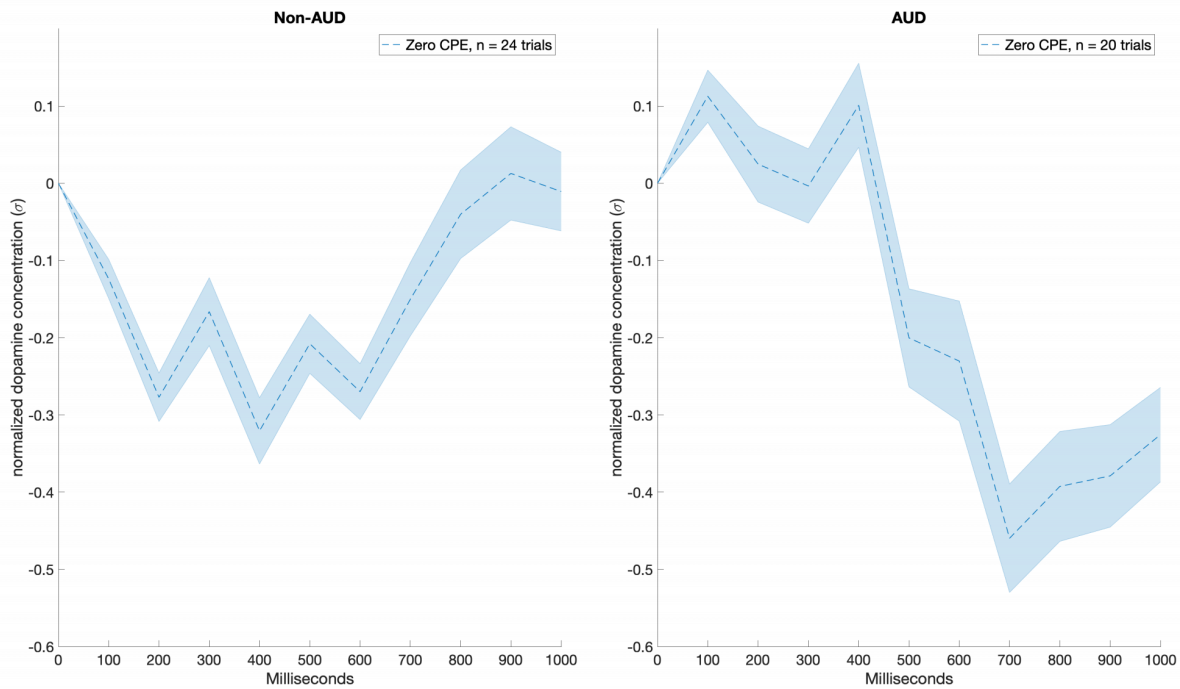
trace and red crosshair terminating in the caudate. Possible clinical electrode trajectories shown in green, with clinical target (in the VIM) shown with green cross hairs. Views are in plane with the electrode trajectory. All views collected from WayPoint Navigator software version 4.4 (Neurotargeting LLC).



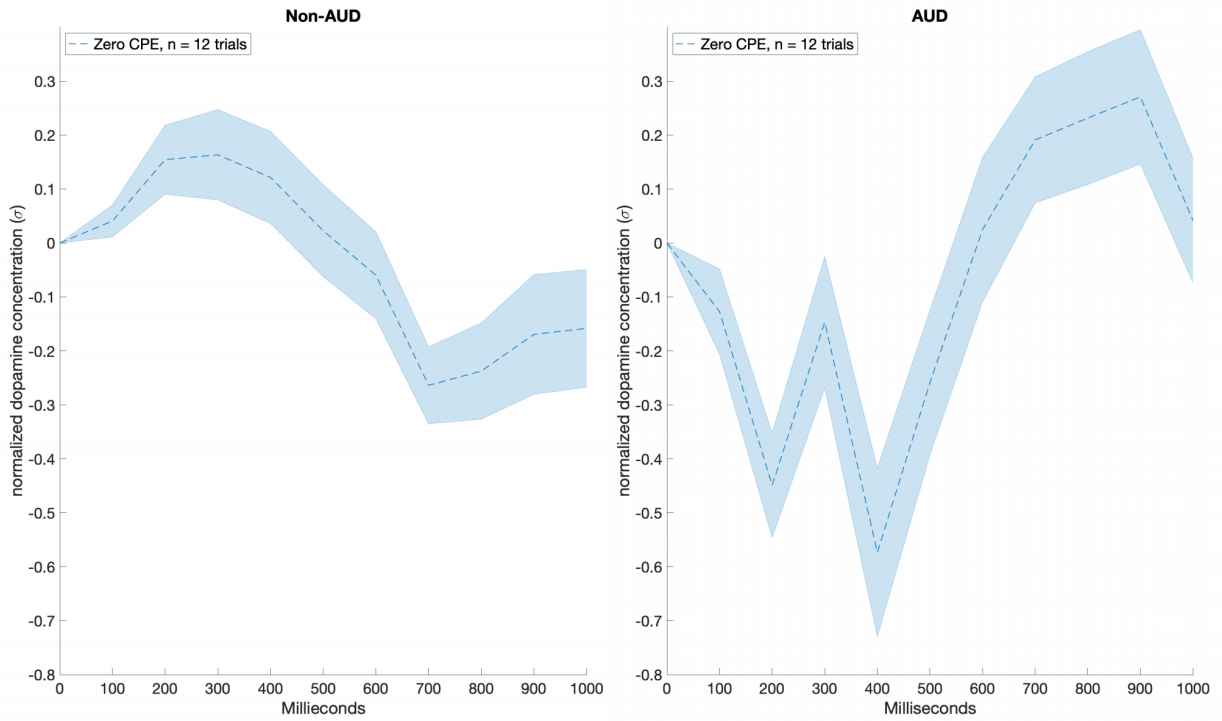
Supplemental Figure 2: Distribution of Sure Bet Counterfactual Prediction Errors. The distribution of the Counterfactual Prediction Error values for all trials on which participants selected the Sure Bet option, separated by group. Groups include pooled data for patients with a history of Alcohol Use Disorder (AUD) and without a history of Alcohol Use Disorder (Non-AUD).



Supplemental Figure 3: Distribution of Gamble Counterfactual Prediction Errors. The distribution of the Counterfactual Prediction Error values for all trials on which participants selected the Gamble option, separated by group. Groups include pooled data for patients with a history of Alcohol Use Disorder (AUD) and without a history of Alcohol Use Disorder (Non-AUD).



Supplemental Figure 4: Sub-Second Dopamine Fluctuations for Neutral CPE Outcomes during Sure Bet Trials in Patients with and without Alcohol Use Disorder. Sub-second dopamine fluctuations for patients with Alcohol Use Disorder (AUD) and without Alcohol Use Disorder (Non-AUD) for all trials on which participants selected the Sure Bet option and received a neutral Counterfactual Prediction Error (CPE) outcome. Trials are pooled within the AUD and Non-AUD groups.



Supplemental Figure 5: Sub-Second Dopamine Fluctuations for Neutral CPE Outcomes during Gamble Trials in Patients with and without Alcohol Use Disorder. Sub-second dopamine fluctuations for representative patients with Alcohol Use Disorder (AUD), AUD1, and without Alcohol Use Disorder (Non-AUD), Non-AUD1. Sub-second dopamine fluctuations include trials on which participants selected the Gamble option and received a neutral Counterfactual Prediction Error (CPE) outcome.