

SUPPLEMENTARY TABLE 1. STATISTICS SOURCE DATA

Figure Number	Which Test?	Sample Size(N)	Sample Type	Descriptive STATS	Exact p-value	Statistical values
1j	Paired t-test (two-tailed)	6,7,7,6,6	mice	error bars are mean ± SEM	(Before vs Duration) **p=0.0087 ***p=0.0008 **p=0.0021 **p=0.0046	t(5) = 4.179 t(6) = 6.193 t(6) = 5.156 t(5) = 4.862 t(5) = 3.392
1m	Paired t-test (two-tailed)	8	mice	error bars are mean ± SEM	(Saline vs LiCl) **p=0.0019	t(7)=4.844
2b	One-way Repeated Measure (RM) ANOVA	11	mice	error bars are mean ± SEM	***p=0.0001	F(1.287,12.87)=25.01 (No Assumption of sphericity; Geisser-Greenhouse correction)
	Holm-Sidak post-hoc multiple comparison	11	mice	error bars are mean ± SEM	Fed – Obj vs Chow **p=0.0010 Fasted – Obj vs Chow: **p=0.0019 Chow: Fed vs Fasted: **p=0.0069	n/a
2e	One-way RM ANOVA	11	mice	error bars are mean ± SEM	p=0.0001	F(1.734,19.07) = 16.69
	Holm-Sidak post-hoc multiple comparison	11	mice	error bars are mean ± SEM	Fed - Obj/cup vs Chow/cup : *p =0.0133 Chow/cup vs Chow : **p=0.0053 Fasted – Obj/cup vs Chow/cup : *p=0.0298, Chow/cup vs Chow : **p= 0.0068	n/a
2h	One-way RM ANOVA	11	mice	error bars are mean ± SEM	P=0.0002	F (1.643, 16.43) = 16.19
	Holm-Sidak post-hoc multiple comparison	11	mice	error bars are mean ± SEM	Fed – PB/cup vs Peanut Butter: **p=0.0031, Fasted- PB/cup vs Peanut Butter : **p=0.0026	n/a
2k	One-way RM ANOVA	11	mice	error bars are mean ± SEM	p=0.0003	F(1.277,12.77)=20.51
	Holm-Sidak post-hoc multiple comparison	11	mice	error bars are mean ± SEM	Fasted-Chow vs Fasted-Chow/cup, p= 0.2634 Fasted-Chow vs Fasted-Object, ***p=0.0005 Fasted-Chow vs Fed-Chow, **p=0.0016	n/a
2l	One-way RM ANOVA	11	mice	error bars are mean ± SEM	p=0.0107	F(1.15,11.5) = 8.694

	Holm-Sidak post-hoc multiple comparison	11	mice	error bars are mean \pm SEM	Fed-PB/cup vs PB, p=0.0987 Fasted-PB/cup vs PB, p=0.0987 PB-fed vs PB-fasted, **p=0.0064 PB/cup-fed vs PB-fasted, *p=0.0389	n/a
3b	Mann-Whitney U test (two-tailed)	12,8	mice	error bars are mean \pm SEM	(Female vs Male) **p=0.0030	U=11.000
3b	Wilcoxon matched signed rank test (two-tailed)	7,8	female mice	error bars are mean \pm SEM	(Fake vs Pup) *p=0.0156	W=28.000
3g	Paired t-test (two-tailed)	5	mice	error bars are mean \pm SEM	(Before vs Duration) *p=0.0215	t(4)= 3.665
4e	Two-way RM ANOVA	10,7	mice, ChR2 and eYFP control	error bars are mean \pm SEM	Different days, p=0.1075; Between groups, p =0.0480; and interaction, p=0.0126	Different days, F(5,75)=1.882; Between groups, F(1,15)=4.638; and interaction F(5,75) =3.14
4e	Holm-Sidak post-hoc multiple comparison	10,7	mice, ChR2 and eYFP control	error bars are mean \pm SEM	(ChR2 vs eYFP) Day2, p=0.9166 Day3, p=0.7745 Day4, p=0.0717 Day5, *p=0.0448; Post, *p=0.0134	n/a
4f	Paired t-test (two-tailed)	10,7	mice, ChR2 and eYFP control	error bars are mean \pm SEM	(Pre vs Post) ChR2: ****p<0.0001 eYFP control p=0.9542	t(9)=6.794 t(6)=0.05982
5e	Two-way RM ANOVA	11,8	mice, eArch3.0 and eYFP control	error bars are mean \pm SEM	Different days, p=0.5565; Between groups, **p =0.0011; and interaction, ***p=0.0001	Different days, F(5,85)=0.7947; Between groups, F(1,17)=15.28; and interaction F(5,85) =5.803
5e	Holm-Sidak post-hoc multiple comparison	11,8	mice, eArch3.0 and eYFP control	error bars are mean \pm SEM	(eArch3.0 vs eYFP) Day2, *p=0.0259 Day3, *p=0.0258 Day4, *p=0.0259 Day5, ****p<0.0001 Post, ***p=0.0007	n/a
5e, inset	Two-way RM ANOVA	11,8	mice, eArch3.0 and eYFP control (Day2)	error bars are mean \pm SEM	Different time points, p=0.0971 Between groups, p=0.0118; and interaction, **p=0.0123	Different time points, F(5,85) = 1.934; Between groups, F(1,17)=7.949; and interaction, F(5,85) = 3.122
5e, inset	Holm-Sidak post-hoc multiple comparison	11,8	mice, eArch3.0 and eYFP control	error bars are mean \pm SEM	(eArch3.0 vs eYFP) 5mins, p=0.2661 10mins, p=0.2661 15mins, *p=0.0251 20mins, *p=0.0251	n/a

			(Day2)		25mins, *p =0.0171 30mins, **p=0.0029	
5f	Paired t-test (two-tailed)	11,8	mice, eArch3.0 and eYFP control	error bars are mean ± SEM	(Pre vs Post) eArch3.0, **p=0.0058 eYFP, p=0.1533	t(10)=3.49, t(7)=1.601
6c	Two-way RM ANOVA	12,9	mice, ChR2 and eYFP control	error bars are mean ± SEM	Different days, P<0.0001; Between groups, P<0.0001; and interaction, P=0.0057	Different days, F(5,95)=18.41; Between groups, F(1,19)=31.49; and interaction F(19,95) =2.01
6c	Holm-Sidak post-hoc multiple comparison	12,9	mice, ChR2 and eYFP control	error bars are mean ± SEM	(ChR2 vs eYFP) Day2, *p=0.0308 Day3, **p=0.0090 Day4, **p=0.0038 Day5, ****p<0.0001 Post ***p=0.0006	n/a
6d	Paired t-test (two-tailed)	12,9	mice, ChR2 and eYFP control	error bars are mean ± SEM	(Pre vs Post) ChR2, *p=0.0262 eYFP, ***p=0.0008	t(11)=2.363, t(8)=5.223
6e, S10a	Two-way RM ANOVA	12,9	mice, ChR2 and eYFP control	error bars are mean ± SEM	Different days, P=0.6506; Between groups, P<0.0001; and interaction, P=0.1403	Different days, F(3,57)=0.5495; Between groups, F(1,19)=29.23; and interaction F(3,57) =1.897
6e, S10a	Holm-Sidak post-hoc multiple comparison	12,9	mice, ChR2 and eYFP control	error bars are mean ± SEM	(ChR2 vs eYFP) Day2, *p=0.0236 Day3, ***p=0.0005 Day4, *p=0.0110 Day5, ****p<0.0001	n/a
6f, S10b	Two-way RM ANOVA	12,9	mice, ChR2 and eYFP control	error bars are mean ± SEM	Different days, P=0.0527; Between groups, P<0.0001; and interaction, P=0.2488	Different days, F(3,57)=2.723; Between groups, F(1,19)=27.71; and interaction F(3,57) =1.411
6f, S10b	Holm-Sidak post-hoc multiple comparison	12,9	mice, ChR2 and eYFP control	error bars are mean ± SEM	(ChR2 vs eYFP) Day2, **p=0.0098 Day3, **p=0.0033 Day4, **p=0.0011 Day5, ****p<0.0001	n/a
6g	Two-way RM ANOVA	12,9	mice, ChR2 and eYFP control	error bars are mean ± SEM	3' time bins, P<0.0001; Between groups, P=0.0009; and interaction, P<0.0001	15' time bins, F(10,250)=84.54 Between groups, F(1,25)=14.1; and interaction F(10,250) =12.58
6g	Holm-Sidak post-hoc multiple comparison	12,9	mice, ChR2 and eYFP control	error bars are mean ± SEM	(ChR2 vs eYFP) 15', **p=0.0098 18', **p=0.0015 21'~30', ****p<0.0001	n/a
7c	Unpaired t-test	7,8	mice,	error bars are mean ± SEM	(eArc3.0 vs eYFP) ***p=0.0001	t(13)=5.434

	(two-tailed)		eArch3.0 and eYFP control			
7d	Paired t-test (two-tailed)	7,8	mice, eArch3.0 and eYFP control	error bars are mean \pm SEM	(Pre vs Post) eArch3.0, p=0.8975; eYFP ***p=0.0001	t(6)=0.1344, t(7)=7.621
7e	Unpaired t-test (two-tailed)	7,8	mice, eArch3.0 and eYFP control	error bars are mean \pm SEM	(eArch3.0 vs eYFP) *p=0.0149	t(13)=2.805
7f	Paired t-test (two-tailed)	7,8	mice, eArch3.0 and eYFP control	error bars are mean \pm SEM	(Pre vs Post) eArch3.0, p=0.7690; eYFP *p=0.0147	t(6)=0.3073, t(7)=3.219
S3a	Mann-Whitney U test (two-tailed)	7,4	mice	error bars are mean \pm SEM	(Above vs Side) **p=0.0061	U=0.0
S3b	Paired t-test (two-tailed)	6	mice	error bars are mean \pm SEM	(Above vs Side) *p=0.0369 (Above vs Bottom) *p=0.0331	t(5)=2.764 t(5)=2.917
S4a	One-way RM ANOVA	7	mice	error bars are mean \pm SEM	**p=0.0074	F(1.890, 11.34) = 7.993
	Holm-Sidak post-hoc multiple comparison	7	mice	error bars are mean \pm SEM	(0 vs 22hr) p=0.0652, (22hr vs refed) *p=0.0216, (0 vs refed) p=0.2220	n/a
S4b	One-way RM ANOVA	7	mice	error bars are mean \pm SEM	****p<0.0001	F(1.998, 11.99) = 22.26
	Holm-Sidak post-hoc multiple comparison	7	mice	error bars are mean \pm SEM	(0 vs 22hr) *p=0.0293, (22hr vs refed) **p=0.0015, (0 vs refed) *p=0.0293	n/a
S6b	One-way RM ANOVA	11	mice	error bars are mean \pm SEM	***p=0.0003	F(1.531, 15.31) = 16.59
	Holm-Sidak post-hoc multiple comparison	11	mice	error bars are mean \pm SEM	(Object vs Chow) Fed: *p=0.0197, Fasted: **p=0.0021, Fed-object vs Fasted-object, *p=0.0231	n/a
S6d	Paired t-test (two-tailed)	12,8	male or female mice	error bars are mean \pm SEM	(Baseline vs Pup) Male: p = 0.4382 Female: *p= 0.0103	t(11)=0.8044 t(7)=3.476
S9	Paired t-test (two-tailed)	5	mice	error bars are mean \pm SEM	(Baseline vs invest.) p=0.1079	t(4)=2.065
S10d	Two-way RM ANOVA	12,9	mice,	error bars are mean \pm SEM	Different days, p=0.6506;	Different days, F(3,57)=2.233;

			ChR2 and eYFP control		Between groups, $p < 0.0001$; and interaction, $p = 0.1403$	Between groups, $F(1,19) = 29$; and interaction $F(3,57) = 1.294$
S10d	Holm-Sidak post-hoc multiple comparison	12,9	mice, ChR2 and eYFP control	error bars are mean \pm SEM	(ChR2 vs eYFP) Day2, * $p = 0.0360$ Day3, * $p = 0.0360$ Day4, * $p = 0.0360$ Day5, **** $p < 0.0001$	n/a
S10e-Day3	Two-way RM ANOVA	12,9	mice, ChR2 and eYFP control	error bars are mean \pm SEM	3' time bins, $p < 0.0001$; Between groups, $p = 0.0009$; and interaction, $p < 0.0001$	3' time bins, $F(10,250) = 58.9$ Between groups, $F(1,25) = 13.86$; and interaction $F(10,250) = 7.786$
S10e-Day3	Holm-Sidak post-hoc multiple comparison	12,9	mice, ChR2 and eYFP control	error bars are mean \pm SEM	(ChR2 vs eYFP) 15', * $p = 0.0235$ 18', * $p = 0.0106$ 21', ** $p = 0.0026$ 24', *** $p = 0.0004$ 27'~30', **** $p < 0.0001$	n/a
S10e-Day4	Two-way RM ANOVA	12,9	mice, ChR2 and eYFP control	error bars are mean \pm SEM	3' time bins, $p < 0.0001$; Between groups, $p = 0.0061$; and interaction, $p < 0.0001$	3' time bins, $F(10,250) = 83.55$ Between groups, $F(1,25) = 8.967$; and interaction $F(10,250) = 6.566$
S10e-Day4	Holm-Sidak post-hoc multiple comparison	12,9	mice, ChR2 and eYFP control	error bars are mean \pm SEM	(ChR2 vs eYFP) 15', * $p = 0.0352$ 18', * $p = 0.0439$ 21', * $p = 0.0313$ 24', *** $p = 0.0008$ 27', **** $p < 0.0001$ 30', *** $p = 0.0002$	n/a
S10e-Day5	Two-way RM ANOVA	12,9	mice, ChR2 and eYFP control	error bars are mean \pm SEM	3' time bins, $p < 0.0001$; Between groups, $p = 0.0006$; and interaction, $p < 0.0001$	3' time bins, $F(10,250) = 93.97$ Between groups, $F(1,25) = 15.57$; and interaction $F(10,250) = 12.17$
S10e-Day5	Holm-Sidak post-hoc multiple comparison	12,9	mice, ChR2 and eYFP control	error bars are mean \pm SEM	(ChR2 vs eYFP) 12', * $p = 0.0218$ 15', ** $p = 0.0021$ 18', *** $p = 0.0003$ 21'~30', **** $p < 0.0001$	n/a

SUPPLEMENTARY TABLE 2. BEHAVIOR ANNOTATIONS

The terms for annotated behavioral responses during GCaMP recordings are described.

Session	Annotation text		Description
FST	Intro. to water		The moment at which the recorded mouse was put into the water
	Swimming		Swimming, rotating in the water-containing cylinder
	Climbing		Trying to climb up the cylinder using their limbs
Tail restraint	Chased		The moment at which the recorded mouse was chased by a human hand
	Struggle		Display of struggling behavior while being grabbed with a hand
Overhead object /Looming disk	Overhead object		Presentation of a bird-like object flying overhead
	Looming disk		Presentation of a visual shaded looming disk from above
	Flight		Display of flight response or running to a nest when exposed to a looming disk from above
	In nest		Hiding in a nest when exposed to a looming disk
	Freezing		Display of freezing response or immobility; a period during which speed of an animal decreases to less than 2cm/s
TMT	Flight		Display of flight response when exposed to TMT
	Freezing		Display of freezing response when exposed to TMT
Feeding related behaviors	Investigation		Display of Investigating (such as licking or biting) an object or a cup
	First bite		The moment at which a mouse had the first bite of chow pellet or peanut butter
	Consumption		Display of consuming chow pellet or peanut butter
Aggression	Attacked		Display of being bitten by a CD1 aggressive intruder
	Investigation		Display of being sniffed by a CD1 aggressive intruder
Pup-tending behaviors	interaction	Sniffing	Display of sniffing a pup by the recorded mouse
		Grooming	Display of grooming or licking a pup
		Crouching	Display of crouching-over a pup underneath tummy with the fixed hind legs
	Approach		Display of approaching to a pup
	Intro/Remove		The moment of introduction/removal of a pup by an experimenter's hand