"The image of black in a thousand different ways": Materiality and visual perception in the work of Franz Kline, David Smith, Ad Reinhardt and Francis Newton Souza

Abstract. This paper reviews the literature on the physical, cognitive and perceptual aspects of black materiality in the art of the modern period, and considers how we perceive the physical methods, materials and processes used in the work of Franz Kline, David Smith, Ad Reinhardt and Francis Newton Souza. The paper highlights the value of embodied simulation theory in understanding work in black paintings and drawings in the modern period, and considers the various ontologies for these objects. It concludes that how we perceive abstract black monochromatic and gestural works of art may be seen as being dependent on a carefully structured relationship between choice and manipulation of material by the artist and a number of complex cognitive functions that occur as part of our visual perception.

Keywords. Visual perception, modern painting, technical art history, artists' materials, neuroaesthetics.

Introduction

The transformative presence and material resonances of the black and white monochrome as a motif in early and mid-twentieth century painting, drawing and sculpture is well documented and extensively studied in the art historical literature. [1] Black in all its variant painted shades has a powerful and transcendent symbolic, monolithic, and often religious presence in the paintings of Kazimir Malevich,[2] Ad Reinhardt,[3] Mark Rothko[4], Pierre Soulages[5] and Francis Newton Souza[6], in the drawings of David Smith[7] and the sculpture of Louise Nevelson[8], amongst other artists of the period. However, while research on the materials and techniques of notable works is extant in much of the growing technical literature on artists of the modern period, there is little research on the materiality of such monochromatic work as a function of its interaction with the human neurophysical system. Notable recent work on the cognitive function in human visual perception has certainly facilitated new knowledge on how we view and understand abstract works of art, but this paper is amongst the first to draw together a review of the neurophysiological literature and the links between materiality and perception as it relates to our understanding of works created in black media.

Moving beyond the rich symbolism of black toward a study from the point of view of neutral materiality is naturally challenging. When encountered in a painting, drawing or sculpture, the colour black is difficult to separate from its signifiers, at least in its Eurocentric conception. Black and blackness suggest absence in both light and spectral colour. Black represents the hidden and unknowable, the Nietzschean abyss and the Jungian shadow-self that one must contend with. In the West at least, its associations are with mourning, formality and the authority of law and the church, and black cannot be disassociated with the West's colonial past.[9] Death, evil, and fear of the unknown are associated values that are almost universally embedded in human cultural consciousness, and the complete absence of reflected light and colours in our visual field inevitably provokes an adaptive wariness.

The primacy of visual perception for elucidating our knowledge of the world has been studied in the phenomenological literature since the 1960s, and more recently applied to physical art objects.[10] We perceive painted works in general through a number of senses, but our visual perception is a function of the reception of electromagnetic waves of energy emitted by a given illuminant, reflected from the surface of a physical object in the real world to our retina and then interpreted by our visual cortex. Physiologically, perception of black surfaces is dependent on the relative absence of all wavelengths of reflected visible light (to a greater or lesser extent). Although this is fairly well accepted, it is clear that, as Anderson has noted, our perception of objects via this visual stimulus it is not particularly well understood. [11] When observing a physical surface, we encode local visual properties such as luminance, colour, texture, contrast, motion and orientation, but this low level, proximal stimulus, does not by itself uniquely identify surface material properties. In this model, low level, proximal feature detection activity must progress to a higher level distal scene analysis that encompasses cognitive functions such as object recognition, the object's spatial relationships with itself and its environment, then cross referencing this with embodied kinaesthetic perception and with prior experience of both similar and different objects obtained from the memory.[12]

The field of neuroaesthetics is an emerging science, but in its fundamental aim to unravel the mechanisms by which the brain distinguishes and interprets works of art, it is an interesting lens through which to look at a number of works by twentieth century artists who employed black media in their work. Although some studies have posited a causal relationship between brain states and the aesthetic experience [13], or have attempted to demonstrate exceptional levels of visual cognition in the brains of visual artists,[14] the evidence for specific causal relationships that can articulate 'the constitutive elements of aesthetic experience and the genesis of aesthetic concepts' remain controversial.[15] [16]A complete review of the research

on the neurophysical mechanisms that underlie human perception of painted surfaces is far beyond the scope of this paper. However, as I will discuss below, how we perceive the black square, the black gestural brush mark and the black field monochrome in the art of the modern period may be seen as dependent on a carefully structured relationship between choice and manipulation of material by the artist and a number of complex cognitive functions that occur as part of our perception.[17]

Franz Kline, David Smith and the sensorimotor response

Past studies have drawn links between the cortical organisation of the visual nervous system and the visual attributes that artists use in their work. Important early research by Calvo-Merino and colleagues demonstrated how fMRI neuroimaging could be utilised to reveal the same premotor, parietal and cerebellar activity in the brain when participants visually studied the actions of experienced ballet dancers.[18] This initial work prompted a number of further studies (notably by Gallese and colleagues) that demonstrated that we understand physical actions of the body not only by visual recognition but via sensorimotor responses in the brain, and that this is no less true when perceiving art objects.[19] In Gallese's 'simulated embodiment' theory for example, cortical areas of the brain in the form of both mirror and canonical neurons activate pre-rationally both when executing a physical action and when observing others execute the same action. [20]

Such neuroactivity is also demonstrated in empathic responses to simulated reality scenes. It is self-evident that painted depictions of violent or moving scenes in a representational image will evoke the same or similar empathic responses in the brain as they do in real life. However, it also appears that areas of the sensorimotor system in the viewer are activated in the perception of visual evidence of physical actions by craftsmen and artists that were carried out in the past. Gallese and Freedberg, for example, posit that embodied simulation is observed in the implied gestures (goal-directed movements) in both the poured paints in Jackson Pollock's work and the knife-slashed canvases in the work of Luca Fontana, whether we are rationally aware of the method originally used by the artist or not. In other words, in works of art, when we perceive the traces of gesture in an artist's manipulation of media on a flat surface, even without observing the artist at work, we activate the same areas of the brain responsible for the physical action.

To understand how this might relate to the aesthetic experience in observing monochromatic black works, recent studies on non-representational art provide additional

context. Taking the embodied simulation theory as a starting point, in their study, Sibrisca-Fioretti and colleagues explored the possibility that highly competent artists might have an tacit, unconscious ability to emphasise visual elements in their work that are capable of activating areas of the visual systems of the observer.[21] The authors looked at the black gestural paintings of Franz Kline (1910-62) and found that the implicit movement in the abstract, architectonic brushstrokes in Kline's black paintings was sufficient to activate the cortical motor circuits used in the physical execution of the act of painting when participants were shown the original paintings, but crucially not for participants that were shown a digitised version that lacked the texture and brushstrokes of the original. The authors also found that the visual observation of Kline's black brushstrokes also activated the reward centre of the brain, where an object under observation is cross-referenced with similar objects from the brain's memory systems and thus 'identified' as a work of art.

Franz Kline's gestural black and white calligraphic paintings appear to be an exercise in gestural spontaneity and invite a comparison with east Asian brush calligraphy. (Fig. 1) (FIGURE 1 CLOSE TO HERE) However, subtle nuances in his technique and use of materials also contribute to our visual experience of the paintings. It is the black painted forms that - like East Asian brush painting - stand out most strongly to us, yet in closer study, equal importance is given by Kline to white painted areas of the canvas. Both are painted in a medium that lacks viscosity of traditional oil paint, and perhaps is more akin to the consistency of ink. To achieve the consistency, Kline used both inexpensive alkyd house paints, or oil paint thinned down to a liquid consistency with turpentine. [22] Given that both oil and alkyd paints contain drying oils that are prone to yellowing (to a greater or lesser degree), in the surface of Kline's painted work we are often presented with shades of white that are applied beneath, on top of and mixed with the black calligraphic brush strokes.[23] Kline stressed that in spite of concerns over the lack of permanence of his paints, the tonal relationships between the blacks and whites remained the same. In their technical study of Kline's paintings, Rogge at al. found that in at least one painting, Kline used three different white paints, but suggest that they may have been deliberately chosen to modulate the white areas, or simply whatever was to hand, since other paintings have a single white paint. [24]

The perceptual considerations in viewing Kline's work is partially in our recognition of its similarity to what we know from prior visual exemplars (East Asian calligraphy, paintings on canvas) and in our perceptual tracing of the artist's movements. But Kline's thinned, liquid paint that often drips vertically from its brushstrokes additionally allows us also to perceive both the urgency and speed of the applied paint. It enables an ontic understanding of the black

elements, as they orientate us physically in space in alignment with the orientation of the painting as it was positioned while it was painted. In the absence of referential subject matter, spectral colour or strong specular reflection, our perception is also motile. In other words, the work may also demand corporeal muscular movement of the body to perceive its surface characteristics correctly. As Fielding has observed in her study of the sculpture of Anne Truitt, they resist representational reduction.[25] Kline's black brushstrokes, as much as any three dimensional object then, possess both ontic and phenomenal realities and, much like abstract sculptures, demand a physical interaction on the part of the observer.

Similar realities are revealed when observing the drawings of the American abstract sculptor, David Smith (1905-65), another artist for whom the materiality of black was of evident significance. Smith understood the expressive potential of black, writing in 1954: 'Everybody knows what black is…. The mind of man has recorded the image of black in 1000 different ways. Any one or combination may be recalled under certain circumstances when black occurs in the work of an artist.'[26] While Smith's attention to the materials that he used in both drawing and sculpture have been documented in previous studies by the author [27], it is relevant to note here that the perception of Smith's drawings is, to an extent, enhanced by his use of carefully chosen medium that worked for the expressive qualities of the work, but was also to suited the movements of his body in the act of drawing. He stated in 1960:

> I wish somebody had taught me to draw in proportion to my own size, to draw as freely and easily with the same movements as I dressed myself with, or that I ate with, or worked with in the factory. Instead, I was required to use a little brush, a little pencil, to work on a little area, which put me in the position of knitting – not exactly my forte…I think that the first thing that I should have been taught was to work on great big paper, big sizes, to utilise my natural movements…[28]

The majority of Smith's drawings from the 1950s are executed in a mixture of egg yolk and drawing ink, sometimes with the addition of textural materials to the black ink such as dry artists' pigments, metal particles and other materials. The rheological properties of the medium, and the sense of touch in these works is expressed through what Mark Paterson has called the 'sensory appeal of texture and form.'[29] In the understanding if this textural medium, the perceptual and cognitive functions discussed above build on Merleau-Ponty's much earlier synaesthetic theory of perception. As early as 1945, Merleau-Ponty had suggested that, when one sees physical objects, one sees "the hardness and brittleness of glass … the springiness of

steel … the hardness of the plane blade, the softness of shavings … the fluidity of water and the viscosity of syrup.'[30] What this suggests is that paintings, like all objects in our sensory environment, are perceived not only in by the visual cortex as a function of the viewer's embodied simulation of the artist's action as described above, but also as a collage of contours, shapes and textures that are primarily associated in the mind with the memory of real world tactile experiences. Indeed, as Peterson observes, that "a quotidian relation of touch, kinaesthesia and memory through the body is called upon in the aesthetic encounter with painting, sculpture and architecture alike."[31]

Richard Shiff is surely correct in his observation that the brushstroke in abstract painting is a technique concerned with affirming painting's physicality, and that it is, as he puts it, "as capable as sculpture of conveying material resistance to the touch."[32] Textural painting, as is the case of Smith's egg-ink, possesses weight, thickness and density, and in this sense, as Shiff notes, painting as much as sculpture can be the vehicle for what he terms "metonymic exchange" - a connection between the artist's/viewer's physicality and the constructed physicality of the painted surface.[33] Or, as Morley has stated, that the seer and the seen are indivisible, not observed as ontological opposites of subject and object, but rather part of a complex visual and embodied, kinaesthetic experience.[34]

The use of black by Smith and other abstract expressionist artists can perhaps be over-interpreted. It may be as Richard Serra has wryly observed, simply the most obvious way of making marks against a white field or the clearest way of making marks without creating the undesired associations that come with colour. Serra however, like Smith, acknowledges the weight of black as a pigment and its expressive potential: '…black is heavier, creates larger volume, holds itself in a more compressed field. A black shape can hold its space and place in relation to a larger volume and alter the mass of that volume readily.'[35] Although caution dictates that Smith's work not be interpreted through the lens of later ideas, it is important to note that the vertical tensions in Smith's welded steel sculptural work often rely on the dialectic that exists between gravity and heavy steel forms - drawings in space that were, in his conception, pulled up from the paper.

Perceiving the monochrome: Ad Reinhardt and Francis Newton Souza

Between 1957 and 1967, Ad Reinhardt (1913-67), created a large series of some of the most remarkable black paintings of the twentieth century, the culmination of what he considered to be the negation of painting and whose blackness and subtle surface effects existed at the edge

of visual perception. At first glance, they appear to the viewer as a homogenous black painted square, yet on further examination and from different physical points of view, the subtleties of the painted surface become clear. The paintings are divided into a grid of squares, each square painted in a subtly different shade of black, the almost imperceptible variations achieved by the addition of dry, coloured pigments. The medium too demands tactile engagement from the viewer. Created by adding Mars and Bone black tube oil paint to a bath of solvent thinner, decanting this when the oil rose to the top, and using the underbound sludge at the bottom, the result was a rich matte pigment with "just enough binder to be brushable'[36]

The velvety, matte nature of Reinhardt's surfaces intentionally inhibits specular reflection and they almost become, as Yve Alain Bois has put it, 'perceptual blotting paper'.[37] The effect is not without its drawbacks. The underbound black paint notoriously fragile, friable and susceptible to abrasion and fingerprints. Indeed, Reinhardt was known to be a frequent restorer of his own work in the 1960s, such was the constant damage from errant visitor fingers, and today, long after Reinhardt's death, the surfaces still pose difficult issues for modern conservators.[38].

Early perceptual studies considered the large colour field and action paintings of the 1950s and 1960s through a Gestalt and Spatial Vision lens. These certainly posit an idea for how we perceive things in our visual field, but they fail to consider the body as active participant in the whole perceptual processes.[39] More recent fMRI studies have shown that while there is evidence that there are neural correlates for recognisable geometrical and gestural shapes present in abstract painting, there is no specific activity related to the perception of 'all over' monochromatic works.[40] Aviv posits the simplest simple explanation for this - that since such work does not belong in any other specific recognition category in the brain, we recognise it rather by its exclusion from all other known categories.[41]

Looking specifically at black, other studies support the notion that biologically we respond more preferentially to dark fields of view than light. Baraza and Martin found that cells in the retina that correspond to black (OFF) and white (ON) send signals that are not equally balanced.[42] Light enters photoreceptors in the retina and sends signals to the brain through ganglion cells, and within these two parallel channels separate positive (white) and negative (black) signals to assist in the detection of boundary and shape. The authors found that although these converge in the primary visual cortex, there is an over-representation in the frequency of signals sent to the brain that correspond to black, and the cortical OFF (black-corresponding) pathways are faster than those of the ON (white corresponding) pathway. Neurons therefore appear to respond more preferentially to dark areas in the visual field than to light.

This correlates neatly with recent work on eye movement in participants observing both representational and non-representational painting. For example, Taylor et al. note that on observing abstract paintings, the visual/perceptual system seems to engage with a more homogeneous gaze rather than a more narrow-focused one that is common to viewing paintings that contain recognisable shapes.[43] The observation is further supported by Aviv, who suggests that perceiving something like an Ad Reinhardt black monochrome painting may encourage brain responses that are less restrictive, allow new associations and activate alternative paths for emotions and new creative links to form.[44]

Gaze and embodied perception are also implicit in the work of Francis Newton Souza (1924-2002). Like Reinhardt, Souza, who was born in Goa and came to Britain in the early 1950s, also made a series of remarkable monochromatic black paintings in the 1960s. (Fig. 2) (FIGURE TWO CLOSE TO HERE).[45] Like Reinhardt, Souza's paintings require a deep level of engagement from the viewer. Unlike the subtle black fields of Reinhardt though, lurking under Souza's work, and almost invisible to frontal viewing, are expressionistic landscapes, portraits and recognisable objects created using paint applied with brushes and palette knives, whose ghostly forms become discernible only after the eye adjusts and the body moves so the plane is seen in oblique light. Gupta notes that when observing these works, a kind of 'visual misapprehension' occurs that can only be corrected by moving one's physical position in relation to the picture plane. The complex movements involved in viewing confirming the "impossibility of any unmediated transparency in cognition."[46] The works present independently recognisable elements, but defy any perception of traditional figure/ground separation in the sense that both background and composition are the same shade of black, and differentiated only by texture, gloss and brushstroke. Returning to Gallese's simulated embodiment for a moment, Souza's monochromatic works require a similar pre-rational cognitive engagement as those discussed above, but to view them correctly requires an additional physical engagement – a motile perception of the space between viewer and object that is more akin to the viewing of sculpture. Ultimately, it brings us into contact with what F. D. Martin has called "the palpitating tangibility of our withness of things."[47]

Conclusion

From the 1950s onwards, the manipulation of black painting and drawing media was a preoccupation for artists in both America and Europe. The vast range of materialities in the

black drawings and paintings created by artists in the modern period demonstrates the regard and attention artists paid to the textural, perceptual and kinaesthietc qualities of their materials.

Attention to the subtle nuances possible only with black media, in both the gestural and the monochrome field, resulted in a new formal expressive language for artists like David Smith, Ad Reinhardt, Franz Kline and Francis Newton Souza, and their radically different technical approaches created nuanced visual experiences that resulted in visual, tactile, perceptual and textural qualities that were not achievable in a chromatic realm. This brief study, the first to draw together a review of the neurophysiological literature and the links between perception, materiality and meaning in artists' work, provides new perspectives on how we perceive the black monochromatic paintings and drawings in the art of the modern period, and demonstrates that it may be seen as dependent on a carefully structured relationship between choice and manipulation of material by the artist, and a number of complex cognitive functions that occur as part of our perception.

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Notes

[1] For a synoptic overview of the cross-cultural symbolism and history of the colour black in art and culture see: Harvey, 2013. On individual artists' relationship with black, see for example: Alloway, 1960; Cheetham, 2005; Wilson, 2011 and Gupta, 2021.

[2] Vakar, 2019

[3] Stringari, 2008

[4] Nodelman, 1997 and Mancusi-Ungaro, 1990.

[5] Helou-de La Grandiere, 2008; Adamson, 2016

[6] Gupta, 2021

[7] Cummings, 1979, Cooke, 2005 and Mulholland, 2009

[8] Wilson, 2011 and Bryan-Wilson, 2017

[9] See for example: Loffman. (2022).

[10] Aviv, 2014; Fielding, 2011; Kozbelt and Seeley, 2007 and Sbriska et al. 2013.

[11] Anderson, 2011, p. R978

[12] Anderson, ibid.

[13] Gellese, V, 2018, p.51

[14] Differences in accuracy between artists and non-artists in representational drawing has been explored by Perdreau and Cavanagh, 2013; Cohen and Bennet, 1997; Kozbelt and Seeley and Mitchell et al., 2005.

[15] Perdreau and Cavanagh for example, found that while skilled artists had some perceptual advantages likely gained from experience and in the manner in which they analyse and encode an object's structure, they found no particular exception or modification to their visual processing. (Perdreau and Cavanagh, 2013). Casati and Pignocchi argue that the neural basis for empathic responses to art is only of marginal relevance for aesthetics. However they acknowledge that responses to the artist's technical process is an area for further research (Casati and Pignocchi, 2007).

[16] Gallese, 2018, p52.

[17] See: Heeger, 2006. It is worth pointing out here that the human visual system is extremely well adapted for perceptual constancy within disparate ambient illumination environments. Our visual system accounts for roughly 80 percent of our perception and so light is the single element with the greatest influence over perception of objects and our body's relationship with it. The visual system's ability to maintain colour and perceptual constancy means that black looks black and white looks white regardless of the level of illumination. In this sense the primary mechanism for brightness constancy is light adaptation. However, while this system functions well for the most part, as we know from the experience of optical illusion, our visual system can be confused, tricked and subject to error.

[18] Calvo-Merino et al. 2006

[19] See, for example: Gallese, 2008; Gallese and Freedberg, 2007 and Anderson, 2011.

[20] See: Rizzolatti et al, 1996 and Rizolatti and Craighero, 2004. The discovery of mirror neurons in animal subjects by Giacomo Rizzolatti and colleagues in 1996 contributed significantly to the understanding of perception and action. Mirror neurons are a class of neuron that changes in activity both when an individual executes a specific motor act and when they observe the same or similar act performed by another individual. Mirror neurons are also utilised in neurocognitive functions including language, empathy and theory of mind. Canonical neurons respond when perceiving the shape and size of object in the visual field.

[21] Sibrisca-Fioretti et al., 2013

[22] See Rogge et al., 2019

[23] Although his use of alkyd house paints raised questions on its permanence by his dealer Sidney Janis at the time, Kline claimed not to view the yellowing negatively, explaining that the whites, no matter how yellow, always retained their correct relationship with the black. (Rogge et al. p414).

[24] Rogge et al., 2019.

[25] Fielding, 2011, p, 521.

[26] Smith, 1954

[27] Mulholland, 2009; Mulholland 2011

[28] David Smith, 'Memories to Myself', Speech, 5 May, 1960, in McCoy, 1973: 149.

[29] Paterson, 2007, p. 94.

[30] Merleau-Ponty, 1945, p.267

[31] Paterson, 2007: p. 94.

[32] Richard Shiff, 'Constructing Physicality', Art Journal, vol.50, no.1, Spring, 1991: 44.

[33] Shiff, 1991, p.43.

[34] Morley, 2021, p.2.

[35] Serra and Borden, 1977.

[36] Stringari notes that this is likely to have been a more pliable than making his own paint using dry pigment and that it would be more responsive to the pressure of the brush. Stringari, 2008, p.

[37] Bois, Y., 2008, p.14

[38] Stringari, 2008, p.31

[39] Bridgemand and Hower, 2008

[40] Kawabata and Zeki, 2004; Vartanian and Goel, 2004.

[41] Aviv, 2014

[42] Baraza and Martin, 2020

[43] Taylor et al., 2011

[44] Aviv, 2014, p.3

[45] F.N. Souza, *Black Art and Other Paintings*, Grosvenor Gallery, London, 1966. For an comprehensive analysis of Souza's black paintings, see Gupta, 2021. Gupta notes that critical analysis Souza's black paintings as invoking prior abstract expressionist notions of transcendence, spirituality and the absolute is limiting. In the kinaesthetic interaction demanded by the paintings and within the political context of the late 1960s, Gupta suggests that the colour black cannot be disassociated from colonialism and oppression, the Négritude movement in Paris or the Black Panthers in the United States. In this context, Souza's black paintings might be seen as "a chromatic contraction of resistance." (Gupta, 2021, 134)

[46] Gupta, A, 2021, p. 111

[47] Martin, 1981, p. 78-79.