



Neuroticism, schizotypy, and scale anchors influence eye movement behaviour in the visual exploration of abstract art: An exploratory study

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ABSTRACT

The same piece of artwork can attract both admiration and rejection from different people. One potential explanation for this effect is individual differences in perceptual biases, which influence the way in which we see different aspects of the same image. We explored the relationship between individual differences (i.e., personality) and eye movements for examinations of abstract art. Images were presented for 5000 ms, after which participants judged aesthetic appeal and perceived value using visual analogue scales. Scale anchor labels (*Looks Good/Looks Bad; \$0/\$5000*) were counterbalanced between participants such that positive labels were on the left half of the time and on the right half of the time. Overall, more fixations occurred to the right and upper visual fields. Neuroticism significantly predicted the proportion of fixations to the left, whereas cognitive disorganisation negatively predicted the proportion of fixations to upper space. Participants found images more aesthetically pleasing and more valuable when positive anchors were on the left. Findings demonstrate that personality traits influence fixation patterns. Further, the positioning of positive anchor labels on the left leads to higher ratings of visual stimuli.

1. Neuroticism, schizotypy, and scale anchors influence eye movement behaviour in the visual exploration of abstract art: an exploratory study

The same piece of artwork can attract both admiration and rejection from different people. Unsurprisingly, there is a high degree of inter-individual variability in what people find appealing and unsightly. This variability in artwork preference is undeniably a positive aspect of art, because it allows a variety of artists to find a market. But, how do such differences in art appreciation occur? One intuitive explanation is that personality and the way in which we visually examine artwork contributes to our preferences for particular art.

1.1. Personality and artwork preference

Many contemporary personality psychologists believe that personality exists along 5 dimensions (i.e., openness, conscientiousness, extraversion, agreeableness, and neuroticism), which are commonly indexed using Costa and McCrae's (1992) *Big Five Personality Inventory*. *Openness* reflects characteristics such as imagination, creativity, and openness to try new things. *Conscientiousness* includes high levels of thoughtfulness, good impulse control, and goal-directed behaviour.

Extraversion is characterized by excitability, sociability, and talkativeness, which is often associated with greater levels of emotional expressivity. Individuals with higher levels of *agreeableness* have attributes such as trust, altruism, and prosocial behaviours. Finally, those who score high on *neuroticism* report moodiness, emotional instability, and anxiety. Features across all five dimensions interact and combine to produce individual differences in personality types.

Furthermore, various constellations of personality characteristics can contribute to the formation of schizotypal personality (Mason, 2015). Schizotypy is characterized as a useful unifying construct for understanding schizophrenia-spectrum psychopathology (Kwapil & Barrantes-Vidal, 2014), as symptoms can range from the very mild (e.g., odd beliefs) to substantial extremes (e.g., hallucinations; Kwapil & Barrantes-Vidal). Importantly, schizotypy is multidimensional and occurs amongst diverse populations, with a variety of expressions (Kwapil & Barrantes-Vidal, 2014).

The common features of schizotypy include ideas of reference (i.e., suspicions that people or the media are specifically referring to you), excessive social anxiety, odd beliefs or magical thinking, unusual perceptual experiences, odd or eccentric behaviour, a lack of close interpersonal relationships, odd speech, constricted affect, suspiciousness, cognitive disorganisation, physical anhedonia, and impulsive

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nonconformity. Commonly, schizotypy is qualified as demonstrating either positive (i.e., magical thinking; Eckblad & Chapman, 1983) or negative (i.e., physical anhedonia; Chapman, Chapman, & Raulin, 1976) symptoms. This list emphasises the heterogeneous and multi-dimensional nature of schizotypy, while also clearly highlighting the importance of thoroughly understanding of this personality type.

A number of personality traits have been linked to artwork preferences (Chamorro-Premuzic, Reimers, Hsu, & Ahmetoglu, 2009) and, more specifically, individuals with more neurotic or schizotypal traits report common preferences for particular pieces of art. For example, Furnham and Walker (2001) asked participants to rate their personal preference for representational, abstract, or pop art paintings, using an 11-point Likert scale (ranging from ‘dislike extremely’ to ‘like extremely’). Following presentation of the paintings, participants completed two personality questionnaires: the *Sensation Seeking Scale Form VI* (Zuckerman, 1984), and the *NEO Five-Factor Inventory (FFI) Form S* (Costa & McCrae, 1985). Neuroticism correlated positively with preferences for abstract and pop art, showing that more neurotic individuals found abstract and pop art more appealing.

Using a similar design, Rawlings (2000) asked participants to rate their preference for seven categories (abstract, violent, erotic, religious, complex, simple, organised/structured, and realism) of paintings. Participants observed each painting and rated their preferences on a 2-point scale (like/dislike). Participants also completed an abbreviated version of the *Oxford-Liverpool Inventory of Feelings and Experiences* (Mason, Claridge, & Jackson, 1995), which includes four subscales of schizotypy. Significant Pearson correlations indicated that participants who were high on ‘impulsive nonconformity’ preferred violent paintings, those with greater scores of ‘unusual experiences’ preferred both abstract and simple paintings, and finally individuals who were high in ‘cognitive disorganisation’ indicated a dislike for organised, erotic, and realistic paintings. In a second experiment, six categories of paintings were viewed (violent/abstract, violent/realistic, erotic/abstract, erotic/realistic, neutral/abstract, and neutral/realistic), and participants used a similar rating scale. Pearson correlations indicated that violent/abstract art was appealing to participants with higher scores of ‘unusual experiences’ and ‘impulsive nonconformity’. Neutral/abstract art was also preferred by participants with greater scores of ‘unusual experiences’ and ‘impulsive nonconformity’. Taken together, these studies demonstrate that individuals who score higher on measures of schizotypy and neuroticism demonstrate consistent preferences for particular types of artwork. Notably, the relationship between personality traits and artwork preferences (e.g., genre of painting, style, type of art) is well established (Chamorro-Premuzic et al., 2009; Fiest & Brady, 2004; Furnham & Walker, 2001); however, one might wonder, how do relationships between personality traits and art preferences emerge?

1.2. Lateral asymmetries in eye movements

One possible underlying mechanism for observed relationships between artwork preferences and personality (Andrews & Coppola, 1999; Ceballos & Bauer, 2004; Rauthmann, Seubert, Sachse, & Furtner, 2012) is an attentional bias in viewing behaviour. Although it is well established that our attention is most often initially directed to the left (Corbetta & Schulman, 2011; Jewell & McCourt, 2000), many individual differences, such as reading habits influence eye movement patterns. For example, two people might focus their attention upon entirely different aspects of the same image, purely as a result of individual differences in viewing strategy, which are driven by underlying personality characteristics.

Rauthmann et al. (2012) used linear mixed modelling to determine whether Big Five personality traits (Costa & McCrae, 1992) and the Behavioural Inhibition/Activation Systems (Carver & White, 1994) relate to eye movements when viewing abstract images. They found that participants with higher levels of openness and neuroticism demonstrated longer mean fixation durations and longer overall dwelling

times. In addition, higher levels of behavioural activation characteristics were positively correlated with number of fixations, mean fixation duration, and dwell time. Additional research has also shown that individuals with schizotypal personality traits (both clinical and non-clinical samples) showed a reduction in smooth pursuit eye movements when tracking a white target, an LED, or a laser (Ettinger et al., 2005; Sereno & Holzman, 1995; Yee et al., 1987). Although these studies illustrate that individuals show unique and consistent eye movement patterns, both over time and when viewing different stimuli, which are directly related to personality characteristics (Andrews & Coppola, 1999; Castlehano & Henderson, 2008; Rauthmann et al., 2012; Risko, Anderson, Lanthier, & Kingstone, 2012), they do not indicate whether *fixation location* is influenced by personality.

Leonards and Scott-Samuel (2005) suggested that the balance between internal (e.g., attention) and external (e.g., stimulus features) factors might dictate fixation location during visual exploration. Eye movements were recorded while participants explored faces, landscapes, fractals, and inverted faces. These particular images were selected because of the clear differences between their ecological importance (e.g., faces are high and fractals are low in ecological importance) and frequency of occurrence in real life (e.g., faces are more common than fractals). These factors are important because commonly encountered and ecologically important stimuli are more likely to rely on internal attentional factors during visual processing, whereas less encountered and ecologically unimportant stimuli are more likely to rely on external factors. Participants showed an initial saccade bias for faces (60% showed a leftward bias), whereas this bias did not occur for landscapes, fractals, or inverted faces. The authors attributed this bias to internally driven factors, whereas landscapes, fractals, and inverted faces rely on external factors during visual exploration, which is important because fractals share similar characteristics with abstract artwork. For example, both image types are of lower ecological importance and share similar visual properties, such as distributed locations of information rich areas. As such, abstract artwork alleviates the need to account for pre-existing biases, such as leftward attentional and scan-based asymmetries, and image characteristics (e.g., saliency, memorial factors), providing an excellent medium to explore whether personality traits and eye movements interact to influence artwork preference (Nodine & Krupinski, 2003; Rauthmann et al., 2012).

Although attention, as indexed by behavioural response data (Corbetta & Schulman, 2011; Jewell & McCourt, 2000; Kinsbourne, 1970; Niemeier, Stojanoski, Singh, & Chu, 2008; Reuter-Lorenz, Kinsbourne, & Moscovitch, 1990; Thomas, Loetscher, & Nicholls, 2014), is biased to the left, eye movements over the course of many visuospatial tasks are biased slightly to the right of centre (Elias, Robinson, & Saucier, 2005; Leonards, Stone, & Mohr, 2013; Thomas, Loetscher, & Nicholls, 2012). Leonards and Mohr (2009) questioned whether an initial rightward saccade bias was related to individual differences in personality. Higher scores for positive schizotypal characteristics (e.g., magical ideation) were related to significantly more initial saccades toward the left half-face. Importantly, when positive and negative schizotypy scores were used to separate participants into four groups (i.e., high/high, low/low, high/low, low/high), individuals in the high/high group showed the greatest left half-face preference, and participants in the low/low group exhibited the lowest preference. Coy and Hutton (2013) also found a stronger initial leftward saccade bias and longer dwell times on the left when freeviewing faces amongst individuals with higher levels of schizotypy; however, this bias did not extend to fractals. These findings raise the question, *do reliable horizontal asymmetries in eye movements, as related to personality characteristics, occur when viewing abstract art?*

In addition, asymmetries in gaze patterns are not limited to horizontal space; fixations are also biased toward the upper visual field (Thomas, Loetscher, et al., 2014; Thomas & Elias, 2011). Visual search, face matching, and letter naming performance are superior in upper

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