

## Supplementary material

**Table S1:** Results of models assessing systematic changes in strike performance resulting from fatigue for repeated strikes within a treatment

Variable	Strike Order P-value	
	Western Rattlesnake	Mohave Rattlesnake
	15°C	
Max. strike velocity	0.27	0.41
Max. strike acceleration	0.63	0.08
	20°C	
Max. strike velocity	0.86	0.48
Max. strike acceleration	0.61	0.26
	25°C	
Max. strike velocity	0.88	0.89
Max. strike acceleration	0.57	0.79
	30°C	
Max. strike velocity	0.76	0.65
Max. strike acceleration	0.66	0.13
	35°C	
Max. strike velocity	0.63	0.08
Max. strike acceleration	0.17	0.7

**Table S2: Results of generalized linear mixed models examining the effects of cloacal temperature and strike distance on Mohave rattlesnake strike performance. Bolded rows indicate a statistically significant effect of temperature.**

Variable	Strike distance P-value	Temperature P-value	Temperature slope	Temperature intercept	Q10	1/Q10
<b>15-25°C</b>						
<b>Max. strike velocity</b>	<b>0.0361</b>	<b>0.0104</b>	<b>0.011</b>	<b>0.249</b>	<b>1.297</b>	<b>0.771</b>
<b>Max. strike acceleration</b>	<b>0.1915</b>	<b>0.0085</b>	<b>0.017</b>	<b>1.460</b>	<b>1.495</b>	<b>0.669</b>
<b>Max. gape angular velocity</b>	<b>0.2107</b>	<b>0.0033</b>	<b>0.016</b>	<b>1.470</b>	<b>1.436</b>	<b>0.696</b>
Max. gape angular acceleration	0.4744	0.1694	0.012	3.506	1.313	0.762
Min. time to max gape	0.1064	0.0849	-0.007	1.981	0.845	1.183
Strike distance	NA	0.1459	0.014	0.860	1.384	0.723
Strike latency	NA	0.1864	-0.081	3.312	0.156	6.410
<b>Mean strike velocity</b>	<b>0.0019</b>	<b>0.0062</b>	<b>0.013</b>	<b>-0.152</b>	<b>1.356</b>	<b>0.737</b>
<b>15-35°C</b>						
<b>Max. strike velocity</b>	<b>0.0173</b>	<b>0.0173</b>	<b>0.006</b>	<b>0.345</b>	<b>1.158</b>	<b>0.864</b>
<b>Max. strike acceleration</b>	<b>0.6727</b>	<b>0.0000</b>	<b>0.014</b>	<b>1.535</b>	<b>1.385</b>	<b>0.722</b>
<b>Max. gape angular velocity</b>	<b>0.9863</b>	<b>0.0000</b>	<b>0.012</b>	<b>1.546</b>	<b>1.304</b>	<b>0.767</b>
<b>Max. gape angular acceleration</b>	<b>0.0143</b>	<b>0.0013</b>	<b>0.013</b>	<b>3.481</b>	<b>1.341</b>	<b>0.746</b>
<b>Min. time to max gape</b>	<b>0.1365</b>	<b>0.003</b>	<b>-0.010</b>	<b>2.040</b>	<b>0.791</b>	<b>1.264</b>
Strike distance	NA	0.5072	0.004	1.055	1.098	0.911
Strike latency	NA	0.1298	-0.031	2.463	0.492	2.033
Mean strike velocity	0.1260	0.1003	0.008	-0.048	1.192	0.839
<b>20-30°C</b>						
Max. strike velocity	0.0263	0.1625	0.005	0.433	1.122	0.891
<b>Max. strike acceleration</b>	<b>0.6842</b>	<b>0.0058</b>	<b>0.016</b>	<b>1.527</b>	<b>1.459</b>	<b>0.685</b>
Max. gape angular velocity	0.8541	0.1682	0.006	1.709	1.159	0.863
Max. gape angular acceleration	0.9239	0.5003	-0.004	3.920	0.910	1.099
Min. time to max gape	0.1018	0.2497	-0.005	1.923	0.884	1.131
Strike distance	NA	0.2367	0.010	0.957	1.258	0.795
Strike latency	NA	0.0594	-0.057	2.860	0.268	3.731
<b>Mean strike velocity</b>	<b>0.0004</b>	<b>0.0006</b>	<b>0.016</b>	<b>-0.197</b>	<b>1.433</b>	<b>0.698</b>
<b>25-35°C</b>						
Max. strike velocity	0.0358	0.0934	0.005	0.411	1.119	0.894
<b>Max. strike acceleration</b>	<b>0.5396</b>	<b>0.0152</b>	<b>0.015</b>	<b>1.522</b>	<b>1.398</b>	<b>0.715</b>
<b>Max. gape angular velocity</b>	<b>0.7225</b>	<b>0.0479</b>	<b>0.006</b>	<b>1.729</b>	<b>1.157</b>	<b>0.864</b>
<b>Max. gape angular acceleration</b>	<b>0.0031</b>	<b>0.0010</b>	<b>0.020</b>	<b>3.234</b>	<b>1.577</b>	<b>0.634</b>
<b>Min. time to max gape</b>	<b>0.4375</b>	<b>0.0017</b>	<b>-0.017</b>	<b>2.291</b>	<b>0.672</b>	<b>1.488</b>
Strike distance	NA	0.0691	0.013	0.751	1.342	0.745
Strike latency	NA	0.7603	0.013	0.897	1.353	0.739
Mean strike velocity	0.5365	0.8791	0.001	0.204	1.024	0.977

**Table S3: Results of generalized linear mixed models examining the effects of cloacal temperature and strike distance on western rattlesnake strike performance. Bolded rows indicate a statistically significant effect of temperature.**

Variable	Strike distance P-value	Temperature P-value	Temperature slope	Temperature intercept	Q10	1/Q10
<b>15-25°C</b>						
Max. strike velocity	<b>0.4755</b>	<b>0.0034</b>	<b>0.011</b>	<b>0.323</b>	<b>1.290</b>	<b>0.775</b>
Max. strike acceleration	<b>0.0683</b>	<b>0.0347</b>	<b>0.017</b>	<b>1.662</b>	<b>1.469</b>	<b>0.681</b>
Max. gape angular velocity	<b>0.8588</b>	<b>0.0000</b>	<b>0.017</b>	<b>1.471</b>	<b>1.474</b>	<b>0.678</b>
Max. gape angular acceleration	<b>0.0533</b>	<b>0.0460</b>	<b>0.015</b>	<b>3.479</b>	<b>1.411</b>	<b>0.709</b>
Min. time to max gape	<b>0.0047</b>	<b>0.0083</b>	<b>-0.008</b>	<b>2.074</b>	<b>0.827</b>	<b>1.209</b>
Strike distance	NA	<b>0.0394</b>	<b>0.014</b>	<b>0.949</b>	<b>1.372</b>	<b>0.729</b>
Strike latency	NA	0.0607	-0.039	1.939	0.408	2.451
Mean strike velocity	<b>0.3644</b>	<b>0.0137</b>	<b>0.012</b>	<b>-0.031</b>	<b>1.305</b>	<b>0.766</b>
<b>15-35°C</b>						
Max. strike velocity	<b>0.0669</b>	<b>0.0048</b>	<b>0.004</b>	<b>0.447</b>	<b>1.102</b>	<b>0.907</b>
Max. strike acceleration	<b>0.7036</b>	<b>0.0017</b>	<b>0.007</b>	<b>1.820</b>	<b>1.181</b>	<b>0.847</b>
Max. gape angular velocity	<b>0.6954</b>	<b>0.0000</b>	<b>0.012</b>	<b>1.555</b>	<b>1.315</b>	<b>0.760</b>
Max. gape angular acceleration	<b>0.0762</b>	<b>0.0268</b>	<b>0.012</b>	<b>3.560</b>	<b>1.321</b>	<b>0.757</b>
Min. time to max gape	<b>0.0055</b>	<b>0.0004</b>	<b>-0.008</b>	<b>2.081</b>	<b>0.837</b>	<b>1.195</b>
Strike distance	NA	<b>0.0053</b>	<b>0.010</b>	<b>1.026</b>	<b>1.247</b>	<b>0.802</b>
Strike latency	NA	0.6664	-0.005	1.377	0.886	1.129
Mean strike velocity	<b>0.3553</b>	<b>0.0109</b>	<b>0.006</b>	<b>0.053</b>	<b>1.157</b>	<b>0.864</b>
<b>20-30°C</b>						
Max. strike velocity	0.1030	0.0609	0.005	0.451	1.116	0.896
Max. strike acceleration	0.2095	0.1269	0.004	1.938	1.098	0.911
Max. gape angular velocity	<b>0.7317</b>	<b>0.0000</b>	<b>0.013</b>	<b>1.542</b>	<b>1.357</b>	<b>0.737</b>
Max. gape angular acceleration	<b>0.4121</b>	<b>0.0014</b>	<b>0.020</b>	<b>3.369</b>	<b>1.595</b>	<b>0.627</b>
Min. time to max gape	0.0808	0.0808	-0.006	1.999	0.875	1.143
Strike distance	NA	0.9542	0.000	1.290	0.995	1.005
Strike latency	NA	0.9547	-0.001	1.111	0.982	1.018
Mean strike velocity	0.2850	0.0884	0.004	0.134	1.094	0.914
<b>25-35°C</b>						
Max. strike velocity	0.5764	0.9533	0.000	0.598	1.002	0.998
Max. strike acceleration	0.0002	0.8723	-0.001	2.099	0.980	1.020
Max. gape angular velocity	<b>0.6840</b>	<b>0.0279</b>	<b>0.007</b>	<b>1.709</b>	<b>1.186</b>	<b>0.843</b>
Max. gape angular acceleration	0.0934	0.0653	0.015	3.455	1.415	0.707
Min. time to max gape	0.0065	0.3355	-0.003	1.952	0.926	1.080
Strike distance	NA	0.1854	0.008	1.091	1.192	0.839
Strike latency	NA	0.4402	0.021	0.496	1.625	0.615
Mean strike velocity	0.1388	0.6222	0.001	0.232	1.025	0.976

**Table S4:** Results of generalized linear mixed models examining the effects of species, cloacal temperature, and their interaction on strike performance variables. All models also include snake ID as a random effect, and, except for models assessing strike distance and strike latency, include strike distance as a covariate. Bolded values indicate a significant temperature effect.

Variable	15–25°C		15–35°C		20–30°C		25–35°C	
	Temp:Species F-ratio	Temp:Species P-value	Temp:Species F-ratio	Temp:Species P-value	Temp:Species F-ratio	Temp:Species P-value	Temp:Species F-ratio	Temp:Species P-value
Max. gape angular acceleration	0.1788	0.6785	0.0523	0.8204	8.7389	<b>0.0086</b>	0.0264	0.8726
Min. time to max gape	0.1494	0.7036	0.5405	0.4736	0.0217	0.8839	1.2769	0.2753
Max. gape angular velocity	0.0029	0.9573	0.1423	0.7099	2.2167	0.146	0.0803	0.7785
Max. strike acceleration	0.2035	0.6573	3.919	0.055	10.3365	<b>0.0029</b>	1.2926	0.2722
Max. strike velocity	0.9282	0.3497	5.8027	<b>0.0308</b>	0.05	0.8255	4.0043	0.0623
Mean strike velocity	1.446	0.2462	6.0369	<b>0.0244</b>	0.7943	0.3842	6.4148	<b>0.0217</b>
Strike distance	0.046	0.8326	0.2033	0.6591	2.3615	0.1444	0.0052	0.9435
Strike latency	2.1116	0.1646	1.9994	0.1746	4.85	0.0545	0.0462	0.8324

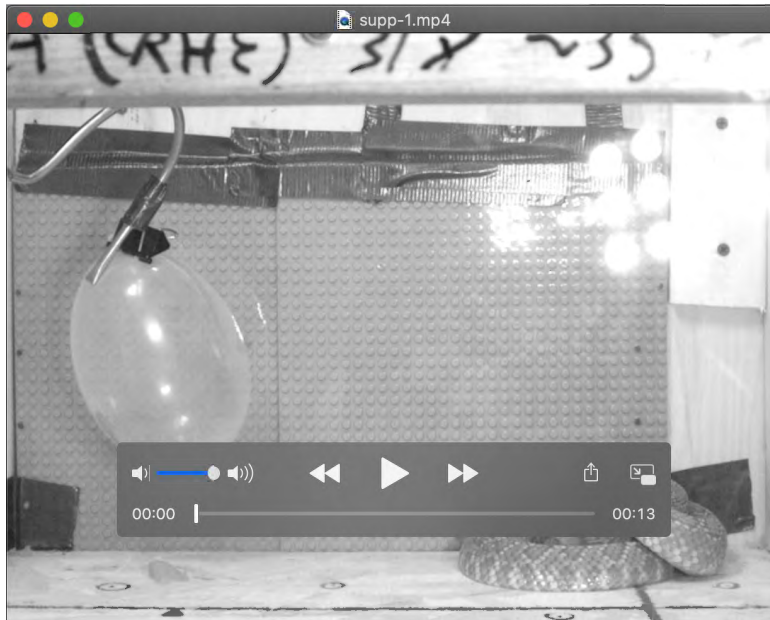
**Table S5:** Results of generalized linear models examining the effect of species within each temperature treatment on strike performance. bolded values indicate a significant temperature effect.

Variable	15°C		20°C		25°C		30°C		35°C	
	F-ratio	P-value	F-ratio	P-value	F-ratio	P-value	F-ratio	P-value	F-ratio	P-value
Max. gape angular acceleration	0.1722	0.6831	0.3669	0.5532	0.0351	0.8537	7.0268	<b>0.0163</b>	0.2611	0.6147
Min. time to max gape	20.6835	<b>0.0001</b>	7.8936	<b>0.0126</b>	3.7924	0.0693	1.3723	0.2567	11.6931	<b>0.0026</b>
Max. gape angular velocity	0.0473	0.8303	0.449	0.5124	0.0294	0.8661	2.7883	0.1123	0.0831	0.776
Max. strike acceleration	9.5708	<b>0.0063</b>	6.6051	<b>0.0206</b>	0.7384	0.4021	2.5313	0.129	0.0467	0.831
Max. strike velocity	5.9938	<b>0.0248</b>	0.3543	0.56	1.61	0.2216	0.0003	0.9875	0.262	0.6141
Mean strike velocity	1.6802	0.2113	0.2585	0.6181	0.0079	0.9303	0.2707	0.6092	0.6418	0.432
Strike distance	0.8317	0.3738	2.0562	0.1708	0.4199	0.5257	0.0137	0.9082	2.7601	0.1115
Strike latency	7.8968	<b>0.012</b>	0.2977	0.5986	0.0675	0.7988	0.0092	0.9247	0.2007	0.6588

**Table S6:** Summary table of performance values for all recorded western rattlesnake and Mohave rattlesnake defensive strikes (as opposed to summaries of maximum values only presented in Table 1) .

Variable	15°C			20°C			25°C			30°C			35°C		
	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max
<b>Western rattlesnakes</b>															
Max. strike velocity (m s <sup>-1</sup> )	2.96	2.17	3.73	3.31	2.31	4.41	3.73	2.76	5.17	3.77	2.73	5.09	3.59	2.28	5.15
Max. strike acceleration (m s <sup>-2</sup> )	72.79	43.66	112.83	89.87	59.68	134.96	111.56	56.39	319.88	104.56	77.46	146.43	102.20	65.88	160.31
Max. gape angular velocity (rad s <sup>-1</sup> )	52.82	38.20	86.14	60.52	40.93	83.48	70.27	39.57	92.21	83.25	53.36	116.31	86.01	58.88	136.86
Max. gape angular acceleration (rad s <sup>-2</sup> )	4692.94	1553.30	18397.41	5066.47	1719.33	11419.93	5785.40	2498.10	11482.01	8933.43	3166.13	20889.15	7827.36	2915.32	18514.58
Min. time to max gape (ms)	93.29	72.00	124.00	88.59	64.00	132.00	84.71	48.00	112.00	78.25	40.00	152.00	82.80	44.00	180.00
Strike distance (cm)	14.19	7.70	27.60	16.64	7.60	34.10	17.96	6.60	31.30	16.98	7.00	30.40	21.08	5.10	35.50
Strike latency (ms)	28.73	4.00	79.00	23.86	1.00	86.00	18.27	3.00	102.00	41.67	1.00	312.00	41.75	3.00	258.00
<b>Mohave rattlesnakes</b>															
Max. strike velocity (m s <sup>-1</sup> )	2.49	1.52	3.18	3.07	1.53	4.20	3.39	2.50	4.81	3.58	2.31	5.32	3.51	1.79	5.26
Max. strike acceleration (m s <sup>-2</sup> )	60.66	37.62	81.51	73.43	37.52	112.13	87.94	55.17	145.33	108.43	62.93	147.13	110.13	71.04	182.20
Max. gape angular velocity (rad s <sup>-1</sup> )	53.21	41.14	73.44	63.96	45.24	85.01	70.67	58.28	94.79	74.34	49.45	107.89	82.64	63.49	108.48
Max. gape angular acceleration (rad s <sup>-2</sup> )	4433.70	2141.27	11424.00	5257.48	2811.16	8610.11	5001.85	2874.14	9148.76	5424.34	3082.52	10964.47	6806.63	4021.71	14397.84
Min. time to max gape (ms)	81.39	60.00	136.00	73.25	56.00	96.00	72.47	56.00	104.00	65.50	40.00	96.00	58.34	32.00	76.00
Strike distance (cm)	10.30	4.00	25.30	13.66	5.70	23.00	14.43	6.50	25.40	16.12	6.30	33.80	14.77	4.50	34.50
Strike latency (ms)	112.25	14.00	280.00	18.75	4.00	27.00	75.80	1.00	283.00	57.75	1.00	233.00	83.27	1.00	260.00

## Movies



Movie 1. A defensive strike that hit the target in the 20°C treatment.



Movie 2. A defensive strike that missed the target in the 35°C treatment.