Supplemental Material

Supplemental Figure Legends

Figure S1. Comparison of the DA neuron firing in the VTA (n = 24) and SNc (n = 8). In both areas, nicotine increases the action potential firing rate of putative DA neurons in freely-moving rats. Nicotine administration increased the overall DA unit firing rate ***A,*** number of bursts per second ***B,*** number of spikes per burst ***C,*** and percentage of spikes in bursts ***D.*** There were no significant differences between VTA and SNc. There was statistical significance ($p < 0.05$) between "control" and "nicotine" in each panel. However, there is no statistical significance ($p > 0.05$) when comparing within "control" (i.e., VTA to SNc) or within "nicotine".

Figure S2. Recovery of the DA signal observed during consecutive single pulse stimuli (*p1* and *p2*) separated by different times stimulation. ***A,*** Example traces showing the recovery time of DA release following consecutive stimuli at increasing time between pulses. The amplitude of DA signal evoked by *p2* recovered as the interval of time increased to 80 s. ***B,*** The amplitude of the second stimulus (*p2*) with respect to *p1* at different time intervals between the stimuli (mean ± SEM) (n = 4–6). Note the Y-axis scale break. We allowed at least 120 s between our experimental stimulations to allow recovery of the DA signal.

Figure S3. The frequency dependence of the DA signals in the NAc shell does not depend on the order to the stimulations. ***A,*** The two traces show 2 different sequences of stimulus trains evoked by a single pulse (1p) and by 5-pulse trains at different frequencies (10–80 Hz). Analysis showed that the signals were not dependent on the stimulation sequence. ***B,*** The expanded traces of DA signals evoked by 1p and by 5p @ 20 Hz, 40 Hz, and 80 Hz indicate that the amplitudes at 20

and 40 Hz are similar, but the area on the curve is greater at 20 Hz. ***C,*** Example voltammograms indicated DA and artifactual signals. The voltammetry signals obtained from these experiments showing the typical oxidation and reduction potentials for DA are at approximately +510 mV and -250 mV, respectively, vs. Ag/AgCl ground.

Figure S4. The burst firing by DA neurons measured *in vivo* was used to evoke DA release in the presence and absence of nicotine. The DA traces shown in bold (a1, a4, b1, b4) are those expected biologically, and those are shown in Figure 8 of the main text. For completeness, all of the possible stimulus trains are displayed. Patterned stimulus trains based on the *in vivo* DA-unit recordings are shown below the evoked DA release in the absence (control) or presence of nicotine bathing the slices from the ***A,*** dorsal striatum or ***B,*** the NAc shell. Scale bar: 0.1 μM, 1 s. The relative DA signal (area-under-curve) is compared to a1 (horizontal line) in ***C,*** the dorsal striatum and to b1 (horizontal line) in ***D,*** the NAc shell. When considering the stimulus train the matches the biological situation, the relative DA signal was unchanged by nicotine in the dorsal striatum (a4 relative to a1) but was increased in the NAc shell (b4 relative to b1) with $n = 5$, $p < 0.01$.