

Cross-Species Comparison in the Evolutionary Study of Art: A Cognitive Approach to the Ape Art Debate

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Aside from humans, artistic behavior has been attributed to species varying from bowerbirds to elephants. The most notable case are nonhuman primate species, and chimpanzees in particular. Some researchers have stated that the latter provide us with a window to the evolution of human art via the phylogenetic tree. However, little argumentation has been developed to substantiate these claims. This article undertakes a joint examination of empirical studies on 'ape art' and literature on human artistic cognition, with a focus on the capacities of intentionalist thinking, symbolism, and aesthetic sensitivity. Although aesthetic sensitivity turns out to be a potential parallel between human and nonhuman cognition with regard to art-making, little or no evidence surfaces to support the presence of intentionalist thinking and symbolic cognition among, for example, chimpanzees, in their response toward painting and drawing material. As a result, few reasons remain to consider chimpanzee painting and drawing as art. The evolutionary study of art is therefore unlikely to prosper much through primatology and comparative psychological analysis of humans and their primate cousins. Several implications of the present analysis are discussed.

Keywords: aesthetics, art, cognition, comparative psychology, primatology

The 20th century has witnessed the development of a scientific debate that questions some of the most fundamental aspects of the presumed uniqueness of being human. The evolutionary origins of art have preoccupied numerous researchers, some of whom have argued that the key to explaining the emergence of our artistic behavior lies in cross-species comparison, and in particular the study of nonhuman primates (Morris, 1962, 2013). The ape art debate does not only spark vivid aesthetic discussions, it also touches upon a number of philosophical issues. Its remarkable history and content are the result of decades of arguments going back and forth between primatologists, psychologists, philosophers and art critics. In general, this matter is broadly covered by two diametrically opposed perspectives. One constitutes a positive artistic appraisal, by what Lenain (1997) terms zoologists, of what nonhuman primates do when given painting or drawing material, as well as an aesthetic appreciation of their products. These researchers try to clarify the origins of art by pushing back in time its emergence, and by relating it to an aesthetic sense common among several species. The other perspective is that of the historians, and proclaims that ape art is a concept that originated in the mind of humans. In other words, the so-called artistic capacities of nonhuman primates are seen as a human construct.

In this article, I use a cognitive approach to shed a new light on the most notable empirical studies performed with chimpanzees

during the 20th century. This approach will consist of outlining the main cognitive building blocks of the behavioral outcome of making art, and the aesthetic propensity to appreciate the result. These psychological features will be confronted with existing empirical studies on 'ape art' that describe nonhuman primate painting and drawing behavior, so as to assess to what extent they correspond. The emphasis will be on visual art of an abstract nature. I argue that to categorize nonhuman primate painting and drawing as art, evidence must emerge that these animals possess a significant part of what is considered human artistic cognition. A cognitive perspective is likely to make a more objective contribution to the speculative nature of earlier research in the ape art debate. This analysis can also address the question whether painting and drawing among our closest living relatives is important for clarifying the origins of art in human evolution.

A History of the Ape Art Debate

Most historical research on drawing and painting in great apes has been conducted with chimpanzees, in this case referring to the common chimpanzee species rather than the overarching genus also encompassing bonobos (Boysen, Berntson, & Prentice, 1987; Iversen & Matsuzawa, 1996, 1997; Morris, 1962; Schiller, 1951; Smith, 1973; Tanaka, Tomonaga, & Matsuzawa, 2003; Tanaka, 2007). Other great ape species appear only seldom if ever in this debate, the most notable example being a gorilla named Sophie, who was studied during the 1950s. A few orangutans are also known to have been examined during the same decade. In addition, an early study documented colored chalk drawing by a capuchin monkey, whereas a more recent examination of tufted capuchins revealed a variety of art-like behaviors (Klüver, 1933; Westergaard & Suomi, 1997). This article focuses on chimpanzees, as these make up the study population of almost all empirical research. In

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addition, their close phylogenetic relationship to humans makes them the most relevant species for assessing the ape art debate in relation to the evolution of art among humans.¹

The art-like technique most commonly used in empirical studies is drawing, as this method, and especially the use of preexisting stimulus patterns, is most suitable for assessing whether chimpanzees possess any notions of balance, symmetry, and completion. In addition, other techniques such as finger painting, brush painting, and in later experimental work, electronic finger painting have been practiced.

Researchers have used a variety of different methods for analyzing nonhuman primate paintings and drawings. Early studies, performed at the beginning of the 20th century, often employed observation and semiguideance of the behavior of the animals (see, e.g., Morris, 1962; Schiller, 1951). Others sought a comparative psychological approach, looking for developmental patterns and cross-species differences and similarities in young chimpanzees and human infants (Kellogg & Kellogg, 1933; Kohts, 1935). In these studies, the aim was often not to explore the ability of art-making as such, but rather to investigate perceptual and learning abilities, which later yielded relevant information on the ontogenetic development of drawing in both species. More recent research consists of highly controlled experiments aimed at specific aspects of cognition, perception, and motor skills relevant in the context of painting and drawing (Tanaka et al., 2003; Tanaka, 2007). All of these methods provide little overall clarity concerning the phenomenon of ape art as a whole, and often raise a considerable amount of speculation as to how various behaviors should be interpreted. A cognitive approach might provide both an overarching framework and a solid scientific basis for reassessing painting and drawing in great apes.

Already in the 19th century, reports surfaced of nonhuman primates performing what seemed to be human-like drawing. Far from the results of deliberate teaching attempts by humans, these were actions undertaken by the animals themselves, and coincidentally observed by humans. Around 1875, the director of the Zoological Institute in Berlin noticed the attempts of a chimpanzee to draw lines on paper with a pen, imitating the director's son (Lenain, 1997). Several decades later, actual scientific research emerged on what would later become known as 'ape art.' In Russia, Kohts (1935) conducted a lengthy investigation of the psychological and perceptual aspects of shape and color with a chimpanzee named Joni. Not only did she compare the drawings of Joni with the artistic development of her own child, she also conducted similar studies with capuchin monkeys. She concluded that chimpanzees are considerably better than capuchins at developing their drawing skills and showing a certain progress, but that they seem to lack the capacity for progressing to the stage of representation, as occurs in human children. This was regarded as the point at which chimpanzee and child drawing abilities diverge (De Waal, 2001). The study done by Kohts is highly relevant as it demonstrated that chimpanzees too can make significant progress in their drawing abilities. Rather than remaining in the stage of boundless scribbling, Joni acquired greater visual and motor control, evident from the production of intersecting lines.

Kellogg and Kellogg (1933), known for their comparative psychological study *The Ape and the Child*, applied a range of standardized experiments to both their own infant son Donald and a young chimpanzee named Gua. When looking at the develop-

ment of drawing abilities, they found that the child would spontaneously start to scribble when offered a pencil and paper, whereas the chimpanzee had to be shown what to do. Although Gua did eventually proceed to spontaneous scribbling, his drawings did not become imitative, contrary to Donald's, who mastered the copying of straight lines exemplified by the experimenters.

Perception research was also the starting point of Schiller, when he pursued the first systematic scientific study into ape art in the 1940s. A large amount of his work took place with a female chimpanzee named Alpha. By means of a range of blank and marked sheets, Schiller examined the ways in which Alpha responded to preexisting shapes. For example, he writes that "if the figure is near the middle of the sheet, it becomes a starting point or focal point for broad scribbling If it is off center, she tends to focus her scribbling in the largest open space . . . , producing a sort of balance between her markings and the presented figure. There is some reason to believe that this is a genuine tendency to balance masses in the total configuration" (1951, p. 104). In other cases, Alpha tended to fill out lighter shades more than darker areas. It is important to note that Schiller took the paper away after a maximum of 180 seconds. After this time, "her concentration on the figure diminishes and the whole sheet is eventually covered in scribbles" (1951, p. 109).

Morris's encounter with the chimpanzee Congo at London Zoo meant the offset of a long-term and comprehensive study on ape art, as well as one of the most vivid pleas for a true artistic status. His landmark book *The Biology of Art* documents a history of the ape art debate, as well as matters of composition, different methods such as pencil scribbling, finger painting, and brush painting, while also advocating the importance of apes in clarifying the emergence of art in human evolution (Morris, 1962). In addition, he arranged the first exhibition of ape art, which took place in 1957. Several of his findings elaborate on earlier studies such as the Alpha experiments done by Schiller, whose results are thoroughly compared with Morris's own experiments with Congo. He also teased apart the various formal features of ape painting and drawing, by distinguishing between composition—referring to, for example, concepts of balance, symmetry, and completion—and calligraphy—the creation of more general displays such as spirals or fan patterns.

In the following decades, several other systematic studies were conducted. Smith (1973) presented three young chimpanzees with a variety of stimulus patterns on paper to reassess the claims made earlier by Morris, for example with regard to balancing preexisting patterns and scribbles, and the closure of open figures. Boysen et al. (1987) undertook a similar study, largely confirming Smith's findings. Both of these analyses were conducted with the help of statistical methods, in contrast to the earlier intuitive assessment characteristic of Morris's work. Interestingly, one study specifically investigated the potential influence of subjective judgment versus quantitative methods by ordering two independent judges to

¹ Taxonomically, the word 'ape', as used in the ape art debate, should include common chimpanzees, bonobos, gorillas, orangutans, gibbons, and humans, and should not incorporate capuchin monkeys. However, as nonhuman primate painting and drawing almost exclusively focuses on common chimpanzees, the word 'ape' is here taken to refer to this species. For a full overview of non-human primates engaged in painting and drawing studies up until 1959, see Morris (1962, pp. 43–44).

consider all drawings as deliberately marked, balanced or closed. A comparison between their assessment and the experimenter's statistical analysis found that subjective judgment resulted in a much higher attribution of deliberate intent when scribbling (Smith, 1973).

In recent decades, primatologists have undertaken several experimental studies according to strict methodological guidelines, focusing on specific aspects of cognition and perception that are relevant for painting and drawing. Several of these studies have employed the method of electronic finger painting, which involves scribbling on a monitor. Iversen and Matsuzawa (1996, 1997) used this technique to test chimpanzee drawing ability in response to a line model provided by the experimenters, which resulted in copying behavior by the chimpanzees without the verbal or manual instruction that was employed in earlier studies. In addition, the method of electronic finger painting proved to be particularly useful for infant chimpanzees, whose motor skills did not allow for handling drawing tools yet. A similar study by Tanaka et al. (2003) confirmed that electronic finger painting appears to be easier for younger animals, and suggested that the perceptual-motor control necessary for this kind of drawing is to be added to more advanced skills such as combinatory object manipulation, to enable instrumental drawing or painting on paper.

Tanaka (2007) also investigated whether chimpanzees are able to recognize novel photographic and nonphotographic images of flowers, such as sketches and cartoon-like figures, based on earlier seen photographs of flowers. The results showed that a period of learning is necessary for chimpanzees to recognize representational images, while juvenile chimpanzees appeared to be considerably better at the task of identifying different kinds of flower images compared to adults, suggesting the particular importance of an early learning period. One adult chimpanzee, who had previously acquired visual symbolic skills during earlier research also performed well, indicating a link between pictorial competence in recognition and the understanding of symbols.

Artistic Cognition in the Human Species

Chimpanzees' phylogenetic proximity to *Homo sapiens*, along with a variety of striking behavioral observations of both wild and captive animals, has sparked a vivid and extensive body of research that investigates to what extent the evolutionary divide of around six million years truly makes for fundamental differences between humans and their closest primate cousins. Although purely anatomical traits can be investigated in a relatively objective manner, psychology and behavior tend to require an important element of interpretation. Researchers have looked at a wide variety of topics, notable subjects being nonhuman primate tool use and elements of social learning and cultural differences (e.g., Whiten et al., 1999; Whiten, 2000), prosociality and altruism (e.g., de Waal, 2008), and the debated presence or absence in these animals of higher-order reasoning, comparable with the ability of theory of mind (ToM) (e.g., Tomasello, 1999). A recurrent question often refers to the matter of presumed human uniqueness: to what extent can we derive from any observed chimpanzee behavior whether nonhuman primates rival humans in their cognitive and behavioral repertoire?

Among all possible traits to be investigated with regard to human and nonhuman primate similarities and differences, the

creation and appreciation of art is probably among the most salient topics, as it is often widely regarded as the epitome of human culture. Even Morris, by far the most notable advocate of ape art, refers to art as "one of the most exciting ways in which we have manifested ourselves as a unique animal— . . . the complex activity we refer to as art . . . more than any other activity it has set us apart from other species" (2013, p. 10). Defining art has been and continues to be one of the most challenging topics in art historical and philosophical writings. Attempts to cover all artistic products of humans differ greatly according to disciplinary perspectives, philosophical propositions, and a range of intuitive or folk-based ideas. A cross-species comparative approach would naturally benefit from departing from a narrow Western perspective, and in this sense, attempts to define art cross-culturally may be relevant. For example, one might consider art to refer to a wide range of cultural products such as music, song, dance, stories, painting, sculpture, and so forth, compared with which Western fine art is merely "one species within a wider genus that also includes religious art, domestic art, and so on," as Davies (2006, p. 224) notes.

Folk concepts approach what we intuitively consider to be art, and have been captured by some authors in cluster concepts, which are groups of characteristics that are all related, but not necessarily limited, to art (Dutton, 2006, 2009; Gaut, 2005). According to Dutton for example, the cluster of art contains the following properties: direct pleasure, skill and virtuosity, style, novelty and creativity, criticism, representation, special focus, expressive individuality, emotional saturation, intellectual challenge, art traditions and institutions, and imaginative experience (2009). According to Gaut, "there are multiple criteria for the application of the concept, none of which is a necessary condition for something's being art. A criterion is a property, possession of which conceptually *counts toward* an object's falling under the concept" (2005, p. 273–274, original italics). In sum, cluster concepts allow for a common sense understanding of art as a crosscultural and transhistorical category, and it is this view, rather than an elitist Western perspective on art, that should be the starting point for a comparative psychological analysis.

Evidently, cross-cultural attempts at defining art do not equal a tool for cross-species comparison. The vast complexity of the subject already necessitates limiting the concept of art under consideration to one particular kind, such as visual art. This is the avenue taken in the present article. Second, it is precisely the interpretative nature of studying chimpanzee behavior that severely impedes the use of an approach such as cluster concepts. Even among humans, determining the presence or absence of the abovementioned properties can be challenging, an issue that is even more apparent when attempting to observe the art-like behavior of other species.

The method in this article therefore consists of adopting a cluster approach, but one that is aimed at the cognitive capacities at the basis of art and its aesthetic appreciation, rather than looking at the characteristics of these behavioral traits in themselves. De Smedt and De Cruz (2011) have developed such a cognitive cluster, looking at three abilities thought to be crucial for both producing and recognizing art: the concept of intentionality or the design stance, symbolism, and aesthetic sensitivity. Below, these components are briefly explained before proceeding to an analysis of existing empirical studies of ape art.

The relevance of a cognitive approach is suggested by the apparent fact that art is a universal human behavior. When encountering art from other eras or cultures, humans worldwide often experience a remarkable kind of recognition, enabling them to appreciate different artistic forms, or a different aesthetics much the same way as they appreciate their own. Despite a common lack of contextual knowledge, they have little trouble realizing that they are dealing with art. It has been argued that our evolved cognitive structures and mechanisms transcend temporal and cultural boundaries, enabling us to acknowledge art on a fundamental level. Carroll refers to this as “an inbred capacity to detect the expressive behavior of our conspecifics as it is inscribed in the sensuous media of the traditional arts” (Carroll, 2004, p. 96). Here, this line of reasoning is extended to the question whether this inbred capacity may also transcend the boundaries of our species. The focus will be on the production of art-like results, rather than their appreciation or recognition as such.

Recognition of Intentionality

Levinson has suggested that something is to be recognized as a work of art if its maker intended it to be related to earlier recognized art: “the agent in question intends the object for regard (treatment, assessment, reception, doing with) in some way or ways that what are acknowledged as already artworks, are or were correctly regarded or done with” (1993, p. 411). Bloom (1996) has extended Levinson’s intentional–historical concept of art to the domain of artifacts in general, and has provided support drawn from cognitive and developmental psychology. In his view, humans categorize artifacts based on the original intent of their maker. This kind of thinking about artifacts is governed by the ‘design stance,’ a term originally coined by Dennett (1987). The design stance refers to the tendency of looking at an object from the point of view of its maker, rather than focusing on the physical properties of the object in itself (Bloom, 1996). Gelman and Bloom (2000) have shown experimentally that study participants only tend to regard objects as works of art when they are told the objects in question were deliberately created as such, while this response is not present when the same objects are described as the result of unintentional processes. Similarly, neural activation patterns in response to music differ greatly according to the presumed origin of the sounds. Only when described as the deliberate product of a composer, in comparison with being computer generated, does the same piece of music activate brain areas associated with the attribution of mental states and intentions (Steinbeis & Koelsch, 2009).

Symbolism

The evolutionary origins of art are often associated with the emergence of symbolic cognition (e.g., Henshilwood & Marean, 2003; McBrearty & Brooks, 2000 for archaeological overviews). A considerable amount of discussion has been generated as to what we should understand by a symbol. DeLoache has offered a broad psychological and empirically supported definition, arguing that “a symbol is something that someone intends to represent something other than itself” (2004, p. 66). A more refined, archaeologically based definition comes from Peirce (1932/1960), who distinguishes between icons, indexes, and symbols, the latter being

defined by an arbitrary relationship between a feature and what it refers to, compared with the other concepts which are based on formal resemblance and association respectively. Whereas Peirce’s typology of signs would regard figurative depictions as primarily an example of icons, evolutionary research on art typically links symbolism to the emergence of representational art. In this sense, Upper Palaeolithic cave paintings and mobiliary art are often said to be the first unequivocal proof for the presence of symbolic cognition (e.g., Davies, 2012; Deacon, 1997).

Aesthetic Sensitivity

An important distinction is to be made between art-making in itself and an aesthetic sense, or the ability to enjoy works of art, other objects, natural environments, and so forth. Darwinian or evolutionary aesthetics investigates the nature of animal—including human—decision-making with regard to the qualitative properties of what is judged. The mental experience of beauty evolved as a mechanism to help an individual choose fitness enhancing environments or conspecifics for successful reproduction (Thornhill, 2003). The aesthetic sense therefore spreads out far beyond the human species, as countless species are confronted with the same basic survival issues. Assuming that nonhuman primates and other animals possess a sense of beauty, does not however automatically imply that art-making in itself is a cross-species phenomenon. With regard to artistic cognition as a whole, aesthetic sensitivity is to be regarded as a central feature: it captures our attention and enables our persistent attraction to works of art. This is neurobiologically explained by an evolved system of neural reward mechanisms in the brain, which cause us to feel good whenever we perceive something which may enhance our fitness level (Berridge, 2003; Lacey et al., 2011).

But Is It Art?

Recognition of Intentionality

As was stated earlier, the design stance refers to regarding an object from the perspective of its maker, and the intentionalist theories of Levinson and Bloom suggest that we presume intentionality to be a fundamental criterion in the creation of artifacts in general, and works of art in particular (Bloom, 1996; Levinson, 1993). This implies that the artist must possess a mental representation of the work of art intended to be the final result. Empirical evidence supporting a similar cognitive process among chimpanzees is scarce to nonexistent. Findings such as those of Schiller (1951) do point out that chimpanzees like Alpha have a notion of completion to some degree, as she was observed to be filling gaps in accordance with preexisting shapes. This could be interpreted as an attempt to continue the original markings to achieve a completed shape, which would mean that Alpha had a concept in mind of what the finished figure should look like. However, different authors report behavior that seems to indicate a lack of concern with the final result, or with creating an enduring work of art. Although chimpanzees apparently enjoy the act of drawing and painting, they often stop showing interest, and have been observed to destroy their work by tearing up the paper (De Waal, 2001; Schiller, 1951). In addition, they have been known to eat their

chalk and crayons, rather than drawing with them (Lenain, 1997; Schiller, 1951).

The intentionality and design element of human art-making implies not only ideas about embarking upon creation, but also where to finish. Even though an artist often does not have an exact idea about what the final work of art should look like, the intent to eventually arrive at a finished result is generally present at different stages of creation. No convincing evidence of this has emerged from empirical studies with nonhuman primates. In many cases, human researchers and caretakers have been known to take a drawing or painting away, often to avoid eventual destruction by the ape. As a result, ape paintings might look like abstract art, while in reality an experimenter has taken the work in progress away as soon as the ape has done enough to *mimic* human abstract art (De Waal, 2001). A large part of the ape art debate therefore appears to be governed by human, rather than ape, concepts of completion, and the more or less delineated act of creating a work of art.

Some counterevidence for this has been put forward by Morris, who reports on Congo resisting to his paintings in progress being taken away, or refusing to continue a painting once he had put down his brush (Morris, 1962). However, one should be cautious with interpreting this as protest *because* the paintings supposedly weren't finished. These rare observations do not account with much more frequent findings that attest to an overall lack of interest in the final result, varying from abandonment to destruction. A fundamental difference between humans and apes is therefore that, in the latter case, "it does not appear to be a means to an end" (De Waal, 2001, p. 174).

Symbolism

None of the empirical studies that have been performed with nonhuman primates have produced any representational painting or drawing. For example, Kohts (1935) remarked that the onset of representation in the drawings of her child was the eventual point of divergence between the child and the chimpanzee. Although she did note that the chimpanzee appeared to be making improvements in abstract drawing—Joni gained an understanding of line intersection—a transition into representational drawing did not occur. If actual figurative representation is taken to be clear proof of symbolism, the aforementioned empirical studies suggest that chimpanzees possess no such capacity. Here, the issue naturally arises that a symbol does not necessarily have to bear physical resemblance to what it refers to (DeLoache, 2004). Therefore the absence of representation in nonhuman primate painting and drawing does not fully exclude the possibility that these animals might possess symbolic cognition, albeit in a less elaborate way than human beings.

Arguments in this direction have been developed from the perspective of language research (Savage-Rumbaugh, Rumbaugh, & Boysen, 1978; Savage-Rumbaugh, 1986). Other studies, for example on the representation of number concepts, are less forthcoming in the attribution of symbolic cognition (Matsuzawa, 2009). The aforementioned study by Tanaka (2007), which showed that some chimpanzees can be taught to recognize both novel photographic and nonphotographic pictorial representations, is also relevant in this regard. The case of Ai, an adult chimpanzee who had previously been taught visual symbolic skills and who

performed well on the recognition tasks, supports the possibility that chimpanzees do appear to be able to acquire symbolic concepts. Although Tanaka's study did not involve the actual production of flower images by the animals, the fact that already present symbolic skills ease the recognition of representations does indicate that an understanding of representations and symbols are developmentally linked.²

In sum, the absence of representation does not prove the absence of symbolism, but the nature of ape painting and drawing also doesn't raise any other arguments in favor of symbolic content. This limit to what can be inferred from these works also causes several important questions to remain unanswered. For example, the drawings and paintings produced do not allow for deductions concerning imagination as a cognitive process that might be present during their creation. One could argue that the presence of representation would be suggestive of the presence of imagination as well, but the absence of the former doesn't automatically imply a lack of imaginative ability, as both are not necessarily linked. However, if imagination were absent during the art-like behavior of chimpanzees and other great apes, this would imply less cognitive involvement compared to humans, indicating a major difference between painting and drawing among the members of these species and our own.

Aesthetic Sensitivity

Several authors have reported observations that seem to support a sense of aesthetics among chimpanzees. According to Schiller (1951), Alpha showed a concept of symmetry and balance when she drew on all three sides of a triangle, opposite the lines as well as in the empty middle of the shape. In other instances, she scribbled across the whole surface of the paper when it was left completely blank by the experimenters, but kept away from the margins and corners when a small figure was presented in the middle, closer to either the top or bottom of the paper. In this case, she filled the blank space opposite the shape, suggesting that she might have tried to balance out the figure already present. As for completion, mixed results emerged from Alpha's drawing behavior. Several different stimulus patterns were presented with the aim of testing whether the chimpanzee would fill a missing part of a shape or complete an outline, but only missing dots in the contour of a shape appeared to elicit a completion response.

Morris (1962) performed an equally wide range of composition tests, and found that some of Schiller's findings were confirmed, whereas others were not, or seemed to reoccur only in a few cases. In addition, he debated some of the outstanding issues concerning balance and completion. For example, when investigating the matter of true balance versus space filling, he found that space filling appears to be the mechanism at work when a stimulus figure is clearly positioned off center, creating a large open space. However, if a stimulus was only slightly offset, the empty space didn't dominate the paper, and Congo appeared to produce genuine balanced scribbles that were equally offset, in the other direction than the original stimulus figure.

The extent to which chimpanzees truly choose where to mark based on an aesthetic understanding of balancing out preexisting

² For a thorough discussion of pictorial competence in great apes, see Persson (2008).

shapes remains unclear. Although the findings by Schiller and Morris appear to demonstrate so, critical questions have been raised as to their interpretation. For example, Smith (1973) only found inconclusive evidence of balancing—true symmetrical balance seemed to be present in only a few instances—and no evidence that the chimpanzees in his study tended to complete preexisting shapes. Boysen et al. (1987) reached the same conclusion about closure and balance not being consistent features of ape drawing. A bimodal distribution of markings, interpreted by Morris (1962) as rough balancing, might merely be attributable to the chimpanzees filling the empty space without a particular concern with balance or symmetry.

The matter of color preference is also undetermined. Schiller (1951) noted no significant differentiation of crayon colors by Alpha, except for a slight preference for brighter colors such as red, orange, and yellow. She merely kept scribbling in the same location when handed another crayon, and didn't distinguish between different colors on various parts of the paper. Recent experimental work by Tanaka et al. (2003) made use of a touch-screen monitor, whereby infant and adult chimpanzees were allowed to make finger-drawings with six colors of electronic ink, including a control condition with white ink against the white background of the screen. Chimpanzees could not choose between various colors as only one color was used during each experimental session, but a color preference, if present, could be deduced from a tendency to draw more strokes during sessions with a particularly appealing color. No such a preference emerged, except for a not surprising, significantly higher interest in all five colors compared with the white, invisible ink. Morris reported a slight preference by Congo for red and orange, similar to what Schiller found, but recognized its relatively weak role. In addition, he pointed out the methodological difficulties in assessing color preference, which became evident when Congo was offered six colors of paint at the same time. "On those occasions where it was attempted, Congo was given the six colors in a tray of six dishes . . . Upon being given a brush he proceeded, each time, to mix the colors together until all the dishes contained a uniform muddy brown. Only then would he show any interest in painting" (1962, p. 54).

In sum, the evidence in support of an aesthetic sense in chimpanzees is mixed. Neither color preference nor formal concepts such as symmetry, balance and completion are to be regarded as constant properties of ape painting and drawing. The pieces of evidence in favor of chimpanzee aesthetics have been interpreted as displaying the seeds of the human aesthetic sense (De Waal, 2001; Morris, 1962), but others have stated that a more parsimonious explanation applies: nonhuman primates are perhaps merely engaging in exploration and play rather than actual artistic behavior, and although they do respond to the visible effects of their markings, the resulting drawings and paintings are very likely based on elementary phenomena of visual perception, such as figure-background distinction, without having to invoke the presence of an aesthetic sense (Boysen et al., 1987; Smith, 1973).

Discussion: The Relevance of Ape Art for the Evolution of Art and an Aesthetic Sense Among Humans

The above analysis confronted empirical studies on nonhuman primate painting and drawing with cognitive views on human art-making, assuming that ape art does not truly qualify as art unless considerable parallels between human and nonhuman pri-

mate cognition can be drawn. Having reviewed the evidence for intentionality, symbolism, and aesthetics in chimpanzee painting and drawing, the former appears to be absent, whereas the latter two are debatable. The presence of symbolic cognition seems to be only circumstantially supported, almost exclusively by referring to other research such as studies in the field of language acquisition, where a seemingly innate basic symbolic potential is extensively trained, strengthened, and expanded (Savage-Rumbaugh, 1986). As was already pointed out, the absence of representation does not unequivocally demonstrate the absence of symbolism as well, but neither do any clear indications of symbolic cognition arise.

This leaves aesthetics as the most fruitful avenue for further research into the nature of the ape art debate. De Waal has argued that the empirical studies on ape art demonstrate that humans are not the only species that enjoys "self-created visual effects," which suggests that a sense of aesthetics probably has relatively old roots (2001, p. 175). If this capacity were to date back to the common ancestor of humans and chimpanzees, this would mean that it is at least five to six million years old. However, elaborate research has been done with regard to behaviors in several bird species, equally suggesting an aesthetic consciousness, or the ability to discriminate between different degrees of beauty. The most famous example in this regard are bowerbirds, native to Australia and New Guinea. As part of their mating strategies, males construct large and complex bowers consisting of natural elements as well as a range of artificial colored objects found in their environment. These bowers are often symmetrical and impressive in size relative to the size of the birds. They are made solely for the purpose of attracting mates, and the effort taken in making them visually distinctive suggests that the female birds must possess a basic capacity of aesthetic discrimination, to be able to decide which male produces the most beautiful bower, and is likely to be the best suitable mate (Miller, 2001). An example such as this one indicates that an aesthetic sense is not limited to the human species, leaving the possibility open that nonhuman primates possess this capacity as well.

Neurobiologically, the apparent presence of a basic aesthetic sense can be explained by referring to neural rewards, associated with pattern recognition. Formal features that ease sensory information intake and cognitive processing should logically be preferred during perception to make sense of the constant input of stimuli in the brain. Humphrey has proposed the following link between aesthetics and information processing: "considered as a biological phenomenon, aesthetic preferences stem from a predisposition among animals and men to seek out experiences through which they may *learn to classify* the objects in the world about them. Beautiful 'structures' in nature or in art are those which facilitate the task of classification by presenting evidence of the 'taxonomic' relations between things in a way which is informative and easy to grasp" (Humphrey, 1973, p. 432, original italics and emphasis).

Morris cites a study by Rensch, who compared two monkey species and two bird species in their reaction to regular versus irregular markings, and found that all four tended to respond more to the regular markings, which could be interpreted as an aesthetic preference for regularity. According to Morris, such a preference shouldn't be limited to perception: "The vital words here are: steadiness - symmetry - repetition - rhythm. These are the basic factors that appeal to the eye and that also appear when, instead of

merely selecting ready-made patterns, they are actually being created. There is, so to speak, a positive reaction to order rather than chaos, to organization rather than confusion" (1962, p. 161). Gazzaniga (2008) has argued that higher primates, among which humans, are especially prone to more sophisticated patterns such as symmetrical or rhythmical displays. The close phylogenetic relationship between humans and chimpanzees might be one of the main reasons why similarities between both species become readily apparent, despite the abovementioned issues when interpreting what is observed.

In sum, it is likely that chimpanzees, and possibly other non-human primates, possess a basic sense of aesthetics. This capacity, along with the fact that chimpanzee and human visual cognition largely coincide, can adequately explain the results emerging from the empirical studies, without having to invoke the category of art.

Given the consideration that several elements of nonhuman primate painting and drawing remain questionable matters, yielding both arguments in favor of and against an equation with humans, the subject matter might benefit from more advanced comparative cognitive psychological analysis. The capacity for symbolic thinking in particular appears to be a matter of debate. A possible avenue for further research would be to explore symbolic cognition in relation to metarepresentational thinking and the ability of decoupling, both of which are closely linked to theory of mind (Leslie, 1987). According to Leslie, metarepresentations are second-order representations of primary, reality-based representations. The human mental capacity to decouple primary and secondary representations avoids the risk of so-called "metarepresentational abuse," where representations at both of these levels become mixed-up. If present and successful, metarepresentational ability enables theory of mind, which is the cognitive ability to understand other people's mental states, intentions, goals, desires, and emotions. It is thought to be one of the cornerstones of empathy and social cognition (Baron-Cohen, 1999). This capacity also appears to be particularly relevant for the production and understanding of fictional art, such as stories or nonveridical representations, as this kind of art requires frequent mental shifts between characters, as well as an abstract understanding of events that do not, or only in part, correspond to real life.

The empirical studies discussed in this article provide no reasons to assume that paintings and drawings by nonhuman primates contain fictional representations, which seems to obviate the need to consider metarepresentational and decoupling ability, or theory of mind in relation to ape art. But apart from fictional art, these abilities are thought to be at the basis of symbolic play. Investigating their presence, for example through testing the theory of mind abilities of chimpanzees (e.g., Tomasello, 1999), might therefore substantiate the present preliminary conclusion about the likely absence of symbolic cognition, or on the contrary, provide new insights into the presence of symbolism in ape art.

An interesting case study would be to make a comparison between the art-like products of chimpanzees and those of savant artists, who often have severely impaired theory of mind abilities (Humphrey, 1998). Previous research has found that in the case of individuals with an autism spectrum disorder, drawing abilities in themselves are often fully in place, with some notable cases of exceptional talent (Scott & Baron-Cohen, 1996; Selfe, 1977). Developmental issues with theory of mind therefore do not automatically result in difficulties in producing representations, but in

developing *metarepresentations*, which are necessary to create imaginary or fictional drawings or paintings. This can also be traced back to a lack of conceptualization, or the production of images based on a mental concept of what is depicted, rather than its visual resemblance to the external world (Humphrey, 1998). In the case of chimpanzees, not only secondary metarepresentations are absent, but primary ones too. However, both savant and chimpanzee drawings and paintings are considered by some to be art, which raises new questions as to the central place of even primary, figurative representations in a definition of art.

Apart from through an elaboration of the cognitive apparatus examined in relation to visual art—of a human or nonhuman nature—yet other insights might be gained through extending the subject matter from purely visual expressions to other art forms such as music. Previous research has indicated that nonhuman primates such as chimpanzees may possess an inclination to produce rhythms (Hattori, Tomonaga, & Matsuzawa, 2013), whereas variety in some primate species' vocalizations can be traced back to different emotional states (Hauser, 2001). Both of these could be regarded as basic components of music, at least in an evolutionary sense as they can be likened to earlier, pre-musical stages described for human history (see, e.g., Mithen, 2005). Evolutionarily, music may have followed trajectories that were significantly different from the emergence of visual arts. Coinciding with this, the cognitive and perceptual foundations and mechanisms at the heart of music are likely very different from those involved in visual representations, or visual art. A thorough assessment of music-like practices among nonhuman primates, potentially also focusing on chimpanzees so as to achieve a delineated subject sample for comparative, cross-species analysis, may well lead to a different conclusion in terms of the applicability of the term 'music' outside the human lineage.

The artificial nature of ape art studies also yields an interesting avenue for assessing the naturalness of art-like behavior. All empirical studies have been performed with apes kept in captivity, many of which have taken part in other research as well. Similar behavior has not been reported for wild chimpanzees. Although this is evidently also explained by the absence of drawing and painting materials in nonexperimental conditions, one might expect to observe a basic kind of art-like behavior as registered in captive chimpanzees, perhaps using natural tools, if such behavior belonged to the instinctive repertoire of nonhuman primates.

Several authors do report that their experimental subjects tended to engage in painting and drawing without receiving any food rewards, and the willingness to do so demonstrated by the chimpanzees does suggest an intrinsic interest in these activities (Boysen et al., 1987; Schiller, 1951). However, caution is necessary in interpreting these observations. Morris has stated that "the aesthetic aspect of picture-making" is shared between humans and chimpanzees, which might be true considering the apparent presence of a basic sense of aesthetics in chimpanzees, but this doesn't equal the statement that both species also have in common "an inherent need to express themselves aesthetically" (1962, pp. 148, 151). If this were true, one should indeed expect to observe similar art-like behavior in wild chimpanzees. Spontaneous emergence of a behavior in an individual's lifetime seems particularly relevant given the fact that this has been described as a criterion in favor of the adaptiveness—and therefore functional importance—of art for humans (Carroll, 2005). The interest witnessed in chimpanzees is

most likely to be explained by what was already described by Boysen et al. as an "intrinsic interest in exploratory and manipulative play" (1987, p. 82).

On a final, philosophical anthropological note, the ape art debate is especially relevant for considering the relationship between human and nonhuman primates. The fact that nonhuman animals reach into the ultimate realm of human culture—the world of art—is sufficient to elicit fierce responses by those displaying adverse reactions, as well as by proponents. Several of Congo's paintings have been auctioned for large sums of money, which means that chimpanzees are regarded, by at least a small group of admirers, as actual artists withstanding the competition with many human artists.

The responses in favor of ape art might be significantly influenced by a tendency to anthropomorphize our closest living relatives. For example, the energy that is evident from some works of ape art, especially paintings, has been taken by some to express an innate aesthetic drive, although this apparent forcefulness is probably merely attributable to the greater physical strength typical of chimpanzees. The recurring 'fan pattern' for example—a set of lines that widen starting from the bottom center of the paper—has been subject to extensive analysis. Describing Congo's actions, Morris writes that the "original, simple fan pattern had now become a complex one. Every line was carefully positioned in relation to every other line, and the whole composition was designed to fit into the space available for it, and also to fill that space . . . Each time he would explore some new variation. He created a lop-sided fan, a subsidiary fan, a fan with a curved base, a split fan with a central yellow spot, a split fan with a central back spot and a split fan with a central blue mark. He was enjoying that most human of aesthetic games—thematic variation" (2013, pp. 36, 37). According to De Waal (2001), these fan patterns can easily be explained by the relatively limited motor control of chimpanzees compared with humans, rather than being a formal, intended pattern in itself. In this view, thematic variation is presumably absent.

In yet other instances, the art-like behavior under consideration is judged and described in a language that is more suitable for philosophical approaches to human art. For example, Lenain (1997) describes the products of nonhuman primates as visual disruption, through repeated probing and eventual destruction of the empty space present on the paper. He observes one of the crucial distinctions between primate and human art-like behavior to lie in the difference between "formal conscience" and "creative conscience" (1995, p. 210). Whereas the former refers to responding to given elements in a field, the latter corresponds to creating, modifying, and adapting a pictorial field with a specific aesthetic purpose in mind. The second of these is the kind of conscience typically associated with human art-making, and according to Lenain, this is one of the points where chimpanzees and other nonhuman primates fall short. In addition, he discusses that ape painting never appears to result in the combination of different individual elements in a second- or third-order formal set-up, such as sequencing elements of a pattern, or alternating different patterns to create a motif, but remains at a one-level operation of, for example, marking a preexisting shape (Lenain, 1995).

Proponents of the art status of nonhuman primate painting and drawing might argue that departing from human art and artistic cognition a priori eliminates the chimpanzee's chance of being recognized as a peer. Based on this consideration, we should

refrain from using ourselves as the point of reference. However, human art is the only possible beginning for attempting to assess a possible parallel in other species, and the ape art debate as a whole is built on human concepts of art and aesthetics. Trying to avoid human influences during the analysis of paintings and drawings would therefore undermine its very existence.

Conclusion

This article has aimed to investigate the question of the extent to which paintings and drawings made by other great apes, and chimpanzees in particular, should be considered to be works of art, based on a cognitive outlook on human artistic practice. Depending on the result of such an analysis, one can determine whether nonhuman primate behavior may shed light on the origin and functions of human art-making. Authors in favor of the idea that chimpanzee paintings and drawings enlighten us as to art's origins, such as Morris (1962), have stated that the art-like behavior observed among nonhuman primates is a clear indication that the roots of artistic behavior and aesthetic consciousness predate the split between humans and our closest primate cousins, chimpanzees. For this claim to be true, the painting and drawing behavior observed among nonhuman primates should correspond at least in part to the cognitive machinery at work when humans create, perceive, and enjoy art. The method in this article therefore has consisted of breaking down artistic behavior into several cognitive capacities responsible for various parts of the process of creating and understanding art. These were the recognition of intentionality, symbolism, and an aesthetic sense. No convincing evidence emerges from the aforementioned empirical studies that the former two capacities, typical of human artistic cognition, are also present in the chimpanzee mind. The aesthetic sense, however, appears to be, at least in a basic version, at work during painting and drawing. De Waal is therefore probably right in concluding that "the evidence, then, is that painting apes have a sense of both balance and completeness, enjoy the visual effect of what they do, and create regularities and patterns, but are not out to produce a lasting product" (2001, p. 173).

If human and chimpanzee artistic cognition coincide only slightly, it is unlikely that the latter's products should be labeled as art. Because art is not a characteristic shared among both primate species, this also almost certainly means that it wasn't a part of the behavioral repertoire of the last common ancestor of humans and chimpanzees, as Morris (1962) suggests. In addition, if no significant arguments, such as relevant selection pressures, exist in favor of the idea that chimpanzees could have developed artistic skills *after* their split from the human lineage, the only conclusion is that art is indeed uniquely human.

However, this does not mean that studies on ape art should be dismissed. In addition to discussing the question of artistic skill and an aesthetic sense, they also contain rich sources of information on a variety of topics such as learning and imitation behavior—as this has been reported for chimpanzees in response to both humans and their own conspecifics—the ontogenetic development of motor skills and object manipulation in infant chimpanzees, and their visual perception mechanisms. In addition, as the aesthetic sense appears to be common to both species, it is important to explore this part of the ape art debate further. If an aesthetic sense does indeed belong to the chimpanzee mind, it is likely, and

desirable, that our primate cousins will help us uncover our early human past.

References

- Baron-Cohen, S. (1999). The evolution of a theory of mind. In M. Corballis & S. Lea (Eds.), *The descent of mind: Psychological perspectives on hominid evolution* (pp. 261–277). Oxford, UK: Oxford University Press.
- Berridge, K. C. (2003). Pleasures of the brain. *Brain and Cognition*, 52, 106–128. [http://dx.doi.org/10.1016/S0278-2626\(03\)00014-9](http://dx.doi.org/10.1016/S0278-2626(03)00014-9)
- Bloom, P. (1996). Intention, history, and artifact concepts. *Cognition*, 60, 1–29. [http://dx.doi.org/10.1016/0010-0277\(95\)00699-0](http://dx.doi.org/10.1016/0010-0277(95)00699-0)
- Boysen, S. T., Berntson, G. G., & Prentice, J. (1987). Simian scribbles: A reappraisal of drawing in the chimpanzee (*Pan troglodytes*). *Journal of Comparative Psychology*, 101, 82–89. <http://dx.doi.org/10.1037/0735-7036.101.1.82>
- Carroll, J. (2005). Literature and evolutionary psychology. In D. M. Buss (Ed.), *The handbook of evolutionary psychology* (pp. 931–952). Hoboken, NJ: Wiley.
- Carroll, N. (2004). Art and human nature. *The Journal of Aesthetics and Art Criticism*, 62, 95–107. <http://dx.doi.org/10.1111/j.1540-594X.2004.00143.x>
- Davies, S. (2006). Aesthetic judgements, artworks and functional beauty. *The Philosophical Quarterly*, 56, 224–241. <http://dx.doi.org/10.1111/j.1467-9213.2006.00439.x>
- Davies, S. (2012). *The artful species: Aesthetics, art, and evolution*. Oxford, UK: Oxford University Press.
- Deacon, T. (1997). *The symbolic species: The co-evolution of language and the brain*. London, UK: Allen Lane.
- Deloache, J. S. (2004). Becoming symbol-minded. *Trends in Cognitive Sciences*, 8, 66–70. <http://dx.doi.org/10.1016/j.tics.2003.12.004>
- Dennett, D. (1987). *The intentional stance*. Cambridge, MA: MIT Press.
- De Smedt, J., & De Cruz, H. (2011). A cognitive approach to the earliest art. *The Journal of Aesthetics and Art Criticism*, 69, 379–389. <http://dx.doi.org/10.1111/j.1540-6245.2011.01482.x>
- De Waal, F. (2001). *The ape and the sushi master: Cultural reflections of a primatologist*. New York, NY: Basic Books.
- de Waal, F. B. (2008). Putting the altruism back into altruism: The evolution of empathy. *Annual Review of Psychology*, 59, 279–300. <http://dx.doi.org/10.1146/annurev.psych.59.103006.093625>
- Dutton, D. (2006). A naturalist definition of art. *The Journal of Aesthetics and Art Criticism*, 64, 367–377. <http://dx.doi.org/10.1111/j.1540-594X.2006.00217.x>
- Dutton, D. (2009). *The art instinct: Beauty, pleasure, and human evolution*. London, UK: Bloomsbury Press.
- Gaut, B. (2005). The cluster account of art defended. *British Journal of Aesthetics*, 45, 273–288. <http://dx.doi.org/10.1093/aesthj/ayi032>
- Gazzaniga, M. S. (2008). *Human: The science behind what makes your brain unique*. New York, NY: Harper Perennial.
- Gelman, S. A., & Bloom, P. (2000). Young children are sensitive to how an object was created when deciding what to name it. *Cognition*, 76, 91–103. [http://dx.doi.org/10.1016/S0010-0277\(00\)00071-8](http://dx.doi.org/10.1016/S0010-0277(00)00071-8)
- Hattori, Y., Tomonaga, M., & Matsuzawa, T. (2013). Spontaneous synchronized tapping to an auditory rhythm in a chimpanzee. *Scientific Reports*, 3, 1566. <http://dx.doi.org/10.1038/srep01566>
- Hauser, M. D. (2001). The sound and the fury: Primate vocalizations as reflections of emotion and thought. In N. L. Wallin, B. Merker, & S. Brown (Eds.), *The origins of music* (pp. 77–102). Cambridge, MA: MIT Press.
- Henshilwood, C. S., & Marean, C. W. (2003). The origin of modern human behavior. *Current Anthropology*, 44, 627–651. <http://dx.doi.org/10.1086/377665>
- Humphrey, N. K. (1973). The illusion of beauty. *Perception*, 2, 429–439. <http://dx.doi.org/10.1068/p020429>
- Humphrey, N. (1998). Cave art, autism, and the evolution of the modern mind. *Cambridge Archaeological Journal*, 8, 165–191. <http://dx.doi.org/10.1017/S0959774300001827>
- Iversen, I., & Matsuzawa, T. (1996). Visually guided drawing in the chimpanzee (*Pan troglodytes*). *Japanese Psychological Research*, 38, 126–135. <http://dx.doi.org/10.1111/j.1468-5884.1996.tb00017.x>
- Iversen, I., & Matsuzawa, T. (1997). Model-guided line drawing in the chimpanzee (*Pan troglodytes*). *Japanese Psychological Research*, 39, 154–181. <http://dx.doi.org/10.1111/1468-5884.00051>
- Kellogg, W. N., & Kellogg, L. A. (1933). *The ape and the child*. New York, NY: McGraw-Hill.
- Klüver, H. (1933). *Behaviour mechanisms in monkeys*. Chicago, IL: University of Chicago Press.
- Kohts, N. (1935). *Infant ape and human child*. Moscow, Russia: Scientific Memoirs of the Museum Darwinianum.
- Lacey, S., Hagtvædt, H., Patrick, V. M., Anderson, A., Stilla, R., Deshpande, G., . . . Sathian, K. (2011). Art for reward's sake: Visual art recruits the ventral striatum. *NeuroImage*, 55, 420–433. <http://dx.doi.org/10.1016/j.neuroimage.2010.11.027>
- Lenain, T. (1995). Ape-painting and the problem of the origin of art. *Human Evolution*, 10, 205–215. <http://dx.doi.org/10.1007/BF02438973>
- Lenain, T. (1997). *Monkey painting*. London, UK: Reaktion Books.
- Leslie, A. M. (1987). Pretense and representation: The origins of “theory of mind.” *Psychological Review*, 94, 412–426. <http://dx.doi.org/10.1037/0033-295X.94.4.412>
- Levinson, J. (1993). Extending art historically. *The Journal of Aesthetics and Art Criticism*, 51, 411–423. <http://dx.doi.org/10.2307/431513>
- Matsuzawa, T. (2009). Symbolic representation of number in chimpanzees. *Current Opinion in Neurobiology*, 19, 92–98. <http://dx.doi.org/10.1016/j.conb.2009.04.007>
- McBrearty, S., & Brooks, A. S. (2000). The revolution that wasn't: A new interpretation of the origin of modern human behavior. *Journal of Human Evolution*, 39, 453–563. <http://dx.doi.org/10.1006/jhev.2000.0435>
- Miller, G. (2001). Aesthetic fitness: How sexual selection shaped artistic virtuosity as a fitness indicator and aesthetic preferences as mate choice criteria. *Bulletin of Psychology and the Arts*, 2, 20–25.
- Mithen, S. (2005). *The singing Neanderthals. The origins of music, language, mind and body*. London, UK: Weidenfeld & Nicolson.
- Morris, D. (1962). *The biology of art: A study of the picture-making behavior of great apes and its relationship to human art*. New York, NY: Alfred A. Knopf.
- Morris, D. (2013). *The artistic ape: Three million years of art*. London, UK: Red Lemon Press.
- Peirce, C. S. (1932/1960). The icon, index, and symbol. In C. Hartshorne & P. Weiss (Eds.), *Collected papers of Charles Sanders Peirce, II* (pp. 156–173). Cambridge, MA: Harvard University Press.
- Persson, T. (2008). *Pictorial primates: A search for iconic abilities in great apes*. Published PhD Dissertation, Lund University.
- Savage-Rumbaugh, E. S. (1986). *Ape language: From conditioned response to symbol*. New York, NY: Columbia University Press.
- Savage-Rumbaugh, E. S., Rumbaugh, D. M., & Boysen, S. (1978). Symbolic communication between two chimpanzees (*Pan troglodytes*). *Science*, 201, 641–644. <http://dx.doi.org/10.1126/science.675251>
- Schiller, P. H. (1951). Figural preferences in the drawings of a chimpanzee. *Journal of Comparative and Physiological Psychology*, 44, 101–111. <http://dx.doi.org/10.1037/h0053604>
- Scott, F. J., & Baron-Cohen, S. (1996). Imagining real and unreal things: Evidence of a dissociation in autism. *Journal of Cognitive Neuroscience*, 8, 371–382. <http://dx.doi.org/10.1162/jocn.1996.8.4.371>
- Selfe, L. (1977). *Nadia: A case of extraordinary drawing ability in an autistic child*. London, UK: Academic Press.

- Smith, D. A. (1973). Systematic study of chimpanzee drawing. *Journal of Comparative and Physiological Psychology*, 82, 406–414. <http://dx.doi.org/10.1037/h0034135>
- Steinbeis, N., & Koelsch, S. (2009). Understanding the intentions behind man-made products elicits neural activity in areas dedicated to mental state attribution. *Cerebral Cortex*, 19, 619–623. <http://dx.doi.org/10.1093/cercor/bhn110>
- Tanaka, M. (2007). Recognition of pictorial representations by chimpanzees (*Pan troglodytes*). *Animal Cognition*, 10, 169–179. <http://dx.doi.org/10.1007/s10071-006-0056-1>
- Tanaka, M., Tomonaga, M., & Matsuzawa, T. (2003). Finger drawing by infant chimpanzees (*Pan troglodytes*). *Animal Cognition*, 6, 245–251. <http://dx.doi.org/10.1007/s10071-003-0198-3>
- Thornhill, R. (2003). Darwinian aesthetics informs traditional aesthetics. In E. Voland & K. Grammer (Eds.), *Evolutionary aesthetics* (pp. 9–35). Berlin, Germany: Springer. http://dx.doi.org/10.1007/978-3-662-07142-7_2
- Tomasello, M. (1999). *The cultural origins of human cognition*. Cambridge, MA: Harvard University Press.
- Westergaard, G. C., & Suomi, S. J. (1997). Modification of clay forms by tufted capuchins (*Cebus apella*). *International Journal of Primatology*, 18, 455–467. <http://dx.doi.org/10.1023/A:1026394618857>
- Whiten, A. (2000). Primate culture and social learning. *Cognitive Science*, 24, 477–508. http://dx.doi.org/10.1207/s15516709cog2403_6
- Whiten, A., Goodall, J., McGrew, W. C., Nishida, T., Reynolds, V., Sugiyama, Y., . . . Boesch, C. (1999). Cultures in chimpanzees. *Nature*, 399, 682–685. <http://dx.doi.org/10.1038/21415>

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