Chimpanzee Behavioral Anomalies: Possible Sensory Integration Difficulties In a Captive Individual (*Pan troglodytes*)

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Holly Chimpanzee

Saint Louis Zoo Outdoor Chimpanzee Habitat

Introduction

Human/chimpanzee similarities have played an important role in our understanding of the evolution and ontogeny of human behavior. While many human developmental disorders are being researched in various monkey species, less evident is whether chimpanzees experience neural disturbances resulting in behavioral anomalies that parallel those seen in human children; and if so, whether therapeutic intervention would be effective.

Many captive chimpanzees display behaviors that are viewed as abnormal and not part of the typical chimpanzee behavioral repertoire. These may be so common, in fact, that they are often considered as "normal for captive chimpanzees." Over the past few decades, many captive facilities have introduced environmental and behavioral enrichment programs in an attempt to improve conditions for the chimpanzees and reduce the incidence of stereotypical behaviors. In spite of this, these behaviors often persist and may result in health or management issues.

This project focuses on a young, adult female chimpanzee (*Pan troglodytes*), Holly, at the Saint Louis Zoo. It began when concerns were expressed over some of Holly's behavior, and their possible relationship to autistic behavior in human children. Holly's behavior included rocking, self plucking, clutching items and tandem walking. These behaviors had not decreased as Holly entered adulthood, as has sometimes been observed to occur with captive chimpanzees. Additionally, her caretakers felt that she did not respond well to social signals, and was often the "odd-man out" in the social group. An interdisciplinary team was gathered to examine Holly's behavior, its possible etiology and to consider possible interventions.

Bakhari and Holly at Saint Louis Zoo

Holly's Background

Holly was born March 30, 1998, at the Montgomery, Alabama zoo. Her mother lacked mothering experience and was considered "rough" with the infant. Holly was removed from her mother and hand-reared by the staff for 3 months prior to being sent to the Saint Louis Zoo to join another infant female, Bakhari, who had also been rejected by her mother. The two were then raised together by the Saint Louis zoo staff and docents until they could be integrated with the other chimpanzees.

Upon her arrival at the Saint Louis zoo, Holly was considered physically well-coordinated and very active, but did not seem fluid in her movements. She did not want to be touched and would play hard. Holly's caretakers considered her behavior to be "different" early on, but attributed it to hand-rearing. By age 1, both infants were being introduced to the larger social group. At age 6-7, Holly was not outgrowing infantile rocking behavior, and began rocking in a side to side, "tick-tock" motion. She continued to be rough in her behavior, and struggled to fully socialize with the group.

As a young adult at age 11 years, Holly continued to display many abnormal behaviors that set her apart from the rest of the social group. She would pluck her hair, rock side to side, clutch items or a peer, and often have a glazed, staring expression on her face. She would react inappropriately to social stimuli, was not well integrated with the group.

The Saint Louis Chimpanzees

Females		Males	
Rosebud	38 yrs	Smoke	42 yrs
Beauty	36 yrs	Jimiyu	17 yrs
Mlinzi	17 yrs	α Hugo	16 yrs
Holly	11 yrs		
Bakhari	11 yrs		
Tammy	7 yrs		
Utamu	7 yrs		

Smoke, the Group's Patriarch

Methodology

In June 2009, experts in chimpanzee caretaking and behavior, as well as human child development, autism and sensory integration met to examine Holly's situation. Holly's behavior was initially assessed through rearing and developmental history, video tapes and direct observations. Following this preliminary assessment, intensive observations were conducted in July 2009 to provide baseline behavioral data on Holly and her age-peers in the group (Bakhari, Tammy and Utamu.) More than 40 hours of direct observation and video taping were collected during a one week period. Data collection techniques included *ad libitum*, all occurrences of specific behaviors, and one-minute interval sampling during 30 minute focal observations. The focal individual's behavior, social partners, proximity to others, and location within the enclosure were all recorded.

Holly and Bakhari with Adoptive Mom, Mlinzi

Initial Results

Initial assessment ruled out a chimpanzee phenotypic equivalent of autism as likely causing Holly's behavior. Alternate explanations emerged emphasizing sensory integration and motor planning difficulties. Key behavioral elements included poor motor fluidity, posture rigidity, lack of restful postures, seeking tactile stimulation, and poor social awareness.

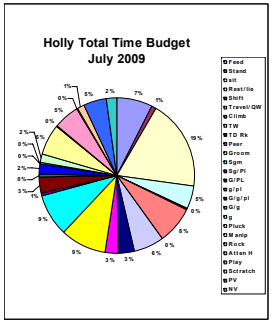

Fig. 1

Holly's Behavior

Quantitative analysis of time budget data for Holly based on interval sampling is presented in Fig. 1. This graph shows that Holly spent 19% of her time sitting. She also spent an equal amount of time engaged in various stereotypic behaviors (Fig. 2). These included Tandem Walking, Tandem Rocking, and Plucking (Fig. 3). Plucking occurred alone and in combination with grooming another individual, being groomed, and during self-grooming. Together, Plucking accounted for 44.87% of the total stereotypic behaviors.

Qualitatively, Holly spent a great deal of time sitting and staring with a glazed expression. This was often accompanied by plucking her hair in one spot, often on the shoulder. Even when engaged in social grooming, Holly would be plucking her own hair simultaneously, and rarely seemed to be fully engaged socially.

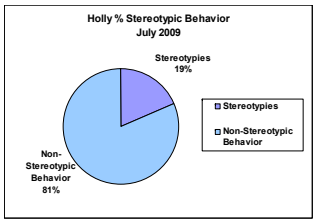

Fig. 2

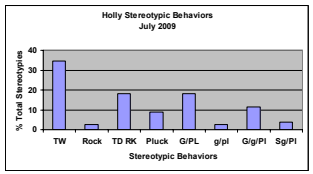

Fig. 3

Comparisons with Age Peers

Comparisons of Holly's behavior with her peers in the social group are presented in Fig. 4. Holly was conspicuous in the range and frequency of stereotypies, her restricted social interactions and lack of rest times. The only times Holly's peers engaged in stereotypies was when Holly engaged one in Tandem Walking or Tandem Rocking. Both Bakhari and Tammy were brought into a Tandem Walk, while only Bakhari engaged in Tandem Rocking with Holly. Utamu was never observed engaged in either behavior. With Tammy, Holly always initiated the behavior. Bakhari, however, would occasionally initiate the behavior with Holly when she was distressed.

Grooming behavior also differed between Holly and her peers. Holly groomed others considerably more often than her peers did, though this behavior was not often reciprocated. Her peers engaged in self grooming more than Holly. While other group members were busy grooming, Holly would often be sitting and plucking her hair. She would sit near group members, but not engage with them.

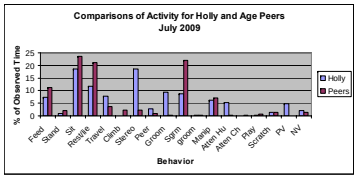

Fig. 4

Holly's Social Interactions

Holly clearly engaged in many behaviors that are abnormal and may even be deleterious to her health and the group's social functioning. Holly's interactions with the other group members demonstrate some of her difficulties. Bakhari was one of her preferred partners, but unless distressed herself, Bakhari often avoided Holly. Holly's second choice of a social partner was the younger Tammy, 7 years of age. Holly was able to dominate Tammy and to some extent control her behavior. However, Tammy was observed beginning to avoid Holly, spending considerable amounts of time out of proximity with all group members. This appeared to be affecting Tammy's normal development within the group. As she avoided Holly, she was also limiting her interactions with all group members.

Among the older adults in the group, Holly also had unequal relationships. She was very cautious of Hugo, the alpha male, and often avoided him. However, she would monitor his behavior and his movements often precipitated her Rocking and Tandem Walking. While seeming distressed by Hugo's presence, Holly would also at times approach him aggressively, and did not seem to learn how to interact appropriately with him.

The oldest male in the group, Smoke, often tolerated Holly's presence. However, Holly did not seem to read subtle social cues from him. While Holly would often sit near Smoke, he at times attempted to increase the distance between them. Holly would sit close to Smoke and drape her arm over his shoulders. Smoke was observed to gently lift her arm from his shoulders and scoot a few inches away. Holly would again move close to him and put her arm on his shoulders. Smoke would repeat the sequence. After a few minutes of this, Smoke would quietly stand up and walk away. This type of sequence was observed several times.

With the other adult females, Holly almost never interacted with Rosebud or Beauty. Only Mlinzi, who had mothered Holly when she was younger, consistently associated with her. Holly was often in proximity with Mlinzi, and would groom her. Mlinzi was the only chimpanzee in the group who groomed Holly.

Holly in July 2009

Holly Feeding in Tree

Discussion

Holly's behavior in this group of chimpanzees presented an opportunity to more fully understand the nature of stereotypic behavior in captivity, its affects on the individual and the social group. It has also allowed us to consider the relationship between these atypical chimpanzee behaviors and some human neurological dysfunctions. The behaviors and postures observed in Holly are common in children diagnosed with sensory integration problems. For nonhumans, environmental enrichment is frequently used to reduce stress and stereotypic behaviors, with mixed results. In an attempt to further address these issues with Holly, and to ameliorate the effects on the entire social group, a sensori-motor therapy approach is being implemented. While many human medical treatments have been researched using chimpanzees, this may be the first time a human-based behavioral therapy protocol has been utilized with a chimpanzee.

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