ORANGUTAN COGNITION

Gary L. Shapiro

OVERVIEW

Comparative psychology learned a lesson from the school of comparative development when it replaced cognition for the black box it had created decades earlier. The work of Piaget (1952) demonstrated that observable behavior patterns in young human primates provide a view to the underlying cognitive foundation. As the child develops from birth, her behavior patterns for the first two years proceeds along a predictable dimension from reflexive to simple repetitive to more complex repetitive actions. The overt behavior is mediated by cognitive function, presumably a cognitive competence, which increases in complexity as the child assimilates information - the consequence of its simple activities, and accommodates the information - the consequence of transforming simple mental structures into more complex ones. Over time behaviors and mediating cognitive structures accrue. Methods of observation and assumptions have been successfully employed in a number of nonhuman primates (Parker and Gibson 1977) including orangutans (Chevalier-Skolnikoff et al. 1982). They have shown that during the first two years of life, there are striking similarities in the developing patterns or phases for the sensori-motor intelligence series for great apes and humans. Cognitive functioning has also been inferred from the following types of studies: self-recognition (Suarez and Gallup 1981); learning and problem-solving (Rumbaugh 1970), memory functioning (Robbins and Bush 1973), tool-using (Parker, 1969), artificial symbol language (Premack 1971) and sign language (Patterson 1978). While a complete review of each of these types of studies is beyond the scope of this section, examples of orangutan cognition are discussed according to the environmental setting.

COGNITION IN THE FIELD SETTING

Wild and feral orangutans have been examined using a Piagetian approach within the forest environment in which they evolved (Chevalier-Skolnikoff et al. 1982; Bard 1990). Throughout the day, the orangutans were observed and their behaviors were scored according to the level of complexity designated within the Piagetian sensori-motor developmental series. Orangutans appear to employ the highest levels of sensory-motor intelligence within the locomotion context.

Bard examined infant and juvenile orangutans during foraging and locomotion and found that although the less complex levels (i.e., single actions, goal-directed sequences, multiple actions, and simple relations) are employed more frequently overall than the more complex levels (i.e., tool use and mental combinations), a greater proportion of more complex events took place during locomotion as compared to foraging for both age groups. Conversely, a greater proportion of less complex events took place during foraging as compared to locomotion (6:1 for infants; 20:1 for juveniles).

Extractive foraging has been a hypothesis (Parker and Gibson 1977) used to explain the evolution of intelligence in primates, especially the great apes and humans. Since wild orangutans rarely make or use tools or resort to complex mental combinations to open encased foods, it is difficult to invoke extractive foraging as the prime evolutionary mover for intelligence in this species.

The adaptive significance of intelligence within the locomotion context becomes clear when once considers the tremendous complexity of the Bornean and Sumatran rain forest, the numerous possible pathways through the canopy and the need for the orangutan to locate available food as quickly as possible. Learning to distribute and transfer weight on fragile branches while moving from tree to tree hundreds of feet above the forest floor requires an understanding of the physics of the branches and the vector forces needed to effectively pole-swing or brachiate from food source to food source. Cognitive processing (e.g., planning; mental problem-solving), as contrasted with reflexive response, is sometimes inferred by the amount of time that elapses between stimulus and response. Orangutans spend a considerable amount of time studying the forest canopy before embarking on their arboreal travels.

Field researchers (MacKinnon 1974; Galdikas 1978; Rijksen 1978) have postulated that orangutans possess mental maps of their local environment, including the ripening resources within, and that they plan their travel based on the best available information. Orangutans have been known to make "beelines" through the forest to trees with preferred fruits, such as durian, weeks or months after last visiting the site. It can be inferred that the orangutan does this to either update the status of the tree's fruiting condition or to feed upon the ripening fruit.

Shapiro (1982) showed that free-ranging orangutans can learn signs like the other great apes. Skolnikoff argues that ape signing shows an orderly development of increasingly complex cognitive function, not

simple “Clever Hans” phenomena. Signing orangutans occasionally do demonstrate insight or invention through mental combinations when they create novel signs and integrate them into their signed combinations (Shapiro and Galdikas 1994a). However, signing performance by orangutans also seems to be influenced by the amount of interest they have with a particular referent (Shapiro 1985) as well as the level of attentiveness given a referent (Shapiro and Galdikas 1994b).

COGNITIVE EXAMPLES IN CAPTIVITY

Lethmate and Ducker (1973) and Suarez and Gallop (1981) used forced mirror exposure to demonstrate self-recognition in the orangutan. This cognitive ability was not demonstrated in gorillas using this methodology. Patterson (1978) has insisted that the gorilla Koko, does recognize herself in a mirror and will use signs to indicate this. Self-recognition infers self-awareness, a cognitive function documented only in humans and great apes.

A number of learning and problem-solving studies have been carried out with orangutans within the captive setting (Rumbaugh 1970). The data show that orangutans are essential equivalent performers to the other great apes on tests such as simple discrimination, discrimination reversals, oddity formation, pattern string problems and transfer index. Caregivers in zoological parks have abundant anecdotal evidence of how orangutans demonstrate their problem-solving abilities within the captive setting including hiding tools (demonstrating displacement) and later trading them for food (demonstrating symbolic reward value), cooperatively gaining access to night enclosures to obtain food (demonstrating cooperative problem-solving).

Caregivers and other observers have also witnessed tool-making and tool-using abilities in orangutans for the purpose of play, food acquisition and aggressive displays. When provisioned and given adequate opportunities to manipulate objects, orangutans in captivity and in rehabilitation settings can learn to make and use simple tools through trial and error and observational learning. Making tools involves modifying or adding to existing objects to improve their function. These tools can be categorized as levers (sticks and other objects to pry open other objects), dippers (cloth, sticks, etc. to obtain liquids), swings (cloth or rope to swing), inclines (boards or pipes propped up to access areas or escape enclosures), covers (plastic, paper or burlap wrapped around objects to protect the mouth from direct contact during biting), and weapons (sticks brandished to defend or attack others).

Orangutans have also learned to associate referents and communicate within artificial language and sign language systems (Shapiro 1975a, 1975b, 1985; Miles 1990). This communicative performance during early training is similar to that observed in chimpanzees and gorillas (Shapiro 1982). Orangutans can learn to produce progressively longer sequences of symbols or signs (combinations) to describe increasingly complex relationships or to request edibles or contact activities. They can generalize a sign to similar referents not used in training but which share one or more significant attributes with the original referent. On occasion, orangutans will combine signs in novel ways that aptly describe attributes of novel referents. This creative use of a language system has been termed productivity and is considered a crucial feature of language. While it has been suggested by some that these events require no advanced cognitive functioning beyond that necessary for simple conditional learning, others have insisted that referent generalization, appropriate combinations, and productivity require advanced cognitive abilities.

CONCLUSIONS

The orangutan's cognitive abilities have not been explored in nearly as much depth as the chimpanzee's. When compared, however, orangutans seem to show cognitive abilities that are comparable to the other great apes. In some measures (e.g., self-recognition), they may even demonstrate abilities not conclusively measured in gorillas. With increased information, caregivers can perhaps better appreciate the need to provide enriched environments for captive orangutans so that their cognitive abilities can be expressed and mental health maintained.

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