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Supporting Information for
Memory for Artwork is Predictable

Trent M. Davis[1], Wilma A. Bainbridge[*1]
[1]Department of Psychology, University of Chicago

* Wilma A. Bainbridge
Email: wilma@uchicago.edu

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Supporting Text: Correlations of Alternate Measures with Art Memorability

Emotional Intensity. For this comparison, emotion ratings were converted into intensity ratings (collapsing across valence), where *extremely positive* (5) and *extremely negative* (1) were given a rating of 3, *somewhat positive* (4) and *somewhat negative* (2) were given a rating of 2, and *neither positive nor negative* (3) was given a rating of 1. A Spearman rank correlation revealed no significant relationship between emotional intensity and memorability: ρ = -0.05, P = 0.529.

Fine-Grained Memory Measures. We tested a version of the final regression model where instead of predicting hit rate, we predicted average memory score with confidence. When participants were asked if they had seen a painting before, they responded on a range of *definitely not* (1) to *definitely yes* (5), and we took the average of this measure for each image. ResMem performed generally the same at predicting this rating (β = 0.35, SE = 0.08, t = 4.16, P < 0.001) as predicting hit rate (β = 0.35, SE = 0.08, t = 4.28, P < 0.001).

Color and Color Contrast. We tested the Spearman rank correlation between memorability and measures of color and contrast (for hue, saturation, and luminance), by taking the mean and standard across the pixels of an image, respectively. No color measures were significantly correlated with any measure of memorability (Table S2 for statistics). However, some color measures did show significant relationships with ratings of beauty, interest, and emotion (Table S2).

Spectral Energy. We tested the Spearman rank correlation between memorability and spectral energy. Spectral energy was defined as the frequency that contains 80% of the power spectrum energy of the image[1]. We found no significant correlation between spectral energy measures and any memorability measure, as well as any higher level attribute measure (e.g., beauty, interest; Table S2).

Clutter. We tested the Spearman rank correlation between memorability and image clutter, as measured by the ratio of edge versus non-edge pixels in an image. Edges were detected using the Laplacian-of-Gaussian transform on the images[2]. Clutter was significantly negatively correlated with online memorability scores (ρ = -0.19, P = 0.014), ResMem predicted scores (ρ = -0.30, P < 0.001), and marginally negatively correlated with in-person memory (ρ = -0.15, P = 0.057). This suggests that less cluttered images (fewer edges) tend to be more memorable. This may align with recent work suggesting that memorable items may be those that are processed most efficiently[3,4]. We also observed significant correlations with higher-level attributes, whereby more beautiful (ρ = 0.21, P = 0.007), interesting (ρ = 0.21, P = 0.008), and emotionally positive (ρ = 0.21, P = 0.008) pieces are more cluttered. All statistics are in Table S2.

Presence of People. We tested whether the presence of people (faces, bodies) resulted in more memorable paintings. There was no significant difference in in-person memory performance across paintings that had only faces, only bodies, both, or neither (1-way ANOVA: $F(3,157)$ = 0.45, P = 0.717). There was also no significant difference between paintings with any people (faces or bodies) versus no people ($t(159)$ = 0.36, P = 0.719).

Number of Pieces. We ran a Spearman rank correlation to test whether in-person memory was influenced by the number of pieces in the same room. We found a marginally significant effect (ρ = 0.16 P = 0.044), although this factor does not remain in a stepwise regression including all factors (Table S5).

In-Person and Online Memorability. We ran a Spearman rank correlation to test whether online memorability scores (Experiment 1) were correlated with in-person memorability scores (Experiment 2). Surprisingly, we observed no significant (and a numerically negative) correlation between these two measures (ρ = -0.02, P = 0.774). This is surprising given that ResMem can significantly predict both measures. This may suggest that memorability scores measured online

include an influence of task that is shared across participants but not present in ResMem's predictions. Similarly, a recent study has found that ResMem can significantly predict the memory of 4-year old children in an object-location cued recall task, while online continuous recognition measures cannot[5]. Thus, it is possible that ResMem's predictions are more "pure" measures of memorability.

Supporting Text: Task Instructions

These are the instructions that were e-mailed to participants in advance of their visit.

1. Please go to the Art Institute of Chicago, located at: 111 S Michigan Ave

2. As soon as you enter, visit the ticket counter.

    a. If you are a student, please bring your student ID, as this will allow for free entry.

    b. If you are a Chicago resident, please bring an ID that includes a Chicago address.

3. After buying your tickets, please proceed to the American Art wing of the museum. This can be done by following the map attached to the email: (if you are having any trouble, please ask one of the employees for directions).

4. Please connect to the Art Institute's WIFI before completing any more of the following steps. Some parts of the survey will not load correctly if you do not have a stable internet connection.

5. Before entering the wing, please fill out the following short survey (demographics): [URL].

6. Once you arrive at the wing, you should see a split staircase.

7. Please walk [down/up] first, and view all of the paintings on that floor. Feel free to walk at whatever pace is comfortable, and try not to pay attention to anything on display that is not a painting (ex: furniture, china, etc.)

8. After you finish looking at all of the paintings on this floor, exit back out of the wing (there are benches against the wall if you look forward / to the right just outside the wing) and please take the following survey: [URL].

9. Once you complete the first survey, please go [up to the second floor / down to the first floor] and view the paintings there as you did on the [first / second].

10. After you view all of the paintings on the [first / second] floor, please exit back to the benches and complete the following survey: [URL].

11. Once you complete the rest of the survey, you're all done! Feel free to walk around the museum or leave if you've seen enough paintings for the day.

Table S1. Statistical measures (*β*, *SE*, *t*, *P*) for the initial model predicting in-person memory. All regressors were first standardized before being entered into the model. ***** indicates regressors that are significantly predictive of in-person memory ($P < 0.05$). For this model, $F = 13.1$, $P < 0.0001$, $R_{adj}^2 = 0.35$, $AIC = 390.41$.

	β	*SE*	*t*	*P*
(Intercept)	0.21	0.08	2.63	0.010
ResMem*	**0.18**	**0.08**	**2.34**	**0.020**
Painting Size*	**0.45**	**0.14**	**3.21**	**0.002**
Floor*	**-0.44**	**0.07**	**-6.11**	**<0.0001**
ResMem Context	-0.15	0.09	-1.70	0.091
Size Context	0.18	0.17	1.02	0.311
ResMem : ResMem Context	<0.01	0.07	0.05	0.961
Size: Size Context*	**-0.24**	**0.05**	**-4.89**	**<0.0001**

Table S2. Spearman rank correlations of low-level visual properties with memorability scores and high-level attributes. Note that these comparisons have not been corrected for multiple comparisons.

	ResMem		Online Scores		In-person Scores	
	ρ	*P*	*ρ*	*P*	*ρ*	*P*
Mean Hue	-0.05	0.543	0.01	0.874	0.07	0.405
St. Dev Hue	0.06	0.463	-0.02	0.763	0.15	0.064
Mean Saturation	-0.04	0.636	-0.11	0.168	0.07	0.355
St. Dev Satur.	0.15	0.062	0.14	0.091	-0.14	0.075
Mean Luminance	-0.11	0.163	-0.03	0.732	-0.08	0.348
St. Dev Lumin.	-0.02	0.834	-0.07	0.383	0.10	0.194
Clutter	**-0.30****	**<0.001**	**-0.19***	**0.014**	-0.15	0.057
Spectral Energy	0.11	0.148	0.11	0.173	-0.02	0.841

	Beauty		Interest		Emotion		Familiarity	
	ρ	*P*	*ρ*	*P*	*ρ*	*P*	*ρ*	*P*
Mean Hue	0.08	0.328	0.02	0.825	0.12	0.150	0.08	0.340
St. Dev Hue	**-0.18***	**0.024**	-0.03	0.742	-0.44	0.584	-0.08	0.308
Mean Saturation	-0.03	0.693	<0.01	0.959	0.10	0.206	<-0.01	0.928
St. Dev Satur.	-0.06	0.424	-0.07	0.375	0.05	0.548	-0.07	0.405
Mean Luminance	0.15	0.054	**0.18***	**0.023**	0.08	0.315	0.15	0.056
St. Dev Lumin.	**0.22****	**0.005**	**0.16***	**0.039**	**0.24****	**0.003**	0.01	0.943
Clutter	**0.21****	**0.007**	**0.21****	**0.008**	**0.21****	**0.008**	0.04	0.605
Spectral Energy	0.02	0.796	<0.01	0.967	-0.07	0.409	0.06	0.442

Table S3. Statistical measures (*β*, *SE*, *t*, *P*) for the final model (i.e., including high-level attributes) predicting in-person memory. All regressors were first standardized before being entered into the model. ***** indicates regressors that are significantly predictive of in-person memory ($P < 0.05$). For this model, $F = 12.40$, $P < 0.0001$, $R_{adj}^2 = 0.44$, $AIC = 369.97$.

	β	*SE*	*t*	*P*
(Intercept)	0.13	0.08	1.74	0.084
ResMem*	**0.35**	**0.08**	**4.28**	**<0.0001**
Painting Size*	**0.39**	**0.13**	**2.93**	**0.004**
Floor*	**-0.43**	**0.08**	**-5.59**	**<0.0001**
ResMem Context	-0.11	0.09	-1.16	0.249
Size Context	0.11	0.16	0.67	0.505
Beauty	-0.18	0.15	-1.19	0.238
Emotion	0.08	0.11	0.79	0.434
Interest*	**0.46**	**0.10**	**4.78**	**<0.0001**
Familiarity	0.09	0.07	1.38	0.171
ResMem : ResMem Context	0.06	0.07	0.90	0.370
Size: Size Context*	**-0.18**	**0.05**	**-3.92**	**0.0001**

Table S4. Unique variance attributed to each significant main predictor in the full model (Table S3). Unique variance was calculated as the increase in R^2 from a model without a given predictor and the model with all main predictors (ResMem, Painting Size, Floor, and Interest).

	Unique Variance (Change in R^2)
ResMem	0.062
Painting Size	0.018
Floor	0.180
Interest	0.192
Full Model	**0.364**

Table S5. Results of a stepwise regression including all possible factors. This stepwise regression used both forward selection and backwards elimination, based on an F-test of the change in the sum of squared error from adding / removing each term ($P < 0.05$ to be added, $P > 0.10$ to be removed). The predictors that did not successfully make it into the model are: mean hue, mean saturation, mean luminance, hue contrast, luminance contrast, ResMem context, number of pieces in room, beauty, emotion, familiarity, the presence of people, and the category of painting (e.g., portrait, landscape). For this model, $F = 16.8$, $P < 0.0001$, $R_{adj}^2 = 0.53$, $AIC = 344.77$.

	β	*SE*	*t*	*P*
(Intercept)	0.12	0.06	1.89	0.061
ResMem*	**0.28**	**0.07**	**4.14**	**0.0001**
Painting Size*	**0.25**	**0.12**	**2.11**	**0.037**
Floor*	**-0.40**	**0.06**	**-6.61**	**<0.0001**
Size Context	0.10	0.15	0.63	0.531
Interest*	**0.38**	**0.07**	**5.29**	**<0.0001**
Saturation Contrast*	**-0.19**	**0.07**	**-2.78**	**0.006**
Clutter	-0.09	0.08	-1.15	0.254
Spectral Energy*	**-0.16**	**0.06**	**-2.75**	**0.007**
Floor: Saturation Contrast*	**-0.15**	**0.06**	**-2.42**	**0.017**
Size Context : Clutter*	**0.36**	**0.07**	**5.02**	**<0.0001**
Interest : Clutter*	0.15	0.07	2.04	0.043

SI References

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