

Inter- and Intra-Individual Differences in Orang-Utan Drawings

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Drawing has increasingly been proposed as an enrichment activity for captive primates in zoological parks and research institutes. The monkeys and apes are free to use the materials at their disposal and are not constrained or conditioned to show this behaviour. This provides a good opportunity to collect drawings by non-human primates and allows for comparative studies between hominids.

Keywords: scribbles ; art ; anthropology ; primatology ; cognition

1. Introduction

Drawing behaviour has been studied in non-human primate species such as chimpanzees (*Pan troglodytes*), gorillas (*Gorilla gorilla*), orang-utans (*Pongo pygmaeus*), capuchin monkeys (*Cebus apella*), and rhesus macaques (*Macaca mulatta*) ^[1].

Orang-utans (*Pongo sp.*) are phylogenetically close to humans, with 97% common genetic heritage ^[2]. This makes them ideal candidates to help us understand the origins of drawing behaviour. They can develop highly sophisticated cognitive abilities ^[3] and complex tool use ^{[4][5][6]} that are both at least comparable to those observed in chimpanzees. They are also well known for their curiosity ^[7]. The wrists of orang-utans are more flexible than those of chimpanzees, making it easier for them to draw as they can bend their hands backwards ^[8].

Previous studies on captive orang-utans and other primates showed that they will continue to draw even in the absence of rewards ^{[9][10][11][12]}. These findings are consistent with the Gestalt principle found in young children, which links the scribbling activity to a discovery of motor play activity ^[13]. Like in humans, spontaneous drawings indicate an intrinsic interest in exploratory and manipulative play for captive non-human primates ^{[9][13]}. Moreover, when tracks have already been drawn on the paper, further scribbles are added, suggesting that visible tracks have some kind of reinforcing value ^[11]. Schiller ^[14] worked with an 18-year-old female chimpanzee called Alpha, who showed a keen interest in drawing. In order to study figure formation and position, different stimuli (squares or scribbles) were drawn on paper by researchers. In terms of figure production, the results showed that Alpha mainly used two types of strokes: short dashes and almost parallel broad zigzag strokes (also referred to as the fan pattern). The findings for the placement of figures revealed that when a single figure was positioned off-centre, Alpha drew in the largest open space, producing what Schiller calls a 'sort of balance between her markings and the presented figure' (p. 104).

Kinematic aspects could be seen as precursors of a graphic representation ^[15], yet drawings by non-human primates include different types of marks, such as the straight lines, curves, loops, or hook-like strokes observed in drawings by chimpanzees ^[11]. Although chimpanzees only develop the skill to use a mark-making instrument at the age of 20–23 months, these marks can be observed before the age of 13–23 months through the use of touchscreens. In a comparative study, a set of 396 pictures was collected, made up of 40 drawings by chimpanzees, 153 by gorillas, 146 by orang-utans, and 57 non-figurative drawings by children up to and including the age of four ^[16]. Zeller ^[16] noticed that the main features of the orang-utans' patterns were diagonals, arcs, and curvilinear designs, while those of the gorillas contained mainly arcs and open curving lines, and a very high proportion of dots. In contrast, the chimpanzees' drawings were mainly characterised by the use of straight and jointed lines. Unlike Tanaka, Zeller noted that orang-utans were the only apes that can use a closed loop or circular pattern ^[16]. This is the most difficult pattern to produce because it requires high levels of motor control. Another important point concerns the use of colours. Findings in children have shown that their choice of colours reflected their emotional state at that time ^[17], and it seems that this may be the case in individuals of other species, as with the case of the orang-utan called Molly ^[9]. These results support the hypothesis that there is a choice in

the use of colour, the type of strokes, and the use of space, and that drawings from great apes do not result from totally random scribbles ^{[18][16]}. Despite their non-figurative nature, drawings produced by apes could therefore provide a great deal of meaningful information.

2. Drawing Behaviour Among Orang-Utans

For most of the studied time, orang-utans used several colours in their drawings. Zeller ^[16] found that blue was the most commonly used colour used in the drawings of apes (including orang-utans) and children. The main colour used in the orang-utans' drawings differed between individuals. As orang-utans see colours as human do ^[19], this difference could reflect either an aesthetic or an emotional preference ^[20]. In children, colours are linked to emotion ^[20], including in their drawing ^[17]. This link with emotion may have an evolutionary origin concerning mate choice and competition ^[21]. Molly, who usually used green and pink colours, mainly chose the colour red when another orang-utan was giving birth ^[9]. All the individuals drew patterns that were described in Kellogg's children's scribbles classification ^[22]. Like children, orang-utans can draw multiple lines (called fan patterns), loops, and circles. Orang-utans have more dexterity than other great apes since they can draw curved lines ^[16]. Orang-utans have also drawn triangles ^[23]. Thus, in a way, orang-utans draw better than other non-human apes. The drawing technique used by orang-utans might also be interesting. Previous studies showed that orang-utans often hold the drawing tool between their fingers. However, one female was regularly observed laying the pastel on the sheet before rolling it with her hand ^[23]. This behaviour could explain some large fan patterns observed in orang-utan drawings. In many studies, primates demonstrated an ability to draw fan patterns. Drawings by chimpanzees, human children, and orang-utans therefore have a lot in common, and these new findings may enrich the phylogeny of drawing behaviour among primates.

Indeed, in humans, great interindividual and interindividual differences are observed in drawings ^[24]. The same could be observed in non-human primates ^[1] as suggested in chimpanzees ^[18]. Studies in human children suggest that these interindividual differences might be due to varying levels of cognitive skill maturation ^[25] and the different speeds at which children learn to draw ^[18]. According to Willats ^[26], there may be an interrelation between a child's stage in their drawing skill development and their increasing comprehension of their living world. The orang-utans have different life experiences. While Molly, who did more complex drawings, was born in the wild and had lived in two zoological parks and given birth four times, Kiki, who produced fewer complex drawings, was born in captivity and quickly moved to Tama Zoological Park, where she gave birth to one baby. Molly had also lost her sight in one eye between 1993 and 1996 (personal communications from Mr. Kurotori, Tama zookeeper). These different experiences could perhaps explain the differences found in the way they drew. We can also mention the age difference between Molly, who was 54 years old at the beginning of her drawing period, and Kiki, who was the youngest of the study group at just 10 years old. Kiki's minimalist use of colours and space in the paper was evidence of either her drawing style or a lack of motivation or interest in the drawing activity. However, Kiki was not the least experienced of the individuals in terms of drawing, even if she was the youngest: she produced 60 drawings, whereas 44-year-old orang-utan Julie produced just 16 drawings. As in humans, younger apes can possess an intrinsic motivation to draw but can be more interested in the objects (crayons and paperboards) than the drawing ^{[18][11]}. However, with age, complexity of drawing can increase. In human beings, Martinet et al. ^[18] showed that adults add more details in their drawing compared to children. This was confirmed by analysing different drawings metrics ^[27]. A parallel could be made between humans and non-human apes for drawing as is done for other activities, such as the social ones ^{[28][29]}.

Data for Molly showed a higher mean and a lower standard deviation of the colour spectrum. This indicates a higher diversity in Molly's drawings, many of which are bright and have lower levels of contrast. Indeed, although Molly did sometimes fill the sheet, particularly with fan patterns—as described for the chimpanzee Congo ^[30]—many of her drawings were almost empty. Other orang-utans showed smaller patterns, which contrasted with the white background. Moreover, Molly seemed to press less on the crayons than the other individuals, which explains the lower contrast (lowest standard deviation of the colour spectrum) in comparison to data for other individuals. The drawings of the orang-utans (and especially those drawn by Molly) confirm the findings of Smith ^[31], who was the first to report that chimpanzees tended to draw near the centre of the page. Zeller ^[16] confirmed this finding for other apes. The wide difference in the number of productions per individual also shows different levels of interest in the activity; this finding confirms the observations in orang-utans and in chimpanzees ^{[10][11][16]}.

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