Supplementary Material

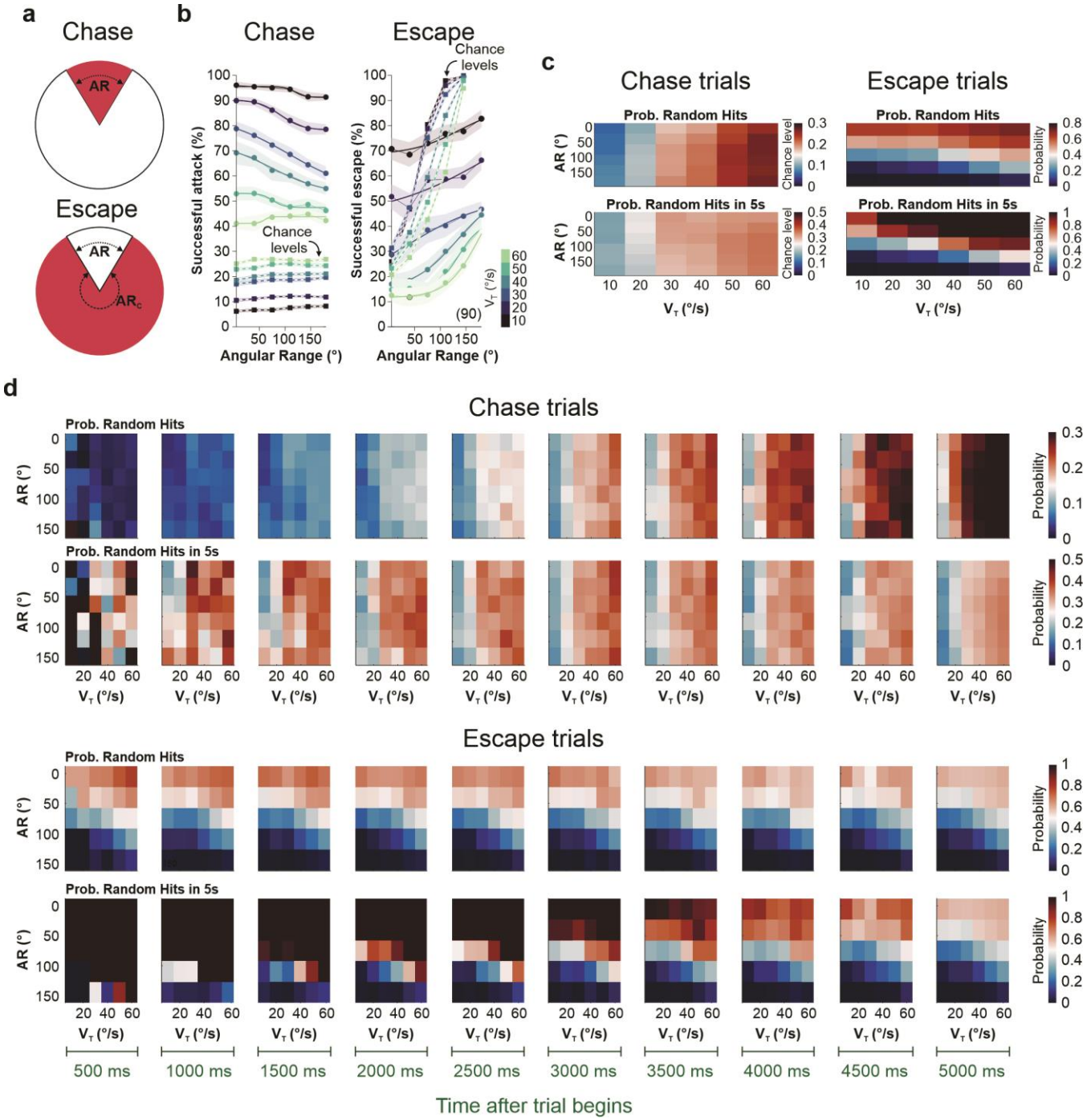
Directional uncertainty in chase and escape dynamics

Mario Treviño[1*], Ricardo Medina-Coss y León[1,2], Sergio Támez[1], Beatriz Beltrán-Navarro[3], Jahir Verdugo[1]

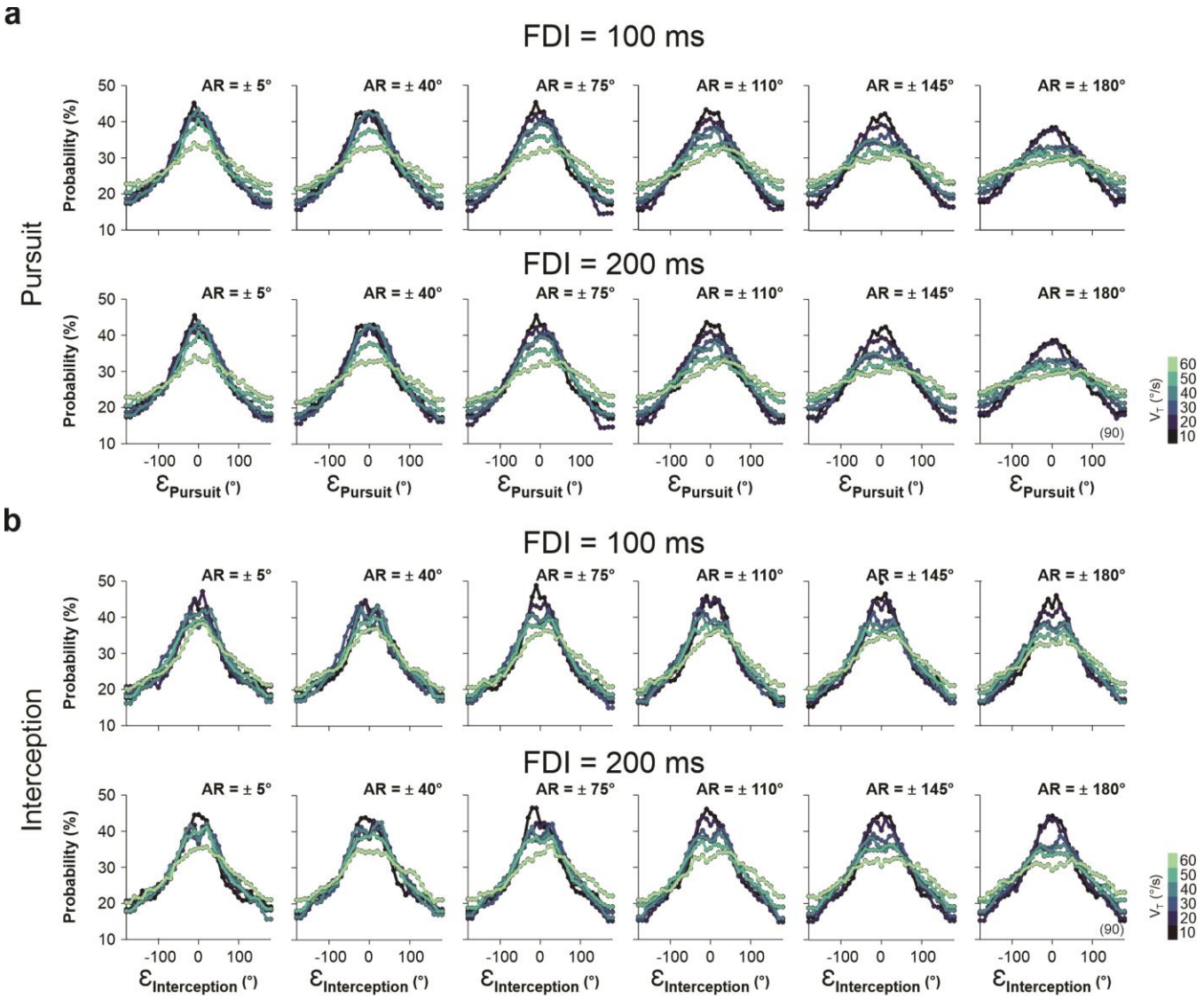
[1]Laboratorio de Plasticidad Cortical y Aprendizaje Perceptual, Instituto de Neurociencias, Universidad de Guadalajara, Guadalajara, Jalisco, México
[2]Southern Illinois University School of Medicine, Springfield, Illinois, USA
[3]Departamento de Neurociencias, Centro Universitario de Ciencias de la Salud, Universidad de Guadalajara, Guadalajara, Jalisco, México.

Correspondence:

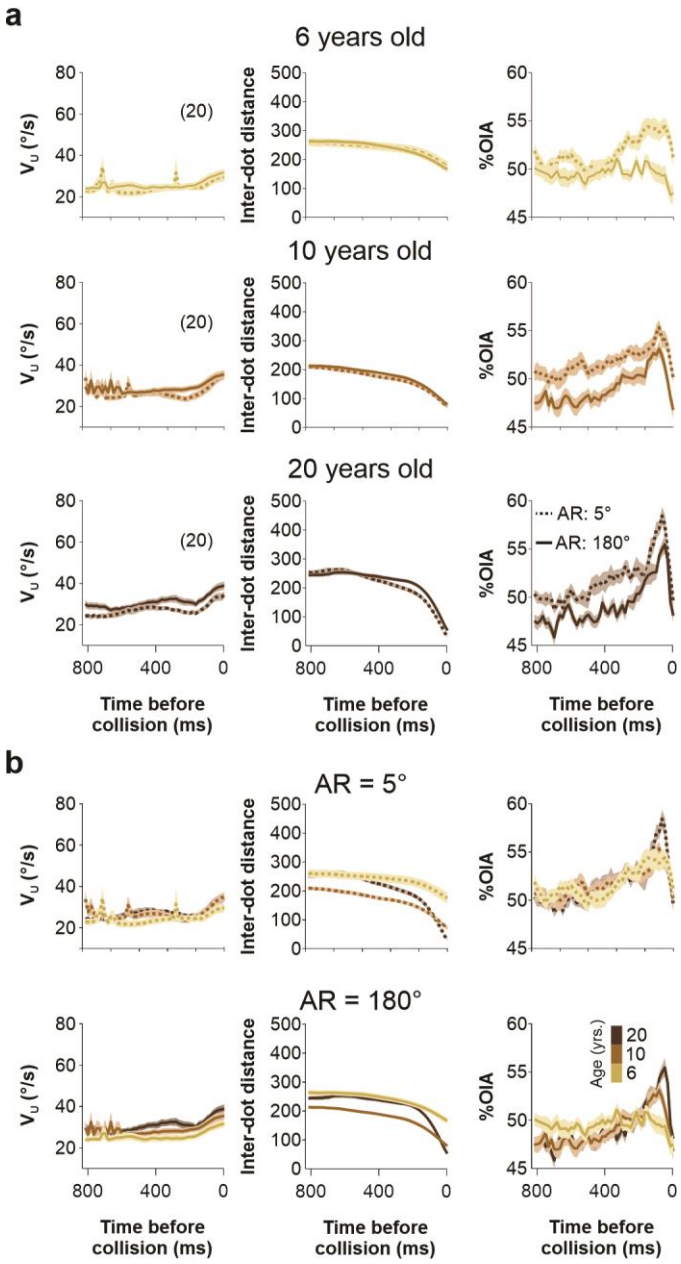
*Dr. Mario Treviño (mariomtv@hotmail.com), Laboratorio de Plasticidad Cortical y Aprendizaje Perceptual, Instituto de Neurociencias, Universidad de Guadalajara. Francisco de Quevedo 180, Arcos Vallarta. C.P. 44130. Guadalajara, Jalisco, México.



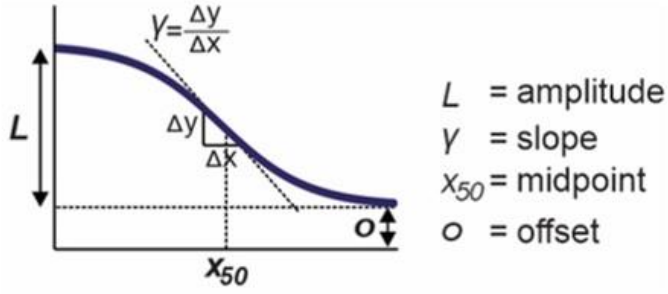
Supplementary Figure 1. Estimating random collisions in chasing and escaping experiments. **a** Random collisions in chase trials were estimated by simulating alternative computer trajectories using the same v_T and AR as those used for the original trials (upper panel). For escape trials, we calculated random collisions by using the same v_T and AR_C (the complement of AR; lower panel; see **Methods**). **b** Psychometric curves from groups of participants solving the chase (right) and escape trials (left). Squares represent chance levels obtained by calculating random collisions. **c** Color panels show the probability of random collision during the analyzed trials (*i.e.*, using paths from the actual traces; upper panels), and the probability of random collision in a time window of 5 s (equivalent to max. trial duration). Both probability colormaps are shown as a function of AR and v_T with an FDI = 100 ms. **d** Similar analyses as before but breaking them down into cumulative 500 ms windows, from the beginning of the trial to the max duration of a trial. Labels for the corresponding time windows on the bottom. Number of participants in parentheses.



Supplementary Figure 2. Gaussian fits to tracking and interception distributions of angular errors. This figure is complementary to *Figure 4b*. The panels show the Gaussian fits to the observed distributions of angular errors for pursuit (**a**) and interception (**b**) errors (see **Methods**). Colorbar represents v_T. Number of participants per experiment in parentheses.



Supplementary Figure 3. Changes in chasing/escaping v_U and IDD through development. This figure is complementary to *Figure 6c,d*. **a** Collision triggered averages of user speed (v_U), inter-dot distance (IDD), and %OIA (see **Method**) before colliding with the target from infants and youngsters belonging to three groups: 5, 10 and 20 years of age. **b** Same analysis but with over imposed traces for the different age groups, which are represented in the colorbar to the right. Number of participants in parentheses.



Chase

	FDI = 100 ms				FDI = 200 ms				
V_{CT}	*L*	γ	x_{50}	o	*L*	γ	x_{50}	o	n
10	0.13 ± 0.06	0.45 ± 0.10	67.81 ± 8.394	0.87 ± 0.03	0.12 ± 0.06	0.44 ± 0.11	94.89 ± 15.90	0.92 ± 0.03	15
20	0.21 ± 0.05	0.27 ± 0.09	97.74 ± 16.46	0.76 ± 0.02	0.24 ± 0.07	0.39 ± 0.10	90.69 ± 16.24	0.78 ± 0.03	15
30	0.19 ± 0.02	0.35 ± 0.09	79.94 ± 9.72	0.60 ± 0.02	0.15 ± 0.03	0.52 ± 0.11	73.96 ± 9.35	0.64 ± 0.03	15
40	0.30 ± 0.09	0.49 ± 0.10	108.91 ± 13.96	0.51 ± 0.03	0.31 ± 0.09	0.42 ± 0.10	97.39 ± 14.14	0.52 ± 0.05	15
50	0.20 ± 0.06	0.46 ± 0.10	104.75 ± 14.84	0.41 ± 0.04	0.23 ± 0.07	0.53 ± 0.08	109.70 ± 17.38	0.47 ± 0.03	15
60	0.16 ± 0.06	0.51 ± 0.11	93.01 ± 14.96	0.35 ± 0.03	0.09 ± 0.02	0.69 ± 0.09	99.74 ± 11.49	0.39 ± 0.01	15

Escape

	FDI = 100 ms				FDI = 200 ms				
V_{CT}	*L*	γ	x_{50}	o	*L*	γ	x_{50}	o	n
10	0.31 ± 0.07	0.59 ± 0.09	108.48 ± 13.22	0.65 ± 0.05	0.33 ± 0.07	0.46 ± 0.09	122.25 ± 12.37	0.51 ± 0.03	15
20	0.31 ± 0.07	0.60 ± 0.09	99.19 ± 11.63	0.45 ± 0.04	0.37 ± 0.06	0.45 ± 0.07	124.70 ± 12.55	0.32 ± 0.02	15
30	0.29 ± 0.06	0.60 ± 0.07	96.87 ± 10.72	0.27 ± 0.04	0.44 ± 0.06	0.50 ± 0.08	119.17 ± 11.42	0.21 ± 0.03	15
40	0.42 ± 0.07	0.41 ± 0.08	124.56 ± 10.58	0.16 ± 0.03	0.45 ± 0.06	0.33 ± 0.08	125.48 ± 9.21	0.17 ± 0.03	15
50	0.45 ± 0.08	0.39 ± 0.08	143.88 ± 9.26	0.13 ± 0.03	0.47 ± 0.06	0.40 ± 0.07	119.93 ± 12.05	0.14 ± 0.03	15
60	0.35 ± 0.06	0.41 ± 0.09	143.38 ± 9.73	0.11 ± 0.03	0.53 ± 0.06	0.28 ± 0.08	115.71 ± 10.22	0.12 ± 0.03	15

Supplementary Table 1. Parameter fits from the psychometric curves from chasing and escaping experiments. This table shows averages ± S.E.M.

Chase

	FDI = 100 ms				FDI = 200 ms				
V_{CT}	L	γ	x_{50}	o	L	γ	x_{50}	o	n
10	0.05 ± 0.01	0.46	74.70 ± 6.80	0.91 ± 0.01	0.05 ± 0.02	0.46	79.67 ± 12.74	0.94 ± 0.01	15
20	0.11 ± 0.02	0.46	80.08 ± 6.24	0.79 ± 0.02	0.09 ± 0.01	0.46	77.03 ± 7.80	0.84 ± 0.01	15
30	0.15 ± 0.01	0.46	89.42 ± 6.78	0.63 ± 0.02	0.11 ± 0.02	0.46	78.48 ± 8.61	0.67 ± 0.03	15
40	0.17 ± 0.03	0.46	95.83 ± 10.54	0.55 ± 0.02	0.16 ± 0.03	0.46	98.80 ± 11.42	0.58 ± 0.04	15
50	0.08 ± 0.02	0.46	86.41 ± 10.48	0.46 ± 0.02	0.15 ± 0.04	0.46	88.62 ± 12.91	0.47 ± 0.03	15
60	0.14 ± 0.05	0.46	79.57 ± 10.73	0.38 ± 0.02	0.08 ± 0.02	0.46	87.93 ± 10.22	0.39 ± 0.01	15

Escape

	FDI = 100 ms				FDI = 200 ms				
V_{CT}	L	γ	x_{50}	o	L	γ	x_{50}	o	n
10	0.14 ± 0.02	0.46	89.95 ± 8.72	0.68 ± 0.04	0.17 ± 0.02	0.46	80.42 ± 7.82	0.50 ± 0.03	15
20	0.18 ± 0.03	0.46	82.68 ± 8.42	0.47 ± 0.04	0.26 ± 0.04	0.46	109.27 ± 8.05	0.32 ± 0.02	15
30	0.23 ± 0.02	0.46	88.28 ± 9.50	0.28 ± 0.04	0.26 ± 0.02	0.46	92.41 ± 7.74	0.24 ± 0.03	15
40	0.25 ± 0.02	0.46	99.43 ± 7.65	0.17 ± 0.03	0.31 ± 0.03	0.46	114.24 ± 7.12	0.20 ± 0.03	15
50	0.26 ± 0.02	0.46	124.20 ± 5.62	0.14 ± 0.03	0.30 ± 0.02	0.46	101.68 ± 8.14	0.17 ± 0.03	15
60	0.29 ± 0.05	0.46	125.69 ± 7.54	0.11 ± 0.03	0.34 ± 0.02	0.46	97.22 ± 6.41	0.15 ± 0.03	15

Supplementary Table 2. Parameter fits from the psychometric curves from chasing and escaping experiments with a fixed γ for all groups. This table shows averages ± S.E.M.

Chase

	FDI = 100 ms				FDI = 200 ms				
V_{CT}	*L*	γ	x_{50}	o	*L*	γ	x_{50}	o	n
10	0.37 ± 0.12	0.29 ± 0.12	93.74	0.76 ± 0.06	0.33 ± 0.11	0.34 ± 0.13	93.74	0.79 ± 0.05	15
20	0.37 ± 0.11	0.20 ± 0.10	93.74	0.66 ± 0.05	0.52 ± 0.12	0.28 ± 0.12	93.74	0.63 ± 0.06	15
30	0.38 ± 0.11	0.29 ± 0.12	93.74	0.52 ± 0.06	0.40 ± 0.12	0.24 ± 0.11	93.74	0.53 ± 0.06	15
40	0.48 ± 0.12	0.23 ± 0.11	93.74	0.39 ± 0.06	0.45 ± 0.11	0.16 ± 0.09	93.74	0.42 ± 0.06	15
50	0.36 ± 0.10	0.22 ± 0.11	93.74	0.32 ± 0.05	0.57 ± 0.11	0.15 ± 0.09	93.74	0.24 ± 0.06	15
60	0.37 ± 0.10	0.10 ± 0.07	93.74	0.24 ± 0.05	0.18 ± 0.08	0.32 ± 0.12	93.74	0.34 ± 0.04	15

Escape

	FDI = 100 ms				FDI = 200 ms				
V_{CT}	*L*	γ	x_{50}	o	*L*	γ	x_{50}	o	n
10	0.29 ± 0.09	0.20 ± 0.08	93.74	0.60 ± 0.05	0.33 ± 0.11	0.34 ± 0.13	93.74	0.79 ± 0.05	15
20	0.50 ± 0.09	0.23 ± 0.09	93.74	0.32 ± 0.05	0.52 ± 0.12	0.28 ± 0.12	93.74	0.63 ± 0.06	15
30	0.47 ± 0.07	0.18 ± 0.08	93.74	0.15 ± 0.04	0.40 ± 0.12	0.24 ± 0.11	93.74	0.53 ± 0.06	15
40	0.41 ± 0.06	0.18 ± 0.08	93.74	0.08 ± 0.02	0.45 ± 0.11	0.16 ± 0.09	93.74	0.42 ± 0.06	15
50	0.27 ± 0.03	0.18 ± 0.07	93.74	0.10 ± 0.03	0.57 ± 0.11	0.15 ± 0.09	93.74	0.24 ± 0.06	15
60	0.24 ± 0.04	0.19 ± 0.08	93.74	0.08 ± 0.03	0.18 ± 0.08	0.32 ± 0.12	93.74	0.34 ± 0.04	15

Supplementary Table 3. Parameter fits from the psychometric curves from chasing and escaping experiments with a fixed x_{50} for all groups. This table shows averages ± S.E.M.