

Figure S1. Correlation analyses between testing modalities; **(A)** correlation analysis between preference scores and olfaction latency as determined by the buried pellet test. The black line displays the best-fit line after controlling for repeated measures Figure 0. **(B)** Correlation analysis between olfaction latency and time taken to cross the beam walk. There was not a significant correlation between these parameters ($p = 0.099$); **(C)** Correlation between beam walk latency and slip frequency from the beam walk test. The correlation between these parameters was statistically significant ($p = 0$).

Table S1. Results of linear mixed model of olfaction data with observations after month 19 removed. P-values comparing both the intercept (9-month baseline score) and slope values between genotypes are provided. For all tests except the novel object recognition test, a more positive slope value indicates worsening performance over time.

Test	Genotype	Baseline Value (8 months)	Slope	p-val vs. Wild Type (Baseline)	p-val vs. Wild Type (Slope)	p-val vs. <i>gba</i> ^{+/-} (Baseline)	p-val vs. <i>gba</i> ^{+/-} (Slope)	p-val vs. <i>SNCA</i> ^{A53T} (Baseline)	p-val vs. <i>SNCA</i> ^{A53T} (Slope)
Buried Pellet	Wild Type	66.5±13.4	-0.98±1.85	~	~	~	~	~	~
	<i>gba</i> ^{+/-}	73.9±11.0	2.04±1.52	0.444	0.209	~	~	~	~
	<i>SNCA</i> ^{A53T}	56.3±10.7	3.31±1.63	0.808	0.084	~	~	~	~
	<i>gba</i> ^{+/-} / <i>SNCA</i> ^{A53T}	56.3±11.8	4.69±1.76	0.815	0.028	0.283	0.257	0.999	0.567

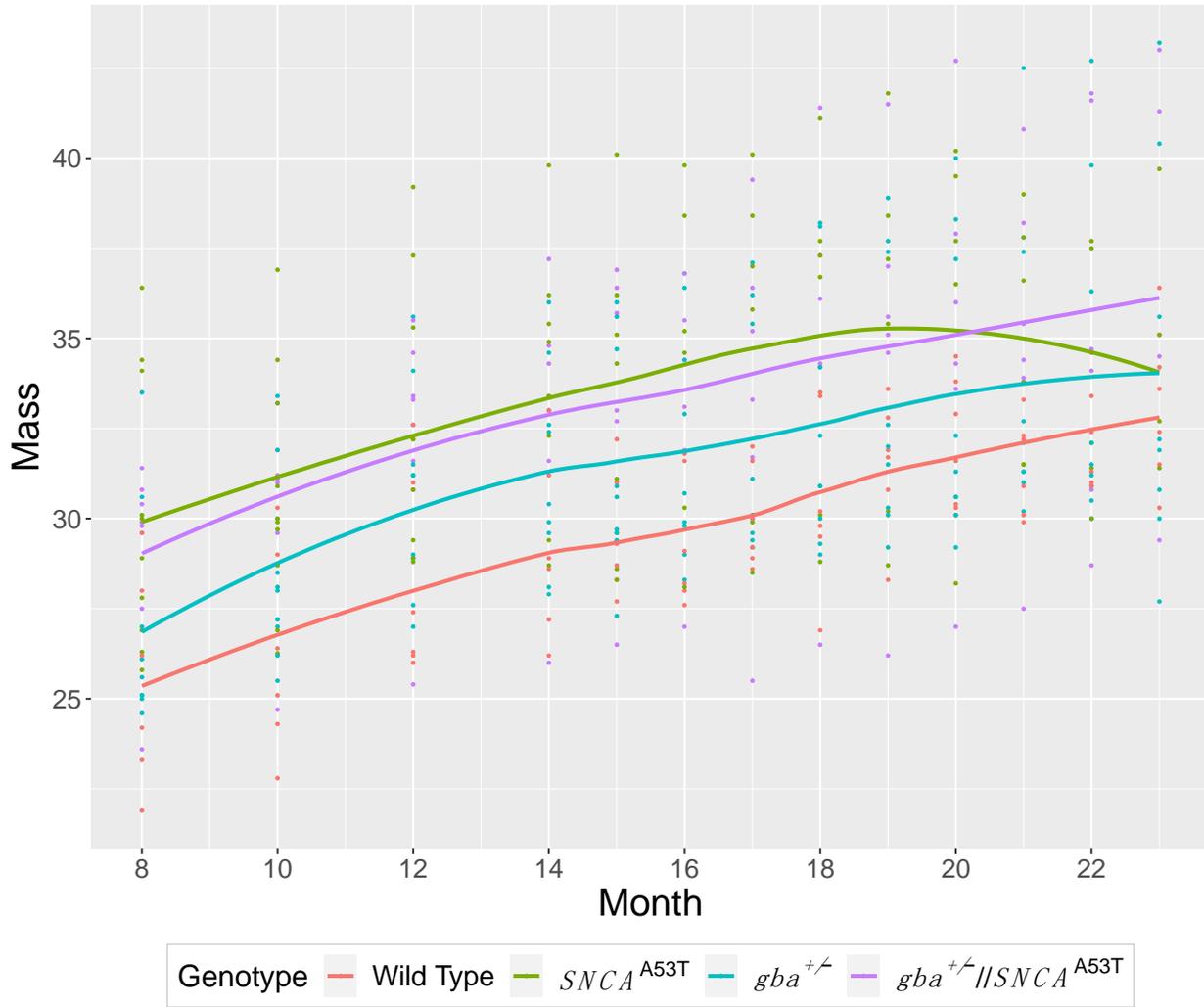


Figure S2. Mouse mass over time. Trend lines were calculated via LOESS regression. Colored fill represents standard error. Colored points represent individual observations, coded by genotype.