

Supplemental Material for:

First Impressions or Good Endings? Preferences Depend on When You Ask
Sinclair, Wang, & Adcock (2024)

Supplementary Table 1. Results from a binomial generalized mixed-effects model predicting trial-wise object recognition accuracy (correct or incorrect) in Study 1. The model included random intercepts for subjects and random slopes for object value, box type, and learning trial number.

Fixed Effects			
Term	Wald Chisq	DF	<i>p</i> -value
Object Value	14.14	1	< 0.001***
Box Type	0.74	2	0.692
Learning Trial Number	30.04	1	< 0.001***
Object Value * Box Type	2.24	2	0.327

Object Value * Box Type Contrasts					
Object Value	Box Type	Estimate	SE	z-stat	<i>p</i> -value
low - high	early	-0.216	0.131	-1.652	0.099
low - high	even	-0.326	0.130	-2.510	0.012*
low - high	late	-0.463	0.131	-3.537	< 0.001***

Supplementary Table 2. Results from a binomial generalized mixed-effects model predicting trial-wise object-value memory accuracy (correct or incorrect identification of high-value objects as high-value) in Study 1. The model included random intercepts for subjects and random slopes for the learning trial number.

Model Information	
N Observations	1064
N Subjects	52
Marginal R ² / Conditional R ²	0.02 / 0.29
ICC	0.28

Fixed Effects			
Term	Wald Chisq	DF	<i>p</i> -value

Box Type	15.55	2	0.000
Learning Trial Number	0.08	1	0.779

Box Type Contrasts				
Box Type	Estimate	SE	z-stat	p-value
early - even	-0.464	0.179	-2.587	0.026*
early - late	-0.697	0.180	-3.868	<0.001***
even - late	-0.233	0.180	-1.295	0.398

Supplementary Table 3. Results from a binomial generalized mixed-effects model predicting trial-wise object-box association memory accuracy in Study 1. The model included random intercepts for subjects and random slopes for the box type and object value.

Fixed Effects			
Term	Wald Chisq	DF	p-value
Box Type	2.67	2	0.263
Object Value	3.83	1	0.050
Learning Trial Number	4.52	1	0.034
Box Type * Object Value	3.90	2	0.142

Box Type Contrasts				
Box Type	Estimate	SE	z-stat	p-value
early - even	-0.062	0.130	-0.474	0.884
early - late	0.262	0.132	1.988	0.115
even - late	0.324	0.148	2.190	0.073

Box Type * Object Value Contrasts					
Object Value	Box Type	Estimate	SE	z-stat	p-value
low - high	early	-0.401	0.151	-2.655	0.008**
low - high	even	-0.164	0.147	-1.116	0.264
low - high	late	0.017	0.160	0.104	0.917

Supplementary Table 4. Results from a linear regression model predicting average *box value estimation error* (continuous variable) in Studies 1-6, comparing *box types* and *task versions*. * $p < .05$, ** $p < .01$, *** $p < .001$

Omnibus Tests			
Term	F-stat	DF	p-value
Box Type	29.66	2, 582	< 0.0001***
Task Version	0.75	10, 582	0.676

Box Type Contrasts				
Contrast	Estimate	SE	t-stat	p-value
Early – Even	0.36	0.06	6.29	< 0.0001***
Early – Late	0.41	0.06	7.05	< 0.0001***
Even – Late	0.04	0.06	0.76	0.729

Task Version * Box Type Contrasts					
Task Version	Contrast	Estimate	SE	t-stat	p-value
Active	Early – Even	0.53	0.15	3.67	0.0008***
Active	Early – Late	0.54	0.15	3.69	0.0007***
Active	Even – Late	0.00	0.15	0.02	0.999
Interleaved	Early – Even	0.17	0.14	1.21	0.448
Interleaved	Early – Late	0.20	0.14	1.41	0.336
Interleaved	Even – Late	0.03	0.14	0.20	0.978
Middle	Early – Even	0.24	0.14	1.75	0.188
Middle	Early – Late	0.39	0.14	2.82	0.014*
Middle	Even – Late	0.15	0.14	1.07	0.535
Original	Early – Even	0.41	0.14	2.96	0.009**
Original	Early – Late	0.50	0.14	3.65	0.0008***
Original	Even – Late	0.09	0.14	0.69	0.772
Passive	Early – Even	0.49	0.14	3.41	0.002**
Passive	Early – Late	0.36	0.14	2.50	0.034*
Passive	Even – Late	-0.13	0.14	-0.91	0.637
Value-Info	Early – Even	0.34	0.15	2.36	0.049*
Value-Info	Early – Late	0.46	0.15	3.17	0.005**
Value-Info	Even – Late	0.12	0.15	0.81	0.696

Supplementary Table 5. Results from a binomial generalized mixed-effects model predicting trial-wise object recognition accuracy (correct or incorrect) in Studies 1-6, comparing task versions. The model included random intercepts for subjects and random slopes for object value, box type, and learning trial number. * $p < .05$, ** $p < .01$, *** $p < .001$

Fixed Effects			
Term	Wald Chisq	DF	p-value
(Intercept)	123.75	1	< 0.001***
Object Value	96.41	1	< 0.001***
Box Type	4.99	2	0.083
Task Version	6.12	5	0.295
Learning Trial Number	216.00	1	< 0.001***
Object Value * Box Type	7.83	2	0.020*
Object Value * Task Version	2.44	5	0.785
Box Type * Task Version	20.87	10	0.022*
Object Value * Task Version * Box Type	7.85	10	0.643

Object Value * Box Type Contrasts					
Object Value	Box Type	Estimate	SE	z-stat	p-value
low - high	early	-0.262	0.054	-4.870	< 0.001***
low - high	even	-0.456	0.055	-8.346	< 0.001***
low - high	late	-0.362	0.054	-6.693	< 0.001***
Box Type * Task Version Contrasts					
Task Version	Box Type	Estimate	SE	z-stat	p-value
Active	early - even	0.008	0.108	0.077	0.997
Active	early - late	-0.151	0.107	-1.418	0.332
Active	even - late	-0.159	0.109	-1.466	0.307
Interleaved	early - even	-0.110	0.104	-1.063	0.537
Interleaved	early - late	0.071	0.101	0.703	0.762
Interleaved	even - late	0.182	0.103	1.762	0.182
Middle	early - even	-0.136	0.106	-1.283	0.405
Middle	early - late	-0.024	0.103	-0.235	0.970
Middle	even - late	0.112	0.105	1.073	0.531
Original	early - even	-0.141	0.105	-1.345	0.370
Original	early - late	-0.128	0.103	-1.236	0.432
Original	even - late	0.013	0.105	0.127	0.991
Passive	early - even	-0.012	0.111	-0.111	0.993
Passive	early - late	0.297	0.108	2.740	0.017*

Passive	even - late	0.310	0.108	2.853	0.012*
Value-Info	early - even	-0.189	0.112	-1.688	0.210
Value-Info	early - late	-0.249	0.111	-2.242	0.064
Value-Info	even - late	-0.060	0.113	-0.528	0.857

Object Value * Box Type * Task Version Contrasts						
Task Version	Object Value	Box Type	Estimate	SE	z-stat	p-value
Active	low - high	early	-0.30	0.13	-2.30	0.022*
Active	low - high	even	-0.36	0.13	-2.68	0.008**
Active	low - high	late	-0.32	0.13	-2.39	0.017*
Interleaved	low - high	early	-0.15	0.13	-1.17	0.240
Interleaved	low - high	even	-0.48	0.13	-3.72	0.0002***
Interleaved	low - high	late	-0.18	0.13	-1.44	0.151
Middle	low - high	early	-0.21	0.13	-1.64	0.102
Middle	low - high	even	-0.58	0.13	-4.48	< 0.0001***
Middle	low - high	late	-0.34	0.13	-2.66	0.008**
Original	low - high	early	-0.22	0.13	-1.74	0.082
Original	low - high	even	-0.35	0.13	-2.71	0.007**
Original	low - high	late	-0.47	0.13	-3.66	0.0003***
Passive	low - high	early	-0.47	0.14	-3.47	0.0005***
Passive	low - high	even	-0.50	0.14	-3.69	0.0002***
Passive	low - high	late	-0.38	0.13	-2.86	0.004**
Value-Info	low - high	early	-0.22	0.14	-1.61	0.108
Value-Info	low - high	even	-0.46	0.14	-3.36	0.0008***
Value-Info	low - high	late	-0.48	0.14	-3.44	0.0006***

Supplementary Table 6. Results from a binomial generalized mixed-effects model predicting trial-wise object-box association memory accuracy in Studies 1-6, comparing task versions. The model included random intercepts for subjects and random slopes for object value, box type, and learning trial number. Note that although there is an interaction between object value and box type, these are driven by a generalized primacy effect (object-box association memory is better for the first few items in each box, regardless of box type) and a generalized reward effect (object-box association memory is better for high-value objects, regardless of box type). * $p < .05$, ** $p < .01$, *** $p < .001$

Fixed Effects			
Term	Wald Chisq	DF	p-value
Box Type	2.39	2	0.302
Object Value	13.23	1	< 0.001***
Task Version	6.16	5	0.291
Learning Trial Number	15.86	1	< 0.001***
Box Type * Object Value	36.82	2	< 0.001***
Box Type * Task Version	10.27	10	0.417
Object Value * Task Version	2.54	5	0.770
Box Type * Object Value * Task Version	11.81	10	0.298

Box Type * Object Value Contrasts					
Object Value	Box Type	Estimate	SE	z-stat	p-value
low - high	early	-0.49	0.07	-6.97	< 0.001***
low - high	even	-0.05	0.07	-0.69	0.493
low - high	late	0.03	0.07	0.39	0.696

Box Type * Object Value * Task Version Contrasts						
Task Version	Object Value	Box Type	Estimate	SE	z-stat	p-value
Active	low - high	early	-0.51	0.16	-3.32	0.001***
Active	low - high	even	-0.21	0.15	-1.33	0.183
Active	low - high	late	0.23	0.16	1.44	0.151
Interleaved	low - high	early	-0.64	0.15	-4.25	< 0.001***
Interleaved	low - high	even	-0.36	0.15	-2.47	0.014
Interleaved	low - high	late	-0.11	0.16	-0.73	0.464
Middle	low - high	early	-0.36	0.16	-2.62	0.024
Middle	low - high	even	0.04	0.16	0.26	0.792
Middle	low - high	late	-0.02	0.16	-0.12	0.904

Original	low - high	early	-0.37	0.14	-2.60	0.009
Original	low - high	even	-0.14	0.14	-1.00	0.317
Original	low - high	late	0.05	0.15	0.32	0.753
Passive	low - high	early	-0.59	0.15	-4.06	< 0.001***
Passive	low - high	even	0.24	0.15	1.62	0.106
Passive	low - high	late	-0.04	0.16	-0.27	0.788
Value-Info	low - high	early	-0.57	0.15	-3.72	<0.001***
Value-Info	low - high	even	-0.21	0.15	-1.42	0.155
Value-Info	low - high	late	0.16	0.16	1.02	0.308

Supplementary Table 7. Results from a binomial generalized mixed-effects model predicting high-value hits (object-value association memory accuracy) in Studies 1-6, comparing task versions. The model included random intercepts for subjects and random slopes for learning trial number. * $p < .05$, ** $p < .01$, *** $p < .001$

Fixed Effects			
Term	Wald Chisq	DF	<i>p</i> -value
Box Type	50.76	2	< 0.001***
Task Version	8.15	5	0.148
Learning Trial Number	8.94	1	0.003**
Box Type * Task Version	13.49	10	0.197

Box Type Contrasts					
Box Type	Estimate	SE	z-stat	<i>p</i> -value	
early - even	-0.25	0.08	-3.28	0.003**	
early - late	-0.56	0.08	-7.12	< 0.001***	
even - late	-0.31	0.08	-4.02	< 0.001***	
Task Version * Box Type Contrasts					
Task Version	Box Type	Estimate	SE	z-stat	<i>p</i> -value
Active	early - even	-0.52	0.20	-2.65	0.022*
Active	early - late	-0.72	0.20	-3.61	0.001***
Active	even - late	-0.21	0.20	-1.05	0.545

Interleaved	early - even	-0.05	0.18	-0.25	0.967
Interleaved	early - late	-0.50	0.19	-2.63	0.023*
Interleaved	even - late	-0.45	0.19	-2.42	0.041*
Middle	early - even	0.146	0.19	0.79	0.710
Middle	early - late	-0.45	0.20	-2.32	0.053*
Middle	even - late	-0.60	0.19	-3.21	0.004**
Original	early - even	-0.483	0.18	-2.71	0.019*
Original	early - late	-0.700	0.18	-3.91	0.0003***
Original	even - late	-0.217	0.18	-1.21	0.445
Passive	early - even	-0.24	0.18	-1.35	0.369
Passive	early - late	-0.27	0.19	-1.44	0.322
Passive	even - late	-0.03	0.19	-0.16	0.987
Value-Info	early - even	-0.35	0.19	-1.82	0.164
Value-Info	early - late	-0.70	0.20	-3.59	0.001***
Value-Info	even - late	-0.35	0.19	-1.80	0.170

Supplementary Table 8. Results from a binomial generalized mixed-effects model predicting trial-wise object recognition accuracy (correct or incorrect) in Studies 1, 7, and 8, comparing task versions. The model included random intercepts for subjects and random slopes for box type and learning trial number. * $p < .05$, ** $p < .01$, *** $p < .001$

Fixed Effects			
Term	Wald Chisq	DF	p-value
(Intercept)	2.22	1	0.136
Object Value	3.85	1	0.0498*
Box Type	5.76	2	0.056
Task Version	43.97	2	< 0.0001***
Learning Trial Number	12.63	1	0.0004***
Object Value * Box Type	7.05	2	0.029*
Object Value * Task Version	21.83	2	< 0.0001***
Box Type * Task Version	4.76	4	0.313
Object Value * Task Version * Box Type	4.14	4	0.388

Object Value * Box Type Contrasts						
Object Value	Box Type	Estimate	SE	z-stat	p-value	
low - high	early	0.04	0.07	0.62	0.538	
low - high	even	-0.06	0.07	-0.89	0.375	
low - high	late	-0.20	0.07	-3.13	0.002**	
Object Value * Task Version Contrasts						
Task Version	Object Value	Estimate	SE	z-stat	p-value	
Original	low - high	-0.31	0.07	-4.76	< 0.0001	
Next Day	low - high	0.11	0.07	1.65	0.100	
Middle (Next Day)	low - high	-0.01	0.06	-0.22	0.825	
Object Value * Box Type * Task Version Contrasts						
Task Version	Object Value	Box Type	Estimate	SE	z-stat	p-value
Original	low - high	early	-0.22	0.11	-1.94	0.053
Original	low - high	even	-0.31	0.12	-2.74	0.006
Original	low - high	late	-0.41	0.12	-3.54	0.0004
Next Day	low - high	early	0.33	0.11	2.92	0.004
Next Day	low - high	even	0.01	0.11	0.11	0.913
Next Day	low - high	late	-0.02	0.11	-0.22	0.829
Middle (Next Day)	low - high	early	0.01	0.11	0.07	0.942

Middle (Next Day)	low - high	even	0.13	0.11	1.15	0.250
Middle (Next Day)	low - high	late	-0.18	0.11	-1.61	0.108

Supplementary Table 9. Results from a binomial generalized mixed-effects model predicting trial-wise object-box association memory accuracy in Studies 1, 7, and 8, comparing task versions. The model included random intercepts for subjects and random slopes for object value, box type, and learning trial number. Note that although there is an interaction between object value and box type, these are driven by a generalized primacy effect (object-box association memory is better for the first few items in each box, regardless of box type) and a generalized reward effect (object-box association memory is better for high-value objects, regardless of box type). * $p < .05$, ** $p < .01$, *** $p < .001$

Fixed Effects			
Term	Wald Chisq	DF	p-value
Box Type	0.47	2	0.791
Object Value	0.04	1	0.862
Task Version	70.83	2	< 0.0001***
Learning Trial Number	2.62	1	0.105
Box Type * Object Value	2.24	2	0.327
Box Type * Task Version	9.49	4	0.0499*
Object Value * Task Version	4.59	2	0.101
Box Type * Object Value * Task Version	9.29	4	0.054

Box Type * Object Value Contrasts					
Object Value	Box Type	Estimate	SE	z-stat	p-value
low - high	early	-0.02	0.12	-0.16	0.871
low - high	even	-0.09	0.11	-0.79	0.430
low - high	late	0.14	0.11	1.28	0.202

Box Type * Object Value * Task Version Contrasts						
Task Version	Object Value	Box Type	Estimate	SE	z-stat	p-value
Original	low - high	early	-0.39	0.14	-2.76	0.006**
Original	low - high	even	-0.14	0.14	-1.00	0.320
Original	low - high	late	-0.06	0.15	0.39	0.694

Next Day	low - high	early	0.47	0.25	1.90	0.057
Next Day	low - high	even	-0.30	0.22	-1.39	0.156
Next Day	low - high	late	0.02	0.20	0.11	0.914
Middle (Next Day)	low - high	early	-0.13	0.20	-0.66	0.508
Middle (Next Day)	low - high	even	0.17	0.21	0.83	0.409
Middle (Next Day)	low - high	late	0.34	0.21	1.62	0.105

Supplementary Table 10. Results from a binomial generalized mixed-effects model predicting high-value hits (object-value association memory accuracy) in Studies 1, 7, and 8, comparing task versions. The model included random intercepts for subjects and random slopes for learning trial number. * $p < .05$, ** $p < .01$, *** $p < .001$

Fixed Effects			
Term	Wald Chisq	Df	p-value
Box Type	6.03	2	0.049*
Task Version	74.47	2	<0.0001***
Learning Trial Number	0.69	1	0.405
Box Type * Task Version	8.39	4	0.078

Box Type * Task Version Contrasts					
Box Type	Task Version	Estimate	SE	z-stat	p-value
early - even	Original	-0.48	0.17	-2.80	0.014*
early - late	Original	-0.71	0.17	-4.11	< 0.001***
even - late	Original	-0.23	0.17	-1.34	0.374
early - even	Next Day	0.24	0.25	0.97	0.595
early - late	Next Day	0.01	0.25	0.03	1.000
even - late	Next Day	-0.24	0.24	-0.98	0.588
early - even	Next Day Middle Cluster	-0.28	0.26	-1.10	0.516
early - late	Next Day Middle Cluster	-0.26	0.25	-1.05	0.543
even - late	Next Day Middle Cluster	0.02	0.24	0.07	0.997

Supplementary Table 11. Results from a binomial generalized mixed-effects model predicting trial-wise object recognition accuracy (correct or incorrect) in Study 9. The model included random intercepts for subjects and random slopes for box type and learning trial number.

Fixed Effects			
Term	Wald Chisq	DF	<i>p</i>-value
Object Value	4.63	1	0.031
Box Type	6.39	2	0.041
Learning Trial Number	9.82	1	0.002
Object Value * Box Type	2.52	2	0.283

Object Value * Box Type Contrasts					
Object Value	Box Type	Estimate	SE	z-stat	<i>p</i>-value
low - high	early	-0.15	0.06	-2.41	0.016
low - high	even	-0.01	0.06	-0.17	0.868
low - high	late	-0.07	0.06	-1.15	0.252

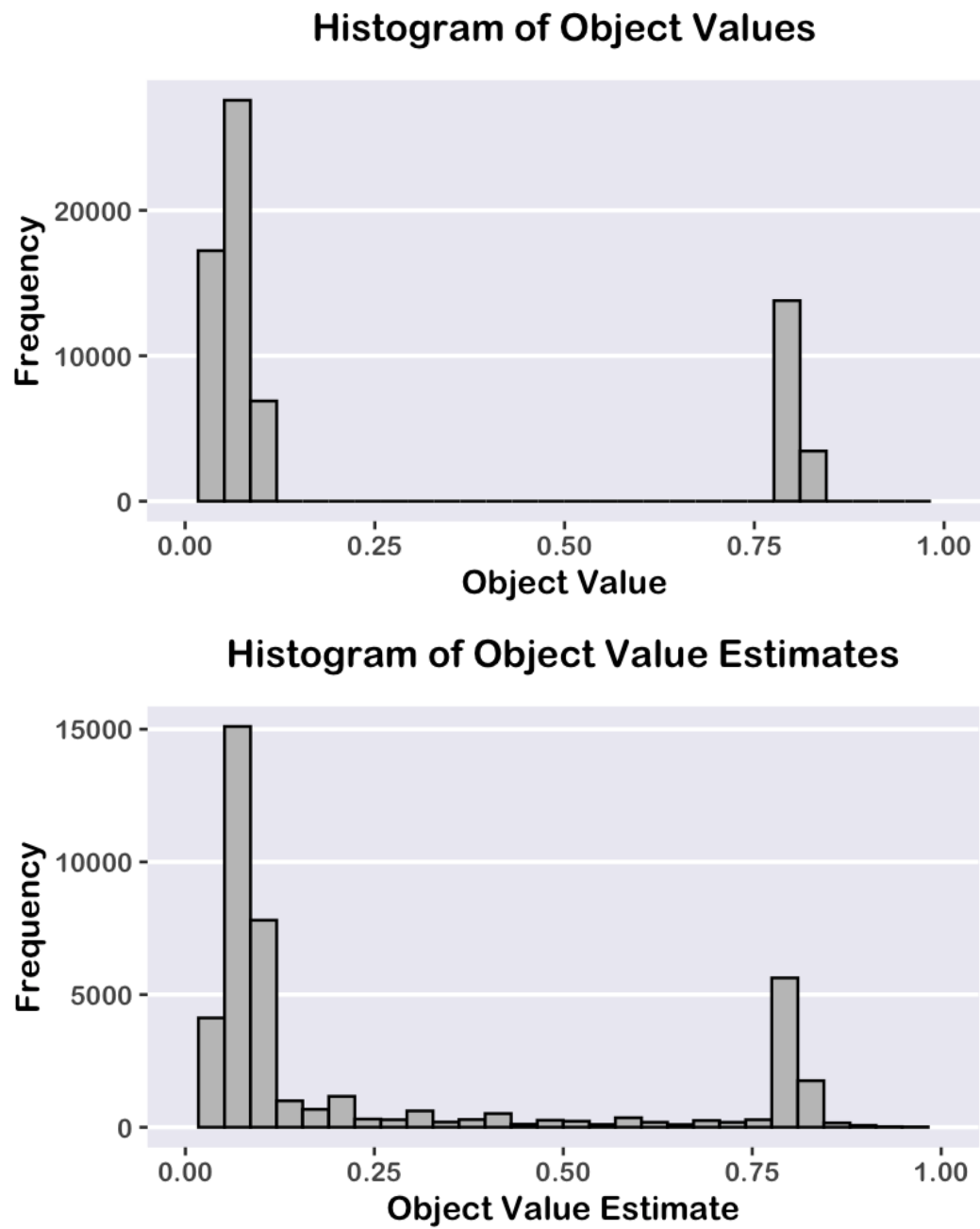
Supplementary Table 12. Results from a binomial generalized mixed-effects model predicting trial-wise object-box association memory accuracy in Study 9. The model included random intercepts for subjects and random slopes for box type.

Fixed Effects			
Term	Wald Chisq	DF	p-value
Box Type	0.66	2	0.718
Object Value	0.02	1	0.888
Learning Trial Number	0.05	1	0.822
Box Type * Object Value	3.78	2	0.151

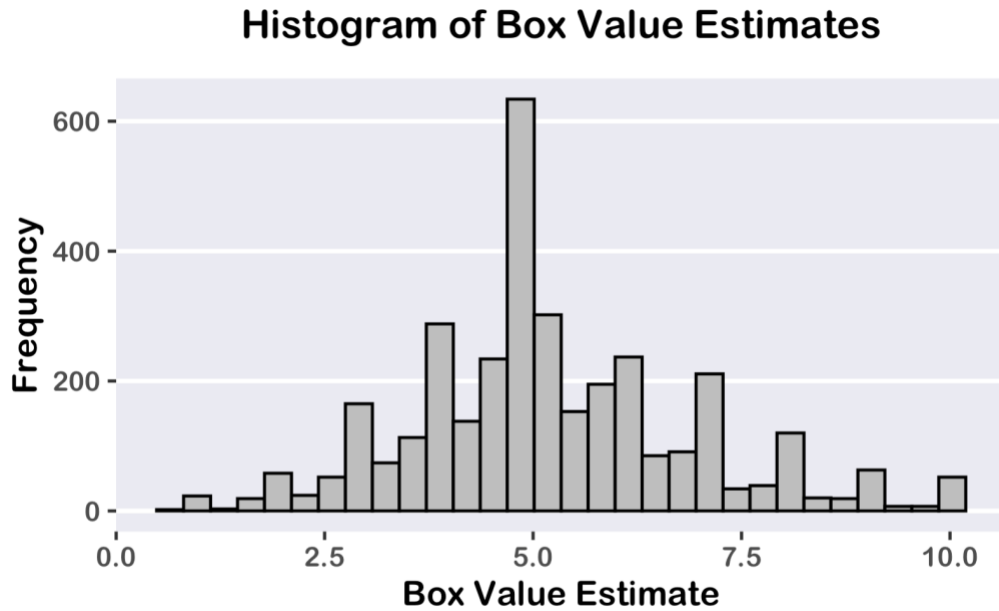
Box Type Contrasts				
Box Type	Estimate	SE	z-stat	p-value
early - even	-0.05	0.09	-0.63	0.806
early - late	0.06	0.09	0.64	0.801
even - late	0.11	0.09	1.25	0.422

Box Type * Object Value Contrasts					
Object Value	Box Type	Estimate	SE	z-stat	p-value
low - high	Early	-0.08	0.11	-0.68	0.496
low - high	Even	-0.09	0.11	-0.80	0.427
low - high	Late	0.19	0.12	1.64	0.101

Supplementary Figure 1. Distributions of object values (top) and participants' estimates of the object values (bottom), combined data from Studies 1-9.



Supplementary Figure 2. Distribution of box value estimates, combined data from Studies 1-9. Although the distribution was approximately centered on the true value of the boxes (\$5, the midpoint of the sliding scale), participants used the full range of the scale and only 14% of responses were between the range of \$4.95 and \$5.05.



Supplemental Text

Object-Value and Box-Value Associations

Across Studies 1-6, we observed that participants overestimated the value of Early boxes (relative to Even and Late boxes), but were less likely to remember which objects from Early boxes were high-value. We interpreted this finding in terms of value information at the beginning of an episode being associated with the box rather than the objects. In an exploratory analysis, we investigated whether there was an inverse association between these two measures (box valuation and object-value memory); such an association would imply a within-subjects trade-off between these two processes.

Using linear regression, we predicted *object-value association memory accuracy* (i.e., proportion of “high-value hits”) from *box value estimates*, *task version*, and the interaction term. This analysis was applied selectively to data from Early boxes in Studies 1-6, as we only observed significant effects for box-value and object-value measures in the same-day task versions. There was no significant association between object-value memory accuracy and box value estimation ($F = 0.06$, $p = 0.800$, $\eta_p^2 = 0.0002$), nor a main effect of task version ($F = 0.83$, $p = 0.527$, $\eta_p^2 = 0.01$). There was a trending interaction ($F = 1.95$, $p = 0.085$, $\eta_p^2 = 0.03$), but follow-up tests did not indicate any significant effects within any task version.

Comparing Active and Passive Task Versions (Studies 3 and 4)

As the task versions in Studies 3 and 4 were designed to contrast with each other (emphasizing or removing agency, respectively), we directly compared these studies on all measures. These tests are reported below; model designs and parameters are all consistent with the tests reported in the main text and in Supplementary Tables 4-7. Here, we focus on testing for differences between the Active (Study 3) and Passive (Study 4) task versions rather than reporting all effects of interest within each task version. However, all effects of interest are reported separately within each task version in preceding tables (refer to pairwise contrasts reported within Supplementary Tables 4-7).

Box Preference: The distributions of box preferences observed did not significantly differ between the Active and Passive task versions ($\chi^2(2) = 5.16$, $p = 0.076$, Cramér's $V = 0.16$, 95% CI [0.04, 0.32]). Plots for the two task versions are provided in Figure 2C and 2F.

Box Value Estimation Error: There was no significant difference between the Active and Passive task versions ($F_{(1,94)} = 0.03$, $p = 0.866$, $\eta_p^2 = 0.0003$, 95% CI [0.00, 0.03]), nor an interaction between box type and task version ($F_{(1,188)} = 0.37$, $p = 0.692$, $\eta_p^2 = 0.12$, 95% CI [0.04, 0.21]).

Object Recognition: There were no overall differences in object recognition accuracy between the Active and Passive task versions ($\chi^2(1) = 1.83$, $p = 0.176$). There was no significant interaction between object value and task version ($\chi^2(1) = 0.99$, $p = 0.320$). However, there was a significant interaction between box type and task version ($\chi^2(2) = 11.28$, $p = 0.004$). Follow-up

pairwise comparisons indicated that participants in the Passive task version tended to show better object recognition memory for objects in Even boxes ($\beta = 0.43$, $z = 1.97$, $p = 0.049$) and Early boxes ($\beta = 0.42$, $z = 1.84$, $p = 0.066$), relative to participants in the Active task. There was no difference between tasks in object memory performance for Late boxes ($\beta = 0.04$, $z = 0.16$, $p = 0.869$). The three-way interaction among object value, box type, and task version was not significant ($\chi^2(2) = 0.25$, $p = 0.883$).

Object-Value Association Memory: There was no significant difference between Active and Passive task versions for object-value association memory (correctly identifying a high-value object as high-value), $\chi^2(1) = 0.03$, $p = 0.856$. There was no interaction between box type and task version ($\chi^2(2) = 2.49$, $p = 0.288$).

Object-Box Association Memory: There was no significant difference between Active and Passive task versions for object-box association memory ($\chi^2(1) = 1.27$, $p = 0.261$), nor an interaction between box type and task version ($\chi^2(2) = 1.15$, $p = 0.563$) or between object value and task version ($\chi^2(1) = 0.04$, $p = 0.842$).