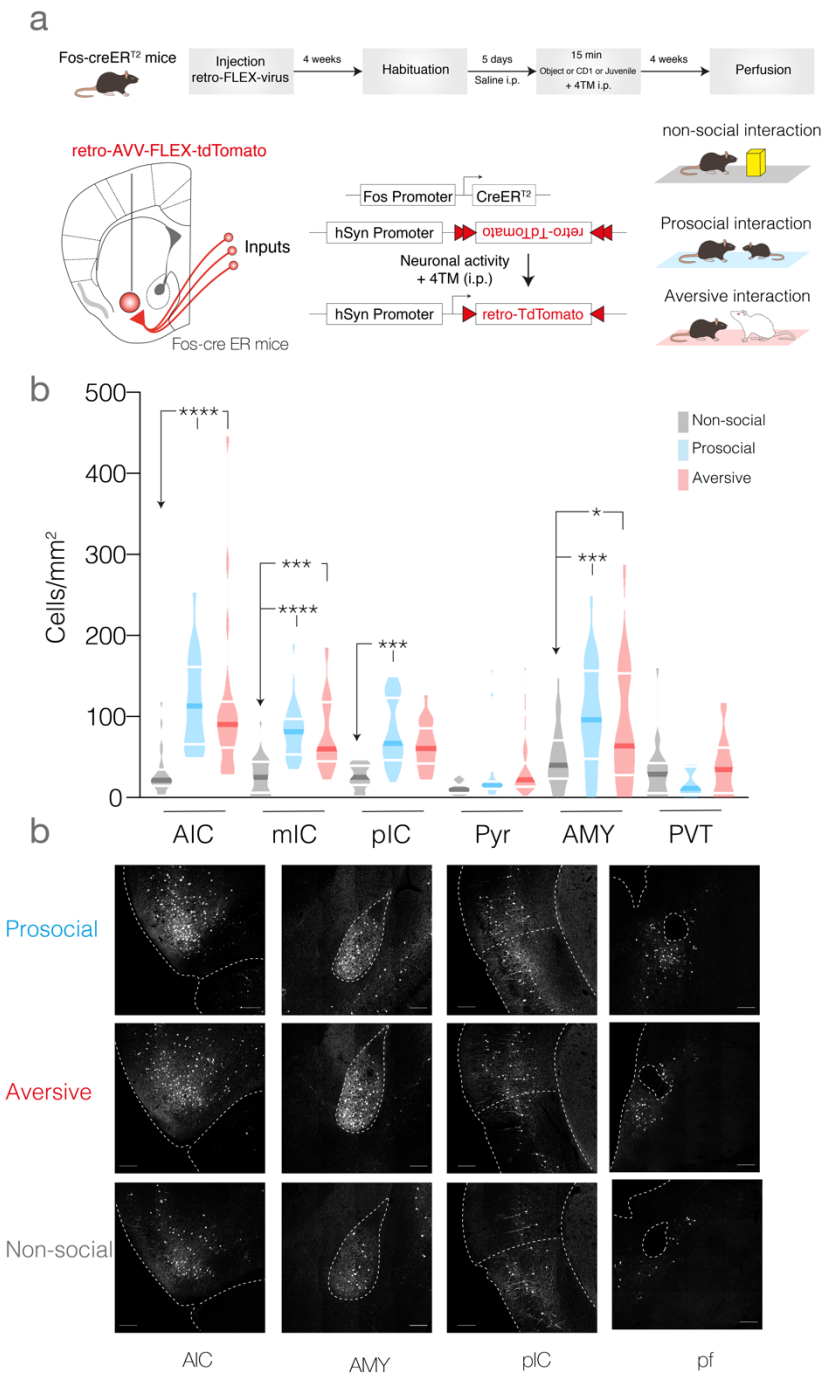
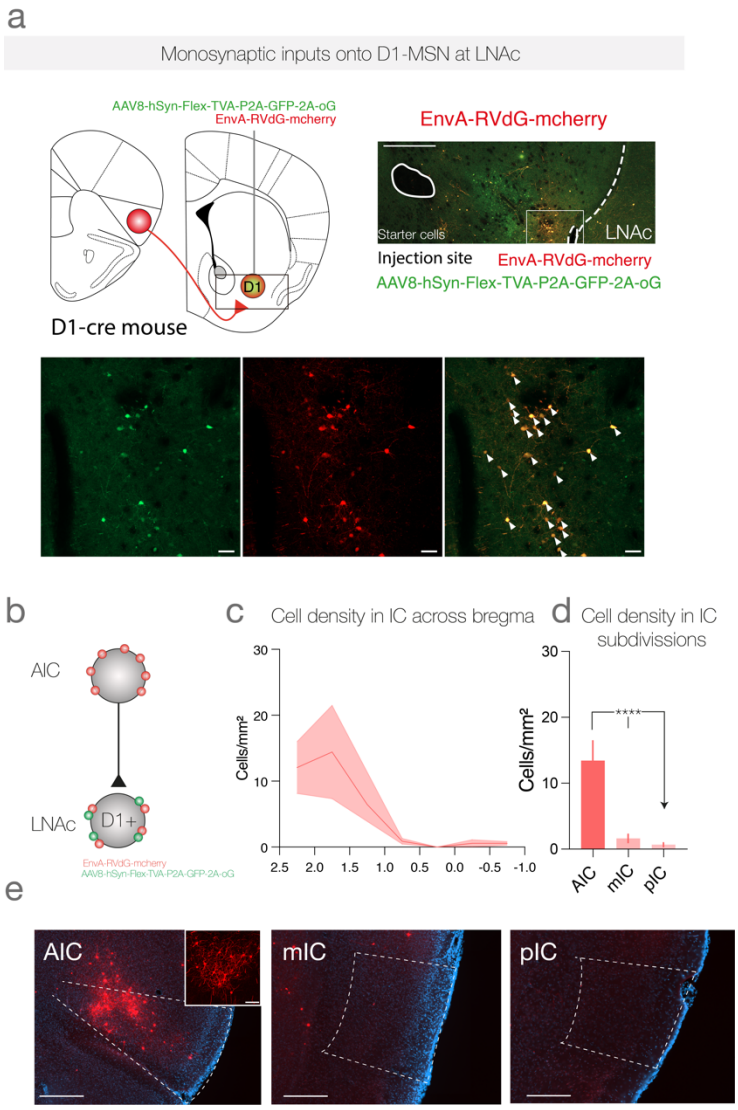
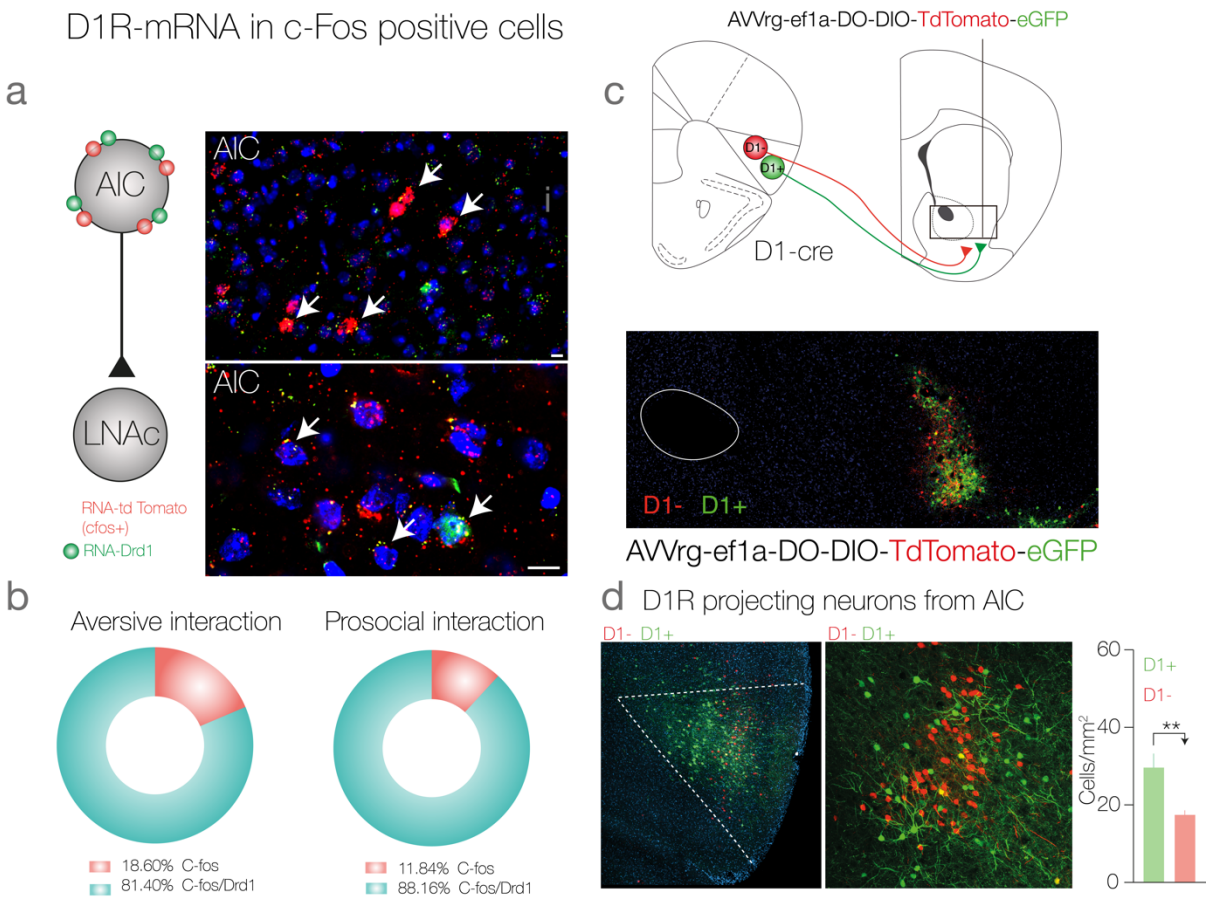


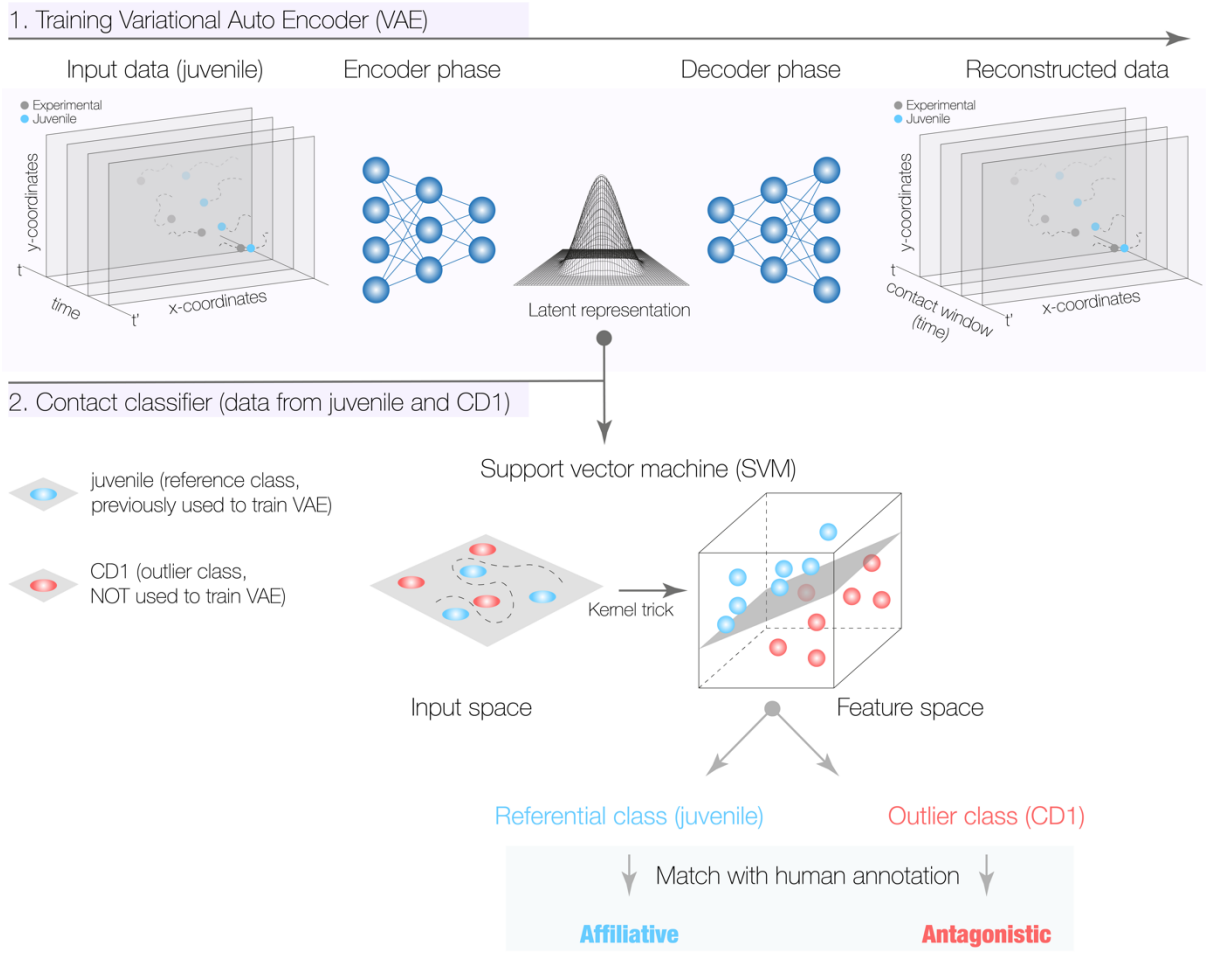
Extended Data Fig. 1. Anatomical characterization of LNAc active inputs. a, Schema of experimental protocol, showing the viral injection and the transgenic construct after activation by 4-OH tamoxifen injection. **b**, Quantification of cell densities from the main brain regions projecting to LNAc, represents the overall active inputs during free social interaction. **d**, Representative pictures of active neurons in different brain regions, AIC: anterior insular cortex, AMY: Basolateral amygdala, pIC, Posterior insular cortex, pf: Parafasicular thalamic nucleus. One-way ANOVA was used as statistical test. For AIC: ****= p<0.0001, mIC: ****= p<0.0001, ***= p=0.0002, pIC: ***= p=0.0001. AMY: *= p=0.0378, ***= p=0.0004. n=4 per condition (prosocial, aversive, non-social).



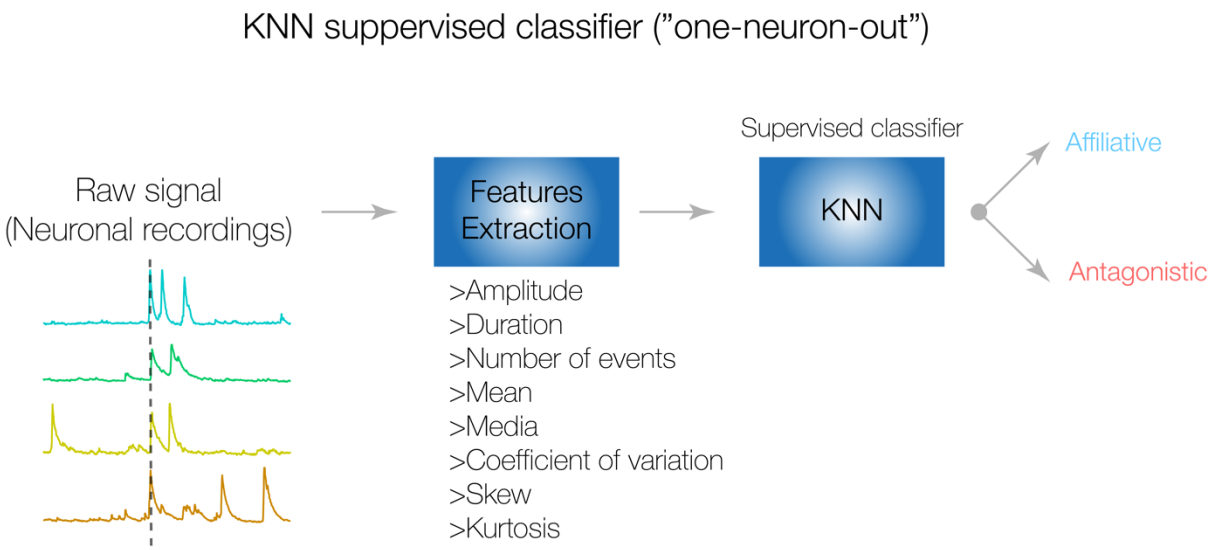
Extended Data Fig. 2. Anatomical characterization of AIC monosynaptic inputs onto D1-MSN of LNAc. a, Left, schematic showing the viral injection (scale 500 µm) and at the right panel the representative picture of the injection site. Below, magnification of injection site, scale 50 µm. **b**, schematic illustrating the mechanism of rabies viral expression. **c**, Cell densitiy across the rostro-caudal axis of mCherry positive neurons. **d**, same quantification but separated across the different insular subdivision, AIC: anterior insular cortex, mIC, medial insular cortex and pIC, posterior insular cortex. One-way ANOVA was used as statistical test, ****p<0.0001. **e**, Representative pictures in each subdivision of insular cortex scale 500 µm, in AIC, the small picture represent a magnification with a confocal microscope, scale 100 µm, n=3.



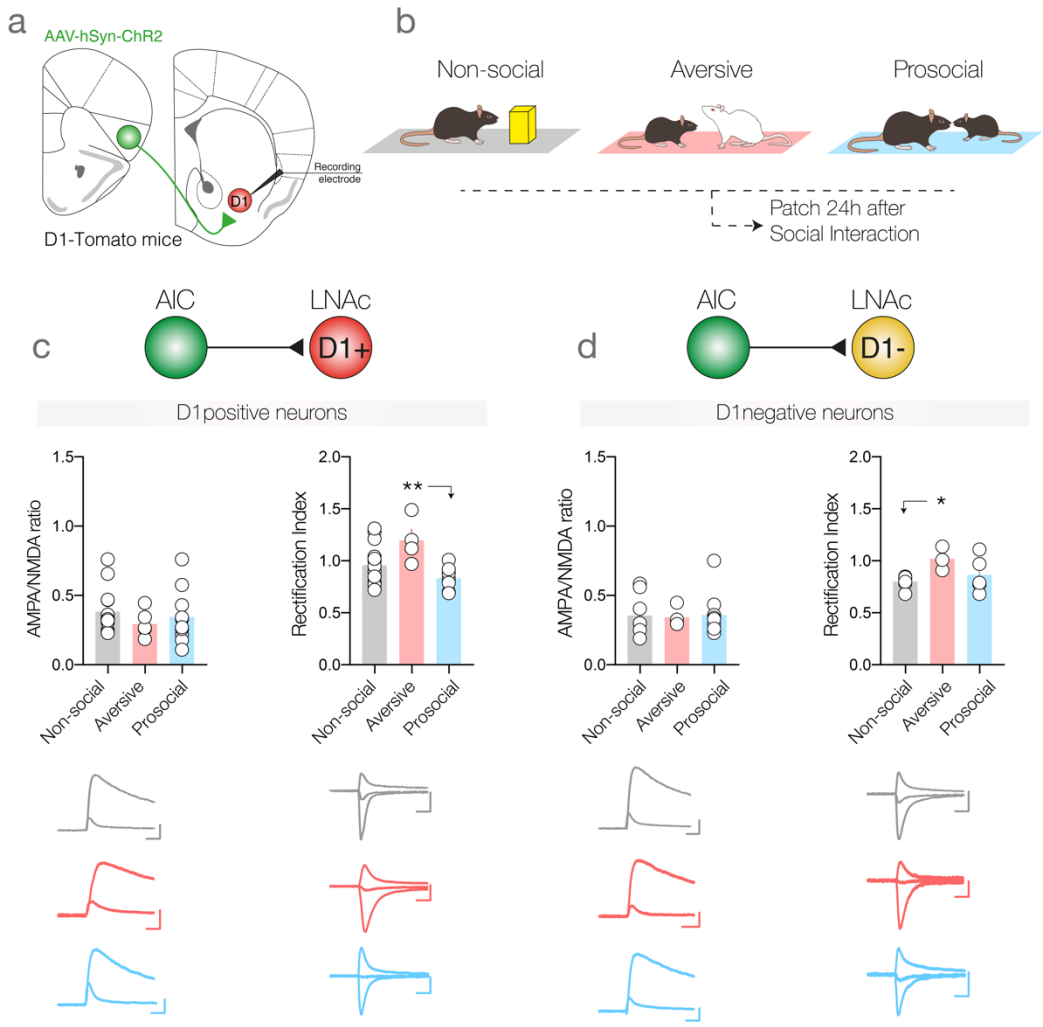
Extended Data Fig. 3. Cellular characterization of AIC-LNAc pathway. a, hybridization in situ for mRNA of D1R and td-Tomato, showing a high correspondence between c-fos positive cells (mRNA td-Tomato) and D1R mRNA, scale 10 µm. n=2 for aversive and n=3 for prosocial. **b**, most of the neurons colocalize for mRNA of td-tomato (c-fos signal) and D1R. **c**, schematic of viral injection where we employed a bicolor retro virus that will turn green in presence of cre-recombinase, and it will remain red in absence of it, scale 500 µm. Below the representative picture of site of injection. Right panel, representative image of AIC illustrating the D1R projecting neurons subpopulation and its quantification in the AIC. **d**, Left, Picture of AIC showing the D1 positive neurons in green and D1 negative in red. Right, a magnification of AIC showing in detail the proportion of D1 positive and negative cells. The histogram represents the quantification of D1 positive and negative cells in AIC, unpaired t-test, **= p=0.0091, n=4.



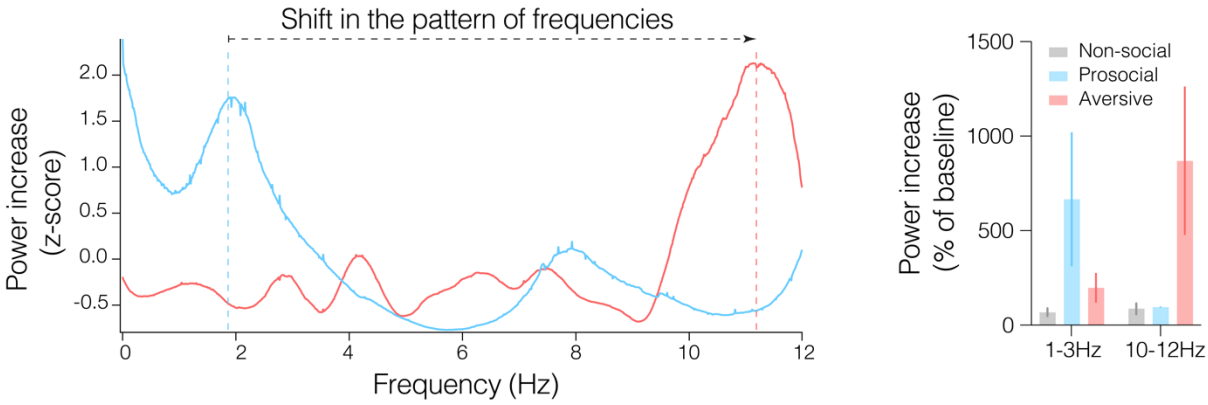
Extended Data Fig. 4. Behavioral classifier. a, Training of a variational autoencoder (VAE) by using coordinates data of each contact with juvenile stimuli (prosocial experience) used as referential class. b, Training of contact classifier by using SVM algorithm with latent representation of VAE from contact with juvenile stimuli (prosocial experiences) and CD1 stimuli (aversive experiences). Accuracy of classifier for each class and matching of predicted class with human manual annotation were made and shown in Figure 2. Contact classified in referential class is defined as affiliative and contact classified in outlier class is defined as antagonistic.



Extended Data Fig. 5. Classifier for calcium activity of individual neurons. One-neuron-out training by using KNN algorithm with features obtained from calcium activity of individual neurons during affiliative and antagonistic contact. For each neuron n analyzed, a classifier was trained by using all the neurons except the neuron n analyzed and then the neuron n analyzed was tested with the classifier to predict the probability of coming from affiliative or antagonistic contact.



Extended Data Fig. 6. hSyn promoter channelrhodopisn expression in AIC neurons does not elicit synaptic plasticity after social interaction. a, scheme of viral injection and patch recordings. **b**, Protocol of free social interaction **c**, AMPA/NMDA ration, for non-social versus juvenile p>0.9999, non-social versus aversive p=0.7779. Right, rectification index in D1-MSN, for non-social vs juvenile p=0.3941, non-social versus aversive p=0.0747, **= p=0.0095, showing the lack of plasticity after social interaction. **d**, AMPA/NMDA ratio (p>0.9999 in all conditions) and rectification index in D1 negative-MSN, for non-social versus juvenile p>0.9999 and *= p=0.0405, showing the lack of plasticity after social interaction. Below the representative traces for each group. Scale 10ms/100pA. One-way ANOVA was used as statistical test.



Extended Data Fig. 7. Prosocial and aversive social experiences elicit different patterns of activity in D1-AIC. Left, the schematic shows the shift in the frequencies for prosocial and aversive experiences from calcium activity. Right, bar plot showing for prosocial interaction a higher contribution of low frequencies (1-3 Hz) and for aversive experiences an increase in higher frequencies (10-12 Hz).