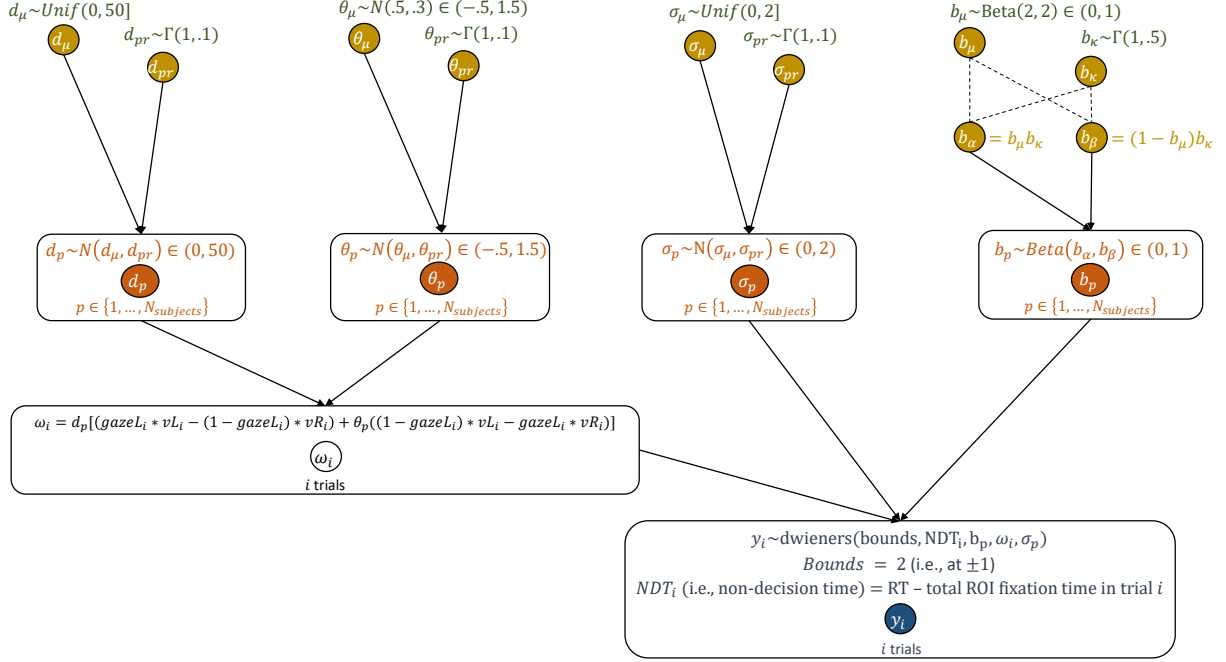
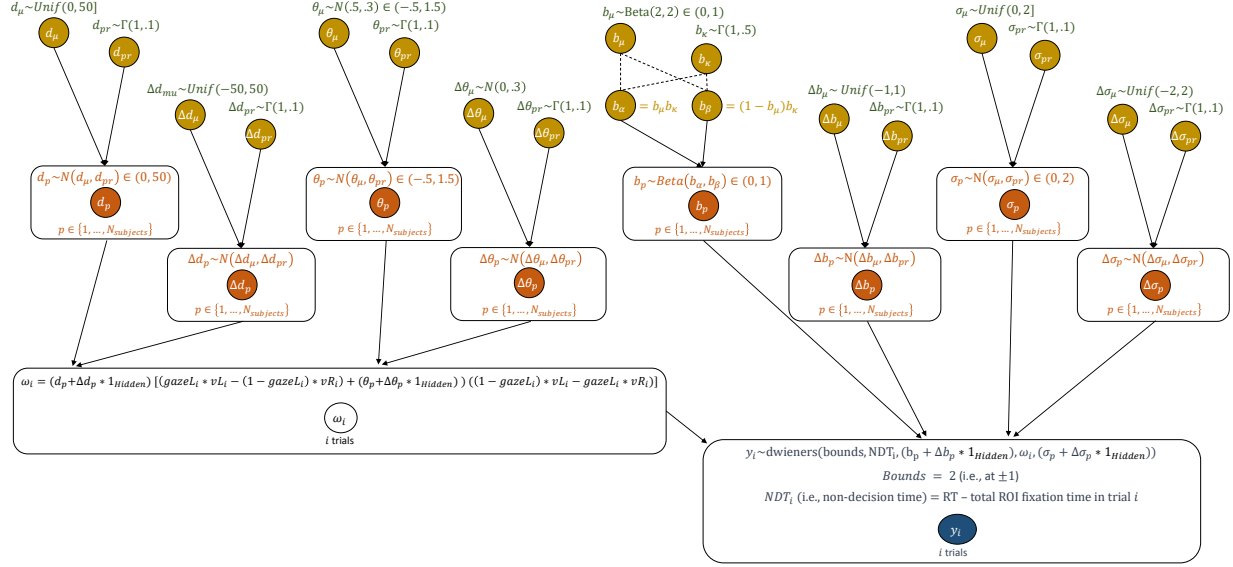


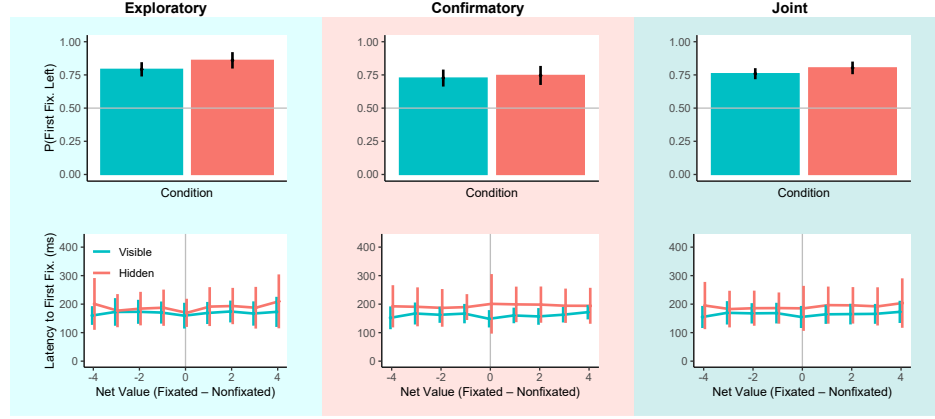
Supplementary Material



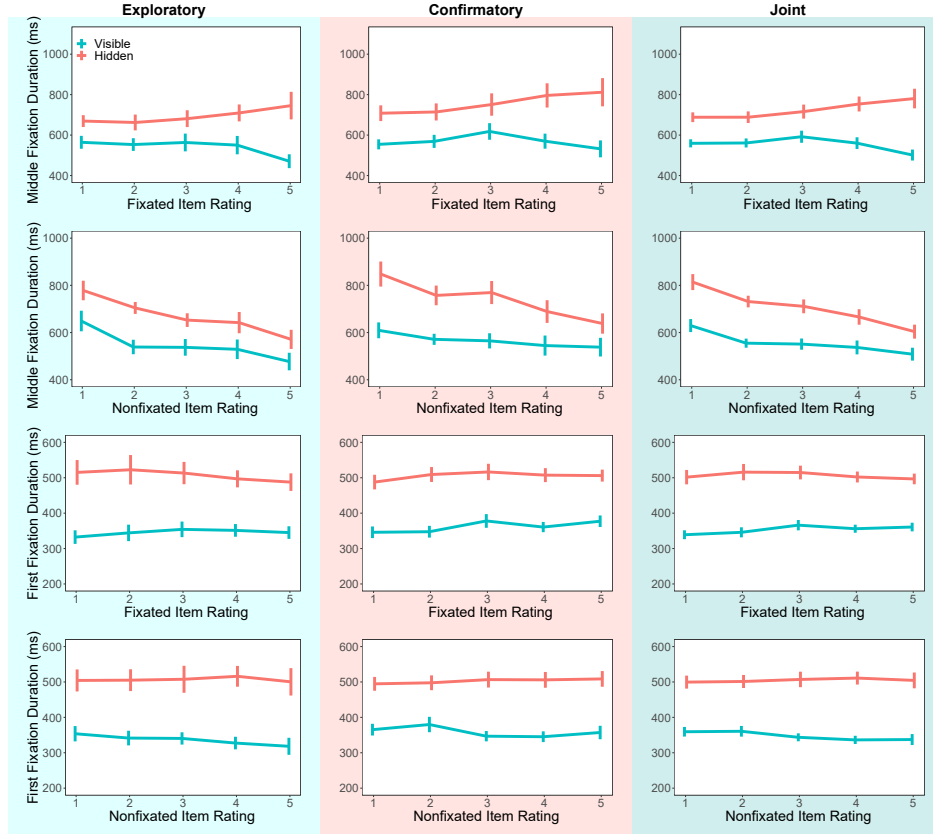
Supplementary Fig. 1. Directed acyclic graph of hierarchical aDDM with uncorrelated priors. The hierarchical model estimates group and individual parameters for the aDDM with uncorrelated priors. The 10 group parameters are depicted in the top row of yellow circles. The 4 individual parameters estimated for each subject are depicted in orange in the middle row. The distribution of individual parameters as a function of the group parameters is specified using a transformation of some of the parameters, denoted by the dashed lines. The choice and RT outcome y_i of trial i for a subject p is modeled as a Drift-Diffusion-Model with bounds at ± 1 , non-decision time NDT_i , bias b_p , trial specific slope ω_i , and noise σ_p . The trial specific slope ω_i depends on the subject's drift rate parameter d_p , attentional bias parameter θ_p , gaze data for the trial $\text{gaze}L_i$, and item liking ratings for the foods used in the trial (vL_i, vR_i). $\text{gaze}L_i$ denotes the proportion of time spent fixating on the left item during the trial. The hyperpriors for the group parameters are described at the top of the graph. “ $\in (X, Y)$ ” indicates truncation to bounds. $N_{\text{subjects}} = 25$ in the exploratory and confirmatory datasets, and 50 in the joint dataset.



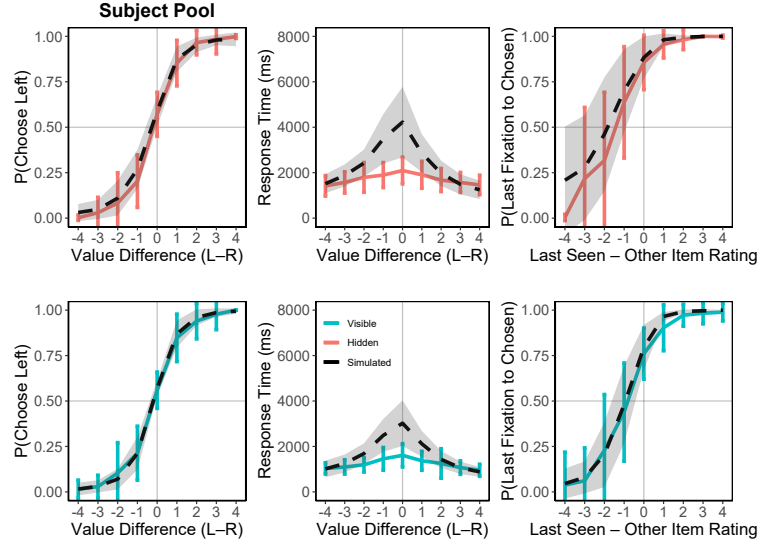
Supplementary Fig. 2. Directed acyclic graph of hierarchical aDDM with correlated priors. The hierarchical model estimates group and individual parameters for the aDDM with correlated priors. The 18 group parameters are depicted in the top row of yellow circles. The 8 individual parameters estimated for each subject are depicted in orange in the middle row. The distribution of individual parameters as a function of the group parameters is specified using a transformation of some of the parameters, denoted by the dashed lines. The choice and RT outcome y_i of trial i for a subject p is modeled as a Drift-Diffusion-Model with bounds at ± 1 , non-decision time NDT_i , bias b_p , conditional difference in bias Δb_p , trial specific slope ω_i , noise σ_p , and conditional difference in noise $\Delta \sigma_p$. The trial specific slope ω_i depends on the subject's drift rate parameter d_p , conditional difference in drift rate parameter Δd_p , attentional bias parameter θ_p , conditional difference in attentional bias parameter $\Delta \theta_p$, gaze data for the trial $\text{gaze}L_i$, and item liking ratings for the foods used in the trial (vL_i, vR_i) . $\text{gaze}L_i$ denotes the proportion of time spent fixating on the left item during the trial. The hyperpriors for the group parameters are described at the top of the graph. “ $\in (X, Y)$ ” indicates truncation to bounds. $N_{subjects} = 25$ in the exploratory and confirmatory datasets, and 50 in the joint dataset.



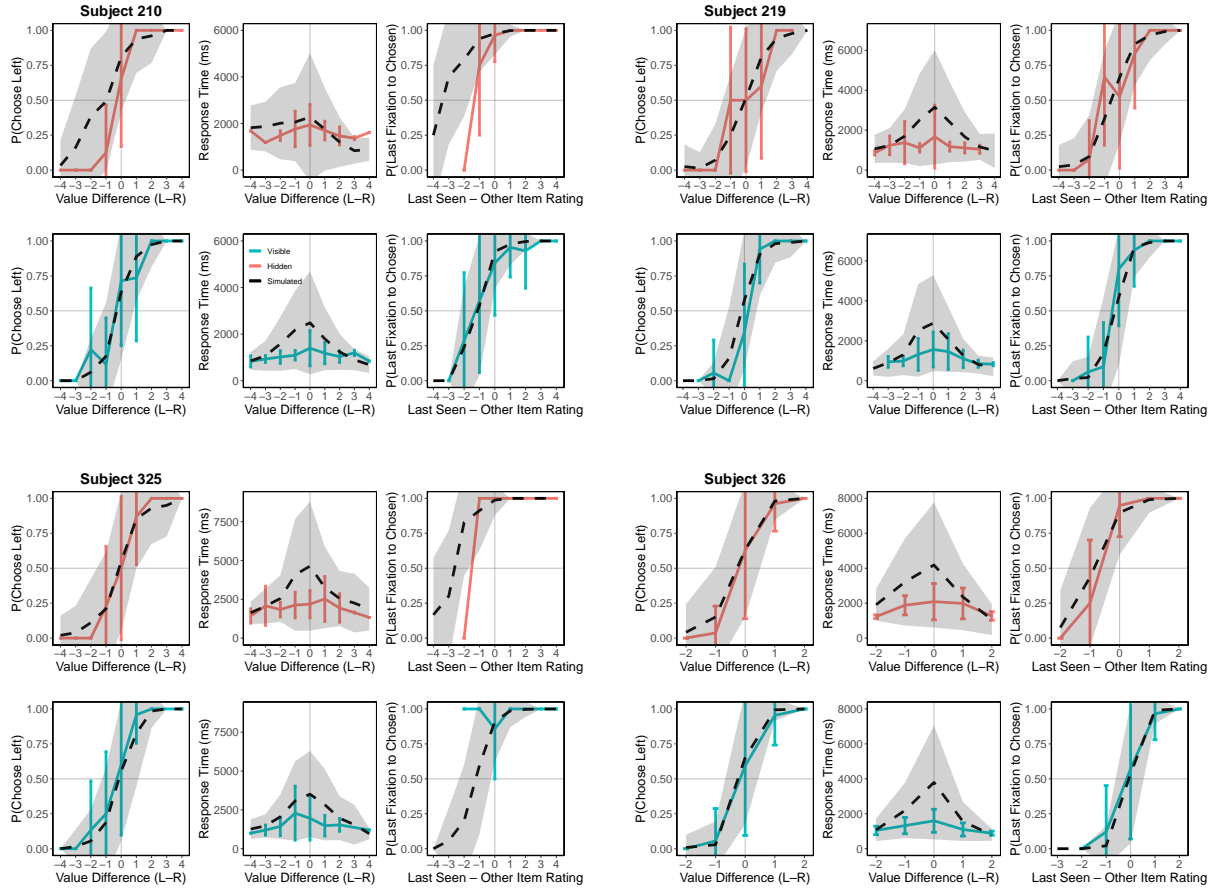
Supplementary Fig. 3. Additional fixation properties. (Top) Probability of first fixation to the left item in the two conditions. (Bottom) Latency to first fixation as a function of the relative rating of the fixated item. Columns indicate which dataset generated the figures. Black error bars show standard errors of the mean across participants. Color error bars show standard deviation across participants.



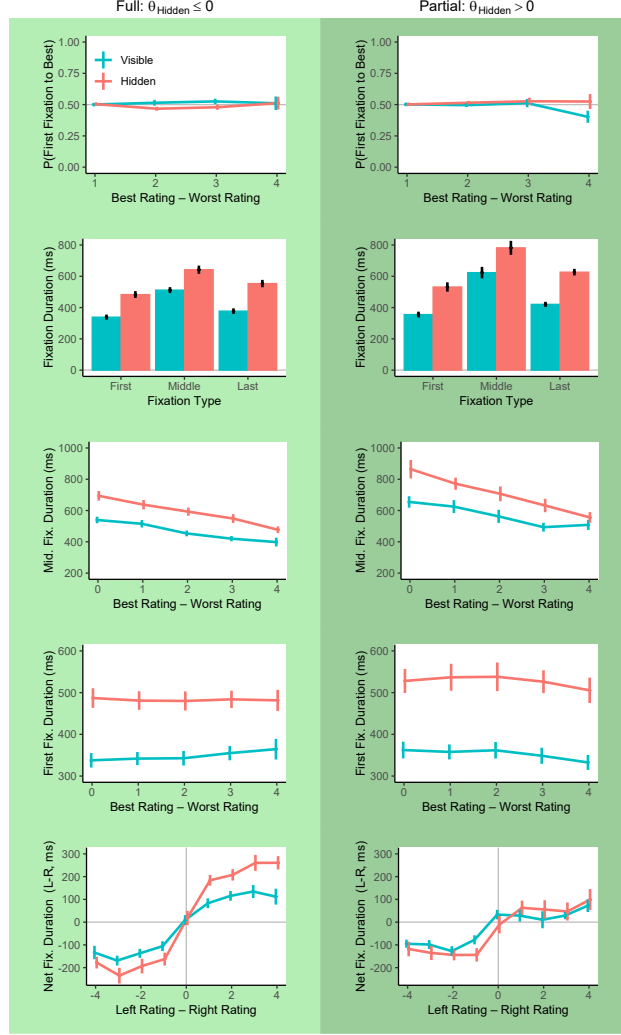
Supplementary Fig. 4. Fixation durations. (Row 1) Middle fixation duration as a function of the fixated item rating. (Row 2) Middle fixation duration as a function of the nonfixated item rating. (Row 3) First fixation duration as a function of the fixated item rating. (Row 4) First fixation duration as a function the nonfixated item rating. Columns indicate which dataset generated the figures. Error bars show standard errors of the mean across participants.



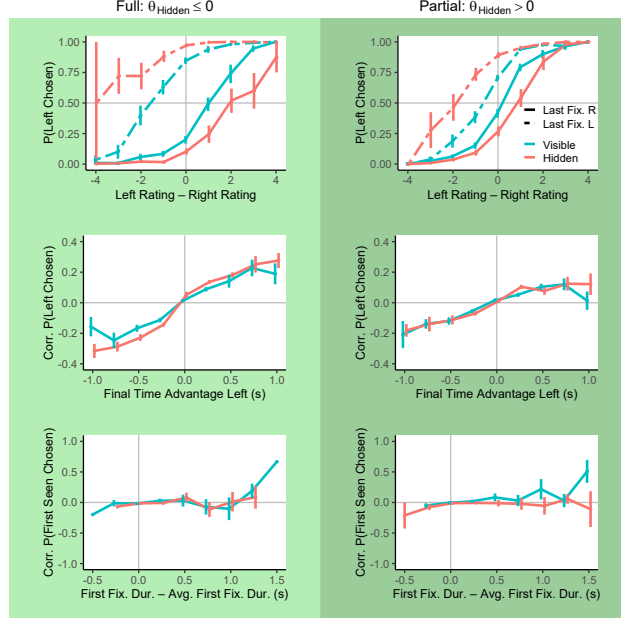
Supplementary Fig. 5. Group level predictions in the joint dataset. We use the estimates of the hierarchical aDDM in the odd trials to make predictions out-of-sample, in the even trials, separately for each subject and condition. For each subject, we simulate 10 observations per trial, and compare the simulated and observed data. *Blue lines*: Behavior in the visible condition. *Red lines*: Behavior in the hidden condition. *Black dashed lines and grey areas*: Simulated behavior for the respective condition (dash = mean, grey = SD). Error bars show standard deviations across subjects.



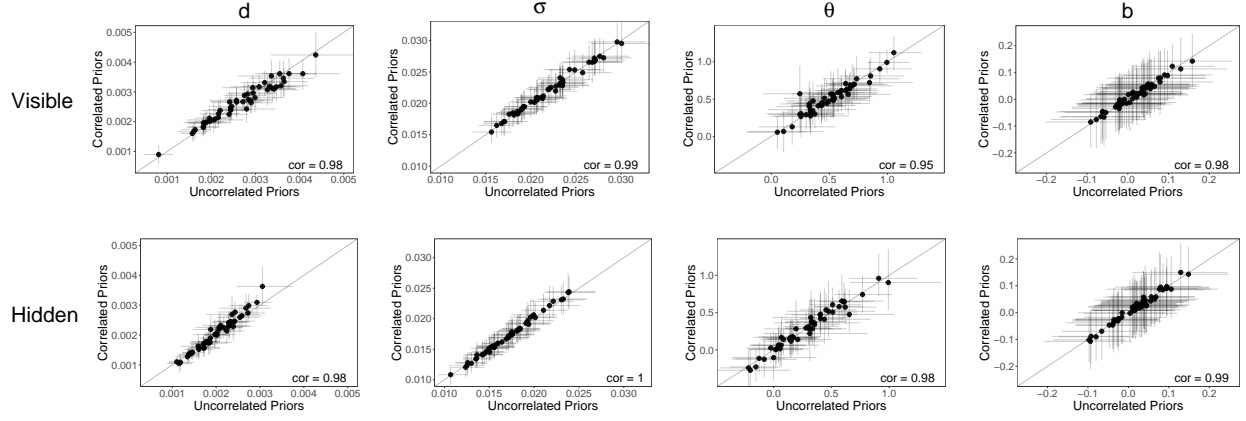
Supplementary Fig. 6. Subject-level simulations. Out-of-sample predictions versus data for four randomly selected subjects. See Figure S5 and Supplementary Methods for details. *Blue lines*: Behavior in the visible condition. *Red lines*: Behavior in the hidden condition. *Black dashed lines and grey areas*: Simulated behavior for the respective condition (dash = mean, grey = SD). Error bars show standard deviations across subjects.



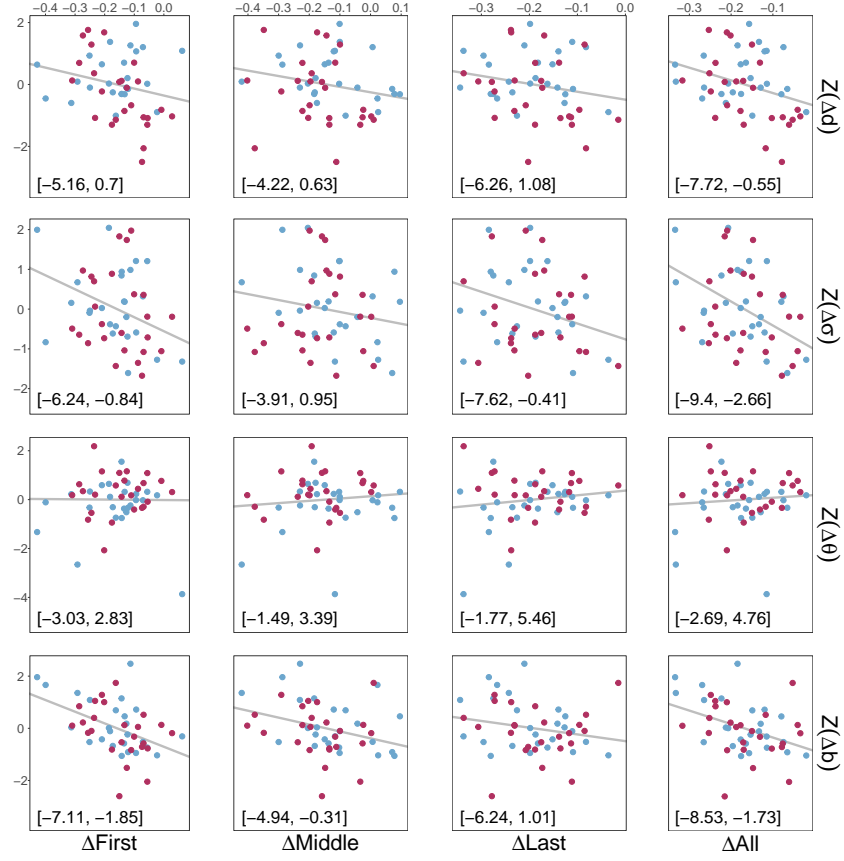
Supplementary Fig. 7. Fixation properties by attentional discounting group. (Row 1) The probability that the first fixation is to the best item as a function of choice difficulty. (Row 2) Fixation durations by fixation type. (Row 3) Middle fixation duration as a function of choice difficulty. (Row 4) First fixation duration as a function of choice difficulty. (Row 5) Net fixation duration to the left item as a function of its relative value. Columns indicate which dataset generated the figures: “ $\theta_{\text{Hidden}} \leq 0$ ” indicates subjects with full attentional discounting ($N = 7$), “ $\theta_{\text{Hidden}} > 0$ ” indicates subjects with partial attentional discounting ($N = 43$). Data is from the joint dataset. Error bars show standard errors of the mean across participants.



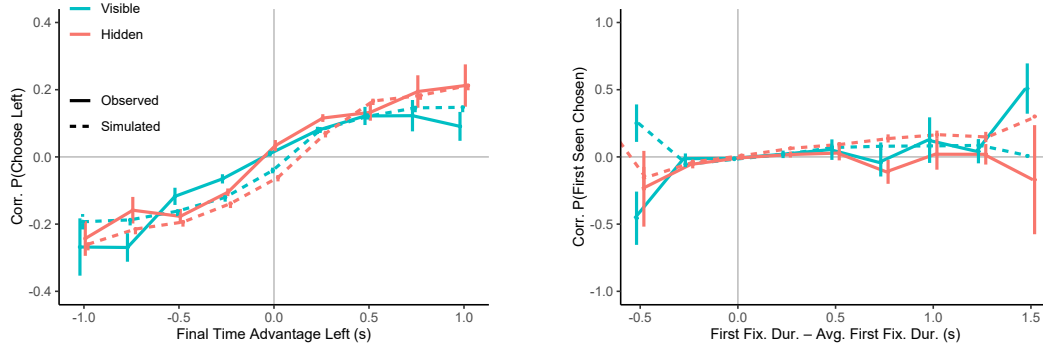
Supplementary Fig. 8. Choice biases by attentional discounting group. (Top) The probability of choosing the left item as a function of its relative value, conditional on last fixation location. (Middle) The corrected probability of choosing the left item as a function of the net fixation time to the left item. (Bottom) Corrected probability that the first seen item is chosen as a function of the excess first fixation duration, defined as first fixation duration minus mean first fixation duration (computed for each subject). Columns indicate which dataset generated the figures: “ $\theta_{Hidden} \leq 0$ ” indicates subjects with full attentional discounting ($N = 7$), “ $\theta_{Hidden} > 0$ ” indicates subjects with partial attentional discounting ($N = 43$). Data is from the joint dataset. Error bars show standard errors of the mean across participants.



Supplementary Fig. 9. Comparison of subject-level aDDM MAP parameter estimates between models with uncorrelated and correlated priors. Parameter estimate from the model with correlated priors as a function of its respective estimate from the model with uncorrelated priors. Rows separate by condition, columns separate by parameter. Data from joint data set. Black lines denote 95% HDIs. “cor” denotes Pearson correlation coefficient.



Supplementary Fig. 10. Linking fixation patterns with aDDM parameters. Each point represents a subject (blue = exploratory, red = confirmatory). ΔFirst is the mean first fixation duration in the visible condition minus the mean in the hidden condition. ΔMiddle , ΔLast , and ΔAll are the same, except for middle, last, and all fixations, respectively. Δd is the MAP estimate of drift rate in the visible condition minus the MAP estimate in the hidden condition. $\Delta\sigma$, $\Delta\theta$, and Δb are the same, except for the noise, attentional discounting, and bias parameters, respectively. Δ parameters have been Z-scored. Data is from the joint dataset. Grey lines are univariate linear regression predictions. Black text presents the 95% HDI for the slope of the regression line.



Supplementary Fig. 11. Other choice bias simulations. (Left) Corrected probability of choosing the left item as a function of net fixation time to the left item, in observed (solid) and simulated (dashed) out-of-sample data. The corrected probability is computed by subtracting from each choice observation (coded as 1 if left chosen, and 0 otherwise) the proportion with which left is chosen at each relative value. (Right) Corrected probability that the first seen item is chosen as a function of the excess first fixation duration, defined as first fixation duration minus mean first fixation duration (computed for each subject), in observed and simulated out-of-sample data. Blue lines indicate data in the visible condition. Red lines indicate data in the hidden condition. Data is from the joint dataset. Error bars show standard errors of the mean across participants.

Supplementary Table 1. Regressions associated with the basic psychometric results in Fig. 3

		Exploratory			Confirmatory			Joint		
Dept. Var.	Indept. Var.	Est.	SE		Est.	SE		Est.	SE	
Left chosen (Logistic) (Top)	Intercept	0.11	0.07		0.03	0.04		0.07	0.04	
	L - R rating	1.58	0.13	*	1.69	0.15	*	1.64	0.10	*
	Hidden	-0.03	0.09		0.09	0.06		0.03	0.06	
	Interaction	0.19	0.10		0.08	0.08		0.12	0.06	*
RT (Linear) (Middle)	Intercept	1491.27	99.61	*	1759.54	121.52	*	1635.85	80.61	*
	Best - worst rat.	-172.28	25.95	*	-213.22	26.02	*	-194.33	18.05	*
	Hidden	542.61	76.61	*	497.94	96.90	*	520.08	61.05	*
	Interaction	-13.62	18.93		-33.38	30.68		-22.47	17.17	
# of fix. (Linear) (Bottom)	Intercept	2.83	0.09	*	3.19	0.10	*	3.01	0.07	*
	Best - worst rat.	-0.20	0.02	*	-0.27	0.02	*	-0.23	0.02	*
	Hidden	-0.02	0.07		-0.21	0.10	*	-0.11	0.06	
	Interaction	0.05	0.02	*	0.09	0.03	*	0.07	0.02	*

* indicates significance in all data sets at the 95% confidence level.

* indicates a significant effect that was not present in all three data sets.

Supplementary Table 2. Regressions associated with the fixation results in Fig. 4

		Exploratory		Confirmatory		Joint	
Dept. Var.	Indept. Var.	Est.	SE	Est.	SE	Est.	SE
1st fix. best (Logistic) (Row 1)	Intercept	0.14	0.06	-0.10	0.05	0.01	0.04
	Best - worst rat.	-0.04	0.03	0.04	0.03	0.00	0.02
	Hidden	-0.16	0.09	0.13	0.08	0.00	0.06
	Interaction	0.05	0.05	-0.06	0.04	-0.02	0.03
Mid. fix. dur. (Linear) (Row 3)	Intercept	618.35	36.49	595.78	36.27	612.92	23.59
	Best - worst rat.	-55.23	8.09	-47.48	8.37	-51.20	5.84
	Hidden	103.82	27.53	129.57	33.42	141.50	22.48
	Interaction	-7.04	11.68	-7.87	15.14	-13.19	9.65
1st fix. dur. (Linear) (Row 4)	Intercept	341.64	21.31	353.30	16.29	348.37	13.23
	Best - worst rat.	-0.83	2.43	1.50	2.38	0.32	1.66
	Hidden	159.51	25.57	152.78	20.04	158.73	15.57
	Interaction	0.50	3.84	-4.78	3.39	-2.18	2.44
Net fix. dur. (Linear) (Row 5)	Intercept	14.45	20.80	-12.18	30.78	4.44	17.81
	Net. Val. > 0 (A)	-56.13	59.87	-38.46	69.75	-54.50	44.02
	Net. Val. < 0 (B)	50.64	59.66	14.11	67.26	24.83	42.89
	A : Net. Val. (C)	9.78	20.15	16.86	21.88	14.55	14.77
	B : Net. Val. (D)	63.20	20.40	47.00	21.64	54.48	14.66
	Hidden (E)	-22.05	39.01	-21.88	42.16	-23.83	27.89
	A:E	68.83	41.34	81.30	43.28	77.78	29.09
	B:E	-108.67	39.16	-40.40	43.83	-70.26	28.91
	C:E	3.08	12.73	8.90	14.65	5.49	9.84
	D:E	-35.43	13.05	-6.01	13.85	-20.20	9.35

* indicates significance in all data sets at the 95% confidence level.

* indicates a significant effect that was not present in all three data sets.

Supplementary Table 3. Regressions associated with the first fixation latency results in Fig. S3

		Exploratory			Confirmatory			Joint		
Dept. Var.	Indept. Var.	Est.	SE		Est.	SE		Est.	SE	
Latency to 1st fix. (Linear)	Intercept	167.16	8.89	*	157.22	6.89	*	162.48	162.48	*
	Fix. - nonfix. rating	-0.97	3.26		1.45	4.38		0.30	0.30	
	Hidden	3.74	4.42		5.06	4.75		8.20	8.20	
	Interaction	1.12	3.97		0.81	4.59		2.17	2.17	

* indicates significance in all data sets at the 95% confidence level.

* indicates a significant effect that was not present in all three data sets.

Supplementary Table 4. Regressions associated with the fixation duration results in Fig. S4

		Exploratory			Confirmatory			Joint		
Dept. Var.	Indept. Var.	Est.	SE		Est.	SE		Est.	SE	
Mid. fix. dur. (Linear) (Row 1)	Intercept	587.88	36.06	*	567.63	27.92	*	576.42	21.60	*
	Fix. rating	-11.83	7.66		1.43	8.44		-3.96	5.66	
	Hidden	61.91	28.76	*	85.31	29.15	*	78.08	20.22	*
	Interaction	24.21	10.49	*	29.37	11.11	*	26.19	7.51	*
Mid. fix. dur. (Linear) (Row 2)	Intercept	672.53	38.31	*	654.00	28.25	*	661.13	23.87	*
	Nonfix. rating	-42.07	6.73	*	-29.98	8.84	*	-34.24	5.74	*
	Hidden	143.89	30.69	*	218.65	38.68	*	193.83	25.95	*
	Interaction	-8.57	9.43		-21.26	9.77	*	-16.84	6.62	*
1st fix. dur. (Linear) (Row 3)	Intercept	329.36	21.44	*	340.71	20.31	*	334.77	14.75	*
	Fix. rating	4.17	2.23		5.71	3.47		5.19	2.00	*
	Hidden	189.71	30.63	*	156.43	23.03	*	176.84	19.61	*
	Interaction	-10.27	4.56	*	-3.45	3.56		-7.31	3.07	*
1st fix. dur. (Linear) (Row 4)	Intercept	357.71	21.32	*	374.03	17.20	*	367.47	13.59	*
	Nonfix. rating	-6.73	2.15	*	-6.63	2.01	*	-6.52	1.46	*
	Hidden	129.55	24.69	*	122.36	19.34	*	130.51	15.53	*
	Interaction	10.20	3.18	*	7.81	2.94	*	8.80	2.12	*

* indicates significance in all data sets at the 95% confidence level.

* indicates a significant effect that was not present in all three data sets.

Supplementary Table 5. Regressions associated with choice bias results in Fig. 5

Dept. Var.	Indept. Var.	Exploratory			Confirmatory			Joint		
		Est.	SE		Est.	SE		Est.	SE	
Left chosen (Logistic) (Top)	Intercept	-0.68	0.16	*	-1.59	0.26	*	-1.11	0.16	*
	Left - right rating (A)	1.54	0.14	*	1.75	0.18	*	1.64	0.11	*
	Last fix. loc. (0=R,1=L;B)	1.83	0.31	*	3.20	0.47	*	2.46	0.30	*
	Hidden (C)	-1.20	0.30	*	-1.46	0.36	*	-1.32	0.23	*
	A:B	0.15	0.12		-0.14	0.13		-0.01	0.08	
	A:C	0.28	0.15	*	-0.18	0.18		0.08	0.09	
	B:C	3.74	0.63	*	3.82	0.63	*	3.69	0.43	*
	A:B:C	-0.59	0.23	*	0.14	0.25		-0.26	0.15	
Corr. left chosen (Linear) (Middle)	Intercept	0.00	0.01		0.00	0.00		0.00	0.00	
	Net fixation left (s)	0.25	0.04	*	0.24	0.04	*	0.24	0.03	*
	Hidden	0.00	0.01		0.01	0.01		0.01	0.01	
	Interaction	0.04	0.04		0.04	0.03		0.04	0.02	
Corr. 1st seen chosen (Linear) (Bottom)	Intercept	-0.01	0.01		-0.02	0.01	*	-0.01	0.00	*
	Excess first fix. dur. (s)	0.21	0.07	*	0.21	0.08	*	0.22	0.05	*
	Hidden	-0.01	0.01		0.00	0.01		0.00	0.01	
	Interaction	-0.21	0.07	*	-0.13	0.06	*	-0.18	0.05	*

* indicates significance in all data sets at the 95% confidence level.

* indicates a significant effect that was not present in all three data sets.

Excess first fixation duration is defined as first fixation duration minus mean first fixation duration.

Supplementary Table 6. Group-level MAP parameter estimates for model with correlated priors across datasets and conditions

	Exploratory		Confirmatory		Joint	
	H	V	H	V	H	V
d_{group}	0.002	0.003	0.002	0.003	0.002	0.003
	[0.002, 0.002]	[0.002, 0.003]	[0.002, 0.002]	[0.002, 0.003]	[0.002, 0.002]	[0.002, 0.003]
σ_{group}	0.018	0.023	0.016	0.021	0.017	0.022
	[0.015, 0.020]	[0.021, 0.025]	[0.014, 0.019]	[0.019, 0.023]	[0.016, 0.019]	[0.021, 0.023]
θ_{group}	0.38	0.54	0.20	0.49	0.28	0.52
	[0.22, 0.54]	[0.42, 0.66]	[0.06, 0.35]	[0.37, 0.62]	[0.18, 0.39]	[0.44, 0.61]
b_{group}	0.02	0.03	0.01	0.00	0.02	0.02
	[-0.10, 0.14]	[-0.06, 0.11]	[-0.10, 0.14]	[-0.09, 0.09]	[-0.04, 0.08]	[-0.03, 0.06]

MAP estimate and 95% HDI of group-level mean.

Supplementary Table 7. Effects of early versus late fixations on corrected choice

Dept. Var.	Indept. Var.	Exploratory			Confirmatory			Joint		
		Est.	SE		Est.	SE		Est.	SE	
Corr. left chosen	Intercept	0.03	0.01	*	0.03	0.01	*	0.03	0.01	*
Observed	Net fix. L before 1 s (A)	0.17	0.03	*	0.12	0.03	*	0.16	0.02	*
	Net fix. L after 1 s (B)	0.24	0.05	*	0.23	0.03	*	0.23	0.03	*
	Hidden (C)	0.02	0.01		0.03	0.01		0.02	0.01	
	A:C	-0.03	0.04		0.04	0.03		-0.01	0.02	
	B:C	0.02	0.04		0.04	0.03		0.04	0.02	
Corr. left chosen	Intercept							-0.01	0.00	
Simulated	Net fix. L before 1 s (A)							0.05	0.01	*
	Net fix. L after 1 s (B)							0.13	0.02	*
	Hidden (C)							0.01	0.00	
	A:C							0.02	0.01	
	B:C							0.06	0.02	*

* indicates significance in all data sets at the 95% confidence level.

* indicates a significant effect that was not present in all three data sets.

“Prop.”: proportion.

Trials shorter than 1 s dropped for this analysis.

Supplementary Table 8. Regressions associated with choice bias simulations in Fig. S11

Dept. Var.	Indept. Var.	Est.	SE	
Corr. left chosen (Linear) (Left)	Intercept	-0.02	0.00	*
	Net fixation left (s)	0.13	0.02	*
	Hidden	0.00	0.00	
	Interaction	0.08	0.02	*
Corr. 1st seen chosen (Linear) (Right)	Intercept	-0.01	0.00	*
	Excess first fix. dur. (s)	0.06	0.02	*
	Hidden	0.03	0.00	*
	Interaction	0.06	0.02	*

* indicates significance at the 95% confidence level.