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Supplementary Materials

Loss of behavioral stress response in blind cavefish reduces energy expenditure

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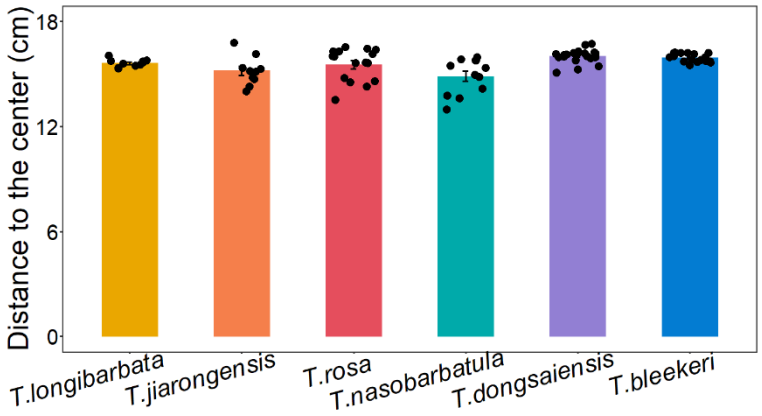
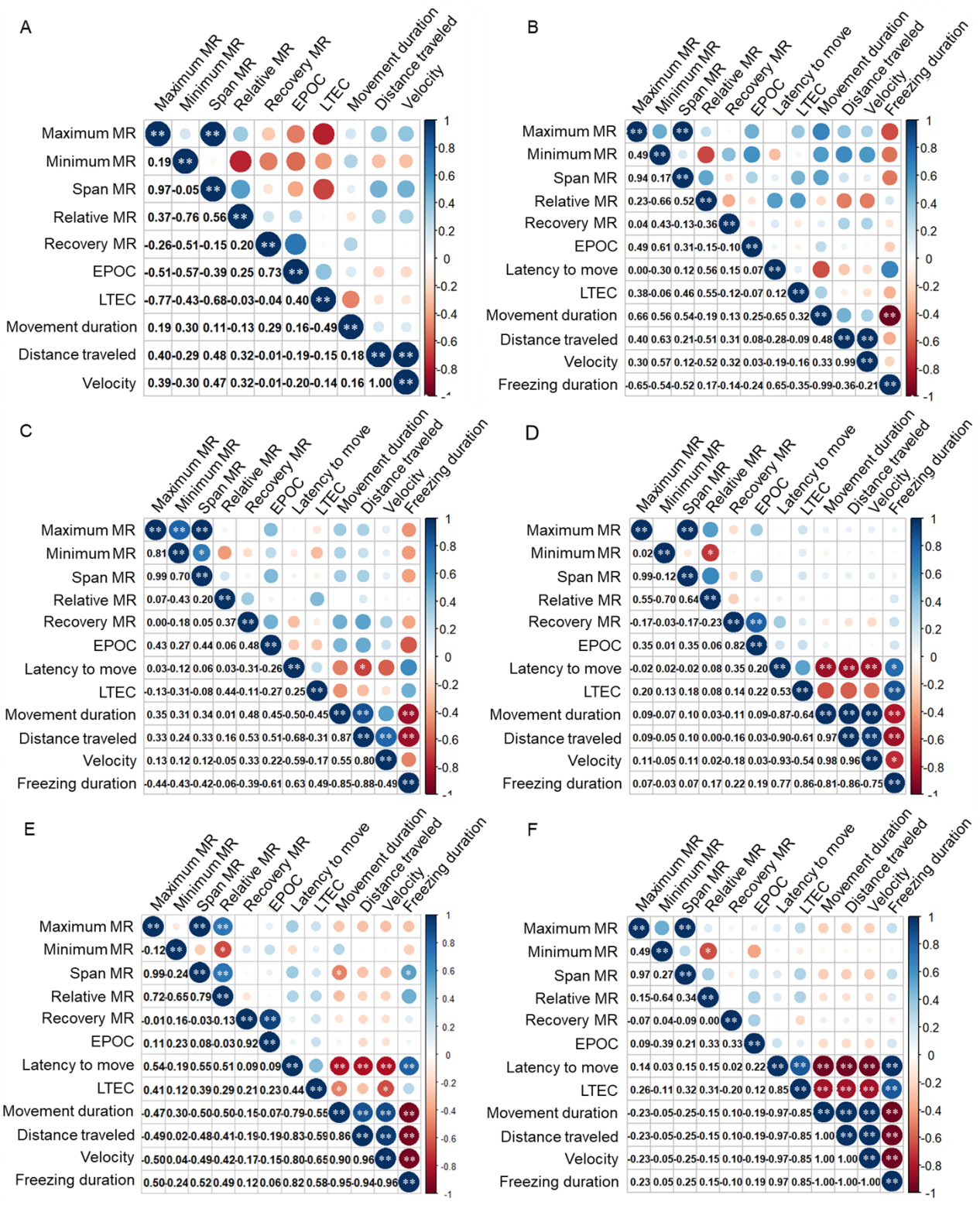


Supplementary Figure S1 Interspecies comparisons of distance to the center (thigmotaxis). Warm colors indicate cavefish (goldenrod: *T. longibarbata*; coral: *T. jiarongensis*; and crimson: *T. rosa*), cool colors indicate river fish (sea green: *T. nasobarbatula*; slate-blue: *T. dongsaiensis*; and dodger blue: *T. bleekeri*). Data among species were analyzed by one-way ANOVA with Tukey's honest significant difference (HSD) *post hoc* test. All error bars represent mean±standard error (SE).



Supplementary Figure S2 Interspecific correlations between metabolic rate (MR) and behavioral variables. (A) *T. longibarbata*; **(B)** *T. jiarongensis*; **(C)** *T. rosa*; **(D)** *T. nasobarbatula*; **(E)** *T. dongsaiensis*; **(F)** *T. bleekeri*. Span MR: difference between maximum and minimum MR (mg O_2/h); relative MR: ratio between maximum and minimum MR; recovery MR: MR recovery duration; EPOC: excess post-stress oxygen consumption (mg O_2); LTEC: latency to enter the center (min). Movement duration (s), distance traveled (body length, BL), velocity (BL/s), and freezing duration (s) data were

from the first minute of the open field test. Intraspecific correlations were analyzed by ‘corrplot’: number in the lower left corner and size of the circle in the upper right corner indicate correlation coefficients, colors in the upper right corner from blue to red indicate correlation coefficients from 1 to -1, and * indicates significance of the correlation (* $P<0.05$; ** $P<0.01$).

Supplementary Table S1 Details of fitted model design. For all formulas, y is the metabolic and behavioral variates, *Asym* is the asymptotic value, R_0 is the initial value of the dependent variable when time is zero, and *k* is the rate constant, ID is the test number of each individuals. When executing 'nlmer', we first define formula: nform <- ~ Asym + (R0 - Asym)*exp(-k*time), and then use 'deriv' to construct function: nfun <- deriv(nform, namevec = c("Asym","R0","lrc"), function.arg = c("time","Asym","R0","lrc")).

Model	Formula
1	nlmer(y ~ nfun(time, Asym, R_0, k) ~ (Asym|ID) + (R_0|ID) + (k|ID))
2	nlmer(y ~ nfun(time, Asym, R_0, k) ~ (Asym|ID) + (R_0|ID))
3	nlmer(y ~ nfun(time, Asym, R_0, k) ~ (Asym|ID) + (k|ID))
4	nlmer(y ~ nfun(time, Asym, R_0, k) ~ (R_0|ID) + (k|ID))
5	nlmer(y ~ nfun(time, Asym, R_0, k) ~ (Asym|ID))
6	nlmer(y ~ nfun(time, Asym, R_0, k) ~ (R_0|ID))
7	nlmer(y ~ nfun(time, Asym, R_0, k) ~ (k|ID))
8	nls(y ~ nfun(time, Asym, R_0,k))
9	lmer(y~ time + (1|ID))
10	lm(y~time)

Supplementary Table S2 Comparison of behavioral variable (movement duration (s), freezing duration (s), velocity (BL/s), distance traveled (BL)) fitting models. Given are AIC and the ΔAIC (in parentheses) values (ΔAIC: the AIC difference between a model of interest and the model with the lowest AIC). The model with the lowest AIC score with was selected as the best model, which are indicated in bold. Gaps in the table indicate that the model was fitted to fail due to singularity, non-convergence or others. BL: body length.

Variates	Model	*T. longibarbata*	*T. jiarongensis*	*T. rosa*	*T. nasobarbatula*	*T. dongsaiensis*	*T. bleekeri*
Movement duration (s)	1	891.08 (3.32)	2157.39 (4)		2961.35 (2)	4871.01 (5.18)	**3873.15 (0)**
	2	888.42 (0.66)	2155.39 (2)		**2959.35 (0)**	**4865.83 (0)**	3924.15 (51.00)
	3	N/A	2155.39 (2)			4866.58 (0.75)	3964.85 (91.69)
	4	N/A	2169.01 (15.62)		2963.12 (3.78)		
	5	**887.76 (0)**	**2153.39 (0)**		3056.19 (96.84)	4909.14 (43.31)	4031.03 (157.88)
	6		2167.01 (13.62)		3041.05 (81.70)	4919.35 (53.52)	
	7		2204.53 (51.14)		3010.66 (51.31)	4936.30 (70.47)	4028.70 (155.54)
	8		2410.56 (257.17)		3195.82 (240.43)	5201.77 (335.94)	4326.48 (453.33)
	9	905.47 (17.71)	2168.34 (14.95)	**3922.43 (0)**	3040.13 (80.78)	4951.09 (85.27)	4099.12 (225.97)
	10	926.86 (39.10)	2408.65 (255.26)	4160.68 (238.25)	3199.51 (244.12)	5208.78 (342.95)	4330.23 (457.08)
Freezing duration (s)	1		2075.54 (4.02)	3876.03 (2)	3024.90 (2.18)	5137.15 (2.68)	
	2		2073.59 (2.07)	**3874.03 (0)**	**3022.72 (0)**	**5134.48 (0)**	**4038.02 (0)**
	3		2073.58 (2.06)		3083.81 (61.09)	5243.37 (108.90)	4172.59 (134.58)
	4		2086.09 (14.57)		3031.43 (8.71)		
	5		**2071.52 (0)**		3109.58 (86.86)	5169.14 (34.66)	4139.02 (101.00)
	6		2083.71 (12.18)	3940.23 (66.20)			4134.20 (96.18)
	7		2112.65 (41.13)	4032.48 (158.45)	3094.43 (71.71)	5197.23 (62.76)	
	8		2301.23 (229.70)		3270.63 (249.71)	5466.12 (331.64)	4477.69 (439.68)
	9	**67.60 (0)**	2085.87 (14.35)	3946.18 (72.15)	3105.29 (82.57)	5211.41 (76.94)	4222.33 (184.31)
	10	72.61 (5.01)	2299.54 (228.02)	4160.37 (286.34)	3275.44 (257.72)	5474.98 (340.51)	4482.12 (444.11)
Velocity (BL/s)	1	**-134.75 (0)**	**37.85393 (0)**	142.23 (1.90)	311.94 (2.73)	-165.78 (5.19)	**774.58 (0)**
	2	-125.66 (9.09)	47.58044 (9.73)	**140.32 (0)**	**309.21 (0)**	**-170.97(0)**	777.62 (3.04)
	3	-79.30 (55.44)	61.55024 (23.70)	185.56 (45.24)	340.62 (31.41)	-143.88 (27.09)	814.39 (39.81)

	4		39.28 (1.43)	163.40 (23.08)	324.30 (15.09)		
	5	-99.29 (35.45)	105.78 (67.92)	173.33 (33.00)	351.66 (42.45)	-66.93 (104.04)	806.36 (31.77)
	6	-100.69 (34.06)	71.67 (33.82)	178.45 (28.12)		-94.89 (76.08)	
	7	-70.24 (64.51)	62.78 (24.93)	191.48 (51.15)	366.00 (56.79)	-31.25 (139.72)	810.76 (153.53)
	8	132.94 (267.68)	281.53 (243.67)	291.08 (150.75)	480.75 (171.54)	440.82 (611.78)	928.11 (72.69)
	9	-84.38 (50.37)	94.88 (57.02)	193.55 (53.23)	399.69 (90.48)	-54.87 (116.10)	847.28 (72.69)
	10	132.74 (267.48)	294.00 (256.15)	292.68 (152.35)	490.15 (180.94)	442.98 (613.96)	936.50 (161.92)
Distance traveled (BL)	1	**2332.73 (0)**		3769.81 (20.05)	3025.4 (2)	4588.00 (2)	4166.80 (2)
	2	2335.83 (3.1)	**2515.56 (0)**	**3749.76 (0)**	**3023.4 (0)**	**4586.01 (0)**	**4164.80 (0)**
	3	2358.01 (25.27)	2537.595 (22.03)	3761.17 (11.41)	3161.98 (138.57)		
	4		2537.595 (22.03)	3761.17 (11.41)	3161.98 (138.57)		
	5	2361.074 (28.34)	2582.478 (66.91)		3081.44 (58.03)	4671.85 (85.84)	4216.77 (51.98)
	6	2359.91 (27.18)	2535.566 (20.00)	3828.17 (78.41)		4674.98 (88.97)	
	7	2399.50 (66.77)	2552.695 (37.13)		3135.81 (112.41)	4678.99 (92.98)	
	8	2594.20 (261.47)	2410.556 (255.32)	3976.24 (226.50)	3179.25 (155.85)	5141.70 (555.69)	4419.12 (254.32)
	9	2360.14 (27.41)	2543.98 (28.42)	3833.92 (84.16)	3090.96 (67.55)	4757.56 (16.56)	4259.53 (94.73)
	10	2593.98(261.25)	2780.819 (265.26)	3977.34 (227.58)	3183.15 (159.74)	5141.08 (555.07)	4425.05 (260.25)

Supplementary Table S3 Comparison of metabolic rate (mg O_2/h) fitting models. Given are AIC and the ΔAIC (in parentheses) values (ΔAIC: the AIC difference between a model of interest and the model with the lowest AIC). The model with the lowest AIC score with was selected as the best model, which are indicated in bold.

Model	*T. longibarbata*	*T. jiarongensis*	*T. rosa*	*T. nasobarbatula*	*T. dongsaiensis*	*T. bleekeri*
1	**-796.98 (0)**	-928.48 (2)	**-1075.15 (0)**	-824.83 (2)	-4095.15 (2)	**-642.26 (0)**
2	-784.54 (12.44)	**-930.48 (0)**	-1005.10 (70.05)	**-826.83 (0)**	**-4097.15 (0)**	-641.50 (0.76)
3	-781.27 (15.71)	-925.18 (5.30)	-892.07 (183.08)	-591.29 (253.55)	-3602.09 (495.06)	-564.54 (77.72)
4	-766.47 (30.51)	-927.32 (3.15)	-941.28 (133.86)	-763.81 (63.03)	-3995.96 (101.20)	-629.75 (12.50)
5	-773.48 (23.51)	-903.42 (27.05)	-895.99 (179.16)	-586.07 (240.76)	-3604.09 (493.06)	-563.68 (78.58)
6	-768.99 (27.99)	-926.32 (4.16)	-906.71 (168.43)	-765.78 (61.05)	-3970.04 (127.12)	-499.26 (143.00)
7	-758.04 (38.95)	-848.19 (82.29)	-816.84 (258.30)	-582.87 (243.97)	-3559.79 (537.37)	-501.87 (140.39)
8	-759.95 (37.03)	-802.83 (127.65)	-732.29 (342.86)	-573.93 (252.90)	-3561.69 (535.46)	-436.45 (205.81)
9	-723.35 (73.64)	-894.65 (35.83)	-860.87 (214.28)	-488.36 (338.47)	-2395.34 (1701.81)	-322.67 (319.58)
10	-739.54 (57.44)	-796.66 (133.82)	-688.71 (386.44)	-493.26 (333.57)	-2421.27 (1675.88)	-256.52 (385.74)