Supplementary Information

Who benefits from online art viewing, and how: The role of pleasure, meaningfulness, and trait aesthetic responsiveness in computer-based art interventions for well-being

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Online Art Intervention Stimulus

Monet: The Water-Lily Pond. An in-painting tour from the National Gallery, London (https://artsandculture.google.com/story/monet-the-water-lily-pond/WgIS72lKcegxJQ)

1. It wasn't actually a painting that Monet deemed his 'greatest work of art' but the beautiful gardens he created at his home in Giverny. In his later years, it became his sole subject.
2. The bridge, which Monet designed himself, shows the influence of Japanese art on his work. This is one of 18 canvases of this view in differing light conditions that Monet started in summer of 1899, the same year he started painting Waterloo and Charing Cross bridges.
3. The late afternoon sun casts a shaft of light over the bridge, illuminating the right-hand side in pale green in contrast to the prevailing darker blue-green.
4. The bold line of the bridge and the longer brushstrokes of the reeds provide a contrast to the small daubs of colour of the water-lilies.
5. Monet's water-lilies were a hybrid breed in pink and yellow as well as white.
6. The undersides of the water-lilies were dark red, the same colour in which Monet signed the painting. Red is on the other side of the colour wheel to the green that dominates the painting; this contrast was in keeping with Monet's interest in complementary colours.
7. Among the mass of water-lilies, you can also see the reflection of the willow trees on the surface of the pond.

Examination of the Impact of Device Type

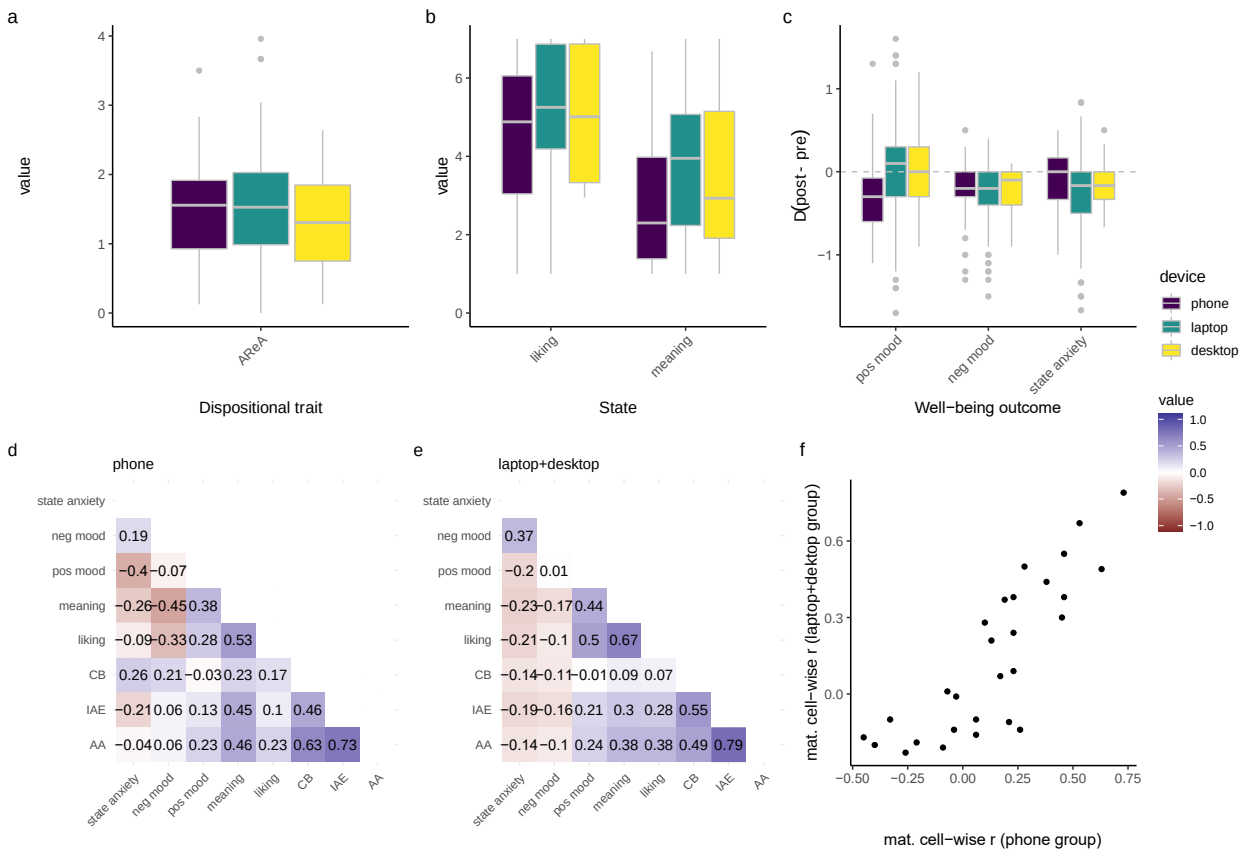
We examined the impact of the type of device (i.e., phone, laptop, and desktop) that participants used to visit the online art exhibit and carry out the survey on. Device type was self-reported by participants. As noted in the main text, 71% of participants completed the experiment on a laptop (N = 171), 17% used a smartphone (N = 40), and 12% used a computer with a desktop monitor (N = 29). We split the AReA (trait), liking and meaning (state), and the well-being outcomes by phone, laptop, or desktop computer. As shown in the upper panel of Supp. Figure 1, on average, those who used a phone had lower levels of meaning and liking and reduced positive mood from pre- to post-assessment. The descriptive statistics can be found in Supp. Table 1.

Supplementary Table 1.

Descriptive Statistics of Trait, State and Well-being Outcomes split by Device Type

	Dependent Variable					
Device Type	AReA	Liking	Meaning	Change in Pos. Mood	Change in Neg. Mood	Change in Anxiety
	M (SD)					
Phone	1.50 (.76)	4.48 (1.67)	2.87 (1.68)	-0.27 (.50)	-0.23 (.37)	-0.05 (.33)
Laptop	1.53 (.74)	5.33 (1.43)	3.69 (1.68)	0.02 (.54)	-0.25 (.32)	-0.23 (.45)
Desktop	1.31 (.69)	5.11 (1.60)	3.42 (1.77)	0.00 (.49)	-0.23 (.27)	-0.10 (.29)

We tested the significance of the effect of device type via six univariate ANOVAs, and Bonferroni corrected for multiple comparisons. There were no differences for AReA, $F(2, 237) = 1.13$, $p > .999$, for meaning, $F(2, 237) = 3.92$, $p = .127$, for change in negative mood $F(2, 237) = 0.14$, $p > .999$, or for change in anxiety $F(2, 237) = 3.29$, $p = .235$ across device types. However, there was a significant difference between device types for liking, $F(2, 237) = 5.24$, $p = .036$, and change in positive mood, $F(2, 237) = 5.17$, $p = .0.038$ (all p-value Bonferroni adjusted). Posthoc Tuckey‘s Honest Significance Difference tests carried out on the significant ANOVAs revealed significant differences between viewing the art on phones and laptops for mean changes in positive mood ($p = .004$), and liking ($p = .004$), where those who used phones had lower liking and reductions in positive mood.



Supplementary Figure 1. *Trait, State and Well-being Outcomes Split by Device Type.* **A),** The level of AReA is split by device type, where purple represents phones, green represents laptops, and yellow represents desktop (in order from left to right for each box plot graph). Median is shown by the grey horizontal line mid-box plot **B)**, Differences between device types for liking and meaning. **C)**, Changes in well-being outcomes split by device type; the horizontal dashed line indicates no change from pre to post. **D)**, Standardized variance-covariance matrices (i.e., the correlation matrices) of the variables of interest for only the phone group. **E)**, Standardized variance-covariance matrices for combined laptop and desktop groups. **F)**, The scatter plot between cell matrices shown in panels D and E, where the phone group is on the x-axis, and the laptop + desktop group are shown on the y-axis (mat. = matrix).

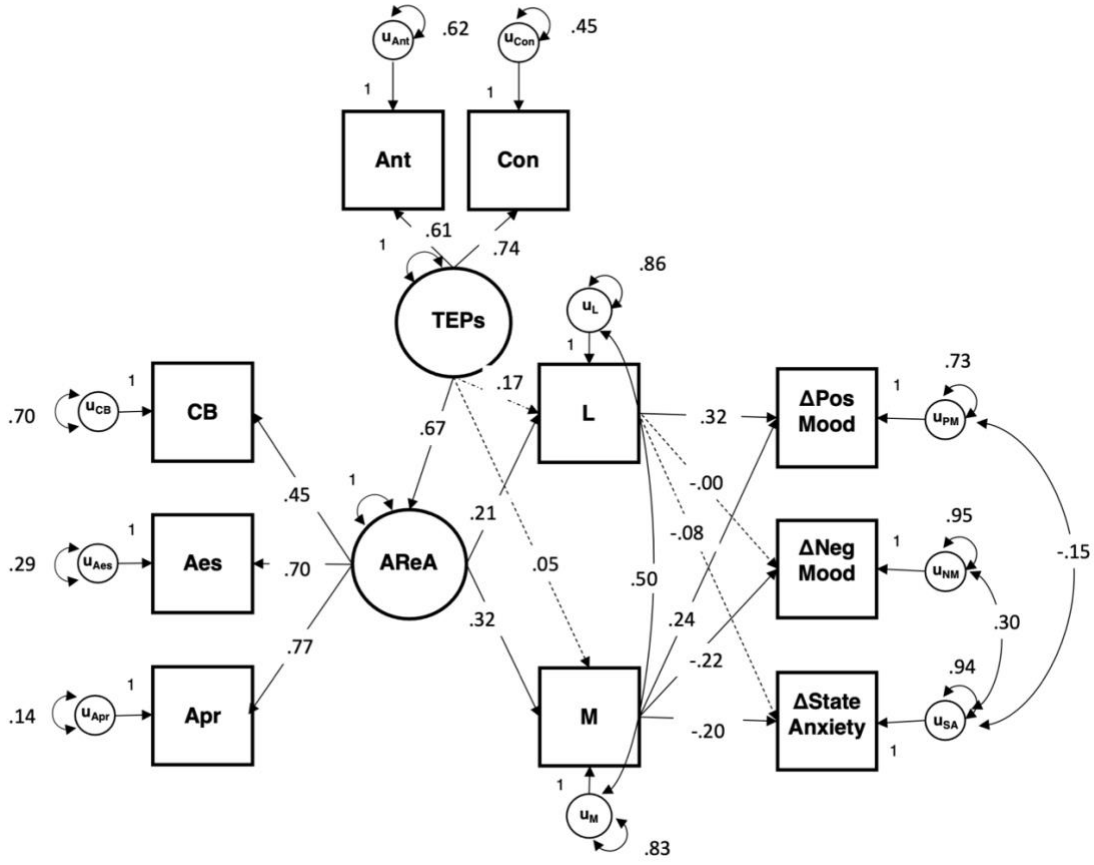
We then investigated whether the relationships across variables of interest (trait, state, and well-being outcomes) differed across device types. To do so, we compared the standardised variance-covariance matrices (i.e., the correlation matrices) computed by stratifying over device type. Given that we did not find significant differences across laptop and desktop, and that we observed similar descriptive results for the two types, we decided to cluster laptop and desktop in one larger group (laptop + desktop). This was done to increase the sample and to reduce the burden of further multiple comparison tests. As seen in the lower panel of Supp. Figure 1, the variance-covariance matrices were similar and highly correlated (Figure 1f; Mantel test with 5000 permutations Spearman rho = .85, p <.001). This indicated that the underlying structure of relationships amongst variables of interest was highly similar across device types, suggesting our

SEM of trait-state-outcome fitted in the main text could likely hold regardless of the device group. However, further study should confirm if this is the case.

To further investigate the differences between device types (phone vs., laptop+desktop; liking and positive mood changes), we tested if differences in liking across condition could explain the different impact of the art viewing on positive mood. As expected when running three linear models, device type significantly predicted changes in positive mood (model: lm(positive mood ~ device); $\beta = .29$, $t(1, 238) = 3.22$: $p = .001$). When including both device type and liking as IVs, the effect of device was no longer significant (model: lm(positive mood ~ device + liking): $\beta = .16$, $t(2, 237) = 1.95$, $p = .052$), while liking significantly predicted changes in positive mood ($\beta = .16$, $t(2,237) = 7.95$, $p = < .001$). However, as we included the interaction between device type and liking, we found that the interaction was the only remaining significant effect (model: lm(positive mood ~ device*liking); $\beta = .10$, $t(3, 236) = 2.00$, $p = .047$), although we note that liking was also marginally significant $\beta = 0.08$, $t(3, 236) = 1.85$, $p = .066$. This indicated that the relationship between liking and positive mood was weaker, although still positive, in the phone condition compared to the laptop and desktop conditions.

Overall, this supplementary analysis indicated that the vehicle of delivery of online art interventions could play a role in the positive mood outcomes caused by art viewing. However, it is difficult to interpret these supplementary results given the relatively small sample size in the phone group. We urge further research to consider the role of device type and especially to examine differences in user experience of online art exhibitions between different modalities that could contribute to the subjective experience that individuals have. We suggest that it could be important to control for the level of optimization across device types as the quality of the experience is likely a major factor of how effectively art viewing can impact levels of mood. For example, simply the size of artwork could have a strong impact on the subjective experience, such as those viewing the art on phones were simply unable to observe the level of detail in the painting that would be afforded on a larger screen. In the future, we suggest online art viewing studies to control for device type and design experiments with equally sized groups across laptops/desktops compared to phones or tablets to provide a more nuanced explanation.

Sensitivity Analysis Including Reward Sensitivity (TEPs) in SEM Model



Supplementary Figure 2. *SEM model with Reward sensitivity as a covariate of AReA.* Standardized path estimates are shown. Significant paths are represented as solid lines.