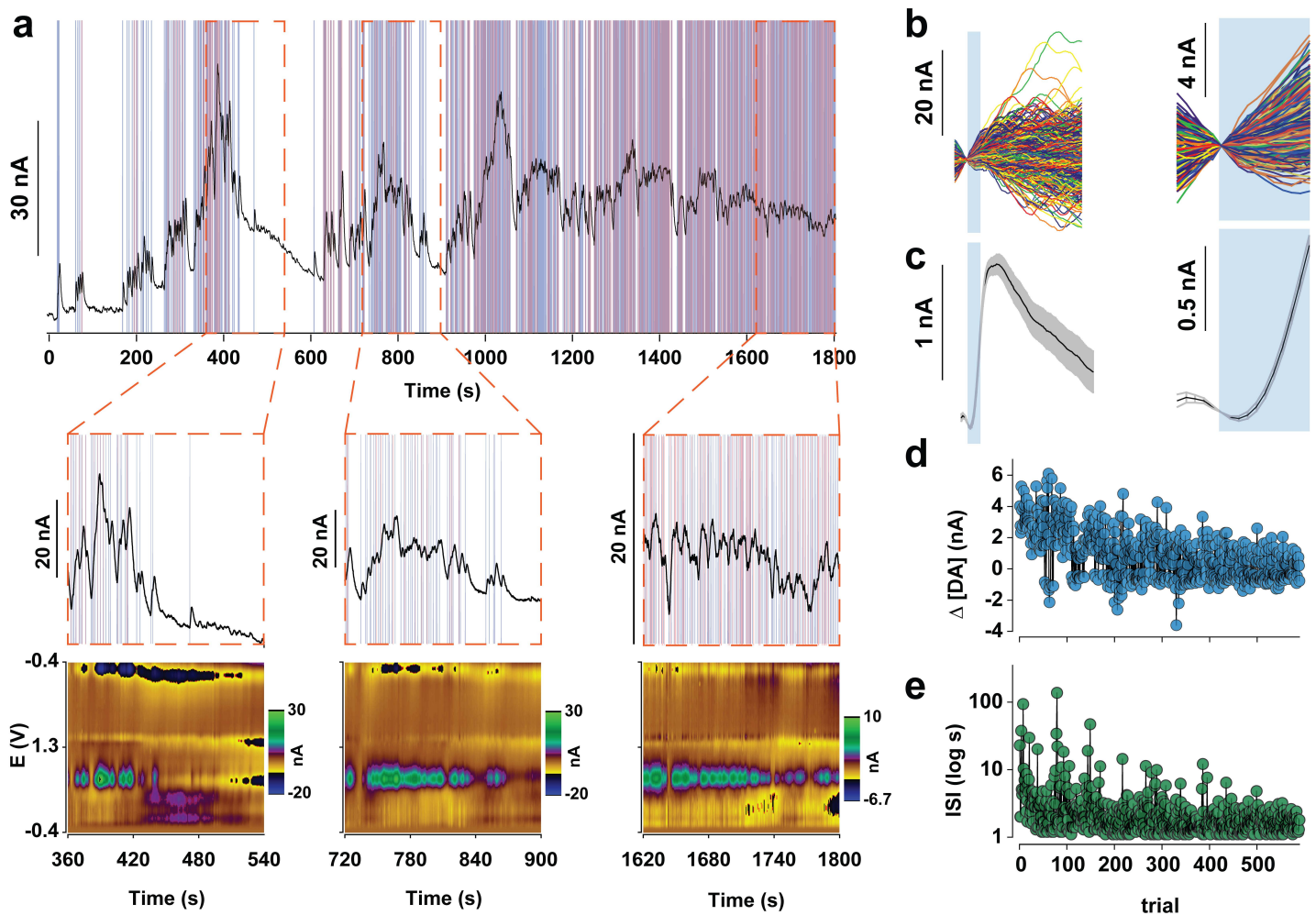


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Supplemental Information

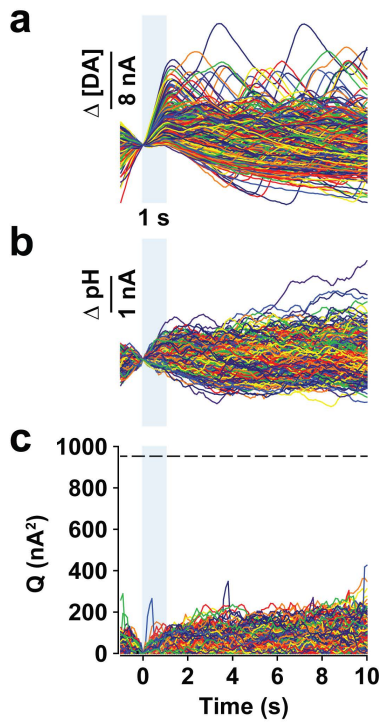
**Accumbal Dopamine Release Tracks the Expectation
of Dopamine Neuron-Mediated Reinforcement**

Dan P. Covey and Joseph F. Cheer



1
2 **Supplemental Figure 1.**

3 Dopamine release during FR1 ICSS. Related to Figure 2. **(a)** Example FSCV recording (black trace) during a 30-minute, fixed ratio 1
4 (FR1) ICSS session. Blue vertical lines indicate active lever presses reinforced by laser stimulation (30 Hz, 1s) and red vertical lines
5 indicate active presses occurring during an ongoing stimulation (non-reinforced). Insets below show 3-minute periods highlighting the
6 temporal contiguity between reinforced presses and fluctuations in the FSCV trace. Pseudo-color plots below display sequential cyclic
7 voltammograms of changes in current (z-axis) across the applied potential (y-axis), plotted sequentially across time (x-axis). **(b)**
8 Individual and **(c)** mean (\pm SEM; bottom) DA concentration changes (Δ [DA]) time-locked to laser stimulation (blue, transparent box)
9 during each 10s (left) and 1s (right) period following stimulation onset. **(d)** Peak Δ [DA] during each stimulation. **(e)** Inter-stimulation
10 interval (ISI) between each stimulation, plotted in seconds on a log scale.

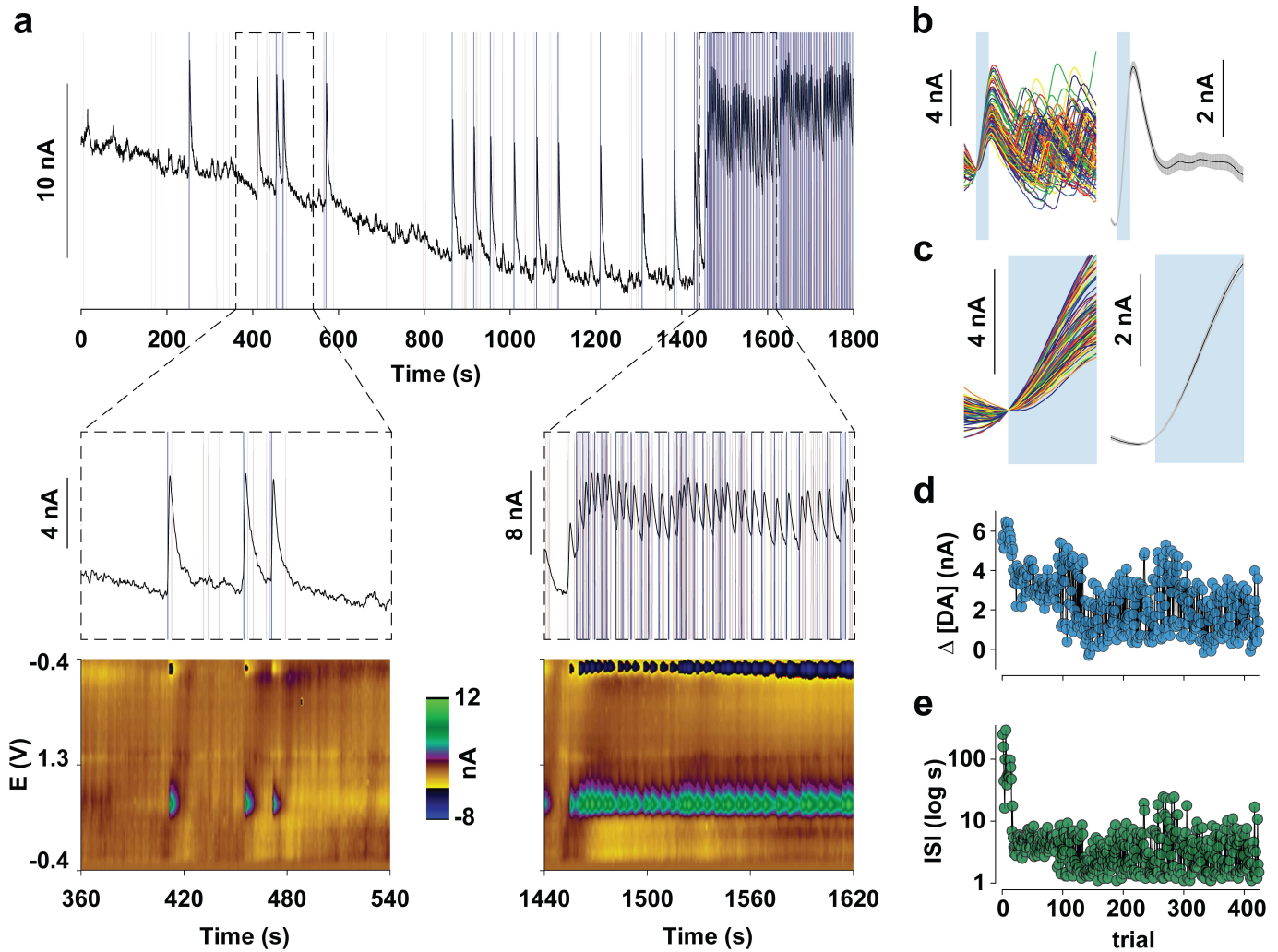


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13 **Supplemental Figure 2.**

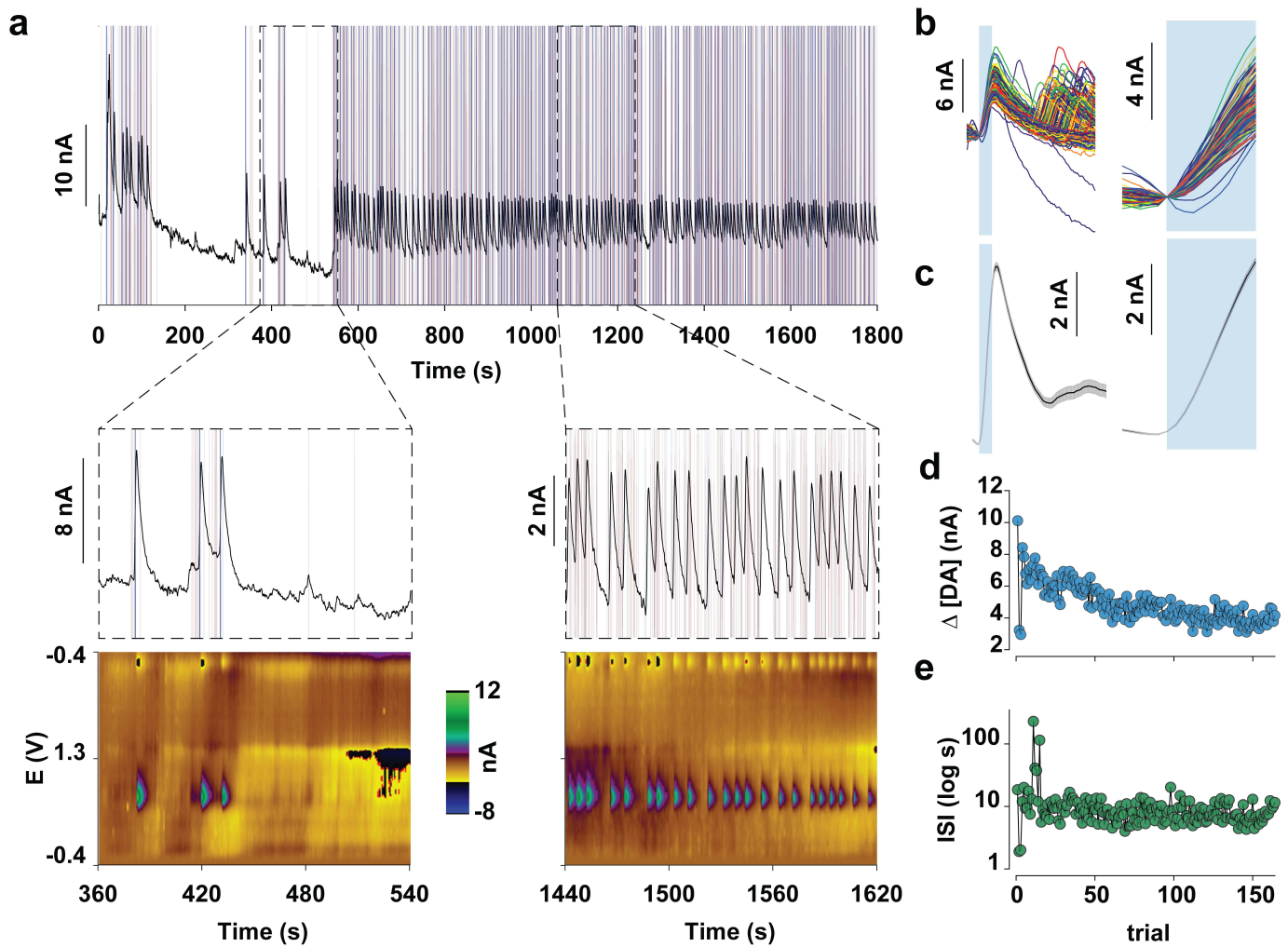
14 Extraction of the dopamine signal during continuous reinforcement schedule. Related to Figure 2. Each individual **(a)** DA concentration
 15 change ($\Delta [DA]$), **(b)** change in pH (ΔpH), and **(c)** residual values from the PCR analysis time-locked to laser stimulation from the
 16 ICSS-FR1 session displayed in Figure 2. Horizontal dashed line in **(c)** indicates the 95% confidence interval.

17



18
19 **Supplemental Figure 3.**

20 Dopamine release during FR5 ICSS. Related to Figure 2. **(a)** Example FSCV recording (black trace) during a 30-minute, fixed ratio 5
 21 (FR5) ICSS session. Blue vertical lines indicate active lever presses reinforced by laser stimulation (30 Hz, 1s) and red vertical lines
 22 indicate active presses occurring during an ongoing stimulation (non-reinforced). Insets below show 3-minute periods highlighting the
 23 temporal contiguity between reinforced presses and fluctuations in the FSCV trace. Pseudo-color plots below display sequential cyclic
 24 voltammograms of changes in current (z-axis) across the applied potential (y-axis), plotted sequentially across time (x-axis). **(b)**
 25 Individual and **(c)** mean (\pm SEM; bottom) DA concentration changes (Δ [DA]) time-locked to laser stimulation (blue, transparent box)
 26 during each 10s (left) and 1s (right) period following stimulation onset. **(d)** Peak Δ [DA] during each stimulation. **(e)** Inter-stimulation
 27 interval (ISI) between each stimulation, plotted in seconds on a log scale.

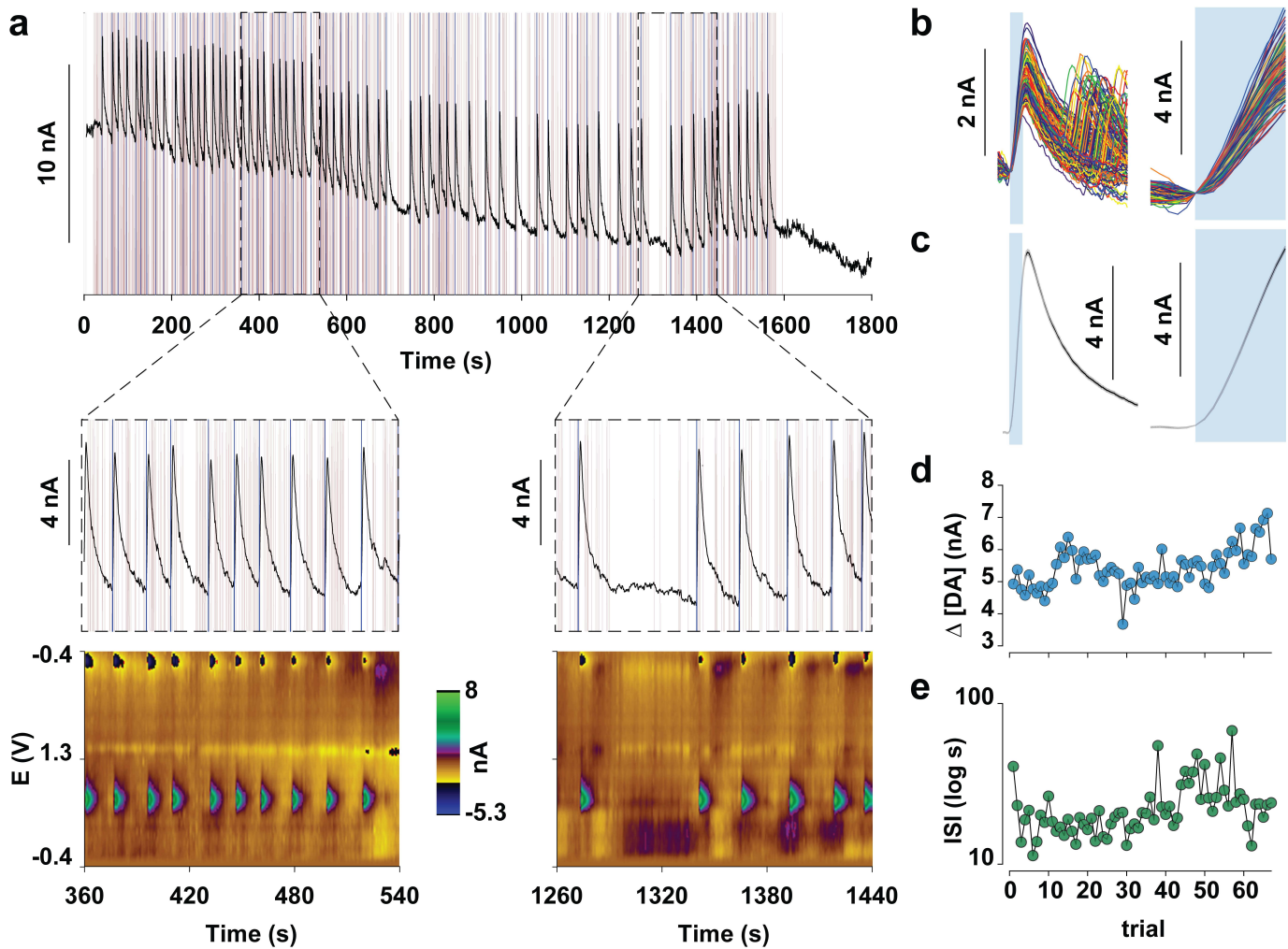


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29 **Supplemental Figure 4.**

30 Dopamine release during FR10 ICSS. Related to Figure 2. **(a)** Example FSCV recording (black trace) during a 30-minute, fixed ratio
 31 10 (FR10) ICSS session. Blue vertical lines indicate active lever presses reinforced by laser stimulation (30 Hz, 1s) and red vertical lines
 32 indicate active presses occurring during an ongoing stimulation (non-reinforced). Insets below show 3-minute periods highlighting the
 33 temporal contiguity between reinforced presses and fluctuations in the FSCV trace. Pseudo-color plots below display sequential cyclic
 34 voltammograms of changes in current (z-axis) across the applied potential (y-axis), plotted sequentially across time (x-axis). **(b)**
 35 Individual and **(c)** mean (\pm SEM; bottom) DA concentration changes (Δ [DA]) time-locked to laser stimulation (blue, transparent box)
 36 during each 10s (left) and 1s (right) period following stimulation onset. **(d)** Peak Δ [DA] during each stimulation. **(e)** Inter-stimulation
 37 interval (ISI) between each stimulation, plotted in seconds on a log scale.

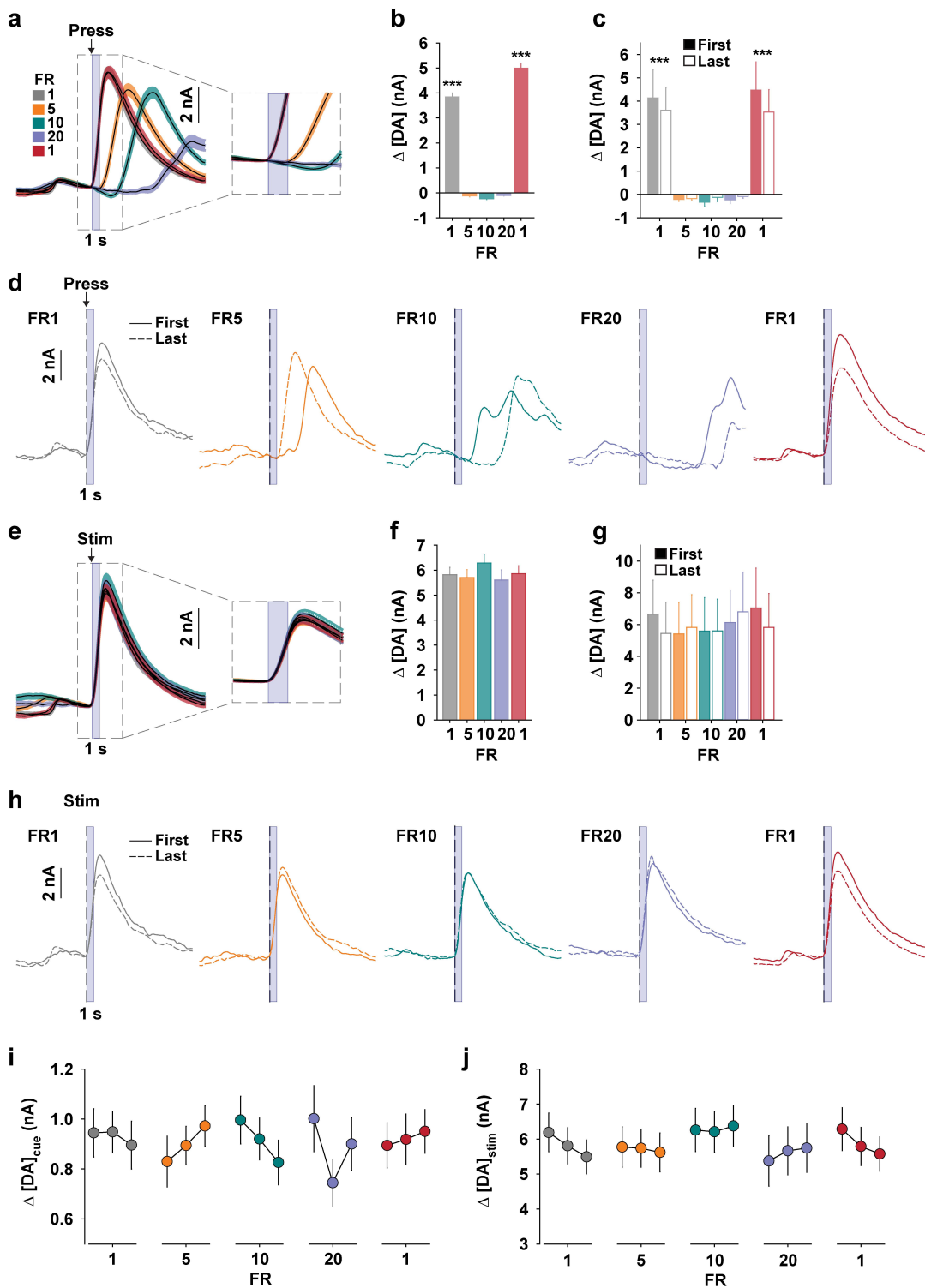
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40 **Supplemental Figure 5.**

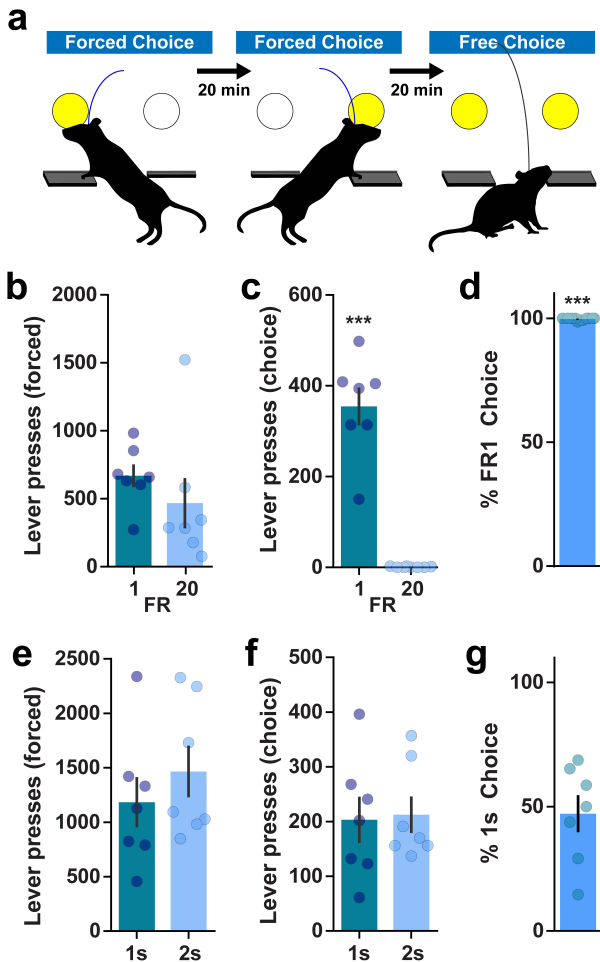
41 Dopamine release during FR20 ICSS. Related to Figure 2. **(a)** Example FSCV recording (black trace) during a 30-minute, fixed ratio
 42 20 (FR20) ICSS session. Blue vertical lines indicate active lever presses reinforced by laser stimulation (30 Hz, 1s) and red vertical lines
 43 indicate active presses occurring during an ongoing stimulation (non-reinforced). Insets below show 3-minute periods highlighting the
 44 temporal contiguity between reinforced presses and fluctuations in the FSCV trace. Pseudo-color plots below display sequential cyclic
 45 voltammograms of changes in current (z-axis) across the applied potential (y-axis), plotted sequentially across time (x-axis). **(b)**
 46 Individual and **(c)** mean (\pm SEM; bottom) DA concentration changes (Δ [DA]) time-locked to laser stimulation (blue, transparent box)
 47 during each 10s (left) and 1s (right) period following stimulation onset. **(d)** Peak Δ [DA] during each stimulation. **(e)** Inter-stimulation
 48 interval (ISI) between each stimulation, plotted in seconds on a log scale.

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Supplemental Figure 6.

Dopamine (DA) release is not modified by changes in the expected reinforcement cost during transitions between each response requirement. Related to Figure 4. **(a)** Mean (\pm SEM) DA concentration changes (Δ [DA]) time-locked to the first lever press on each trial, separated by fixed ratio (FR) requirement. Blue, shaded box demarcates the 1s stimulation time for FR1 trials. **(b)** Mean (\pm SEM) Δ [DA] following the first lever press across all trials (One-way RM ANOVA: $F_{(4, 746)} = 22.30$, $P < 0.001$; $***P < 0.001$ versus FR5-20). **(c)** Mean (\pm SEM) Δ [DA] following the first lever press on the first and last trial of each FR epoch (One-way RM ANOVA: $F_{(9, 45)} = 13.84$, $P < 0.001$; $***P < 0.001$ versus FR5-20). **(d)** Mean Δ [DA] aligned to the first lever press on the first (solid line) and last (dashed line) trial of each FR epoch. **(e)** Mean (\pm SEM) DA concentration changes (Δ [DA]) time-locked to each stimulation (Stim) on each trial, separated by FR requirement. **(f)** Mean (\pm SEM) Δ [DA] time-locked to Stim onset. **(g)** Mean (\pm SEM) Δ [DA] following Stim on the first and last trial of each FR epoch. **(h)** Mean Δ [DA] aligned to Stim on the first (solid line) and last (dashed line) trial of each FR epoch. Mean (\pm SEM) change in dopamine concentration (Δ [DA]) during changing response costs, separated into thirds of each fixed ratio (FR) epoch, following the **(a)** cue (One-way RM ANOVA: $F_{(14, 904)} = 0.49$, $P = 0.939$) and **(b)** stimulation (One-way RM ANOVA: $F_{(14, 880)} = 0.31$, $P = 0.993$).

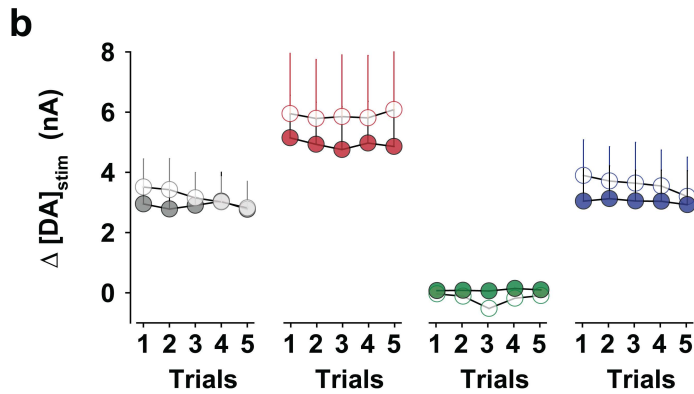
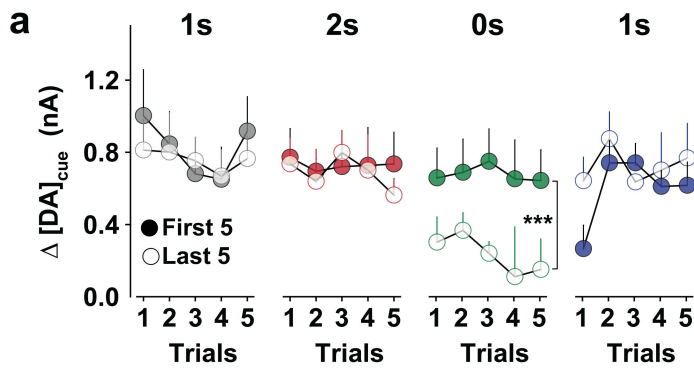


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Supplemental Figure 7.

97 Concurrent choice task. Related to Figures 4-5. **(a)** Schematic representation of the task. On forced choice blocks, each lever and cue
 98 light was associated with either the high (FR20) or low (FR1) cost option and, on a separate session, either 1s or 2s stimulation. During
 99 free-choice blocks, both levers and cue lights were presented. Lever presses for the high and low cost option **(b)** did not differ on forced
 100 trials (one-tailed, paired t-test, $t_{(6)} = 0.974$, $P = 0.184$) but **(c)** were isolated to the low cost option on choice trials (one-tailed, unpaired
 101 t-test, $t_{(6)} = 8.51$, $P < 0.001$). **(d)** Preference for the low cost option significantly differed from chance (50%; one-tailed, paired t-test, $t_{(6)}$
 102 = 249.7, $P < 0.001$). No difference in lever presses for the 1s and 2s stimulation during **(e)** forced (one-tailed, paired t-test, $t_{(6)} = 0.987$,
 103 $P = 0.180$) or **(f)** choice (one-tailed, unpaired t-test, $t_{(6)} = 0.131$, $P = 0.450$) trials, and **(g)** no preference for either stimulation versus
 104 chance (50%; one-tailed, paired t-test, $t_{(6)} = 0.376$, $P = 0.360$).
 105



Supplemental Figure 8.

Dopamine release during transitions between each stimulus duration block. Related to Figure 5. Mean (+ SEM) change in dopamine concentration ($\Delta [DA]$) during changing stimulation durations (indicated in **(a)** above each panel) following the **(a)** cue and **(b)** stimulation. Trials are separated into the first (solid circle) and last (open circle) five trials of each stimulation epoch in ascending and descending order, respectively. *** $P < 0.001$, paired t-test across all trials, First 5 versus Last 5.