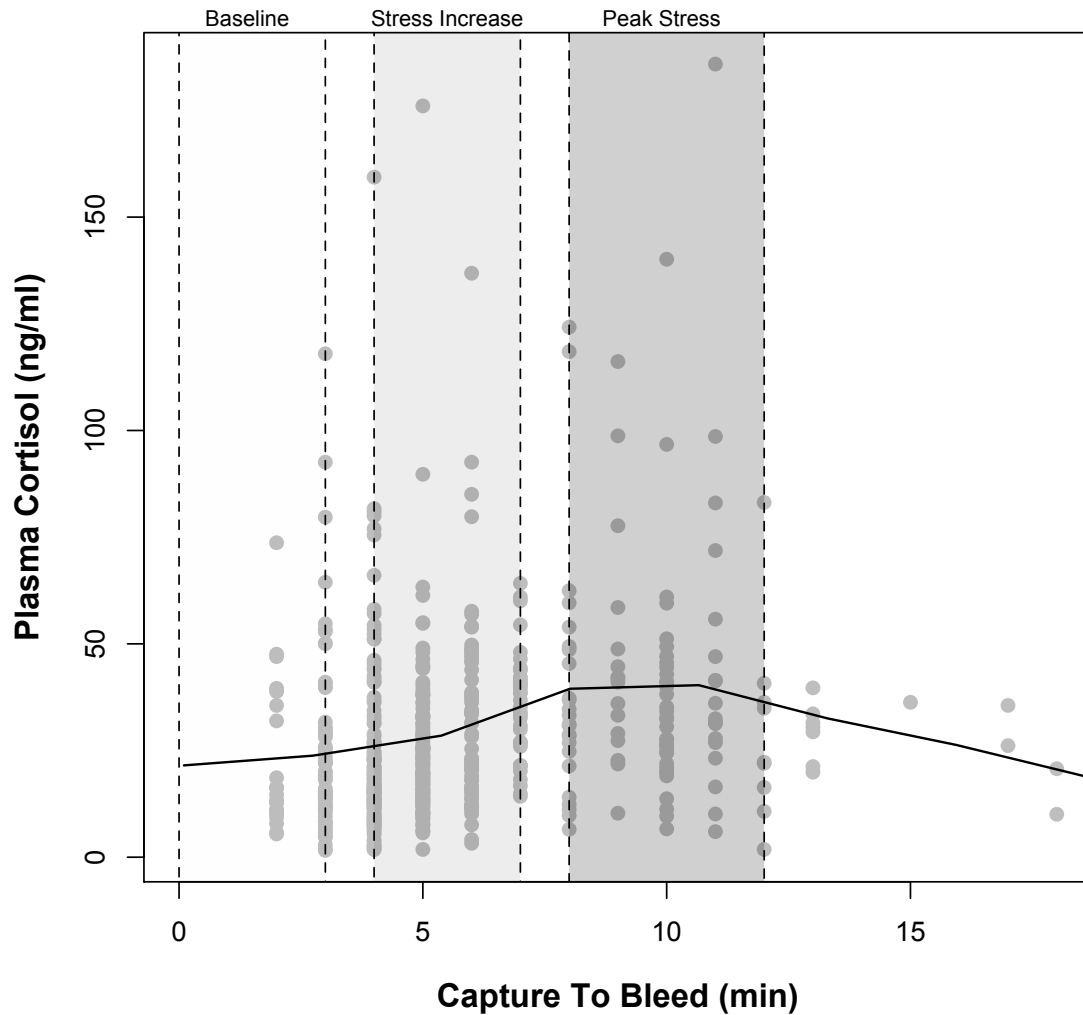


**Electronic Supplementary Material**

*Social conflict and the costs of cooperation in meerkat societies are reflected in measures of stress hormones*

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**Figure S1.** Effect of the amount of time taken from initial capture to acquisition of a blood sample (“Capture to Bleed”) on plasma cortisol levels (ng/ml) obtained from subordinate female and male meerkats. Plasma cortisol levels were categorized as baseline (2-3 min capture to bleed time), stress increase (4-7 min), or peak stress (8-12 min). Regression line was fit using cubic smoothing spline (smoothing parameter = 0.4).



**Table S1.** Effects of individual, social group, and environmental characteristics on subordinate meerkat plasma cortisol levels. Results are from a linear mixed-effects model (conditional  $R^2 = 0.38$ ) that included random intercept terms for individual identity ( $\sigma^2 = 0.04$ ), capture group ( $\sigma^2 = 0.006$ ), and year ( $\sigma^2 = 0.016$ ) were included in model.

Fixed Effect	df	F	P-value
<b>Capture to bleed time</b>	<b>1, 303.5</b>	<b>40.25</b>	<b>&lt;0.0001</b>
<b>Capture to bleed time<sup>2</sup></b>	<b>1, 331</b>	<b>13.32</b>	<b>0.0003</b>
Sex	1, 196.2	1.16	0.28
Age	1, 215.2	0.3	0.58
<b>Body mass</b>	<b>1, 280.4</b>	<b>6.44</b>	<b>0.012</b>
Foraging success	1, 332	1.08	0.29
<b>Weather (PC1)</b>	<b>1, 302.2</b>	<b>10.23</b>	<b>0.001</b>
<b>Group size</b>	<b>1, 69.4</b>	<b>12.07</b>	<b>0.0009</b>
<b>Group size<sup>2</sup></b>	<b>1, 109.1</b>	<b>4.92</b>	<b>0.029</b>
<b>Group sex ratio</b>	<b>1, 167.9</b>	<b>16.88</b>	<b>&lt;0.0001</b>
<b>Dom. female pregnant</b>	<b>1, 313.2</b>	<b>4.29</b>	<b>0.039</b>
<b>Relatedness</b>	<b>1, 98.9</b>	<b>5.91</b>	<b>0.017</b>
Pups in group	1, 286.7	1.02	0.31
Diff. in body mass	1, 279.6	1.01	0.31
Assertions received	1, 337.6	2.7	0.11
Age x Sex	1, 263.9	0.03	0.86
Body mass x Sex	1, 278.4	0.014	0.9
Foraging success x Sex	1, 321.2	3.31	0.07
Weather (PC1) x Sex	1, 335	2.75	0.098
Group size x Sex	1, 311.4	0.06	0.8
Group size <sup>2</sup> x Sex	1, 319.9	1.52	0.22
Group sex ratio x Sex	1, 301.4	1.43	0.23
<b>Dom. female pregnant x Sex</b>	<b>1, 339.4</b>	<b>5.34</b>	<b>0.02</b>
Relatedness x Sex	1, 213.3	0.07	0.87
Pups in group x Sex	1, 340.4	0.03	0.86
Diff. in mass x Sex	1, 275.3	1.72	0.19
Assertions received x Sex	1, 338.7	2.85	0.09
<b>Group size x Weather (PC1)</b>	<b>1, 201.8</b>	<b>4.49</b>	<b>0.035</b>
Group size <sup>2</sup> x Weather (PC1)	1, 227.9	1.79	0.18
Group size x Foraging success	1, 337.8	0.002	0.96
Group size <sup>2</sup> x Foraging success	1, 329.7	1.03	0.31
<b>Group size x Pups in group</b>	<b>1, 310.7</b>	<b>2.23</b>	<b>0.14</b>
<b>Group size<sup>2</sup> x Pups in group</b>	<b>1, 324.2</b>	<b>14.6</b>	<b>0.0001</b>
Age x Dom. female pregnant x Sex	1, 334.9	0.38	0.54
Body mass x Dom. female pregnant x Sex	1, 341.7	0.57	0.45

<b>Fixed Effect</b>	<b>df</b>	<b>F</b>	<b>P-value</b>
Weather (PC1) x Pups in group x Sex	1, 341.4	0.61	0.43
Foraging success x Pups in group x Sex	1, 342.4	1.83	0.18
Group size x Pups in group x Sex	1, 341.1	1.42	0.23
Group size <sup>2</sup> x Pups in group x Sex	1, 337.6	0.88	0.35

Degrees of freedom (df) and P-values were estimated using Satterthwaite approximation using lmerTest (version 2.0-32, Kuznetsova et al. 2015)

**Table S2.** Effect sizes for the influence of different individual, social group, and environmental characteristics on subordinate meerkat plasma cortisol levels. 95% confidence intervals were generated using parametric bootstrapping (1000 iterations).

Fixed Effect	b	SE	95% CI	t	df	P-value
<b>Intercept</b>	<b>3.22</b>	<b>0.15</b>	<b>2.91 - 3.54</b>	<b>21.5</b>	<b>30</b>	<b>&lt;0.0001</b>
<b>Capture to bleed time</b>	<b>0.3</b>	<b>0.05</b>	<b>0.21 - 0.39</b>	<b>6.34</b>	<b>303.5</b>	<b>&lt;0.0001</b>
<b>Capture to bleed time<sup>2</sup></b>	<b>-0.08</b>	<b>0.02</b>	<b>-0.13 - -0.04</b>	<b>-3.65</b>	<b>331</b>	<b>0.0003</b>
Sex (Male)	0.044	0.16	-0.29 - 0.36	0.27	294.6	0.79
Age	-0.003	0.1	-0.2 - 0.21	-0.03	232	0.98
Body mass	-0.14	0.08	-0.3 - 0.004	-1.89	294.9	0.059
<b>Foraging success</b>	<b>0.23</b>	<b>0.12</b>	<b>-0.003 - 0.47</b>	<b>2.01</b>	<b>330.9</b>	<b>0.045</b>
<b>Weather (PC1)</b>	<b>-0.32</b>	<b>0.1</b>	<b>-0.54 - -0.1</b>	<b>-3.05</b>	<b>320.9</b>	<b>0.002</b>
<b>Group size</b>	<b>0.37</b>	<b>0.18</b>	<b>0.01 - 0.73</b>	<b>2.08</b>	<b>212.2</b>	<b>0.039</b>
<b>Group size<sup>2</sup></b>	<b>-0.32</b>	<b>0.09</b>	<b>-0.5 - -0.11</b>	<b>-3.4</b>	<b>301.4</b>	<b>0.0007</b>
<b>Group sex ratio</b>	<b>0.26</b>	<b>0.12</b>	<b>0.04 - 0.5</b>	<b>2.21</b>	<b>235.9</b>	<b>0.028</b>
<b>Dom. female pregnant</b>	<b>0.35</b>	<b>0.13</b>	<b>0.07 - 0.63</b>	<b>2.67</b>	<b>331.8</b>	<b>0.008</b>
Relatedness	-0.26	0.14	-0.55 - 0.04	-1.82	163.1	0.07
Pups in group	0.12	0.15	-0.17 - 0.44	0.8	321.7	0.42
Diff. in body mass	-0.012	0.05	-0.13 - 0.09	-0.21	279.1	0.83
Assertions received	-0.002	0.04	-0.08 - 0.08	-0.054	332	0.96
Age x Sex	-0.078	0.12	-0.32 - 0.16	-0.64	272.3	0.52
Body mass x Sex	0.07	0.1	-0.13 - 0.26	0.72	305.7	0.47
<b>Foraging success x Sex</b>	<b>-0.26</b>	<b>0.12</b>	<b>-0.51 - -0.02</b>	<b>-2.11</b>	<b>328.2</b>	<b>0.035</b>
Weather (PC1) x Sex	0.22	0.12	-0.02 - 0.45	1.8	340.9	0.072
Group size x Sex	0.15	0.21	-0.26 - 0.56	0.72	339.8	0.47
Group size <sup>2</sup> x Sex	0.16	0.11	-0.07 - 0.39	1.46	340.8	0.14
Group sex ratio x Sex	0.18	0.15	-0.11 - 0.47	1.19	301.4	0.23
<b>Dom. female pregnant x Sex</b>	<b>-0.37</b>	<b>0.16</b>	<b>-0.7 - -0.02</b>	<b>-3.4</b>	<b>301.4</b>	<b>0.0007</b>
Relatedness x Sex	0.05	0.19	-0.35 - 0.43	0.26	213.3	0.79
Pups in group x Sex	-0.035	0.2	-0.44 - 0.36	-0.17	340.4	0.86
Diff. in body mass x Sex	0.1	0.08	-0.05 - 0.26	1.31	275.3	0.19
Assertions received x Sex	0.17	0.1	-0.02 - 0.39	1.69	338.7	0.09
<b>Group size x Weather (PC1)</b>	<b>-0.1</b>	<b>0.05</b>	<b>-0.19 - -0.005</b>	<b>-2.12</b>	<b>201.8</b>	<b>0.035</b>
Group size <sup>2</sup> x Weather (PC1)	0.05	0.04	-0.02 - 0.13	1.34	227.9	0.18
Group size x Foraging success	-0.001	0.03	-0.07 - 0.06	-0.05	337.8	0.96
Group size <sup>2</sup> x Foraging success	0.04	0.04	-0.037 - 0.12	1.01	329.7	0.31
Group size x Pups in group	-0.03	0.14	-0.31 - 0.23	-0.22	336.3	0.82
<b>Group size<sup>2</sup> x Pups in group</b>	<b>0.34</b>	<b>0.11</b>	<b>0.11 - 0.55</b>	<b>3.07</b>	<b>332.5</b>	<b>0.002</b>
Age x Dom. female pregnant x Sex	0.11	0.19	-0.26 - 0.48	0.61	335	0.54

<b>Fixed Effect</b>	<b>b</b>	<b>SE</b>	<b>95% CI</b>	<b><i>t</i></b>	<b>df</b>	<b>P-value</b>
Body mass x Dom. female pregnant x Sex	-0.12	0.16	-0.43 - 0.18	-0.75	341.7	0.45
Weather (PC1) x Pups in group x Sex	-0.13	0.17	-0.47 - 0.2	-0.78	341.1	0.43
Foraging success x Pups in group x Sex	0.21	0.16	-0.08 - 0.52	1.35	342.4	0.18
Group size x Pups in group x Sex	-0.21	0.18	-0.54 - 0.17	-1.19	341.1	0.23
Group size <sup>2</sup> x Pups in group x Sex	-0.13	0.14	-0.42 - 0.16	-0.94	337.6	0.35

Reference levels (intercept) for “Dom. female pregnant” was No, “Sex” was female, and “Pups present” was No.