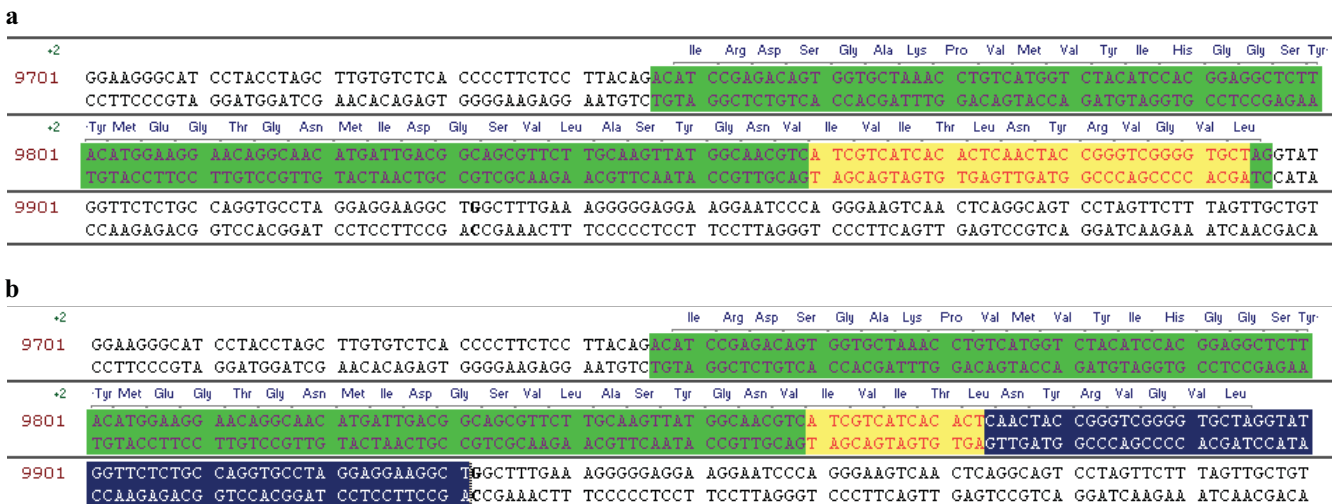


**Supplementary Figure 1| Sequence comparison at the *Fmr1* locus. a, Wildtype: green highlight indicates exon 8; yellow highlight with red text indicates ZFN target site within exon 8; pink highlight indicates exon 9. b, *Fmr1* KO: a 122bp deletion of the intron 7/exon8 junction occurred at 18533bp-18654bp, indicated by blue highlight. Amino acid sequence above the sequence shows the reading frame in the wild type gene. NCBI Gene ID: 24948, RGSC 3.4 assembly.**



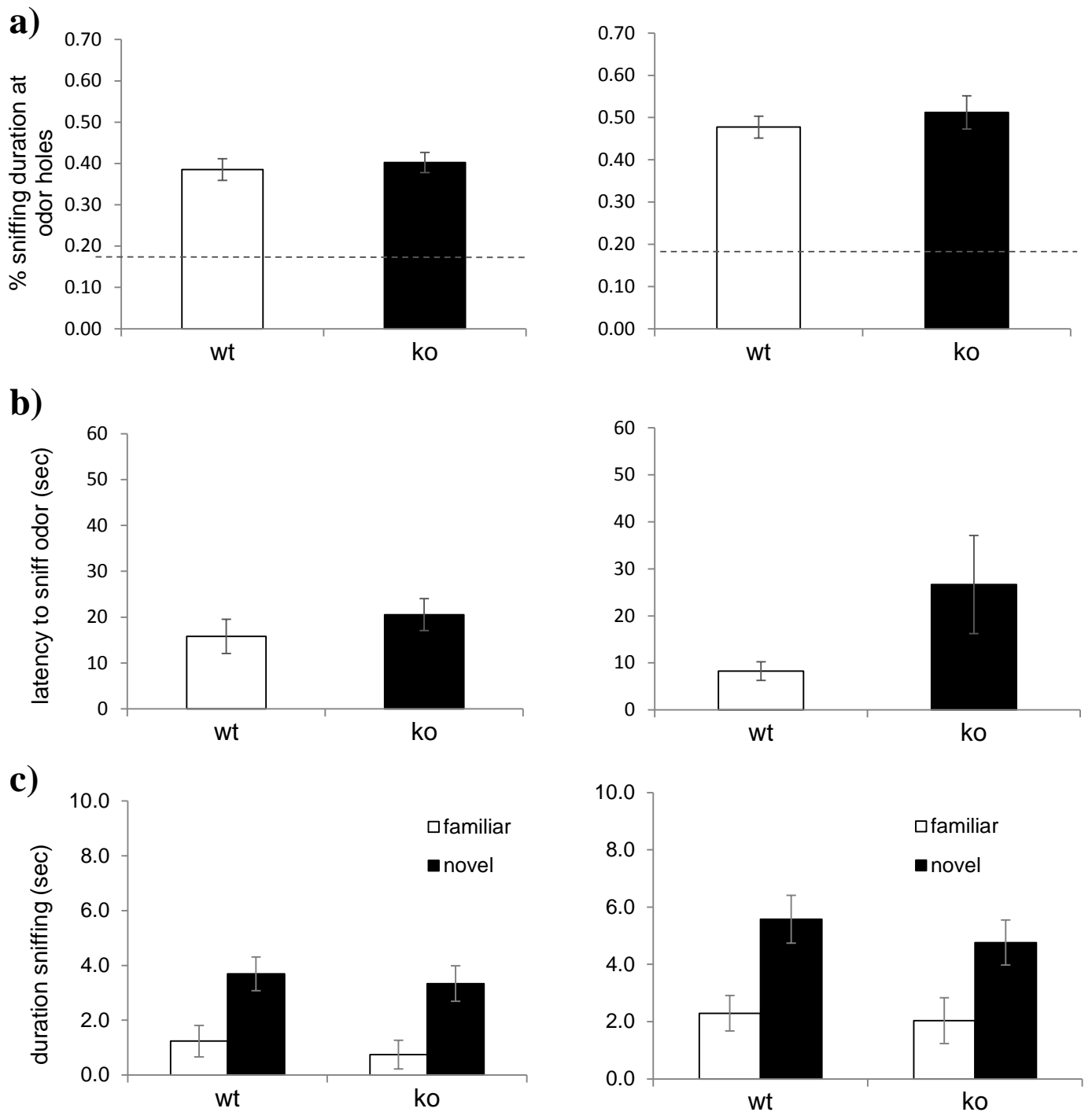
**Supplementary Figure 2| Sequence comparison at the *Nlgn3* locus. a, Wildtype: green highlight indicates exon 5; yellow highlight with red text indicates ZFN target site within exon 5. b, *Nlgn3* KO: a 58bp deletion of the exon5/intron 5 junction occurred at 9874bp-9931bp, indicated by blue highlight. Amino acid sequence above the sequence shows the reading frame in the wild type gene. NCBI Gene ID: 171297, RGSC 3.4 assembly.**

**Supplementary Table 1| Frequency of direct social interaction behaviors**

	tail pull	nape contact	wrestle	box	chase	other contact	sniff/follow	climb	pins
<i>Fmr1</i> KOs	0.50±0.33	10.38±2.39	5.38±1.65	1.13±0.30	2.00±1.03	16.63±1.89	20.88±2.91	4.25±0.59	3.00±1.23
<i>Fmr1</i> WT littermates	1.22±0.36	18.89±2.88	12.78±3.31	2.33±0.58	3.78±0.88	22.11±1.99	19.22±3.05	3.22±0.62	9.78±3.17
<i>Nlgn3</i> KOs	0.50±0.31	14.50±3.79	3.20±0.99	1.30±0.52	0.50±0.27	23.00±2.10	9.00±1.24	1.80±0.76	0.60±0.40
<i>Nlgn3</i> WT littermates	1.36±0.65	15.55±2.00	8.91±1.99	3.00±0.52	0.73±0.30	26.09±2.36	8.82±1.64	1.45±0.62	6.45±1.56

## NON-social odor tests

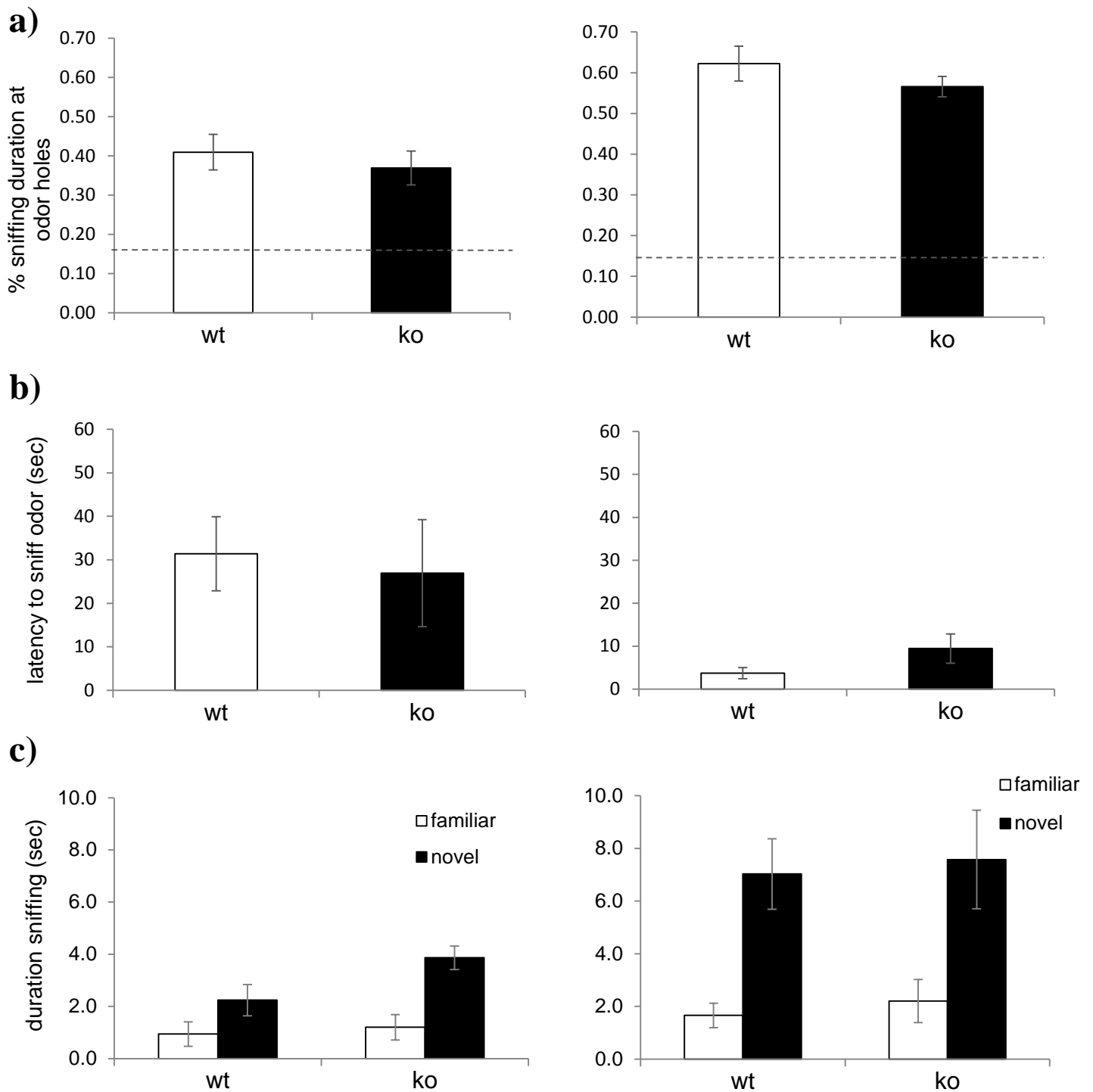
## Social odor tests



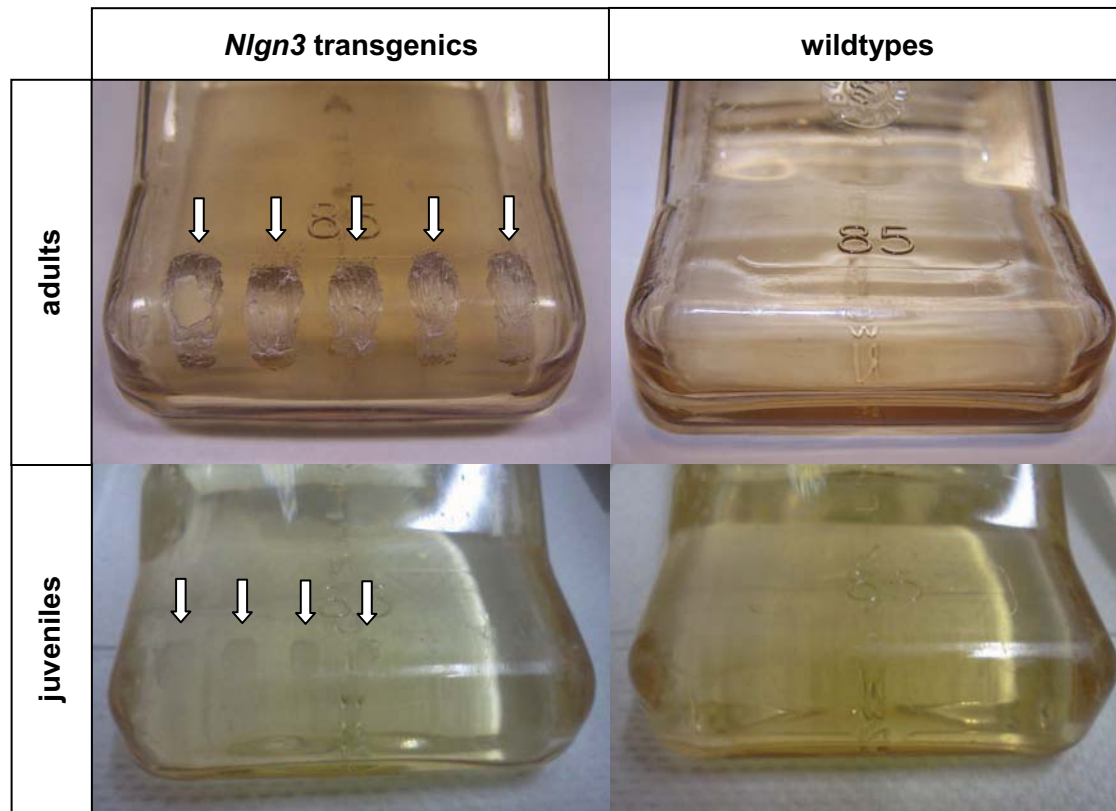
**Supplementary Figure 3| Olfaction control for *Fmr1* KO rats.** **a**, *Fmr1* KO and WT littermates spent significantly greater time at odorant holes [(time at odorant holes/time at any hole) x 100%] than chance (3/16=18.75%, represented by dashed line) for non-social and social odor tests and did not differ between genotypes for non-social ( $P=0.980$ ) or social ( $P=0.508$ ) odor. **b**, *Fmr1* KO did not differ in latency to sniff odorant hole for non-social ( $P=0.366$ ) or social ( $P=0.075$ ) cues. **c**, All rats spent more time at the novel odorant hole than familiar odorant hole for the non-social (WT:  $P<0.001$ , *Fmr1* KO:  $P=0.001$ ) and social (WT:  $P=0.002$ , *Fmr1* KO:  $P=0.004$ ) test.

## NON-social odor tests

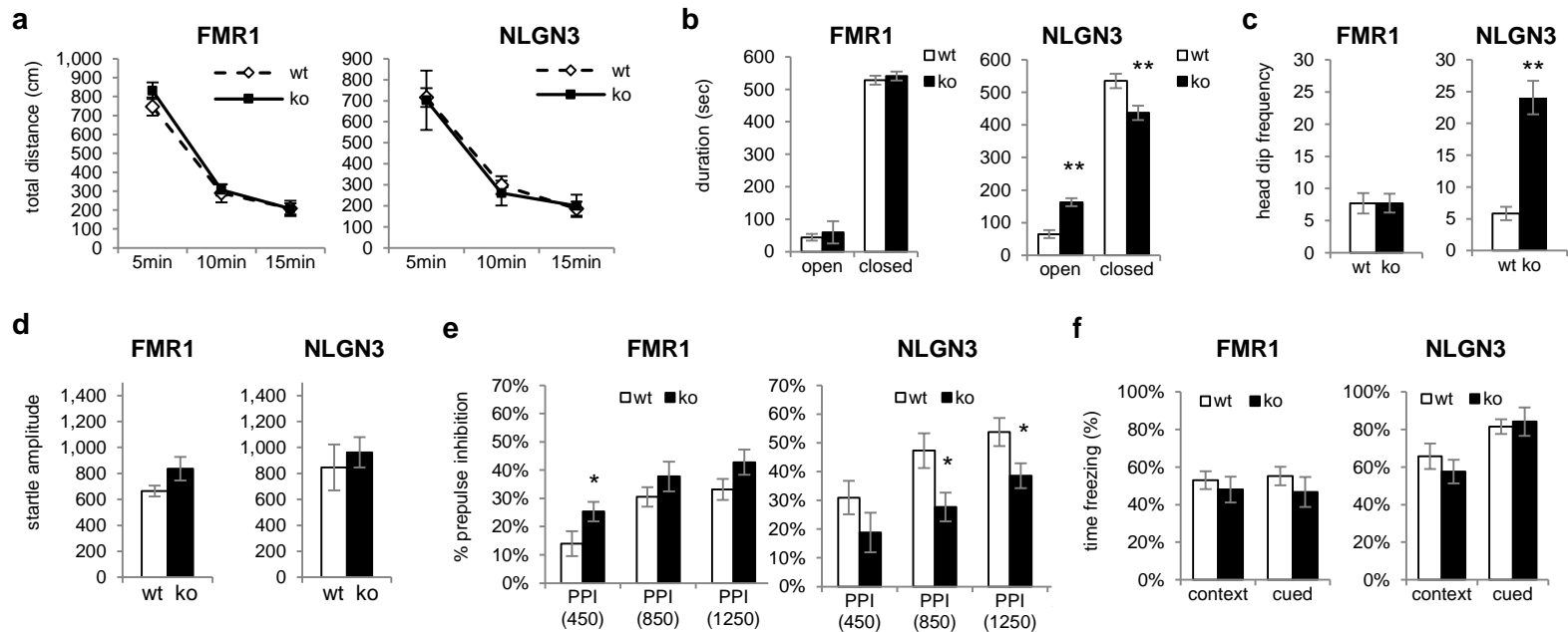
## Social odor tests



**Supplementary Figure 4| Olfaction control for Nlgn3 KO rats.** **a**, *Nlgn3* KOs spend significantly greater time at odorant holes [(time at odorant holes/time at any hole) x 100%] than chance (3/16=18.75%, represented by dashed line) for non-social ( $P=0.211$ ) or social ( $P=0.397$ ) odor tests. **b**, *Nlgn3* KOs did not differ in latency to sniff odorant hole for non-social ( $P=0.787$ ) or social ( $P=0.189$ ) cues. **c**, All rats spent more time at the novel odorant hole than familiar odorant hole for the non-social (WT:  $P=0.045$ , *Nlgn3* KO:  $P=0.001$ ) and social (WT:  $P=0.003$ , *Nlgn3* KO:  $P=0.004$ ) test.



**Supplementary Figure 5| Exemplary polysufone chewing by *Nlgn3* KO rats.** *Nlgn3* heterozygous females chewed all the way through the plastic polysufone water bottle in a 3 day period (upper left). Juvenile *Nlgn3* KO males showed initial evidences of plastic chewing in a single overnight period (lower left).



**Supplementary Figure 6 | *Fmr1* KO and *Nlgn3* KO rats have altered sensorimotor gating behavior and *Nlgn3* KO rats exhibit decreased anxiety.** **a**, Total distance traveled in an automated open field activity assay. **b**, Duration that rats spent in the open or closed portions of an elevated zero maze. **c**, Number of head dips over the side of the open sections of the elevated zero maze. **d**, Mean amplitude (arbitrary units) of the startle response to an auditory stimulus. **e**, Prepulse of 4, 8, or 12 dB above background preceded the startle-eliciting stimulus, mean inhibition of startle for each prepulse is shown. **f**, Percent of time freezing when exposed to a previously shock-paired context and shock-paired cue. All data are mean  $\pm$  s.e.m., \* $P \leq 0.05$ , \*\* $P \leq 0.01$