Analysis of Crawling Rates for Muscle TSC1/Raptor Flies

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Experimental Design

These data are stored in `/Volumes/bridges_lab/Hatfield/Drosophila/Crawling`, with the raw data saved in `../Data/Crawling Data.csv`. This script was most recently run on Mon Feb 24 10:52:09 2014

Analysis

Age.Range	Gene	UAS	mean	se	sd	rel.error	n
(2,19]	Control	36304	4.37	0.19	2.82	64.62	220
(2,19]	Raptor	31528	6.12	0.50	5.56	90.84	125
(2,19]	Raptor	31529	5.94	0.47	4.75	79.95	101
(2,19]	Raptor	34814	10.07	2.64	15.85	157.43	36
(2,19]	Tsc1	31039	5.03	0.22	3.06	60.77	195
(2,19]	Tsc1	31314	14.44	2.78	43.64	302.30	246
(19,45]	Control	36304	6.32	0.60	6.19	97.84	105
(19,45]	Raptor	31528	10.32	2.68	20.77	201.31	60
(19,45]	Raptor	31529	10.22	2.09	9.58	93.75	21
(19,45]	Tsc1	31039	13.82	5.12	46.05	333.21	81
(19,45]	Tsc1	31314	11.21	0.85	8.78	78.30	106
(45,73]	Control	36304	61.56	8.01	94.14	152.94	138
(45,73]	Raptor	31528	59.85	11.79	100.77	168.36	73
(45,73]	Raptor	31529	146.02	19.29	123.53	84.59	41
(45,73]	Raptor	34814	138.58	25.29	140.83	101.62	31
(45,73]	Tsc1	31039	64.60	8.06	94.40	146.12	137
(45,73]	Tsc1	31314	114.62	9.06	125.54	109.53	192
	Raptor	34814	5.19	0.58	2.38	45.89	17

Table 1: Summary of Crawling Times per Cross

To test this effect, first we tested a model in which first the age range was taken into account, and then the uas was included. To test whether there was an interaction between the UAS and the age range on crawling time, we compared these models and did a test. The p-value for this is **0** so we ignored the interaction. The results of this test are in Table 3 and are summarized in Table 1 and Figure 2

Using this model we did an ANOVA testing for whether the Age has an effect on crawlign speed. The p-value for that comparason is **0**. Even though it was not significant, we kept this term in the model, since we expect it to reach significance eventually.

We next tested if CrossName has an effect on the crawling speed. The p-value for that comparason is **0**. We then performed a Dunnett's test comparing each cross to the *C179-GAL4/+* control (see Table 4).

The key packages used in this analysis were R [1], plyr [2], reshape2 [3], and multcomp [4].

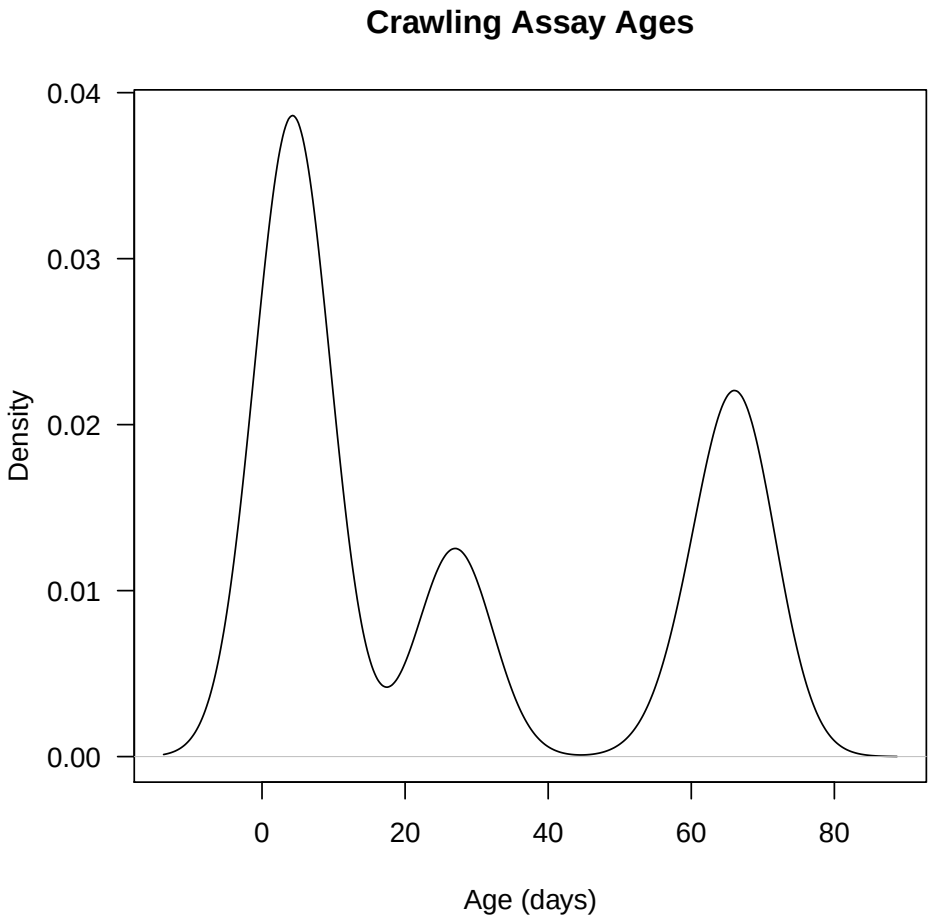

Figure 1: Crawling Assay Ages.

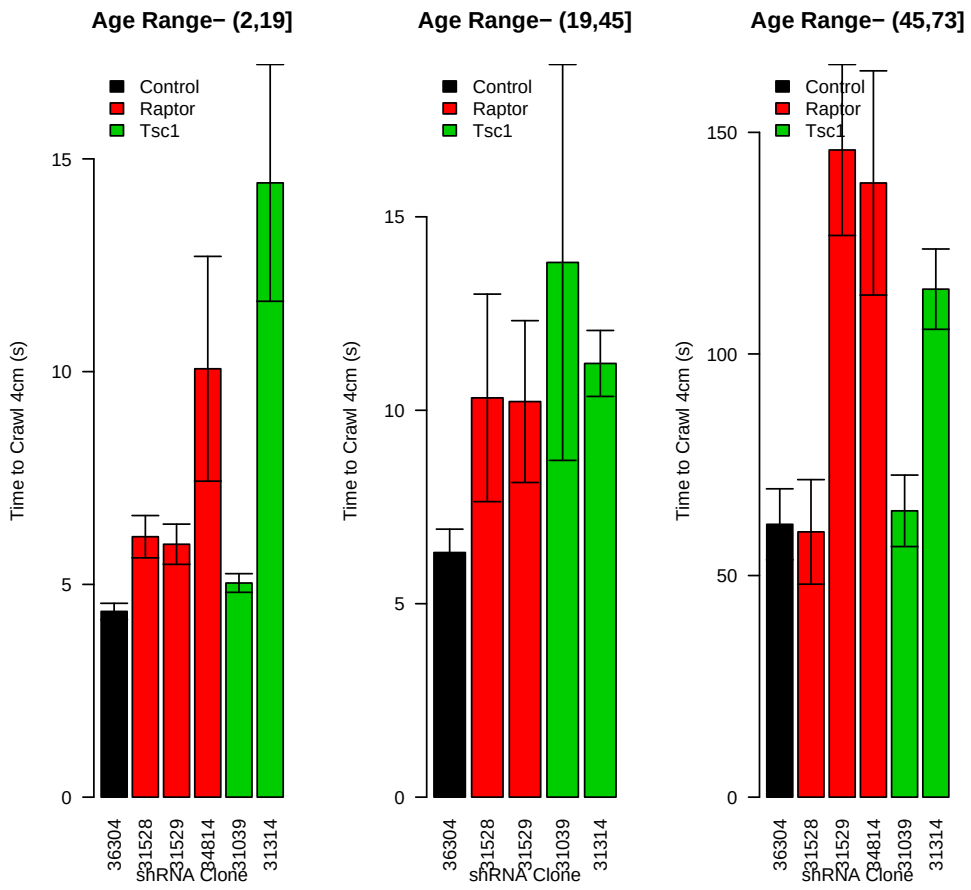

Figure 2: Crawling times for C179 Driven Knockdowns.

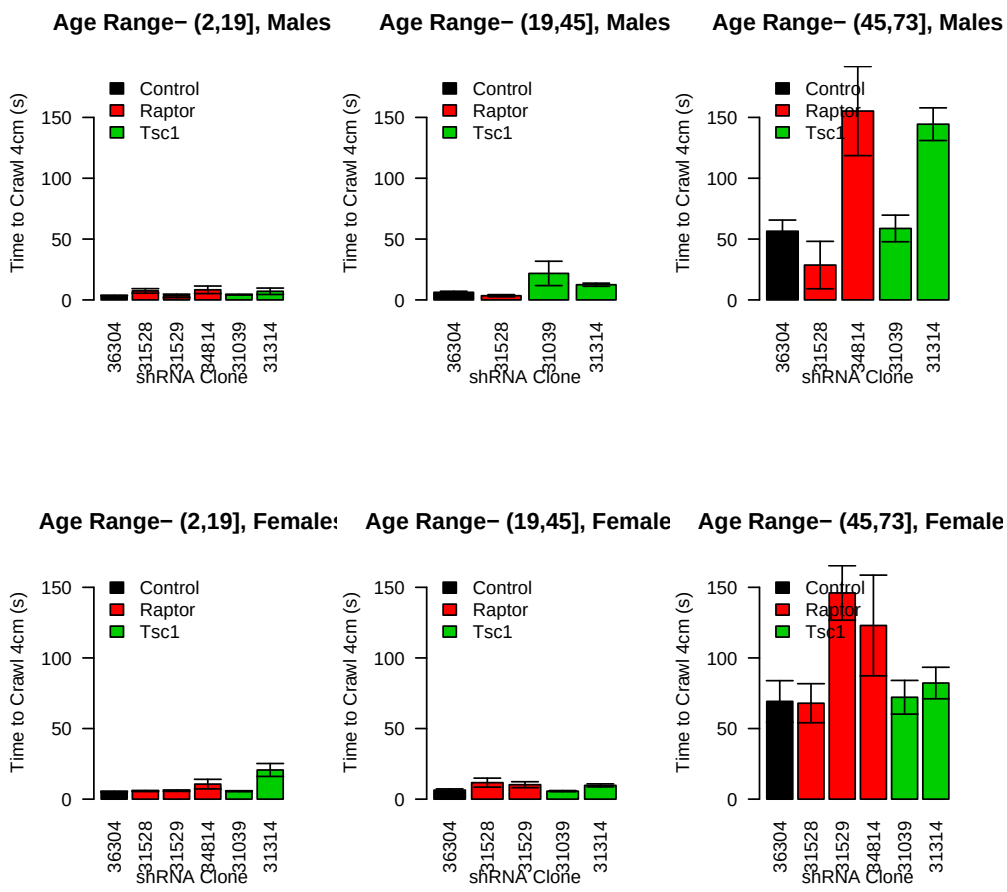

Figure 3: Crawling times for C179 Driven Knockdowns Separated by Gender.

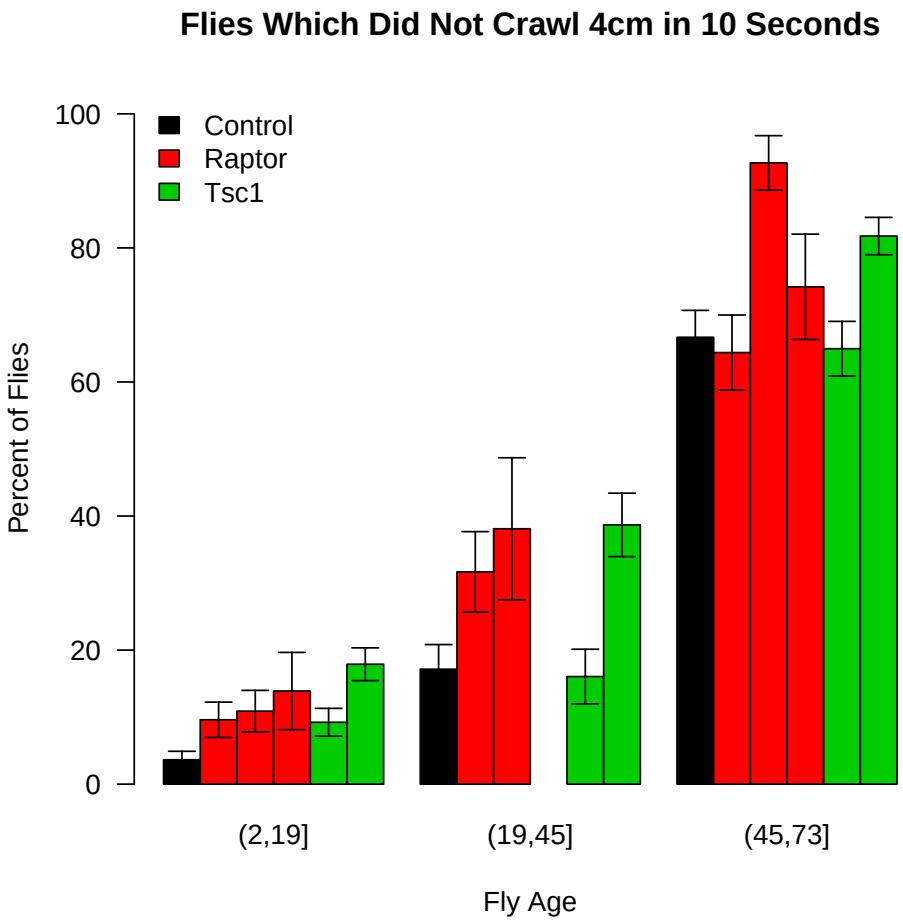

Figure 4: Time Limit Barplot.

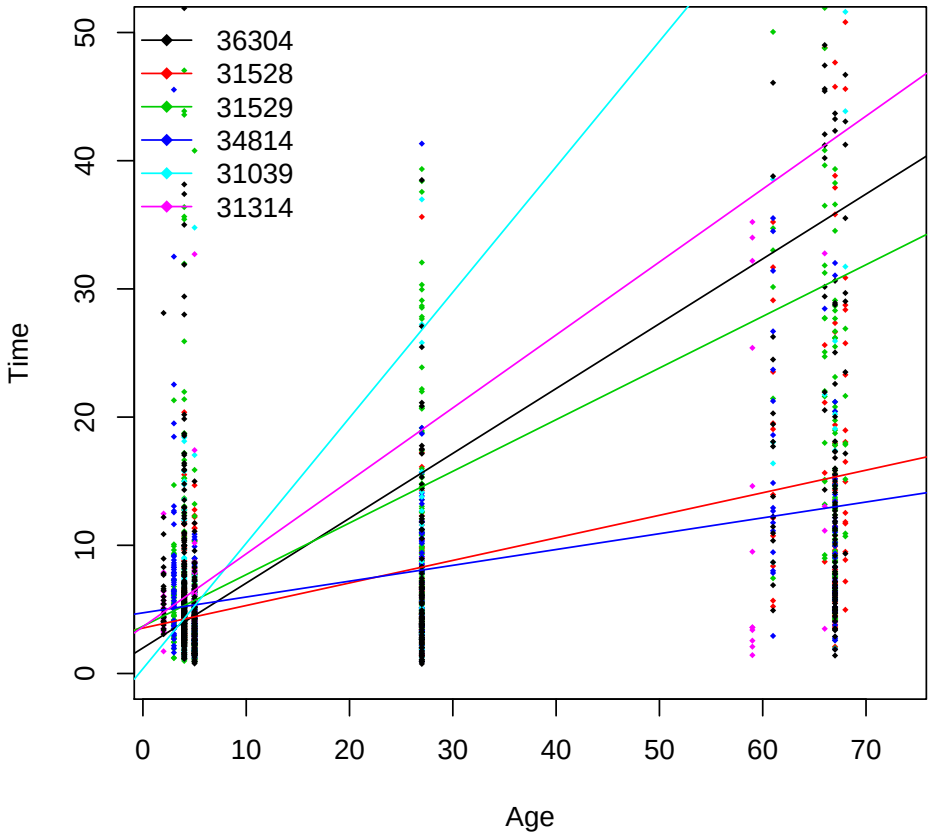

Figure 5: Aging scatter plot.

References

[1] R Core Team. *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria, 2013.

[2] Hadley Wickham. The split-apply-combine strategy for data analysis. *Journal of Statistical Software*, 40(1):1–29, 2011.

[3] Hadley Wickham. Reshaping data with the reshape package. *Journal of Statistical Software*, 21(12):1–20, 2007.

[4] Torsten Hothorn, Frank Bretz, and Peter Westfall. Simultaneous inference in general parametric models. *Biometrical Journal*, 50(3):346–363, 2008.

Session Information

- R version 3.0.2 (2013-09-25), `x86_64-apple-darwin10.8.0`
- Locale: `en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8`
- Base packages: base, datasets, graphics, grDevices, methods, splines, stats, utils
- Other packages: bibtex 0.3-6, lubridate 1.3.3, MASS 7.3-29, multcomp 1.3-2, mvtnorm 0.9-9997, plyr 1.8, reshape2 1.2.2, survival 2.37-7, TH.data 1.0-3, xtable 1.7-1
- Loaded via a namespace (and not attached): digest 0.6.4, grid 3.0.2, lattice 0.20-24, memoise 0.1, sandwich 2.3-0, stringr 0.6.2, tools 3.0.2, zoo 1.7-10

Assay.Group	Age.Range	Driver	Gene	UAS	mean	se	sd	rel.error	n
2013-11-19	(2,19]	C179-Gal4	Control	36304	3.80	0.23	2.45	64.33	116
2013-11-19	(2,19]	C179-Gal4	Raptor	31528	4.55	0.28	2.42	53.12	74
2013-11-19	(2,19]	C179-Gal4	Raptor	31529	5.24	0.99	5.84	111.32	35
2013-11-19	(2,19]	C179-Gal4	Tsc1	31039	4.52	0.27	2.70	59.69	102
2013-11-19	(2,19]	C179-Gal4	Tsc1	31314	7.32	2.47	27.38	373.97	123
2013-11-25	(2,19]	C179-Gal4	Raptor	31528	8.40	1.08	7.69	91.56	51
2013-11-25	(2,19]	C179-Gal4	Tsc1	31314	5.98	0.59	3.71	62.01	40
2013-11-26	(2,19]	C179-Gal4	Control	36304	4.99	0.30	3.08	61.67	104
2013-11-26	(2,19]	C179-Gal4	Raptor	31529	7.16	0.66	4.18	58.45	40
2013-11-26	(2,19]	C179-Gal4	Tsc1	31039	5.60	0.35	3.34	59.60	93
2013-11-26	(2,19]	C179-Gal4	Tsc1	31314	29.06	7.15	65.13	224.14	83
2013-11-26		36304	Control	36304	6.61	0.90	4.77	72.16	28
2013-11-26		C179-Gal4	Raptor	34814	5.19	0.58	2.38	45.89	17
2013-12-03	(2,19]	36304	Control	36304	10.05	2.21	30.73	305.70	193
2013-12-03	(2,19]	C179-Gal4	Raptor	31529	5.02	0.70	3.57	71.10	26
2013-12-11	(2,19]	C179-Gal4	Raptor	34814	10.07	2.64	15.85	157.43	36
2013-12-11	(19,45]	C179-Gal4	Control	36304	6.32	0.60	6.19	97.84	105
2013-12-11	(19,45]	C179-Gal4	Raptor	31528	10.32	2.68	20.77	201.31	60
2013-12-11	(19,45]	C179-Gal4	Raptor	31529	10.22	2.09	9.58	93.75	21
2013-12-11	(19,45]	C179-Gal4	Tsc1	31039	13.82	5.12	46.05	333.21	81
2013-12-11	(19,45]	C179-Gal4	Tsc1	31314	11.21	0.85	8.78	78.30	106
2014-01-20	(45,73]	C179-Gal4	Control	36304	25.10	5.93	53.73	214.03	82
2014-01-20	(45,73]	C179-Gal4	Raptor	31528	10.27	1.11	6.91	67.25	39
2014-01-20	(45,73]	C179-Gal4	Raptor	31529	106.51	32.10	120.09	112.75	14
2014-01-20	(45,73]	C179-Gal4	Tsc1	31039	23.22	5.63	46.10	198.56	67
2014-01-20	(45,73]	C179-Gal4	Tsc1	31314	79.90	11.80	119.18	149.16	102
2014-01-22	(45,73]	C179-Gal4	Control	36304	73.73	26.85	110.69	150.13	17
2014-01-22	(45,73]	C179-Gal4	Raptor	31528	87.15	20.68	109.41	125.54	28
2014-01-22	(45,73]	C179-Gal4	Raptor	31529	102.56	54.33	121.49	118.46	5
2014-01-22	(45,73]	C179-Gal4	Tsc1	31039	97.62	23.22	111.36	114.07	23
2014-01-22	(45,73]	C179-Gal4	Tsc1	31314	66.38	33.78	95.55	143.94	8
2014-01-27	(45,73]	36304	Control	36304	292.61	7.39	14.78	5.05	4
2014-01-27	(45,73]	C179-Gal4	Control	36304	116.21	25.65	99.36	85.50	15
2014-01-27	(45,73]	C179-Gal4	Raptor	31528	254.74	45.26	110.86	43.52	6
2014-01-27	(45,73]	C179-Gal4	Raptor	31529	221.74	39.64	118.91	53.63	9
2014-01-27	(45,73]	C179-Gal4	Tsc1	31039	150.44	24.01	110.01	73.13	21
2014-01-27	(45,73]	C179-Gal4	Tsc1	31314	180.67	14.58	119.33	66.05	67
2014-01-29	(45,73]	36304	Control	36304	181.56	20.46	117.53	64.73	33
2014-01-29	(45,73]	C179-Gal4	Control	36304	78.79	17.86	73.65	93.47	17
2014-01-29	(45,73]	C179-Gal4	Raptor	31529	121.81	35.59	112.54	92.39	10
2014-01-29	(45,73]	C179-Gal4	Raptor	34814	15.11	6.24	12.48	82.57	4
2014-01-29	(45,73]	C179-Gal4	Tsc1	31039	72.72	20.02	102.08	140.38	26
2014-01-29	(45,73]	C179-Gal4	Tsc1	31314	81.44	24.06	93.18	114.42	15
2014-02-03	(45,73]	36304	Control	36304	252.54	12.42	88.67	35.11	51
2014-02-03	(45,73]	C179-Gal4	Control	36304	300.00	0.00	0.00	0.00	7
2014-02-03	(45,73]	C179-Gal4	Raptor	31529	256.42	43.58	75.49	29.44	3
2014-02-03	(45,73]	C179-Gal4	Raptor	34814	156.88	27.33	142.04	90.54	27
2014-02-03	(45,73]								25

Table 2: Summary of Crawling Times per Cross Separated by Assay Group

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Assay.Date	1	2796790.48	2796790.48	665.24	0.0000
Age.Range	2	298012.10	149006.05	35.44	0.0000
UAS	5	233920.39	46784.08	11.13	0.0000
Residuals	1899	7983786.57	4204.21		

Table 3: ANOVA of Crawling Times per UAS

	Effect Size (s)	p-value
31039 - 36304	1.59	1.00
31314 - 36304	22.32	0.00
31528 - 36304	5.40	0.77
31529 - 36304	13.24	0.12
34814 - 36304	-31.37	0.02

Table 4: Dunnet Tests of Crawling Times per shRNA

Gene	UAS	(2,19]	(19,45]	(45,73]
Control	36304	3.64	17.14	66.67
Raptor	31528	9.60	31.67	64.38
Raptor	31529	10.89	38.10	92.68
Raptor	34814	13.89		74.19
Tsc1	31039	9.23	16.05	64.96
Tsc1	31314	17.89	38.68	81.77

Table 5: Percent of Flies Which Do Not Crawl 4cm in 10 Seconds

	(2,19]	(19,45]	(45,73]
36304	1.00	1.00	1.00
31039	0.48	0.07	0.56
31314	0.56	0.00	0.37
31528	1.00	0.03	0.06
31529	0.00	0.00	1.00
34814			

Table 6: Fisher's Exact Test For Flies Which Do Not Crawl 4cm in 10 Seconds