An Analysis of the Chimpanzees of the Sedgwick County Zoo

Susan Hascall, Carolyn Johnson, Becky Cooper
Wichita State University

Abstract

In recent decades, much attention has been devoted to the study of primates in the wild. There has, however, been little research done on primates in captivity. This study focuses on a captive chimpanzee troop in the Sedgwick County Zoo in Wichita, Kansas which was studied as part of a physical anthropology class project for the Wichita State University under the direction of Dr. Peer Moore-Jansen. A research method was developed in which four behaviors were observed for the entire troop simultaneously. Behaviors were chosen which may be indicators of social status and organization as they are for chimpanzees in the wild. The results of our study indicate that troop behavior in captivity may be quite different than in the wild.

Introduction

The study of chimpanzees is important because of the relationship between chimpanzees and humans. According to Wilson and Sarich (1971), chimpanzees are the most closely related animals to humans genetically. Using the serum albumin molecule from one type of animal and injecting it into another, they determined the genetic closeness of the animals. The amount of white blood cells the second animal produced could be measured, and the genetic distance determined (the more white blood cells the injected animal produced, the farther apart they were said to be). The genetic distance between chimpanzees and humans has been determined to be only 2 percent.

Chimpanzees are divided into two species Pan paniscus and Pan troglodytes and several other subspecies. The chimpanzees at the Sedgwick County Zoo all

belong to the species Pan troglodytes. Their natural habitat is the humid forests, deciduous woodland or mixed savannas of west and central Africa. They usually weigh between 66 and 198 pounds, and are 28 to 36 inches tall (Weiss and Mann 1990). Their gestation period is similar to that of humans (230-240 days) and they generally live to be about 45 years old. Their sensory abilities have also been shown to be similar to humans (Weiss and Mann 1990).

The behavior of Pan troglodytes is also significant. Many of the behaviors of the chimpanzees were thought to have been characteristic only of humans prior to the work of Jane Goodall in the Gombe Reserve. Her work has become the model for all the primate studies which have followed and has broken down many of the old misconceptions about the difference between humans and 'animals'. Some of the things which she discovered were that: chimpanzees manufacture and use tools, organize hunting parties, kill small monkeys' and will (under special circumstances) kill each other. Chimpanzees experience many of the emotions that humans do, such as grief, jealousy, affection, and anger. Chimpanzees live in a community and exhibit patterns of social structure (Goodall 1986:71).

Statement of Problem

The study of chimpanzees in captivity has now been undertaken by several zoos under the direction of the Jane Goodall Institute. The purpose of their study is to try to: 1) determine the differences between the behavior of the chimpanzees in captivity and those in the wild; 2) find ways in which an exhibit can become more

interesting to the chimpanzees; 3) find simple ways to enrich the exhibit which could be used by the experimental laboratories which keep chimpanzees in barren cages; 4) involve and inform the public about the 'wonder of chimps' (Goodall, et. al. 1990). This program however, was not directed toward the college student, but rather toward volunteers. Therefore, our group, consisting of one graduate student and two undergraduate students devised, our own research project.

The observation method used by Chimpanzoo is focal animal observation. This method of observation focuses on one animal (the focal animal). The animal is observed for a length of time, and set number of behaviors are observed. At intervals of equal spacing, the behavior of the animal is recorded (using a type of behavior coding system). All the animals in the observation group are observed at different times. The method of operation is based on the idea that if a behavior is significant, an animal will be doing that behavior a certain percentage of the time it is observed. When the data on all the animals is put together, the rate of occurrence of certain behaviors may be quantified statistically. Conclusions can then be drawn about the behaviors of certain animals in relation to others, and the behavior of the group in general.

Methods and Materials

We devised an observation method in which an individual observer recorded a limited number of behaviors done by the entire troop. We discussed how many behaviors could be observed by one person when observing all eight chimpanzees.

We agreed to observe the following four behaviors; grooming, inspection, vocalization, and display.

The troop at the Sedgwick County Zoo consists of eight individuals; four females and four males. Two of the males and one of the females are infants.

Marbles a 20 year old male, was born in the wild, caught, and raised as a pet for two years. He was donated to the zoo in 1972. He was housed with Harriet and Audra (two of the females).

Gomez was born at the Little Rock Zoo, Arkansas, and was originally acquired for breeding at the Sedgwick County Zoo. He has been legally owned since 1987 by the Sedgwick County Zoo. He was mother-raised and is the sire of all the infants that have been born at the Sedgwick County Zoo. He is 13 years old.

Audra a 20 year old female, was wild born and is believed to have been exported from Sierra Leone. Audra gave birth to the first chimp born at the Sedgwick County Zoo, (Mwana). She was housed with Marbles and Harriet when an infant.

Mwana was the first chimp infant born at the Sedgwick County Zoo, and has been mother-raised since his birth, October 28, 1984. He was sired by Gomez, and is owned by the Little Rock Zoo. He is, at the time of this study, 6 years old.

Harriet was wild born and is believed to have been exported from Sierra Leone. She was housed with Audra and Marbles as an infant. She has given birth to two infants. Binti, a female, was hand-raised because Harriet did not take care of her. She is raising Bahati, a male, her second infant. Harriet is about 20 years old.

Bahati is Harriet's second infant. He is about 4 years old, and is being mother-raised in the exhibit. Bahati is owned by Sedgwick County Zoo.

Holly was wild born and is believed to have been exported from Gabon. She was acquired from the Denver Zoo on a breeding loan in 1982. Holly was hand-raised at the Denver Zoo, Colorado so her first contact with mother-rearing was when Audra had Mwana. Holly was 16 years old at that time. Holly had four pregnancies: the first was aborted when the fetus was 20-

30 days old; the second infant was born in the exhibit, but was killed by Audra when Holly did not pick her up; her third, Jiggs, a male, was hand-raised because Holly left him unattended; her fourth, Hazina, a female, is Holly's first mothering success.

Hazina a three year old female, is the third infant born to Holly. She is being mother-raised and was sired by Gomez. Hazina belongs to the Sedgwick County Zoo.

The Behaviors

The following descriptions/definitions of the behaviors we observed are taken directly from "The Chimpanzoo Observers Guide", pages 23, 25, 32, 13-14, respectively.

Grooming: -

serves as a social function in chimp society as well as keeping the body free from dirt and debris. When grooming, a chimp may use both hands, pushing the hair back with the thumb or index finger of one hand and holding it back while picking at the exposed skin with the nail of the thumb or index finger of the other. The chimp can also use one hand parting the hair in the same way and holding it back with the lower lip. Flakes of dried skin and debris are scratched loose and then removed either with the lips or between thumb and finger. Sometimes two or more chimps groom each other (or groom mutually).

Captive chimps have been observed to pull the lower lip with one hand and peer down into it. Then they groom or pick inside the lower lip with the free hand.

Inspection (finger/probe/sniff):

A male or female chimpanzee sniffs or touches the vaginal opening of a female with its finger or with a probe such as a twig. The focal animal may then sniff its finger or the probe. This gesture is often seen during greeting. The anus of a male may be inspected in the same way. In addition, this investigative behavior may occur when a chimpanzee sniffs the area where another was sitting.

Vocalization:

Whimper - A soft whinny vocalization often associated with solicitation of reassurance.

Scream - A sustained loud shrill vocalization often associated with fear. It may be intense enough to lead to glottal cramps or choking.

Bark - A short duration vocalization which may occur singly or repeatedly as a 'woofy' sound associated with greeting or feeding.

Pant-Hoot - A sustained open vocalization, reiterated, rising in pitch and volume. often associated with aggressive displays.

Huu - A short, soft, single vocalization often associated with surprise.

For our study we concentrated on recording only the pant-hoot and the scream, which were part of an aggressive display.

Agressive display:

The chimp may move in a slow rhythmic 'cantering gait', or run at a moderate or very rapid speed. This behavior has sometimes been called a 'brusque rush'. Display patterns that accompany the aggressive display (referred to as a charging display when a great deal of movement is involved) include throwing, branch dragging, swaying, slapping, stamping, drumming, raking and flailing. The chimpanzee holds a branch, stick, or a handful of vegetation in one hand it brandishes at the other chimpanzees. During flailing, the chimp waves this 'weapon' at an opponent. Often the chimp stands or runs bipedally when flailing. The lips of the chimp may be compressed, the body hair erect, it may emit loud pant-hoots. Aggressive displays may be bipedal, quadrupedal, or tripedal. This is typically a male behavior, but females occasionally emit charging displays as well. A display may be nonvocal or vocal.

Captive chimpanzees often display toward the public. Usually an aggressive display begins with a slow side-to-side rock, escalates into a bipedal swagger, then becomes a lunging run toward the public. The chimp typically climaxes this display by throwing some projectile at the public. At the Sedgwick County Zoo, the displays often involve beating on the glass which separates the chimpanzees from the public. In captivity, females often display, alone or with the males, or they act as a 'cheering' section, pant-hooting, screaming, and urging the male on. These displays are very idiosyncratic, varying greatly from one individual to another. There are five kinds of behavior which may be a part of an aggressive display.

Charge - A chimp moves toward another at a run or a gallop.

Arousal - Hair erection and compressed lips are indicators of arousal. Hair erection is sometimes called *pi/o-erection* or *bristling*. The hair of the chimpanzee bristles when he is highly aggressive or socially excited, or when he sees or hears something strange or frightening. The chimpanzee may press it's lips tightly together (compressed lips) so that the upper lip is bunched up and protrude beyond the point where the lips meet.

In place movement - The chimpanzee makes slight or vigorous side to side or front or back movements of the body (rocking and swaying) when it is sitting. Almost imperceptible movements may gradually become increasingly obvious as momentum builds up. The chimpanzee is probably gazing intently at another chimpanzee or toward the public. Rocking in the wild usually occurs when a male is working up to a charging display. Males in captivity may rock prior to an aggressive display toward the public.

Exaggerated movement - The chimpanzee sweeps or rakes the ground with straight arm movements while hunched. Usually *this* proceeds to an aggressive display. It may also scrub by holding vegetation or an object and making semicircular movements on the ground.

Information gathered about each of the behaviors listed above and the individuals involved in these behaviors was to be used to make an assessment of the

social standing of the individuals and social behavior within the troop. We created an observation sheet on which we recorded the date, time, observer, and the beginning and ending time of the observation. The recording sheet was divided into four sections corresponding to the behaviors we were observing (see appendix A). We recorded the beginning and ending time of each behavior and which animals were involved and their roles in the behavior. We also recorded any behavior that was unusual, such as displacement, ie. one chimp moving to a platform where another chimp was, causing the first one to move. We also recorded the estrus levels of each of the females when the information was available. We observed the group of chimpanzees at one hour intervals and were able to gather twenty-one hours of data. These data, in conjunction with further data to be collected, may then be used to reevaluate the social hierarchy of the captive group at the Sedgwick County Zoo.

Observations

According to Goodall, grooming relationships are integral to the social hierarchy of chimpanzee society. An example she uses of this behavior corresponding to status involves a lower ranking male, Mike, who gained status quite abruptly by using gasoline cans in a display. After he had adequately frightened the other males into a submissive state, they approached him and began to groom him. Goodall calls this type of behavior submissive (1971 :112-115).

Taking grooming to be a submissive behavior, the number of instances a chimpanzee grooms another may be interpreted as a rough indication of status within

the group (removing the instances of mother-infant grooming). Therefore, the amount an individual is groomed in relationship to the number of times it grooms another could also be an indication of status. This is not a perfect relationship because Goodall (1986:245-246) says that grooming can also be form of reassurance in which the more dominant individual will, on some occasions, make a few brief grooming motions to the submissive animal, who is involved in a long term grooming activity focused on the higher ranking individual. Also according to Goodall, infants typically do not groom as much as older individuals since they spend most of their time with their mothers. As they grow older, however, they usually begin to groom each other more (Goodall 1986:245).

Results

Our results show that the female who was groomed the most and groomed others the least was Harriet. Indeed, she was groomed 27% of all grooming which was recorded in the study. In contrast, Harriets grooming of others amounted to only 12% of all grooming obseved (Table 1). Hazina ranked second in terms of being groomed, accounting for 20% of the instances recorded. Holly, the third female, groomed a total of 18 times or 15%, and groomed others 35 times or 28% of all the grooming recorded. Bahati was groomed **11** % and groomed others 1% of the time. Marbles was groomed 8% of the instances recorded and groomed others 6%. Mwana was groomed 2% of the instances recorded and groomed others 2%. Gomez was groomed 2% of the instances recorded and groomed others 9%.

Table 1. Grooming results

	Frequency	%	Frequency	%
Hazina	4	3	25	20
Holly	35	28	18	15
Audra	48	39	19	15
Harriet	15	12	33	27
Gomez	11	9	2	2
Bahati	1	1	13	11
Mwana	2	2	3	2
Marbles	7	6	1Q	8
	123	100	123	100

If the instances of mother/infant grooming are removed, the hierarchy based on grooming relationships becomes clearer (Table 2). The individual who is groomed the most is Harriet (34%). Audra was groomed 19% of the time. Holly was groomed 18% followed by Hazina and Marbles who were groomed 11 % of the time. Bahati was groomed 5% of the time and Gomez was groomed 2% of the time.

Table 2. Grooming results, mother/infant grooming results removed: adjusted totals

	Frequency	%	Frequency	%
Hazina	3	3	10	11
Holly	20	21	17	18
Audra	45	48	18	19
Harriet	7	7	33	34
Gomez	11	12	2	2
Bahati	1	1	5	5
Mwana	1	1	0	0
Marbles	7	7	10	11
	95	100	95	100

Our results show that the individual adult who was inspected the most and inspected others the least was Harriet (Table 3). She was inspected a total of 32 times and inspected others 2 times. She was inspected 48% of all inspections recorded. She inspected others 3% of all the inspection that occurred. Gomez was not inspected, but inspected others 12 times or 18%. Audra inspected others 20 times, the highest number of inspections, for a total of 30%. She was inspected 7 times or 11%. Holly inspected 3 times or 5% and was inspected 22 times or 33%. Mwana inspected 14 times or 21% and was inspected 1 time or 1%. Bahati inspected 5 times or 7% and was inspected 4 times or 6%. Hazina inspected 7 times or 10% and was not inspected.

Table 3. Inspection

	Frequency	%	Frequency	%
Gomez	12	18	0	0
Harriet	2	3	32	48
Audra	20	30	7	11
Holly	3	5	22	33
Marbles	4	6	1	1
Mwana	14	21	1	1
Bahati	5	7	4	6
Hazina	7	10	0	0
	67	100	67	100

Table 4 shows that Marbles and Mwana each displayed 13 times for 21 %. Gomez displayed 12 times or 19%. Harriet displayed 8 times or 13%. Bahati displayed 6 times or 10%. Hazina displayed 6 times or 10%. Audra displayed 3 times or 5%. Holly displayed 1 time or 1%.

Table 4. Display

	Frequency	%
Marbles	13	21
Mwana	13	21
Gomez	12	19
Harriet	8	13
Bahati	6	10
Hazina	6	10
Audra	3	5
Holly	1	1
	62	100

Our results on the vocalization study showed Gomez to be the most vocal. He vocalized 19 times or 17% of the instances recorded (Table 5). Holly vocalized 5 times or 16%. Hazina vocalized 1 time or 1%. Bahati vocalized 2 times or 3%. Mwana vocalized 11 times or 16%. Marbles vocalized 9 times or 13%. Audra vocalized 12 times or 17%, and Harriet vocalized 10 times or 15% of the instances recorded.

Table 5. Vocalization

	Frequency	%
Harriet	10	15
Audra	12	17
Holly	5	7
Marbles	9	13
Gomez	19	28
Mwana	11	16
Hazina	1	1
Bahati	2	3
	69	1 00

We also recorded which individuals were grooming each other or being groomed by which individual (Table 6). These results may show some relationships between individuals pertaining to hierarchy or status.

Table 6. Grooming interactions

Groomer	Groomer	Frequency	Groomer	Groomer	Frequency
Holly			Hazina		
	Hazina	15		Holly	1
	Marbles	0		Marbles	1
	Gomez	0		Gomez	0
	Harriet	6		Harriet	1
	Audra	13		Audra	0
	Mwana	0		Mwana	1
	Bahati	2		Bahati	1
Audra			Harriet		
	Mwana	3		Bahati	8
	Holly	13		Audra	2
	Harriet	20		Holly	1
	Gomez	2		Hazina	1
	Bahati	1		Marbles	1
	Marbles	2		Mwana	0
	Hazina	0		Gomez	0
Gomez			Marbles		
	Harriet	1		Hazina	5
	Audra	3		Harriet	2
	Marbles	6		Holly	0
	Hazina	1		Audra	0
	Holly	0		Mwana	0
	Mwana	0		Bahati	0
	Bahati	0		Gomez	0
Mwana			Bahati		
	Audra	1		Harriet	0
	Harriet	1		Hazina	1
	Holly	0		Holly	0
	Marbles	0		Audra	0
	Gomez	0		Marbles	0
	Bahati	0		Gomez	0
	Hazina	0		Mwana	0

Discussion

The results of our study indicate certain hierarchial implications which do not seem to be in accordance with those which normally occur in the wild. The grooming studies show that the individual who was groomed the most was not one of the males, or the 'alpha' male, but rather, one of the females, Harriet. The chimp which groomed others the most was Audra. The relatively high occurrence of others grooming Audra could possibly be explained by the other chimpanzees giving her reassuring pats and short grooming actions during their grooming sessions which were mainly given by Audra. A more detailed account of these grooming sessions needs to be done to indicate whether this is actually the case.

The next grooming section in which the instances of mother-infant grooming (which we do not believe to be indicative of hierarchial status) were removed, Harriet was still groomed much more often than any other individual in the troop (34%). The male which is believed by many of the Chimpanzoo observers to be the alpha male (Marbles) was groomed only **11** % of the time, which was the same amount that Holly's daughter, Hazina, was groomed. This was less than Audra was groomed. Based on these grooming studies, we find that the females were significantly more involved in grooming activities than the males, and that among the females, Harriet is dominant.

The results of the inspection studies further support the conclusion that Harriet is a very high ranking individual. Although inspection frequency varies in accordance with the estrus cycle of the females (they are inspected more frequently when in full

estrus) our study spanned several months, and all of the females went into estrus several times during the study. Harriet, again, was inspected the most, and inspected others very few times. She was inspected 48% of the inspections recorded, and inspected others only 3% of the inspections recorded.

The display studies show that, as in the wild, males display more often than the females, and that Marbles displayed the most. Mwana displayed as much as Marbles, but we interpreted these displays as usually occurring shortly after Marbles' displays, and being adolescent imitations. For the females, Harriet had the most *aggressive* displays, 8,as opposed to Holly's 1 time, and Audra's 3 times.

The results of the vocalization studies show that, for the females, Audra was the most vocal, vocalizing 12 times. Harriet vocalized 10 times. Holly only vocalized 5 times. Gomez was the most vocal individual, vocalizing 19 times. The vocalization studies were the most difficult to record accurately because the glass separating the exhibit from the observers was very thick indeed and muffled the vocalizations which might have otherwise been recorded. Background noise was also a problem as on certain occasions zoo visitors were numerous and made noises.

Following a preliminary examination of the data, different conclusions pertaining to the social hierarchy of the group were apparent between our study and an unpublished study conducted several years ago using the focal animal observation procedure. We feel that the results of the present study are supported by a sound methodological approach because it can be used to show relationships between the subjects, though it may improved and should be expanded. We also feel that this

method is a useful teaching technique for students who want to learn a method of observation in one semester and who also want to gather some useful information. This method of study can also be adapted to the investigation of questions other than hierarchy, such as friendship relationships (looking at interactive play behavior) and mother-infant interactions. We feel that this type of study can be used in conjunction with the Chimpanzoo studies.

More study on captive chimpanzees to be done in the future may shed light on the differences between the behaviors of captive and wild chimpanzees. The behaviors observed in captivity mayor may not have the same' implications as to the social structure and organization of captive chimpanzees as they do to the wild chimpanzees. The results of our study show that the social organization of the captive chimps is quite different than that of those in the wild, and that the behaviors of captive chimps are different than wild chimps and mayor may not imply the same conclusions. Only further study in this area will answer this question.

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