



Supplementary Figure 1. Task responses for individual subjects before, during, and after sessions with medial prefrontal cortex silencing.

a, Individual animal performance ($n = 17$) before (session 1), during (session 2) and after (session 3) pre-choice stimulation for hunger (upper panel) and thirst (lower panel). Tick marks are lever press for food (green) or water (blue). **b**, Individual animal performance ($n = 17$) before (session 1), during (session 2), and after (session 3) outcome evaluation stimulation for hunger (upper panel) and thirst (lower panel).

Supplementary Table 1. Results of statistical analyses.

Figure	Sample size (n)	Statistical Test	Values
1b	9	Two-sided Mann-Whitney U Test Post hoc multiple comparisons with Holm's correction	Hunger/Food vs Hunger/Water: $P < 0.001$ Thirst/Food vs Thirst/Water: $P = 0.0009$ Hunger/Food vs Thirst/Water: $P = 0.02$ Hunger/Water vs Thirst/Food: $P = 0.08$
1d	Neurons in Hunger: 624 Neurons in Thirst: 556	Mann-Whitney U Test single-tailed	Food > Water Water > Food Consumption > Baseline neurons selected at $P < 0.05$
1g/i	Neurons in Hunger: 624 Neurons in Thirst: 556	Two-sided Mann-Whitney U Test Post hoc multiple comparisons with Holm's correction	$P < 0.001$ for all comparisons
2b	Hunger: 9 Thirst: 9	Two-sided Wilcoxon signed rank test	Preference Index: $P = 0.15$ Error Rate: $P = 0.15$
2c	Hunger reg: 13 stim: 9 Thirst reg: 13 stim: 9	2-way ANOVA for pre-choice: Factor 1: <i>Hunger vs Thirst</i> Factor 2: <i>Photostim vs Regular</i> Interaction: <i>State x Stimulation</i> 2-way ANOVA for evaluation Factor 1: <i>Hunger vs Thirst</i> Factor 2: <i>Photostim vs Regular</i> Interaction: <i>State x Stimulation</i>	$F(1,40) = 0.55, P = 0.4623$ $F(1,40) = 2.73, P = 0.1065$ $F(1,40) = 0.41, P = 0.5256$ $F(1,40) = 0.23, P = 0.6369$ $F(1,40) = 0.23, P = 0.6331$ $F(1,40) = 0.13, P = 0.7225$
2f	Switching 27 Const Hunger: 9 Constant Thirst: 9	For switching need states: 2-way rm ANOVA; Factor 1: <i>Hunger vs Thirst</i> Factor 2: <i>Block</i> Interaction: <i>State x Block</i> For constant need states: 2-way ANOVA; Factor 1: <i>Hunger vs Thirst</i> Factor 2: <i>Block</i> Interaction: <i>State x Block</i>	$F(1,234) = 10.39, P = 0.006$ $F(9,234) = 23.91, P < 0.001$ $F(9,234) = 1.6, P = 0.11$ $F(1,72) = 0.18, P = 0.7$ $F(9,72) = 1.25, P = 0.3$ $F(9,72) = 0.62, P = 0.8$
2g	27	Two sided Wilcoxon signed rank test	Preference index: $P = 0.01$ Error rate: $P = 0.01$
2h	27	2-way rm ANOVA; Factor 1: <i>Hunger vs Thirst</i> Factor 2: <i>Block</i> Interaction: <i>State x Block</i>	$F(1,234) = 14.1, P < 0.001$ $F(9,234) = 9.3, P < 0.001$ $F(9,234) = 1.85, P = 0.059$
2i	27	Two-sided Wilcoxon signed rank test: <i>Correct Hunger vs Thirst</i> <i>Error Hunger vs Thirst</i> <i>Correct overall vs Error overall</i> Post hoc multiple comparisons with Holm's correction	$P = 0.004$ $P = 0.1$ $P = 0.0003$
2j	27	Two-sided Wilcoxon Signed Rank Test: <i>Hunger vs Thirst</i>	$P = 0.015$
2k	Early: 27 Interm: 27 Late: 22	Two-sided Wilcoxon signed rank test Post hoc multiple comparisons with Holm's correction	Early: $P = 0.09$ Intermediate: $P = 0.027$ Late: $P = 0.028$

2l	Early:27 Interm:27 Late:22 Constant: 18	Two-sided Wilcoxon signed rank test: <i>Hunger vs Thirst</i> Two-sided Mann-Whitney U Test: <i>Hunger vs Thirst</i>	Early: $P=0.83$ Intermediate: $P=0.03$ Late: $P=0.008$ Const.: $P=0.73$
2m	Regular switching:27 After Constant Thirst: 7	2-way rm ANOVA Factor 1: State (<i>hunger vs thirst, switching</i>) Factor 2: <i>Block</i> Post hoc multiple comparisons with Holm-Sidak correction	State Factor 1: $F(1,288)=0.39, P=0.54$ Block Factor 2: $F(9,288)=18.9, P<0.001$ Interaction: $F(9,288)=2.65, P=0.006$ Hunger vs. Thirst Block 1: $P<0.001$ Block 2: $P=0.01$ Block 3-10: $P>0.05$
2n	Hunger:6 Thirst:7	2-way rm ANOVA separate for Hunger & Thirst Factor 1: <i>before vs pre-exposure</i> Factor 2: <i>Block</i> Interaction: <i>Condition x Block</i> Post hoc multiple comparison: Tukey's HSD test. <i>Thirst Block 1, Hunger Block 1</i>	Thirst Factor 1: $F(1,54)=11.16, P=0.015$ Thirst Factor 2: $F(9,54)=3.5, P=0.0017$ Thirst Interaction: $F(9,54)=1.98, P=0.058$ Hunger Factor 1: $F(1,45)=1.8, P=0.23$ Hunger Factor 2: $F(9,45)=12.91, P<0.001$ Hunger Interaction: $F(9,45)=2.96, P=0.007$ $P<0.01, P<0.05$
3c	17	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Hunger: $P=0.07$ Thirst: $P<0.001$
3d	17	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Hunger correct: $P=0.76$ error: $P=0.72$ Thirst correct: $P=0.98$ error: $P=0.36$
3g	17	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Hunger: $P=0.08$ Thirst: $P<0.001$
3h	17	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Hunger correct: $P=0.3$ error: $P=0.98$ Thirst correct: $P=0.5$ error: $P=0.07$
3k	6	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Preference Index $P=0.15$ Error Rate $P=0.15$
3l	7	Two-sided Mann-Whitney U Test: <i>Photostim vs Regular</i>	Preference Index $P=0.016$ Error Rate $P=0.016$
ED 2h	Hunger: 12 Thirst: 9	Two-sided Mann-Whitney U Test: <i>Photostim vs Regular</i>	Hunger Food: $P=0.29$ Water: $P=0.24$ Thirst Food: $P=1$ Water: $P=0.87$
ED 3b	Const. Hunger:9 Const. Thirst:9 Switch w/ 1 st Hunger:11 Switch w/ 1 st Thirst:16	Two-sided Mann-Whitney U Test Post hoc multiple comparisons with Holm's correction	Constant Hunger vs. Thirst: $P=0.4$ Switching Hunger vs. Thirst: $P=0.14$ Constant combined vs. Switching combined: $P<0.001$
ED 3c	Const. Hunger: 7 Const. Thirst: 7	Two-sided Mann-Whitney U Test: <i>Food Lever vs. Water Lever</i> <i>Incorrect Water vs Food Lever</i> <i>Correct Water vs Food Lever</i> Post hoc multiple comparisons with Holm-Sidak correction	Hunger: $P=0.015$ Thirst: $P=0.015$ $P=0.2086$ $P=0.6865$
ED3d	Const. Hunger: 7 Const. Thirst: 7	Two-sided Mann-Whitney U Test: <i>Hunger vs. Thirst</i>	$P=0.9015$
ED 4a	Reg: 13 stim: 9	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Hunger: $P=0.35$ Thirst: $P=0.77$
ED 4b	Reg: 13 stim: 9	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Hunger: $P=0.31$ Thirst: $P=0.12$
ED 4c	Reg: 13 stim: 9	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Hunger: $P=0.12$ Thirst: $P=0.54$

ED 4d	Reg: 13 stim: 9	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Hunger: $P=0.68$ Thirst: $P=1$
ED 4e	Reg: 13 stim: 9	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Hunger: $P=0.12$ Thirst: $P=0.12$
ED 4f	Reg: 13 stim: 9	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	Hunger: $P=0.1$ Thirst: $P=0.35$
ED 5b	Switching: 7	Two-sided Wilcoxon signed rank test: <i>Food Lever vs. Water Lever</i> <i>Incorrect Water vs Food Lever</i> <i>Correct Water vs Food Lever</i> Post hoc multiple comparisons with Holm-Sidak correction	Hunger: $P=0.015$ Thirst: $P=0.015$ $P=0.2188$ $P=0.8125$
ED 5c	Switching: 7	Two-sided Wilcoxon signed rank test: <i>Hunger vs. Thirst</i>	$P=0.6875$
ED 5d	Hunger: 7 Thirst: 7	2-way rm ANOVA; Factor 1: <i>Hunger vs Thirst</i> Factor 2: <i>Block (Early, Mid, Late)</i> Interaction: <i>State x Block</i>	Factor 1: $F(1,12)=0.27, P=0.62$ Factor 2: $F(2,12)=3, P=1$ IA: $F(2,12)=1.5, P=1$
ED 5e	Const. Hunger: 7 Const. Thirst: 7 Switching: 7	Two-sided Mann-Whitney U Test for Const: <i>Food Lever vs. Water Lever</i> <i>Incorrect Water vs Food Lever</i> <i>Correct Water vs Food Lever</i> Two-sided Wilcoxon signed rank test for Switching: <i>Food Lever vs. Water Lever</i> <i>Incorrect Water vs Food Lever</i> <i>Correct Water vs Food Lever</i> Post hoc multiple comparisons with Holm-Sidak correction	Hunger: $P=0.015$ Thirst: $P=0.015$ $P=0.2086$ $P=0.3176$ Hunger: $P=0.015$ Thirst: $P=0.015$ $P=0.6563$ $P=0.1563$
ED 5f	Const. Hunger: 7 Const. Thirst: 7 Switching: 7	Two-sided Mann-Whitney U Test for Const: <i>Hunger vs. Thirst</i> Two-sided Wilcoxon signed rank test for Switching: <i>Hunger vs. Thirst</i>	$P=0.3030$ $P=0.3594$
ED 5g	Hunger: 7 Thirst: 7	Two-sided Mann-Whitney U Tests for all comparisons	$P>0.05$ for all comparisons
ED 6c	Early: 27 Interm: 27 Late: 22	Two-sided Wilcoxon signed rank test Post hoc multiple comparisons with Holm's correction	Early: $P=0.045$ Intermediate: $P=0.027$ Late: $P=0.03$
ED 6e	27	Kolmogorov-Smirnov test	$\alpha: P<0.05$ $L: P=0.99$ $S: P=0.69$
ED 6f	Regular switching: 22 After Constant Thirst: 7	2-way rm ANOVA Factor 1: <i>Hunger State (switching vs after constant thirst)</i> Post hoc multiple comparisons with Holm-Sidak correction	State Factor 1: $F(1,243)=0.34, P=0.56$ Block Factor 2: $F(9,243)=11.2, P<0.001$ Interaction: $F(9,243)=4.0, P<0.001$ <i>Hunger vs. Thirst</i> Block 1: $P<0.001$ Block 2: $P<0.001$ Block 3-10: $P>0.05$
ED 6g	Regular: 27 Reversal: 14	Two-sided Mann-Whitney U Test: <i>Regular Hunger vs Thirst;</i> <i>Reversal Hunger vs Thirst;</i> <i>Regular Hunger vs. Reversal Hunger;</i> <i>Regular Thirst vs Reversal Thirst</i>	$P=0.042$ $P=0.982$ $P<0.0001$

		Post hoc multiple comparisons with Holm's correction	$P=0.0057$
ED 8a	17	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i> Post hoc multiple comparisons with Holm's correction	Errors, Hunger: $P=0.07$ Errors, Thirst: $P<0.001$ Reaction Time, Hunger Correct: $P=0.06$ Hunger, Error: $P=0.008$ Reaction Time, Thirst Correct: $P=0.06$ Thirst, Error: $P=0.83$
ED 8b	17	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i> Post hoc multiple comparisons with Holm's correction	Errors, Hunger: $P=0.08$ Errors, Thirst: $P<0.001$ Reaction Time, Hunger correct: $P=0.1$ Hunger, error: $P=0.18$ Reaction Time, Thirst correct: $P=0.12$ Thirst, error: $P=0.9$
ED 8c	12	Two-sided Wilcoxon signed rank test: <i>Pre vs Post1; Pre vs Active; Active vs Post2</i>	$P=0.79$ $P=0.43$ $P=0.71$
ED 9d	16	Two-sided Wilcoxon signed rank test: <i>Regular vs Photostim Outcome</i> <i>Regular vs Photostim Pre-Choice</i>	Hunger: $P=0.569$ Thirst: $P=0.063$ Hunger: $P=1$ Thirst: $P=0.791$
ED 9e	16	Two-sided Wilcoxon signed rank test: <i>Regular vs Photostim Outcome</i> <i>Regular vs Photostim Pre-Choice</i>	Hunger: $P=0.569$ Thirst: $P=0.063$ Hunger: $P=1$ Thirst: $P=0.791$
ED 9f	16	Two-sided Wilcoxon signed rank test: <i>Regular vs Photostim Outcome</i> <i>Regular vs Photostim Pre-Choice</i>	Correct: Hunger: $P=0.733$ Thirst: $P=0.109$ Error: Hunger: $P=0.203$ Thirst: $P=0.413$ Correct: Hunger: $P=0.791$ Thirst: $P=0.322$ Error: Hunger: $P=0.176$ Thirst: $P=0.380$
ED10a	6	Two-sided Wilcoxon signed rank test: <i>Photostim vs Regular</i>	RT correct $P=0.16$ error $P=0.63$ Licks correct $P=0.84$ error $P=0.69$
ED10b	7	Two-sided Mann-Whitney U Test: <i>Photostim vs Regular</i>	RT correct $P=0.01$ error $P=0.07$ Licks correct $P=0.77$ error $P=0.36$

Supplementary Movie 1. Example session of a thirsty animal showing lever press performance in trials before, during, and after optogenetic pre-choice mPFC silencing. After a variable inter-trial interval, each trial begins with the presentation of an auditory cue (1 s) which is presented followed by levers extension. In mPFC silencing trials, laser stimulation starts with the onset of cue presentation and lasts until the animal presses a lever or until the response window ends (5 s).