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Extraversion predicts a preference for high-chroma colors

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ABSTRACT

The multitude of research on human color preferences has primarily focused on hue. Only a modicum of research has focused on preferences along the chroma dimension of color. The present research examines how extraversion relates to a preference for high and low-chroma colors (with chroma being manipulated while holding hue and lightness constant). Results from two studies revealed that extraversion was positively associated with a preference for high-chroma colors, but not low-chroma colors. This relationship remained significant after controlling for the other Big Five traits, sensory-processing sensitivity, positive/negative affect, and sex.

1. Introduction

Research on human color preferences has a long history. One notable issue with the extant literature on color preferences is that researchers typically characterize colors as categorical (i.e., in terms of hue; red, green, blue, etc.) and then assess which categories of colors are generally preferred over others. For example, a common finding is that people report liking blue more than other colors, followed by green, red, and least of all, yellow/brown (Guilford & Smith, 1959; McManus, Jones, & Cottrell, 1981; Palmer & Schloss, 2010; Schloss, Strauss, & Palmer, 2013). While it may be intuitive to consider colors as discrete categories, color varies continuously along the independent dimensions of hue (corresponding to categories like red, green, blue, etc., but also varies continuously, often represented as an angle coordinate in many color spaces), chroma (analogous to saturation or intensity, corresponding to the 'colorfulness' of an object), and lightness (analogous to brightness and value in some color spaces, corresponding to the relative amount of light coming from an object; see Fairchild, 2013 for a comprehensive overview of color models). Any given hue can have a wide range of appearances based on its chroma and lightness content. For example, olives, limes, and emeralds each have a green hue, but they differ in chroma (emeralds are much more vibrant than olives) and lightness (limes are much lighter than emeralds). Primarily focusing on hues is problematic when assessing color preferences, as it is probably not the case that all greens, blues, or reds are liked equally. The present research narrows the scope of color preferences along the chroma dimension. Furthermore, we examine how extraversion may relate to these preferences.

There is reason to believe that extraversion may interact with chroma levels when predicting individual color preferences. Eysenck (1967), for example, has posited that a characteristic of extraverted individuals is a relatively low baseline level of cortical arousal (whereas introverts have a relatively high baseline of cortical arousal). Consequently, extraverts have a higher tolerance for (and seek out) high-intensity sensory stimuli which may provide them with optimal levels of arousal. This has been shown repeatedly in the auditory domain, as extraverts are less sensitive to white noise (Elliot, 1971; Stelmack & Campbell, 1974), music (Dobbs, Furnham, & McClelland, 2011), and television (Furnham, Gunter, & Peterson, 1994), and they actively pursue noisy environments (Campbell & Hawley, 1982; Geen, 1984). There is also evidence that extraverts are less sensitive to gustatory stimulation (Eysenck & Eysenck, 1967) and somatosensory stimulation (Barnes, 1975; Schaefer, Heinze, & Rotte, 2012). Some research also indicates differences in response to visual stimuli, as extraverts have a higher tolerance for lights (Ludvigh & Happ, 1974), and they inspect aspects of their visual field at a faster rate (Brebner & Cooper, 1978). Evidence indicates that extraversion is associated with a greater tolerance toward, and a preference for, high-intensity stimuli across various modalities. It would be reasonable to predict a similar pattern when considering preferences toward colors varying in intensity.

Here we examine whether extraversion will predict a preference for colors varying along the chroma dimension. As chroma is essentially the intensity of hue content in any given color, it seems reasonable to posit that extraverted individuals will show a stronger preference for highly chromatic colors, relative to introverts.

Some research has focused on general preferences toward color stimuli varying along the chroma continuum, though results have been mixed. For example, people tend to have a general preference for high-

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Table 1
Descriptive statistics and correlations between measures in Study 1.

	Descriptives			Correlations			
	M	SD	α	1	2	3	4
1. Extraversion	3.37	0.61	0.82				
2. Openness	3.44	0.56	0.73	0.04			
3. Agreeableness	3.61	0.56	0.79	0.29**	0.04		
4. Conscientiousness	3.56	0.63	0.86	0.22**	−0.08	0.30**	
5. Neuroticism	2.97	0.74	0.88	−0.41**	0.10	−0.27**	−0.41**

* $p < 0.05$.
** $p < 0.01$.

chroma, relative to low-chroma colors (Ou, Luo, Woodcock, & Wright, 2004; Palmer & Schloss, 2010). However, this may only be the case when color preferences are assessed out of context. When color preferences are assessed in conjunction with objects (e.g., clothing, cars, couches), low-chroma colors tend to be preferred (Schloss et al., 2013). In contrast, Hogg (1969), found that people liked colors at medium levels, relative to colors either high or low, on chroma. None of these investigations examined how personality differences may relate to preferences for colors varying in chroma, however.

Other scholars have examined individual differences in preferences for chromatic colors, albeit in a roundabout fashion. For example, when investigating general color preferences, Eysenck (1941a) discovered that people typically fall into one of two groups — those who prefer highly chromatic colors, and those who prefer lowly chromatic colors. Eysenck (1941a) did not, however, investigate potential moderating variables (e.g., extraversion) that might explain why individuals may gravitate toward one preference or the other. In a subsequent study, extraverted participants reported a preference for modern paintings with lively colors, while introverts preferred more subdued colors in paintings (Eysenck, 1941b), though chroma was not manipulated systematically. Barrett and Eaton (1947) explored whether personality variables were related to a general preference for colors versus tints (which can roughly be conceptualized as high-chroma vs. low-chroma colors, respectively). Their general findings indicate that those who preferred high-chroma colors were more engaged with objects in the external environment, whereas those who preferred low-chroma colors were more involved with their own internal thoughts. Barrett and Eaton's (1947) findings seem to provide initial support that a preference for chroma may be associated with extraversion, but it is important to note that the spectral properties of their stimuli were not controlled in any way, and their measure of extraversion was rather indirect. Similarly, Gotz and Gotz (1975) showed that introverts preferred subdued colors, relative to extraverts, but their investigation also neglected to isolate chroma while controlling for other color properties.

The studies described above point to the possibility of a relationship between extraversion and color preferences along the chroma dimension, though methodological shortcomings inhibit interpretations of these findings. In order to rigorously investigate whether psychological variables are related to a specific dimension of color, the methodology must allow for systematic variation of one dimension (e.g., chroma), while holding the others (e.g., hue, lightness) constant. The goal of the present research is to measure preferences for colors varying along the spectral property of chroma and test whether extraversion can predict individual differences in these preferences.

2. Hypotheses

Extraversion will moderate the degree to which chroma predicts color preferences. Specifically, people relatively high on extraversion will report liking high-chroma colors more than individuals who are relatively low on extraversion, and the opposite pattern will be observed for low-chroma colors (i.e., extraverts will like low-chroma colors less than their introverted counterparts). No such relationships will be present for any other Big Five personality traits.

3. Study 1

3.1. Method

3.1.1. Participants and procedure

Participants from an undergraduate psychology course at a U.S. university participated in the study for extra credit ($n = 301$). Sample size was determined by course enrollment. In this and the subsequent experiment, all data were collected before any analyses were conducted. All data exclusions and variables analyzed are reported.

Participants followed a web link to gain access to a survey on color preferences. After reading a consent form and agreeing to participate, the survey continued to a color rating task in which 18 color squares were presented one at a time. The squares were 350 × 350 pixels, centered on the screen. Displayed directly underneath each color square was the question, “How much do you like this color?” to which participants responded on a 0 (not at all) to 100 (very much) slider scale. The order of the color presentation was randomized across participants.

3.1.2. Measures

Personality variables were assessed via the Five Factor Inventory (NEO-FFI; Costa Jr & McCrae, 1992) earlier in the semester in a separate survey, which were matched with participants' color preference data by an identification number. The NEO-FFI contains 60 items that are comprised of 5 subscales (12 items for each of the Big Five personality traits). Participants were instructed to indicate their level of agreement with each item (e.g., I like to have a lot of people around me) on a scale from 1 (strongly disagree) to 5 (strongly agree). Responses for each subscale were averaged to form a composite index (see Table 1 for descriptive statistics and correlations between variables).

3.1.3. Color stimuli

We created 9 pairs of colors representing a wide range of hues. Each pair was equated on hue and lightness using an i1-pro spectrophotometer, such that the only spectral property that varied within pairs was chroma. Hue and lightness varied across pairs (see Appendix for LCh values for all color stimuli). Due to the online nature of the experiment, the exact LCh values varied somewhat between participants due to their computer's unique color display settings.

3.2. Results

We used multilevel modeling (HLM 6.0; Raudenbush, Byrk, & Congdon, 2004) to test the extent to which chroma, personality traits, and their interaction would predict color preferences. We created a two-level model in which repeated assessments of color likeability across levels of chroma (dummy coded; 1 = high-chroma, 0 = low-chroma) were modeled at level 1. Each of the Big Five traits were modeled at level 2. All variables were grand-mean centered. The

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