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Supplemental Information

Between-Group Competition Impacts Reproductive Success in Wild Chimpanzees

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Group	NORTH	MIDDLE	SOUTH	EAST
Period of study	1997-2016	1999-2004	1999-2016	2007-2016
Total number of male follow-days (min 8h of observation per day)	1115	828	2044	1724
Total number of female follow-days (min 8h of observation per day)	2743	602	3108	1041
Group size (Mean ± SE ; min – max)	20.87 ± 0.29 (16 – 32)	8.76 ± 0.3 (5 – 13)	37.44 ± 0.64 (22 – 55)	39.68 ± 0.61 (30 – 49)
Number of weaned individuals (Mean ± SE ; min – max)	14.76 ± 0.20 (11 – 24)	6.48 ± 0.27 (4 – 9)	26.87 ± 0.40 (18 – 42)	27.66 ± 0.41 (22 – 34)
Number of mature males (Mean ± SE; min – max)	1.83 ± 0.05 (0 -4)	1.93 ± 0.12 (1 – 3)	5.11 ± 0.09 (2 – 7)	4.39 ± 0.07 (3 -7)
Annual number of inter-group encounters (all types) (Mean ± SE; min – max)	5.9 ± 1.18 (0 -18)	11.83 ± 4.59 (1 – 31)	5.44 ± 1.08 (0 -16)	9.7 ± 2.68 (1 – 29)
Total number of inter-group encounters (all types)	118	71	98	97
Number of physical inter-group encounters (visual and involving physical aggression)	23	11	31	38
Number of physical inter-group encounters involving physical aggression	10	7	20	18
Number of vocal inter-group encounters	95	60	67	59
Number of inter-group encounters during pregnancy (all types) (Mean ± SE; min – max)	3.12 ± 0.65 (0 – 13)	7.75 ± 4.97 (0 -22)	4 ± 0.64 (0 -13)	8 ± 1.79 (1 -30)
Number of physical inter-group encounters during pregnancy (Mean ± SE; min – max)	0.58 ± 0.19 (0 -3)	0.75 ± 0.75 (0 -3)	1.45 ± 0.24 (0 -5)	3 ± 0.88 (0 -14)
Number of inter-group encounters (all types) during pregnancy in which specific pregnant females are present (Mean ± SE; min – max)	1.33 ± 0.21 (0 – 4)	5 ± 2.85 (0 – 13)	1.39 ± 0.26 (0 -7)	3.65 ± 0.96 (0 -19)
Number of physical inter-group encounters during pregnancy in which specific pregnant females are present (Mean ± SE; min – max)	0.25 ± 0.11 (0 – 2)	0.5 ± 0.5 (0 -2)	0.51 ± 0.12 (0 -2)	1.9 ± 0.57 (0 -10)
Inter-birth interval (Mean ± SE; min – max) (days)	1864 ± 93 (1246 – 2581)	1305 ± 30 (1231 – 1380)	1829 ± 105 (1218 – 2709)	1686 ± 75 (1323 – 2232)
Number of offspring in the survival analysis based on pregnancy (males/females)	14 / 10	1 / 3	20 / 13	8 / 12
Number of dead offspring in the survival analysis based on pregnancy (males/females)	5 / 4	1 / 3	10 / 7	3 / 4

Table S1. Summary of demographic and inter-group encounters parameters for the four studied chimpanzee groups. Group sizes include all individuals of all age-class. Related to STAR Methods.

Terms	z	Hazard ratio	P value	b	SE	95% CI
Food availability[a, h]	1.83	1.772	0.067	0.572	0.312	1.06, 3.00
Number of individuals[b, h]	0.10	1.026	0.920	0.025	0.260	0.67, 1.53
Number of males[c, h]	0.46	1.150	0.650	0.140	0.307	0.65, 1.98
Neighbor pressure[d,h]	1.95	3.754	0.051	1.322	0.677	1.13, 11.36
Sex_infant_Male[e, i]	-1.29	0.536	0.200	-0.623	0.482	0.20, 1.39
Age of mother[f, i]	3.14	2.821	0.001	1.037	0.330	1.60, 4.85
Rank of mother[g, i]	-1.55	0.651	0.120	-0.429	0.276	0.46, 0.94

Table S2. Summary of test statistics, hazard ratios and P values for the Cox proportional hazards model on offspring survival up to three years old, based on the pregnancy months. Related to Figure 1B.

Confidence intervals are based on the hazard ratios and calculated using the R function "coxph". Sample size N = 81; (a) z-transformed, mean and sd of the original values were 3.90 and 2.32, respectively; multiplied by territory size; (b) z-transformed, mean and sd of the original values were 22.82 and 8.30, respectively; (c) z-transformed, mean and sd of the original values were 3.80 and 1.61, respectively; (d) z-transformed, mean and sd of the original values were 0.060 and 0.085, respectively, before being log transformed; (e) Sex of previous infant was dummy coded with sex female being the reference category; the indicated test was obtained from a likelihood ratio test comparing the full model with a reduced model lacking sex of previous infant; (f) z-transformed, mean and sd of the original values (in months) were 308.17 and 122.21, respectively; (g) z-transformed, mean and sd of the original values were 0.59 and 0.27, respectively; (h) test predictor; (i) control predictor

Model	df	logLik	AIC	Delta AIC	AIC weight
Model NPI	7	-122.261	259.5	0	0.925
Model P	7	-125.472	265.8	6.4	0.038
Model N	7	-126.375	266.8	7.3	0.024
Model SP	7	-127.029	269.3	9.82	0.007
Model SN	7	-127.73	269.5	10.01	0.006

Table S3. Survival model comparison, based on the pregnancy period, between the original model including the neighbor pressure index and models switching this index by a count of inter-group encounters. Related to Table 1 and Data S2.

Model NPI refers to a model including the neighbor pressure index as a test predictor; Model P refers to a model replacing the neighbor pressure index by the number of physical inter-group encounters during pregnancy (even if each specific female was not reported as being present); Model N refers to a model replacing the neighbor pressure index by the number of inter-group encounters (all types) during pregnancy (even if each specific female was not reported as being present); Model SP refers to a model replacing the neighbor pressure index by the number of physical inter-group encounters during pregnancy in which each specific pregnant female was reported to be present; Model SN refers to a model replacing the neighbor pressure index by the number of inter-group encounters (all types) during pregnancy in which each specific pregnant female was reported to be present. All models include other predictors as listed into the original survival model from Table 1.

Random effect	Terms	Variance	Estimate	SE	χ^2	Df	P
Mother name	**intercept**	0.000	1680.62	49.97	(h)	(h)	(h)
group	**intercept**	0.019	1680.62	49.97	(h)	(h)	(h)
group	**Food availability**[a,i]	0.000	27.01	37.41	0.492	1	0.482
group	**Number of individuals**[b,i]	0.000	124.62	34.07	5.590	1	0.018
group	**Number of males**[c,i]	0.000	-125.37	39.39	5.860	1	0.015
group	**Neighbor pressure**[d,i]	0.000	86.96	34.15	4.344	1	0.037
group	**Sex_infant_Male**[e,j]	5115	229.56	76.17	5.598	1	0.017
group	**Age of mother**[f,j]	0.070	25.98	36.30	0.282	1	0.595
group	**Rank of mother**[g,j]	0.000	-19.22	35.71	0.200	1	0.654
residual		62200					

Table S4. Determinants of length of inter-birth intervals. Related to Table 2.

Estimated variance components for the random effects and residuals, test statistics of the LMM and associated p values come from a reduced model lacking all non-significant interactions. The column 'term' specifies whether the row refers to a random intercept or random slope component. Marginal effect sizes (R^2), counting for the variance explained by fixed effects, was 0.473, while conditional R2, counting for the variance of both fixed and random effects, was 0.483; (a) z-transformed, mean and sd of the original values were 3.09 and 1.68, respectively; multiplied by territory size; (b) z-transformed, mean and sd of the original values were 24.13 and 8.19, respectively; (c) z-transformed, mean and sd of the original values were 3.51 and 1.60, respectively; (d) z-transformed, mean and sd of the original values were 0.066 and 0.062, respectively before being log transformed; (e) Sex of previous infant was dummy coded with sex female being the reference category; the indicated test was obtained from a likelihood ratio test comparing the full model with a reduced model lacking sex of previous infant; (f) z-transformed, mean and sd of the original values were 327.80 and 97.09, respectively; (g) z-transformed, mean and sd of the original values were 0.63 and 0.26, respectively; (h) Not shown as having a very limited interpretation; (i) test predictor; (j) control predictor.