

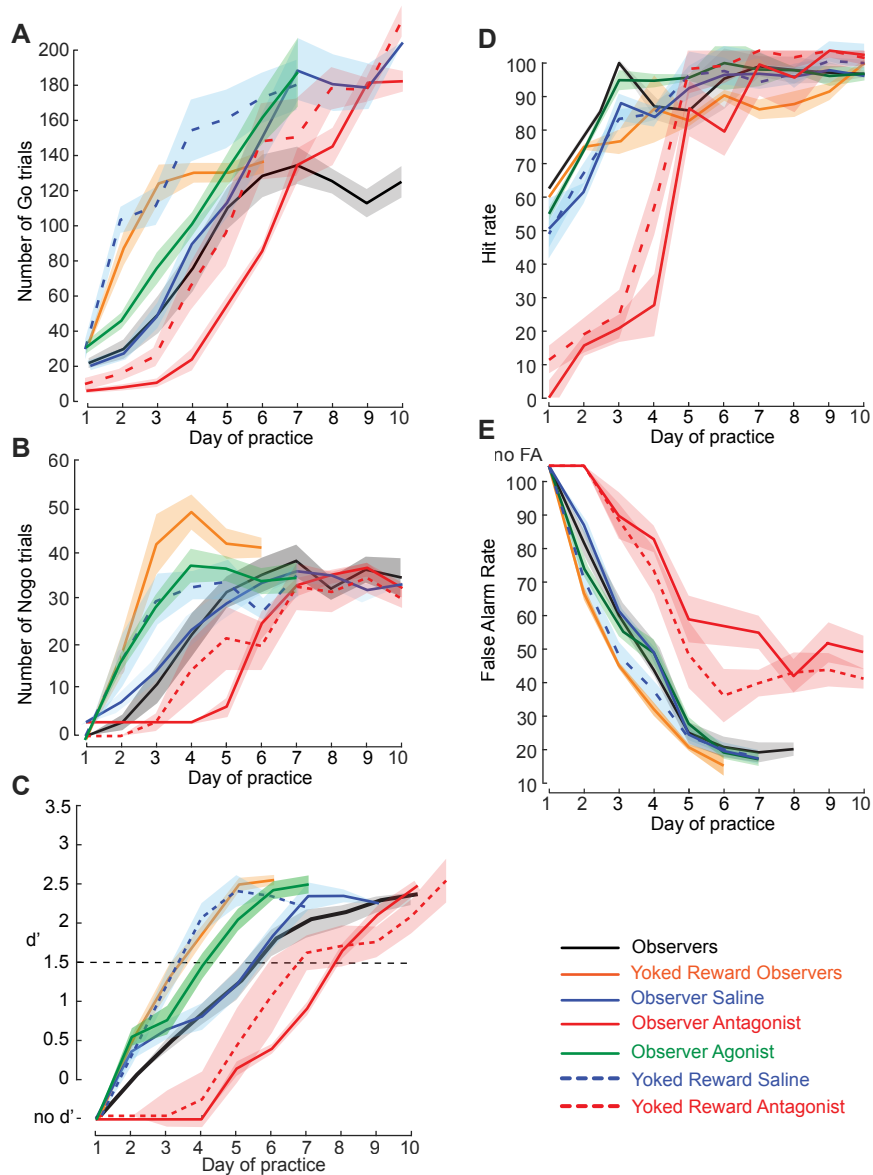
Title Dopaminergic signaling supports auditory social learning

Authors Nihaad Paraouty, Catherine R. Rizzuto, Dan H. Sanes

Supplementary Information

Supplementary Figures 1-4 and Figure legends

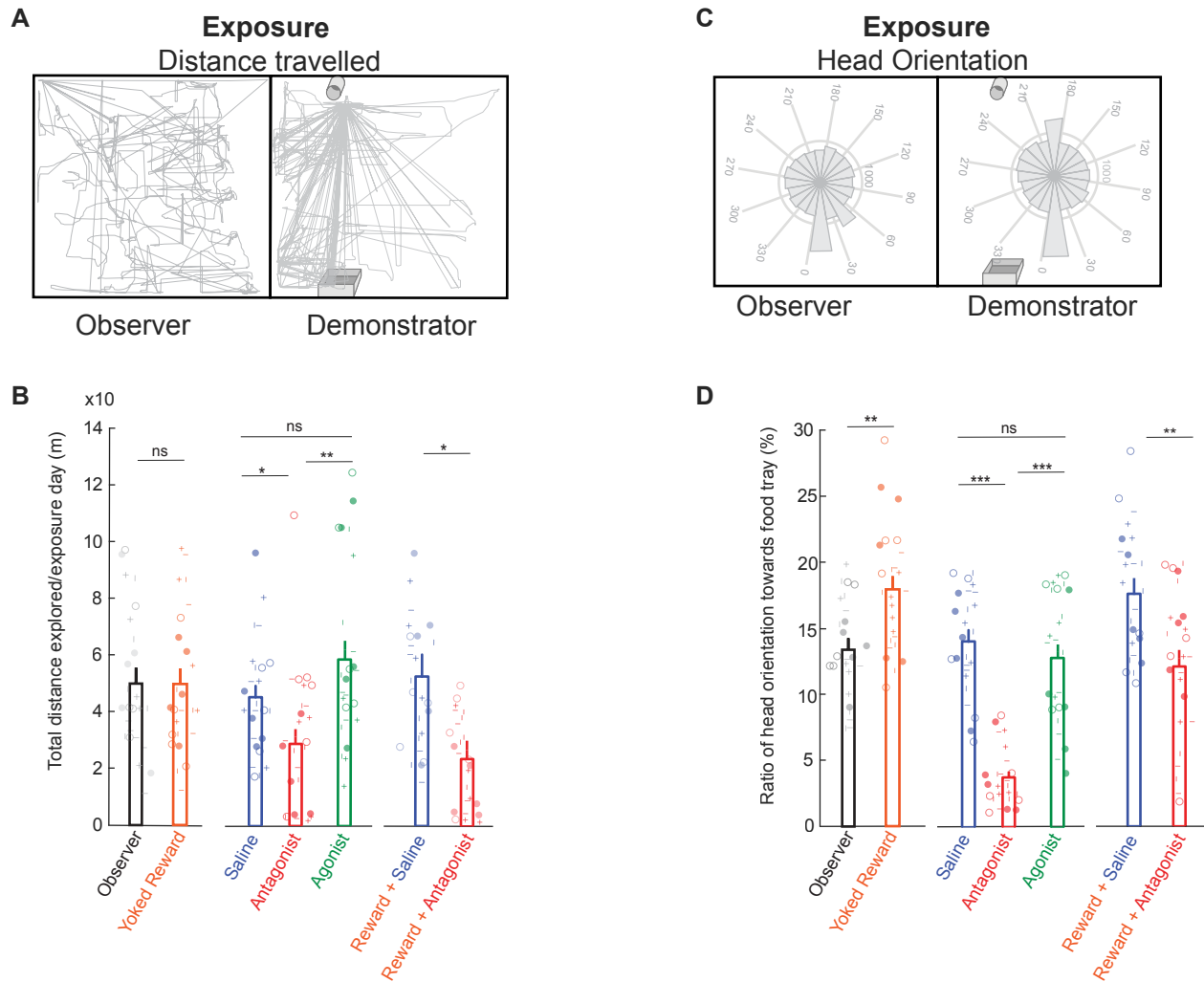
Supplementary Figure 1



Comparison of behavioral performance of all experimental groups across practice days.

A. Mean number of Go trials \pm SEM initiated by all observers in the seven different experimental groups of observers across practice days. **B.** Mean number of Nogo trials \pm SEM initiated across practice days. **C.** Mean d' \pm SEM across practice days. **D.** Mean hit rate \pm SEM across practice days. **E.** Mean false alarm rate \pm SEM across practice days. Mixed-model ANOVAs were used to reveal significant group differences, followed by Holm-Bonferroni-corrected post-hoc comparisons.

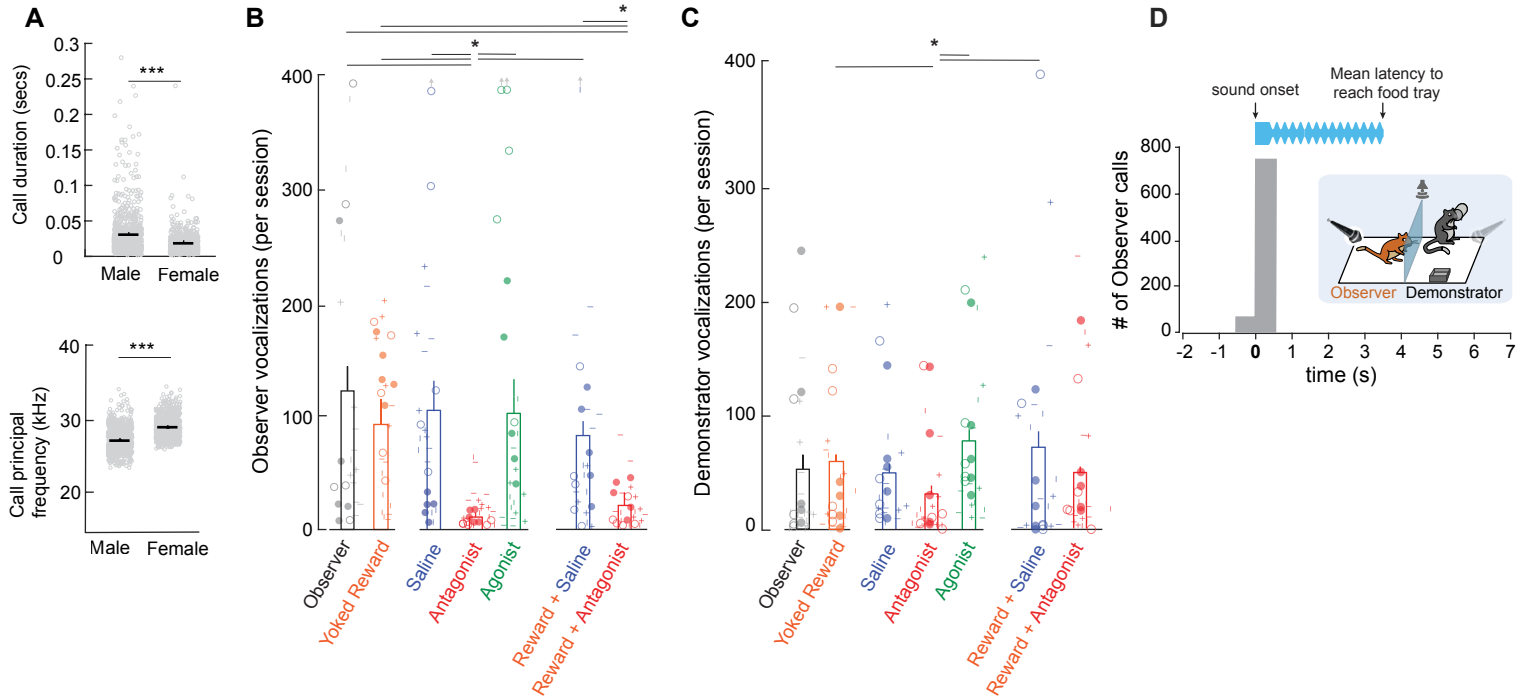
Supplementary Figure 2



Administration of dopamine antagonist impacts the general behavior of observers.

A. Illustration of the distance travelled by a demonstrator and an observer during 1 example exposure session. **B.** Mean distance explored per exposure day for a subset of 5 observers in each of the different observer groups: left-naïve observers (black) and yoked reward observers (orange); middle- observers which received saline (blue), or a dopamine antagonist (red), or a dopamine agonist (green); right- yoked reward observers which received saline (blue), or a dopamine antagonist (red). The analysis of distance travelled was performed on the same number of frames (first 20 minutes) of each of the five daily exposure sessions. **C.** Illustration of the head orientation of a demonstrator and an observer during 1 example exposure session. **D.** Mean ratio of head orientation for the 0-18° which corresponds to the food tray for the same subset of 5 observers (as in B). Asterisks denote statistically significant post-hoc differences at the following levels: * $p < 0.05$ and ** $p < 0.01$.

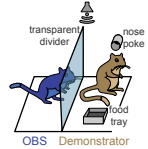
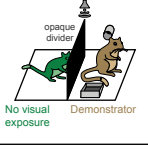
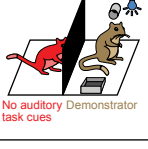
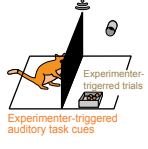
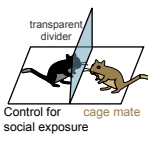
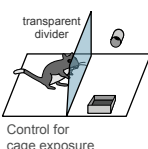
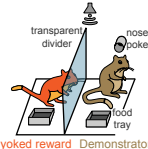
Supplementary Figure 3



Administration of dopamine antagonist impacts observer vocalizations.

A. Sex differences in terms of call duration (top) and call frequency (bottom) for all observers and demonstrators. **B.** Mean number of calls of 5 observers (shown in different symbols) in each of the seven observer groups during the first 20 minutes of the audio recordings for each of the five daily exposure sessions. **C.** Mean number of calls of 5 demonstrators (same demonstrator-observer pairs in B and C) during the first 20 minutes of the audio recordings for each of the five daily exposure sessions. **D.** Histogram of time-locked observer vocalizations (22% of all observers vocalizations) as a function of the sound stimulus onset.

Supplementary Figure 4

Exposure session	5 exposure sessions prior to practice	Interleaved exposure (5) and practice sessions	Exposure with non-cagemate demonstrators	
	Figure 1 (Paraouty et al., 2020) Days to criterion d' = 6.0 ± 0.9 days % reaching criterion = 100% (n=8) days to learn Go = 1.6 days days to learn Nogo = 4.4 days	Supplementary Figure 4 (Paraouty et al., 2020) Days to criterion d' = 5.5 ± 0.4 days % reaching criterion = 100% (n=6) days to learn Go = 2 days days to learn Nogo = 3.7 days	Supplementary Figure 3 (Paraouty et al., 2020) Days to criterion d' = 6.1 ± 0.6 days % reaching criterion = 100% (n=6) days to learn Go = 1.8 days days to learn Nogo = 3.2 days	
	Figure 3 (Paraouty et al., 2020) Days to criterion d' = 4.9 ± 0.4 days % reaching criterion = 100% (n=10) days to learn Go = 1.8 days days to learn Nogo = 3.1 days	Supplementary Figure 4 (Paraouty et al., 2020) Days to criterion d' = 6.7 ± 0.3 days % reaching criterion = 100% (n=9) days to learn Go = 2.2 days days to learn Nogo = 4.4 days	<p>Replication - Exposure with non-cagemate demonstrators</p> <p>Figure 1A (current study) Days to criterion d' = 5.6 ± 0.4 days % reaching criterion = 100% (n=13) days to learn Go = 2.9 days days to learn Nogo = 3 days</p> <p>Exposure with non-cagemate demonstrators + saline</p> <p>Figure 2B (current study) Days to criterion d' = 5.6 ± 0.3 days % reaching criterion = 100% (n=13) days to learn Go = 2.5 days days to learn Nogo = 3.3 days</p> <p>Exposure with non-cagemate demonstrators + D1/D5 agonist</p> <p>Figure 3A (current study) Days to criterion d' = 4.2 ± 0.2 days % reaching criterion = 100% (n=11) days to learn Go = 1 day days to learn Nogo = 3.2 days</p> <p>Exposure with non-cagemate demonstrators + D1/D5 antagonist</p> <p>Figure 2A (current study) Days to criterion d' = 8.3 ± 0.2 days % reaching criterion = 100% (n=10) days to learn Go = 4.4 days days to learn Nogo = 3.9 days</p>	
	Figure 4 (Paraouty et al., 2020) Days to criterion d' = 6.1 ± 0.9 days % reaching criterion = 100% (n=7) days to learn Go = 1.9 days days to learn Nogo = 4.3 days			
	Figure 4 (Paraouty et al., 2020) Days to criterion d' = 8.6 ± 1.9 days % reaching criterion = 100% (n=8) days to learn Go = 4.1 days days to learn Nogo = 4.5 days			
	Figure 2 (Paraouty et al., 2020) Days to criterion d' > 15 days % reaching criterion = 0% (n=7) days to learn Go > 15 days			
	Figure 2 (Paraouty et al., 2020) Days to criterion d' = 15 days % reaching criterion = 25% (n=8) days to learn Go = 10.3 days days to learn Nogo = 5.5 days			
No exposure phase	Figure 2 (Paraouty et al., 2020) Days to criterion d' = 14 ± 1.2 days % reaching criterion = 67% (n=6) days to learn Go = 9.2 days days to learn Nogo = 6 days	Exposure with non-cagemate demonstrators		Exposure with non-cagemate demonstrators + saline
		Figure 1D (current study) Days to criterion d' = 3.3 ± 0.2 days % reaching criterion = 100% (n=15) days to learn Go = 1.3 days days to learn Nogo = 2.4 days		Figure 2F (current study) Days to criterion d' = 3.5 ± 0.2 days % reaching criterion = 100% (n=6) days to learn Go = 1 day days to learn Nogo = 2.5 days
			Figure 2E (current study) Days to criterion d' = 7.2 ± 0.6 days % reaching criterion = 100% (n=6) days to learn Go = 3.7 days days to learn Nogo = 3.5 days	

Summary of all social learning paradigms tested here and in Paraouty et al. (2020).
Illustration of exposure sessions.