

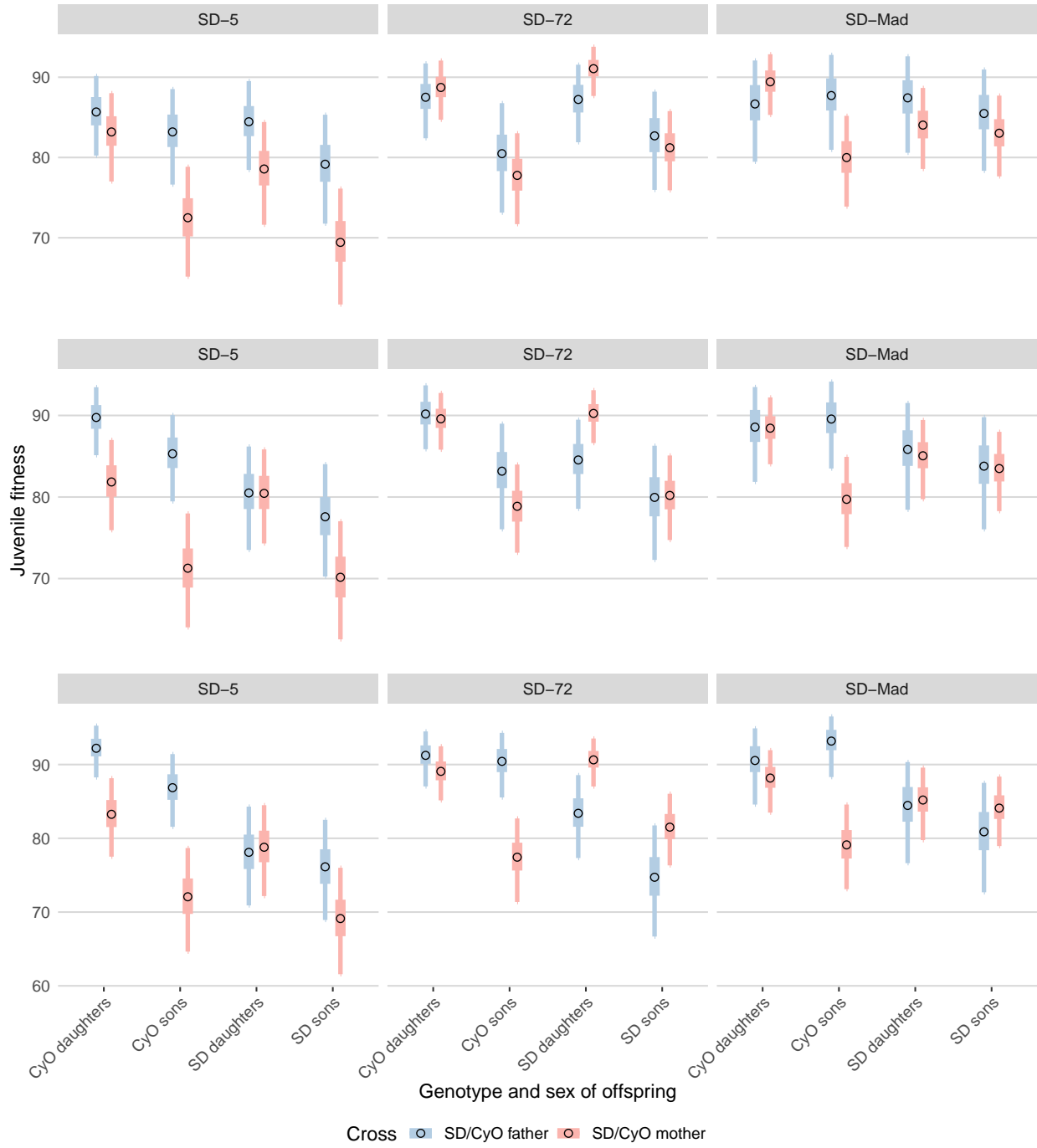
Supplementary Information

Fitness consequences of the selfish supergene *Segregation Distorter*

Supplementary Figure and Supplementary Tables

All of the figures and tables in this document can also be viewed online at <https://lukeholman.github.io/fitnessCostSD/statistics.html>, along with the R code used to generate them.

Supplementary figures



Supplementary Figure 1: Equivalent plots to Figure 2, under the assumption that meiosis is fair ($k = 0.5$, top row, same as Figure 2), slightly biased ($k = 0.6$, middle row), and more strongly biased ($k = 0.7$, bottom row). Note that the significant results for Figure 2 mostly stay the same or increase in magnitude, suggesting that they are genuine and are not sensitive to our assumptions about the data.

Supplementary tables

Supplementary Table 1: Number and percentage of L1 larvae surviving to adulthood for each SD genotype and cross type.

SD	Copies of SD	Parent with SD	Number larvae counted	n survivors	% surviving
No SD chromosome	0	Neither parent	600	495	82.5
SD-5	0	Father	113	89	78.8
SD-5	0	Mother	459	408	88.9
SD-5	0 or 1	Both parents	700	520	74.3
SD-5	1	Father	563	412	73.2
SD-5	1	Mother	494	415	84.0
SD-5	2	Both parents	40	0	0.0
SD-72	0	Father	287	226	78.7
SD-72	0	Mother	396	333	84.1
SD-72	0 or 1	Both parents	700	542	77.4
SD-72	1	Father	600	477	79.5
SD-72	1	Mother	423	342	80.9
SD-72	2	Both parents	600	0	0.0
SD-Mad	0	Father	296	239	80.7
SD-Mad	0	Mother	371	279	75.2
SD-Mad	0 or 1	Both parents	700	558	79.7
SD-Mad	1	Father	600	462	77.0
SD-Mad	1	Mother	436	320	73.4
SD-Mad	2	Both parents	585	413	70.6

Supplementary Table 2: Number and percentage of male and female adults emerging from the juvenile fitness assay vials.

SD	Copies of SD	Parent with SD	n males	n females	n total	% male
No SD chromosome	0	Neither parent	267	228	495	53.9
SD-5	0	Father	48	41	89	53.9
SD-5	0	Mother	206	202	408	50.5
SD-5	0 or 1	Both parents	239	281	520	46.0
SD-5	1	Father	196	216	412	47.6
SD-5	1	Mother	193	222	415	46.5
SD-5	2	Both parents	0	0	0	NaN
SD-72	0	Father	105	121	226	46.5
SD-72	0	Mother	169	164	333	50.8
SD-72	0 or 1	Both parents	272	270	542	50.2
SD-72	1	Father	233	244	477	48.8
SD-72	1	Mother	186	156	342	54.4
SD-72	2	Both parents	0	0	0	NaN
SD-Mad	0	Father	102	137	239	42.7
SD-Mad	0	Mother	145	134	279	52.0
SD-Mad	0 or 1	Both parents	253	305	558	45.3
SD-Mad	1	Father	190	272	462	41.1
SD-Mad	1	Mother	184	136	320	57.5
SD-Mad	2	Both parents	209	204	413	50.6

Supplementary Table 3: Average relative fitness of adult males for each SD genotype and cross type, expressed as the average proportion of offspring sired. The last two columns give the sample size in terms of number of vials (each of which contained 5 focal males), and number of males.

SD	Copies of SD	Parent with SD	Average relative fitness	SE	n vials	n males
No SD chromosome	0	Neither parent	0.79	0.040	13	65
SD-5	0	Father	0.68	0.147	5	25
SD-5	0	Mother	0.82	0.045	17	85
SD-5	0	Both parents	0.59	NA	1	5
SD-5	1	Father	0.14	0.055	18	90
SD-5	1	Mother	0.32	0.072	12	60
SD-5	1	Both parents	0.39	0.074	13	65
SD-72	0	Father	0.88	0.027	16	80
SD-72	0	Mother	0.77	0.054	13	65
SD-72	0	Both parents	0.79	NA	1	5
SD-72	1	Father	0.76	0.045	18	90
SD-72	1	Mother	0.80	0.039	17	85
SD-72	1	Both parents	0.67	0.051	19	95
SD-Mad	0	Father	0.75	0.055	14	70
SD-Mad	0	Mother	0.75	0.069	11	55
SD-Mad	0	Both parents	0.82	0.078	5	25
SD-Mad	1	Father	0.87	0.028	18	90
SD-Mad	1	Mother	0.81	0.037	17	85
SD-Mad	1	Both parents	0.75	0.053	18	90
SD-Mad	2	Both parents	0.19	0.072	14	70

Supplementary Table 4: Average fecundity of adult females for each SD genotype and cross type. The last two columns give the sample size in terms of number of oviposition vials (each of which contained up to 5 focal females), and number of males.

SD	Copies of SD	Parent with SD	Average fecundity	SE	n vials	n females
No SD chromosome	0	Neither parent	26.55	3.874	10	48
SD-5	0	Father	25.06	8.127	6	28
SD-5	0	Mother	41.13	3.700	15	71
SD-5	0	Both parents	24.95	3.767	5	22
SD-5	1	Father	28.88	3.337	12	55
SD-5	1	Mother	29.74	3.118	16	69
SD-5	1	Both parents	26.83	2.583	15	67
SD-72	0	Father	32.68	3.258	14	65
SD-72	0	Mother	35.10	3.023	15	68
SD-72	0	Both parents	22.53	6.671	3	15
SD-72	1	Father	33.97	2.743	16	77
SD-72	1	Mother	41.90	3.792	14	68
SD-72	1	Both parents	31.85	2.885	15	73
SD-Mad	0	Father	28.25	3.769	16	79
SD-Mad	0	Mother	44.71	3.723	13	65
SD-Mad	0	Both parents	16.50	1.762	3	14
SD-Mad	1	Father	36.85	3.968	16	77
SD-Mad	1	Mother	40.58	4.602	14	64
SD-Mad	1	Both parents	34.88	3.478	16	76
SD-Mad	2	Both parents	11.26	1.631	17	83

Supplementary Table 5: Number and percentage of L1 larvae surviving to adulthood in Experiment 2, for each SD genotype, cross type, and offspring sex.

SD	Parent with SD	Offspring sex	% surviving SD larvae	% surviving CyO larvae	n larvae counted	n crosses
SD-5	Father	Female	83.4	83.8	763	16
SD-5	Father	Male	79.0	79.3	727	17
SD-5	Mother	Female	76.4	81.9	871	18
SD-5	Mother	Male	70.8	67.8	972	20
SD-72	Father	Female	85.5	85.9	744	16
SD-72	Father	Male	81.0	78.6	615	15
SD-72	Mother	Female	90.2	87.4	1123	23
SD-72	Mother	Male	78.9	76.8	1186	24
SD-Mad	Father	Female	87.2	83.9	457	10
SD-Mad	Father	Male	87.8	83.1	480	11
SD-Mad	Mother	Female	84.4	85.7	942	20
SD-Mad	Mother	Male	82.3	78.4	1010	21

Supplementary Table 6: The results of hypothesis tests computed using the model of larval survival in Experiment 1. Each row gives the posterior estimate of a difference in means, such that the estimate is positive if mean 1 is larger than mean 2, and negative otherwise (expressed in % larval survival). The mean 1 and mean 2 columns list the parent which had SD (mother, father, or both), followed by the number of SD alleles present in the offspring (0, 1 or 2). The Posterior probability column gives the probability that the mean with the smaller point estimate is actually larger than the other mean, analogously to a one-tailed p-value. The Evidence ratio (ER) column gives the ratio of evidence, such that ER = 5 means that it is 5 times more likely that the mean with the smaller point estimate really is the smaller one. Asterisks highlight rows where the posterior probability is less than 0.05.

SD	Comparison	Difference	Error	Posterior probability
SD-5	Neither, 0 - Father, 0	8.9 (-11.6 to 34.9)	11.8	0.225
SD-72	Neither, 0 - Father, 0	6.0 (-10.5 to 24.3)	8.9	0.246
SD-Mad	Neither, 0 - Father, 0	3.5 (-12.5 to 21.0)	8.4	0.341
SD-5	Neither, 0 - Mother, 0	-5.8 (-18.1 to 5.3)	5.9	0.156
SD-72	Neither, 0 - Mother, 0	-0.9 (-14.0 to 12.1)	6.6	0.444
SD-Mad	Neither, 0 - Mother, 0	5.4 (-9.3 to 20.0)	7.3	0.218
SD-5	Mother, 0 - Father, 0	14.7 (-2.8 to 39.3)	10.7	0.057
SD-72	Mother, 0 - Father, 0	6.9 (-9.6 to 25.0)	8.8	0.214
SD-Mad	Mother, 0 - Father, 0	-1.9 (-18.1 to 15.9)	8.6	0.399
SD-5	Mother, 1 - Father, 1	10.6 (-4.4 to 26.4)	7.8	0.080
SD-72	Mother, 1 - Father, 1	1.2 (-13.1 to 15.4)	7.2	0.429
SD-Mad	Mother, 1 - Father, 1	-1.0 (-17.9 to 15.2)	8.4	0.449
SD-5	Mother, 0 - Mother, 1	5.6 (-5.2 to 17.4)	5.7	0.156
SD-72	Mother, 0 - Mother, 1	3.0 (-10.2 to 16.9)	6.8	0.326
SD-Mad	Mother, 0 - Mother, 1	1.9 (-14.4 to 19.4)	8.6	0.413
SD-5	Father, 0 - Father, 1	1.6 (-25.5 to 23.4)	12.5	0.415
SD-72	Father, 0 - Father, 1	-2.7 (-21.5 to 15.1)	9.3	0.394
SD-Mad	Father, 0 - Father, 1	2.8 (-16.7 to 20.4)	9.2	0.366
SD-5	Both parents, 0 or 1 - Both parents, 2	77.1 (62.2 to 87.8)	6.5	0.000
SD-72	Both parents, 0 or 1 - Both parents, 2	77.5 (63.6 to 87.8)	6.1	0.000
SD-Mad	Both parents, 0 or 1 - Both parents, 2	10.6 (-6.7 to 27.7)	8.7	0.105

Supplementary Table 7: The results of hypothesis tests computed using the model of adult sex ratio in Experiment 1. Each row gives the posterior estimate of a difference in means, such that the estimate is positive if mean 1 is larger than mean 2, and negative otherwise (expressed in % males). The mean 1 and mean 2 columns list the parent which had SD (mother, father, or both), followed by the number of SD alleles present in the offspring (0, 1 or 2). The Posterior probability column gives the probability that the mean with the smaller point estimate is actually larger than the other mean, analogously to a one-tailed p-value. The Evidence ratio (ER) column gives the ratio of evidence, such that ER = 5 means that it is 5 times more likely that the mean with the smaller point estimate really is the smaller one. Asterisks highlight rows where the posterior probability is less than 0.05.

SD	Comparison	Difference	Error	Posterior probability
SD-5	Neither, 0 - Father, 0	-0.3 (-15.9 to 15.7)	8.1	0.482
SD-72	Neither, 0 - Father, 0	7.2 (-4.9 to 19.1)	6.1	0.114
SD-Mad	Neither, 0 - Father, 0	11.1 (-0.8 to 23.0)	6.0	0.034
SD-5	Neither, 0 - Mother, 0	2.5 (-9.0 to 13.7)	5.7	0.323
SD-72	Neither, 0 - Mother, 0	3.2 (-7.9 to 14.5)	5.7	0.284
SD-Mad	Neither, 0 - Mother, 0	0.9 (-11.0 to 12.4)	5.9	0.437
SD-5	Mother, 0 - Father, 0	-2.8 (-18.4 to 13.4)	8.1	0.362
SD-72	Mother, 0 - Father, 0	4.0 (-8.5 to 16.1)	6.3	0.260
SD-Mad	Mother, 0 - Father, 0	10.2 (-2.7 to 22.6)	6.3	0.056
SD-5	Mother, 1 - Father, 1	-1.5 (-13.0 to 9.9)	5.7	0.391
SD-72	Mother, 1 - Father, 1	5.6 (-5.8 to 17.0)	5.7	0.159
SD-Mad	Mother, 1 - Father, 1	18.3 (7.1 to 29.7)	5.7	0.001
SD-5	Mother, 0 - Mother, 1	5.1 (-6.2 to 16.6)	5.8	0.187
SD-72	Mother, 0 - Mother, 1	-3.9 (-15.7 to 7.9)	6.0	0.251
SD-Mad	Mother, 0 - Mother, 1	-6.7 (-18.6 to 5.0)	6.0	0.128
SD-5	Father, 0 - Father, 1	6.3 (-9.9 to 22.4)	8.1	0.208
SD-72	Father, 0 - Father, 1	-2.3 (-13.8 to 9.5)	6.0	0.343
SD-Mad	Father, 0 - Father, 1	1.4 (-10.2 to 13.2)	5.9	0.410
SD-Mad	Both parents, 1 - Both parents, 2	-5.2 (-16.1 to 5.9)	5.5	0.164

Supplementary Table 8: The results of hypothesis tests computed using the model of female fitness in Experiment 1. Each row gives the posterior estimate of a difference in means, such that the estimate is positive if mean 1 is larger than mean 2, and negative otherwise (expressed as the number of offspring produced). The mean 1 and mean 2 columns list the parent which had SD (mother, father, or both), followed by the number of SD alleles present in the offspring (0, 1 or 2). The Posterior probability column gives the probability that the mean with the smaller point estimate is actually larger than the other mean, analagously to a one-tailed p-value. The Evidence ratio (ER) column gives the ratio of evidence, such that ER = 5 means that it is 5 times more likely that the mean with the smaller point estimate really is the smaller one. Asterisks highlight rows where the posterior probability is less than 0.05.

SD	Comparison	Difference	Error	Posterior probability
SD-5	Neither, 0 - Father, 0	1.9 (-12.3 to 14.7)	6.9	0.368
SD-72	Neither, 0 - Father, 0	-5.8 (-18.5 to 6.5)	6.2	0.161
SD-Mad	Neither, 0 - Father, 0	-1.7 (-12.7 to 9.9)	5.8	0.371
SD-5	Neither, 0 - Mother, 0	-14.4 (-28.6 to -0.4)	7.0	0.022
SD-72	Neither, 0 - Mother, 0	-7.9 (-20.5 to 4.5)	6.4	0.105
SD-Mad	Neither, 0 - Mother, 0	-18.7 (-34.7 to -3.8)	7.8	0.006
SD-5	Mother, 0 - Father, 0	16.4 (1.0 to 31.0)	7.6	0.019
SD-72	Mother, 0 - Father, 0	2.0 (-10.9 to 14.7)	6.4	0.371
SD-Mad	Mother, 0 - Father, 0	17.0 (3.2 to 32.6)	7.5	0.009
SD-5	Mother, 1 - Father, 1	-0.1 (-11.5 to 10.8)	5.7	0.500
SD-72	Mother, 1 - Father, 1	8.2 (-5.5 to 22.8)	7.2	0.125
SD-Mad	Mother, 1 - Father, 1	3.4 (-10.5 to 17.7)	7.2	0.321
SD-5	Mother, 0 - Mother, 1	12.5 (-0.2 to 26.1)	6.6	0.027
SD-72	Mother, 0 - Mother, 1	-7.5 (-22.5 to 6.9)	7.4	0.146
SD-Mad	Mother, 0 - Mother, 1	5.4 (-10.9 to 22.3)	8.5	0.255
SD-5	Father, 0 - Father, 1	-3.9 (-16.9 to 10.1)	6.8	0.264
SD-72	Father, 0 - Father, 1	-1.4 (-13.9 to 11.4)	6.3	0.412
SD-Mad	Father, 0 - Father, 1	-8.2 (-20.4 to 3.4)	6.0	0.080
SD-Mad	Both parents, 1 - Both parents, 2	23.4 (15.0 to 33.1)	4.6	0.000

Supplementary Table 9: The results of hypothesis tests computed using the model of male fitness in Experiment 1. Each row gives the posterior estimate of a difference in means, such that the estimate is positive if mean 1 is larger than mean 2, and negative otherwise (expressed in % offspring sired). The mean 1 and mean 2 columns list the parent which had SD (mother, father, or both), followed by the number of SD alleles present in the offspring (0, 1 or 2). The Posterior probability column gives the probability that the mean with the smaller point estimate is actually larger than the other mean, analogously to a one-tailed p-value. The Evidence ratio (ER) column gives the ratio of evidence, such that ER = 5 means that it is 5 times more likely that the mean with the smaller point estimate really is the smaller one. Asterisks highlight rows where the posterior probability is less than 0.05.

SD	Comparison	Difference	Error	Posterior probability
SD-5	Neither, 0 - Father, 0	10.9 (-13.9 to 42.5)	14.6	0.238
SD-72	Neither, 0 - Father, 0	-8.3 (-23.7 to 4.4)	7.2	0.110
SD-Mad	Neither, 0 - Father, 0	1.7 (-15.5 to 19.4)	8.9	0.420
SD-5	Neither, 0 - Mother, 0	-6.2 (-22.2 to 7.6)	7.5	0.195
SD-72	Neither, 0 - Mother, 0	-0.9 (-18.2 to 16.6)	8.6	0.452
SD-Mad	Neither, 0 - Mother, 0	-0.2 (-18.2 to 18.0)	9.2	0.483
SD-5	Mother, 0 - Father, 0	17.2 (-5.8 to 47.4)	13.9	0.091
SD-72	Mother, 0 - Father, 0	-7.3 (-22.6 to 4.7)	7.0	0.133
SD-Mad	Mother, 0 - Father, 0	2.0 (-16.1 to 19.3)	8.9	0.394
SD-5	Mother, 1 - Father, 1	20.0 (5.5 to 39.2)	8.8	0.003
SD-72	Mother, 1 - Father, 1	4.8 (-9.6 to 19.9)	7.4	0.254
SD-Mad	Mother, 1 - Father, 1	-3.8 (-13.8 to 5.1)	4.7	0.201
SD-5	Mother, 0 - Mother, 1	61.6 (41.0 to 77.7)	9.4	0.000
SD-72	Mother, 0 - Mother, 1	-2.2 (-18.4 to 12.7)	7.8	0.399
SD-Mad	Mother, 0 - Mother, 1	-5.7 (-23.0 to 8.5)	7.8	0.229
SD-5	Father, 0 - Father, 1	64.5 (34.6 to 85.6)	13.5	0.000
SD-72	Father, 0 - Father, 1	9.9 (-2.2 to 23.9)	6.7	0.055
SD-Mad	Father, 0 - Father, 1	-11.5 (-26.7 to 0.6)	6.9	0.032
SD-Mad	Both parents, 1 - Both parents, 2	70.6 (54.2 to 82.6)	7.2	0.000

Supplementary Table 10: Complete version of Table 2, showing all the contrasts that were tested in Experiment 2.

SD	Comparison	Difference	Error	Posterior probability	Notable
SD-5	Daughters, CyO, father - Daughters, SD, father	1.2 (-3.5 to 6.3)	2.5	0.310	
SD-5	Daughters, CyO, mother - Daughters, CyO, father	-2.5 (-9.8 to 4.8)	3.7	0.245	
SD-5	Daughters, CyO, mother - Daughters, SD, mother	4.6 (-0.6 to 10.0)	2.7	0.041	*
SD-5	Daughters, SD, mother - Daughters, SD, father	-5.9 (-14.6 to 2.5)	4.2	0.078	
SD-5	Sons, CyO, father - Daughters, CyO, father	-2.5 (-10.4 to 4.9)	3.9	0.260	
SD-5	Sons, CyO, father - Sons, SD, father	4.0 (-1.8 to 10.0)	3.0	0.087	
SD-5	Sons, CyO, mother - Daughters, CyO, mother	-10.7 (-19.4 to -2.0)	4.5	0.008	*
SD-5	Sons, CyO, mother - Sons, CyO, father	-10.7 (-19.8 to -1.5)	4.6	0.010	*
SD-5	Sons, CyO, mother - Sons, SD, mother	3.1 (-2.8 to 9.0)	3.0	0.149	
SD-5	Sons, SD, father - Daughters, SD, father	-5.3 (-14.5 to 3.7)	4.5	0.118	
SD-5	Sons, SD, mother - Daughters, SD, mother	-9.1 (-18.7 to 0.4)	4.8	0.028	*
SD-5	Sons, SD, mother - Sons, SD, father	-9.7 (-19.4 to -0.1)	5.0	0.025	*
SD-72	Daughters, CyO, father - Daughters, SD, father	0.3 (-4.4 to 5.0)	2.4	0.449	
SD-72	Daughters, CyO, mother - Daughters, CyO, father	1.2 (-4.7 to 7.4)	3.0	0.340	
SD-72	Daughters, CyO, mother - Daughters, SD, mother	-2.3 (-5.9 to 1.1)	1.8	0.088	
SD-72	Daughters, SD, mother - Daughters, SD, father	3.8 (-1.6 to 9.9)	2.9	0.085	
SD-72	Sons, CyO, father - Daughters, CyO, father	-7.0 (-15.5 to 1.0)	4.2	0.045	*
SD-72	Sons, CyO, father - Sons, SD, father	-2.2 (-8.8 to 3.8)	3.2	0.243	
SD-72	Sons, CyO, mother - Daughters, CyO, mother	-11.0 (-17.9 to -4.3)	3.5	0.001	*
SD-72	Sons, CyO, mother - Sons, CyO, father	-2.7 (-11.4 to 6.3)	4.5	0.274	
SD-72	Sons, CyO, mother - Sons, SD, mother	-3.4 (-8.1 to 1.2)	2.4	0.074	
SD-72	Sons, SD, father - Daughters, SD, father	-4.5 (-12.7 to 3.3)	4.1	0.134	
SD-72	Sons, SD, mother - Daughters, SD, mother	-9.9 (-15.8 to -4.2)	3.0	0.000	*
SD-72	Sons, SD, mother - Sons, SD, father	-1.5 (-9.3 to 6.4)	4.1	0.354	
SD-Mad	Daughters, CyO, father - Daughters, SD, father	-0.8 (-6.9 to 5.2)	3.1	0.409	
SD-Mad	Daughters, CyO, mother - Daughters, CyO, father	2.8 (-4.3 to 10.7)	3.8	0.236	
SD-Mad	Daughters, CyO, mother - Daughters, SD, mother	5.4 (1.2 to 9.9)	2.2	0.007	*
SD-Mad	Daughters, SD, mother - Daughters, SD, father	-3.4 (-11.0 to 4.9)	4.0	0.196	
SD-Mad	Sons, CyO, father - Daughters, CyO, father	1.1 (-7.8 to 9.8)	4.5	0.413	
SD-Mad	Sons, CyO, father - Sons, SD, father	2.2 (-4.1 to 8.7)	3.2	0.232	
SD-Mad	Sons, CyO, mother - Daughters, CyO, mother	-9.4 (-16.3 to -2.7)	3.5	0.002	*
SD-Mad	Sons, CyO, mother - Sons, CyO, father	-7.7 (-15.6 to 0.6)	4.1	0.034	*
SD-Mad	Sons, CyO, mother - Sons, SD, mother	-3.0 (-8.0 to 1.9)	2.5	0.112	
SD-Mad	Sons, SD, father - Daughters, SD, father	-1.9 (-10.9 to 6.7)	4.6	0.335	
SD-Mad	Sons, SD, mother - Daughters, SD, mother	-1.0 (-8.0 to 6.1)	3.6	0.385	
SD-Mad	Sons, SD, mother - Sons, SD, father	-2.5 (-10.3 to 6.3)	4.1	0.258	