Aesthetic appreciation is more than seeing, and symbolicity is more than discriminating: a comment on Tylén et al. (2020)

Authors: Xinchu Yu^{1,2}, Ernst Pöppel^{1,3}, Yan Bao^{1,3}, *

¹ School of Psychological and Cognitive Sciences, Peking University, Beijing 100871, China

² Department of Chinese Language and Literature, Peking University, Beijing 100871, China

³ Institute of Medical Psychology, Ludwig Maximilian University, Munich 80036, Germany

* Corresponding author: baoyan@pku.edu.cn.

ORCID: Xinchu Yu (<http://orcid.org/0000-0002-6165-7909>)

Ernst Pöppel (<http://orcid.org/0000-0001-9174-7385>)

Yan Bao (<http://orcid.org/0000-0002-5907-3955>)

With 0 figures and 0 tables.

Abstract: This article provides a brief critique on a recent study [Tylén, K. et al. (2020): The evolution of early symbolic behavior in Homo sapiens. *Proc. Natl. Acad. Sci. U.S.A.* 117(9), 1578-1584. doi: 10.1073/pnas.1910880117] on whether early human engravings became more aesthetic, more culturally identifiable and more symbolic over time. We argue that some of the experimental designs in the target article does not match well with the corresponding hypothesis. Future research on the cognitive and neural basis of human art and language evolution should pay more attention on the effect of topological features (“hole-features”) on visual perception, implicit processing in aesthetic appreciation, and the complementarity of generalization and discrimination in the processing of symbolic systems.

Keywords: human evolution, symbolicity, aesthetic appreciation, topological features, complementarity

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In a recent article, Tylén and colleagues (2020) attempted to test whether early human engravings became more aesthetic (H1 in the original article), more culturally identifiable (H2) and more symbolic (H3) over time, using visual stimuli derived from the engravings from the Blombos Cave and the Diepkloof Rock Shelter. However, the experimental designs do not represent unequivocally the corresponding hypotheses; thus, there is no valid basis for some conclusions, especially for H1 and H3. Our reasonings are as follows.

Did the engravings become more aesthetic over time?

Tylén and colleagues (2020) argued that, if the Blombos and Diepkloof engravings evolved to be more aesthetic for human over time (H1), they would be more visually salient to human visual system ($H1_{p1}$) and be perceived as more intentionally created reported by subjects ($H1_{p2}$). Therefore, in Experiment 1, the engraving stimuli were presented to the non-dominant eye of participants, while patches of flickering colors to the dominant eye. The faster the subjects report (by keypress) that they were able to see the stimuli, the more visually salient the stimuli would be. As the authors also admit, the promptness of pressing the key reflects the speed of entering “conscious perception” for the stimuli, and this paradigm measures “low-level visual salience” (Tylén et al., 2020, pp. 4580) for visual stimuli.

However, that the engravings were produced for aesthetic appreciation (H1) does not necessarily predict increased saliency ($H1_{p1}$). Current evidence is not enough to support the concept that the more beautiful an object is, the more visually salient it should be; it is also questionable whether conscious perception (see Zhou et al., 2016) is a necessary condition for aesthetic appreciation as implicit (or “subconscious”) processes are playing an important role (e.g., Era, Candidi & Aglioti, 2015; Massar & Buunk, 2010). Although there have been evidence for faster entrance into consciousness for more attractive stimuli in face perception (Hung, Nieh & Hsieh, 2016; Nakamura & Kawabata, 2018; Tsikandilakis, Bali & Chapman, 2019), similar evidence for visual art has been equivocal (Shang, Liu, Chen & Fu, 2018); the conclusions from face perception could not be simply generalized to visual perception in general, given the special status of face perception in our cognitive system (e.g., Hu, Huang, Eickhoff, Peng & Sui, 2019). Even if there is a correlational relation between consciousness-entering time and beauty for visual art, a causal relation still need to be established in order to test H1. The increased saliency over time could also be confounded by the increase of with-hole stimuli used in this experiment: with-hole visual stimuli have an advantage in visual processing (Meng, Cui, Zhou, Chen & Ma, 2012; Zhang et al., 2009; Zhang et al., 2019), presumably due to its distinct processing pathways in the brain (Meng et al., 2018). Notably, Zhang and colleagues (2009) also used a similar paradigm of binocular rivalry (like that in Experiment 1), and observed that the stimuli with holes (e.g., “O” shape) are faster to be seen by subjects, compared to “no-hole” stimuli (e.g., “S” shape), reflecting the effect of topological features (a “low-level” visual feature) in human visual perception. Furthermore, perceived beauty does not necessarily correlate positively with intentionality (Experiment 2,

H1_{p2}); more direct measurements like explicit beauty ratings of the perceived beauty of the stimuli would have been necessary.

Did the engravings become more symbolic over time?

Tylén and colleagues (2020) also argued that, if the Blombos and Diepkloof engravings evolved to be more symbolic over time (H3), they would be easier to discriminate (H3_{p1}). Therefore, in Experiment 5b (actually using a subset of data from Experiment 5), the authors measured the “discriminability” among stimuli within the same site by the reaction time that the subjects used to find the same stimuli to the target, despite the interference of other same-site stimuli. Faster response will indicate better “discriminability” between the target stimuli and the competitor stimuli. It should be noted that the authors’ own citations in this part do not support the relationship between symbolicity and “discriminability”: Appelle (1972) and Foster & Westland (1995) (ref. 35, 37 in the original article) are about orientation judgement, and Changizi & Shimojo (2005) (ref. 36 in the original article) is about the visual characteristics of human writing systems.

Moreover, being symbolic (H3) is certainly not only about “discriminability” (H3_{p1}). The perception of symbolic systems involves a complementarity of generalization and discrimination (Keller & Schoenfeld, 1950). For example, modern humans could perceive different handwritten characters as the same character appropriately (Babcock & Freyd, 1988), demonstrating an effect of generalization. The explicit “discriminability” measured by reaction time in Experiment 5b, is therefore potentially affected by both generalization and discrimination for the participants. Therefore, an increase in the number of symbols in a symbolic system comes with a new pattern of generalization and discrimination, which could affect the “discriminability” in either direction: this indicates that more symbolicity does not necessarily come with more “discriminability”; furthermore, the limited experimental stimuli for each period (4 engravings for each site) are not necessarily comparable, as it is unknown whether some of the signs were actually perceived as the same symbol (just like the same character with different handwritings). The subjects could be employing discrimination and generalization to different extents for different stimuli triads, according to their experience with modern writing systems. This might leave the stimuli for the three periods inhomogeneous in the need to discriminate or generalize, which is caused by the selection of stimuli set, rather than the engraving systems themselves. Thus, in order to correctly design and interpret Experiment 5, one should also overcome *monocausality* and quantify the opposing effect of complementary components of generalization and discrimination (Bao, von Stosch, Park & Pöppel, 2017). Possibly, the measurements were shadowed by other intervening factors. Absence of evidence is not evidence of absence.

Conclusion

Taken together, although the experimental design of Tylén et al., (2020) in general is very elegant, the conclusions based on the experimental data are with respect to aesthetic appreciation data too “ambitious” and with respect to symbolicity too “conservative”. Therefore, we call for a more careful and cautious interpretation of the results for H1 (“the aesthetic resonance hypothesis”) and

H3 (“the symbolic denotation hypothesis”) in the original article; this means that more concrete evidence through better-designed research in the future is needed to validate whether early human engravings became more symbolic and aesthetic over time. In this article, we also highlight the effect of topological features (“hole-features”) on visual perception (see also Chen, 2005; Pöppel & Bao, 2011), implicit processing in aesthetic appreciation, and the complementarity of generalization and discrimination in the processing of symbolic systems, which may have not received enough attention in the cognitive approaches to studying archaeology, anthropology, and human evolution.

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