Functional implications of chromatic variations and 'symmetry of things in a thing' in biological vision

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Symmetry contributes to processes of perceptual organization in biological vision and influences the quality and time of goal directed decision making in animals and humans, as discussed in recent work on the examples of 'symmetry of things in a thing' and bilateral shape symmetry (Dresp-Langley, Affine Geometry, Visual Sensation, and Preference for Symmetry of Things in a Thing. *Symmetry* 2016, *8*, 127; Dresp-Langley, Bilateral Symmetry Strengthens the Perceptual Salience of Figure against Ground. *Symmetry* 2019, *11*, 225). The present study was designed to show that selective chromatic variations in geometric shape configurations with mirror symmetry can be exploited to highlight functional properties of 'symmetry of things in a thing' in human vision. The experimental procedure uses a psychophysical two-alternative forced choice technique, where human observers have to decide as swiftly as possible whether two shapes presented simultaneously on a computer screen are symmetrical or not. The stimuli are computer generated 2D shape configurations consisting of multiple elements, with and without systematic variations in local color, color saturation, or contrast to manipulate 'symmetry of things in a thing'. All stimulus pairs presented had perfect geometric mirror symmetry. The results show that altering the color saturation of local shape elements selectively in multi-chromatic and mono-chromatic shapes significantly slows down perceptual response times, which are a direct measure of uncertainty. It is concluded that local chromatic variations may produce functionally important variations in ‘symmetry of things in thing’, increase stimulus uncertainty, and affect the perceptual salience of mirror symmetry and the time course of goal-relevant human decisions.

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