

Complex shapes are darker and more saturated; Shape-Color correspondence in 3D object perception

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An object is perceived in both visual and haptic modalities through its sensory information. The present study aimed to investigate shape-color correspondence of a three-dimensional object. Specifically, we examined whether shape complexity has a systematic relationship with luminance and saturation and whether the relationship depends on the modality of exploration (i.e., visual or visuo-haptic). 3D shape models were produced by Superformula (Gielis, 2003) which allows to parametrically modulate its complexity. White 3D shapes were presented visually through rotating video clips or visuo-haptically through 3D printed stimuli. We created a color palette consisting of luminance and saturation dimensions for five hues selected from a preliminary survey to include a wide range of color options. While exploring the shapes in visual and visuo-haptic conditions, participants proceeded to choose from the palette a color that best matches each shape. The results showed that luminance decreased, and saturation increased with increasing shape complexity. Data from the visuo-haptic condition displayed tighter associations than the visual condition. These results suggest that the complexity of shape has a non-arbitrary association with luminance and saturation of color in a 3D object. Furthermore, our findings suggest that adding haptic exploration to that of visual tightens the associations, with the pattern of the shape-color correspondence maintained.

Keywords: shape-color correspondence, visuo-haptic, 3D object