Differences in Behavior and Interactions in Dominant Males between Gorillas and Chimpanzees in Captivity

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Abstract

Data concerning behaviors and interactions between dominant males and other group members is critical in the aid of forming and maintaining stable social primate groups in captivity. New information on social interaction is of scientific interest to maintain the welfare and reproductive success of captive animals. My research is a comparative study on the differences between dominant male gorillas, and dominant male chimpanzees. The key question asked in this research is if the silverback displays less behavior affiliated with socialization among other group members than the dominant male chimpanzee and his group members. All data was collected over a two week period at the Lincoln Park Zoo in Chicago . Observations were collected via scan sampling and the use of an ethogram.

Of the several social behaviors measured, the most significant differences occurred in amount of time the focal animal spent in inactivity, and social grooming. The standard deviation of Inactive ranged from 2.156 for Hank to 2.609 for Kwan. The standard deviation of Social Groom ranged from .816 for Hank to .306 for Kwan per 30 min observation. This data suggests that Kwan, the silverback gorilla, displayed more behaviors associated with inactivity. He spent the majority of his time watching over his troop. Troop members did not have the authority to socialize with Kwan and thus, there was a distinct dominance associated with him. The same was not supported for Hank. Hank displayed less behavior associated with inactivity than Kwan did; he displayed

more behaviors associated with social interaction. Additionally the study found that there was a significantly higher level of social grooming displays by Hank. This supported the second hypothesis that chimpanzees live in a more egalitarian society than gorillas do.

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Introduction

There are three types of gorillas. The Western Lowland Gorilla *(Gorilla gorilla gorilla)*, the Eastern Lowland Gorilla *(gorilla beringei)*, and the Mountain Gorilla *(gorilla beringei beringei).* Gorillas are the largest of the living primates; they are ground-dwelling herbivores that inhabit the forests of Africa. Western lowland adult male gorillas (*Gorilla gorilla gorilla*) weigh about 400 lb. Eastern lowland gorillas can weigh up to 400 lb. Adult male mountain gorillas (*Gorilla beringei beringei*) may weigh up to 500 lb. Gorillas have larger muscles in their arms than in their legs. This is due to the fact that

they use their increased arm strength for bending and gathering foliage and for defense. Gorillas tend to have dark skin and black to brown-grey hair. Males acquire silver-gray saddles across their backs and upper thighs at sexual maturity, giving them the nick-name silverback. This creates an optical illusion of increased length and larger size (Parnell, 2002). Gorillas tended to use the lower tiers of the exhibit much more so than those closer to the ceiling. This is not surprising as wild gorillas are likely the least arboreal of the great ape species, and much less arboreal than chimpanzees (Ross, 2005).

The social organization of gorillas is typically composed of a single adult male known as the silverback, who is the group's undisputed leader. The silverback is the dominant individual responsible for protecting the members of its group. The silverback's role in mediating intergroup aggression is significant (Margulis 2002). A typical group contains one silverback, one or two blackback (sub adult males), several adult females, and up to ten juveniles and infants. Groups are very cohesive and generally peaceable. There is little overt dominance among females, but access to the breeding females is the prerogative of the silverback male (Parnell 2002).

Chimpanzees (*Pan troglodytes)* are great apes. They are found in the wild in western and central Africa, and inhabit tropical rain forest, lowland and mountain forests. Males tend to weigh from 90 to 120 pounds (40 to 55 kilograms); females—70 to 100 pounds (32 to 45 kilograms). The life span of Chimpanzees is 30-40 years in the wild and 45-55 years in managed situations. They live in social groups called communities or unit groups. Chimpanzees' social structure can be categorized as "fusion-fission." This means they travel around in small groups of up to six, the

membership of which is always changing as individuals wander off on their own for a period of time, or join other groups. When chimpanzees from different troops come together, there is often an exciting, friendly encounter lasting several hours, following which, some of the adult females might switch groups. There is a distinct linear dominance hierarchy in male chimpanzees, with one male as the alpha. All adult males dominate all females.

Primates are usually gregarious mammals, which typically form enduring social bonds with conspecifics in relatively stable social groups. A study done at Ngogo, Kibale National Park, Uganda collected over 10 years investigated whether male chimpanzees established long-term social relationships and determined the factors that affect variation in relationship quality and the stability of social bonds. Maternal brothers and males of the same dominance rank groomed each other more equitably than did unrelated males and males with a different rank. Social bonds were stable over time, with relationships in one year predicting those in subsequent years. The most enduring bonds formed between a few pairs of maternal brothers that maintained balanced grooming interactions. The results indicate that male chimpanzees maintain long-lasting and equitable social bonds whose formation is affected by maternal kinship and quality of social relationships (Mitani 2008).

Observations were undertaken at two zoos in the United Kingdom, one housing a bachelor group, and one housing a breeding group of G.g. gorilla. Data was collected on the frequencies of escalated and non-escalated aggression (aggression), display, play-fighting and displacement (avoidance of aggression), and food-sharing and resource-sharing behaviors (tolerance) between males in three age-classes: silverback,

blackback and sub-adult. Significant differences in behavior were found between the three age-classes (Karger, 2002). The silverback exhibited higher levels of escalated aggression than the sub-adults and higher levels of non-escalated aggression than either the blackbacks or the sub-adults. These results indicate possible differences in age-classes of captive gorillas in their methods of managing social interaction.

The relationships among three adult male chimpanzees were observed over a six year period. The males were members of a large, mixed colony of chimpanzees at Arnhem Zoo in the Netherlands. In spite of several power takeovers and coalition changes among the males, aggression was restrained during most of the period. This portrays a dramatic exception, which occurred after months of instability in the coalition network. At night, the alpha male was attacked and fatally injured in the sleeping quarters. The incident is discussed against the background of the complex balance of power among the males, especially the discrepancy between coalitions serving hierarchical status and coalitions serving sexual competition (de Wall, 1986).

Research Question and Hypothesis

Because gorillas live in one-male groups, with the silverback being the absolute dominant animal, we might expect to see less affiliative behavior between other group members and the silverback than we might between the dominant male and other group members in chimpanzees. Because chimpanzees live in a much more egalitarian society, we expect the dominant male chimpanzees to display behaviors associated with socialization with other members of his group.

1. Materials

Behavioral data of the dominant males will be determined with an ethogram- a list of behaviors, along with their definitions-that will be observed. The ethogram will include behaviors such as, inactive, locomotive, forage, affiliation, aggression, play, out of view, other. It will be developed by reviewing published experiments and other literature. Data will be collected via scan sampling. At preset intervals, (every thirty seconds note on a check sheet the behavior of the dominant male, along with the identity of any animal within a given distance of the focal animal, (for example, within a meter, and 1-3 meters). Location of the focal animal in the exhibit will also be recorded. This will give 3 pieces of data for each point or scan: behavior, neighbors, and location. For each 30-minute session or day, the % time spent in each behavior, and average of these percentages over all observation sessions will be calculated. The results will be graphed in the form of "grouped bar" graphs. We will graph the activity budgets for Hank and Kwan, where the y-axis is percent time, and x-axis is behavior, and each bar color represents the individual.

1.1 *Subjects*

Subjects observed were 5 western lowland gorillas (Gorilla gorilla gorilla), and 5 chimpanzees (Pan troglodytes). Kwan's gorilla group's "home" was Exhibit B at Lincoln Park Zoo (LPZ) in Chicago. Hank's chimpanzee group's "home" was Exhibit C at LPZ. Gorillas lived in one of two social groups, each consisting of a single adult male, several adult females and their immature offspring. Chimpanzees lived in two subgroups of three (one adult male, two adult females) until the groups were merged to form a single

multi-male group of six. Individual subjects by species, age, birthdate, sex, and mother name (if applicable) are presented on Table 1

Table 1 Identities of animals

ID	Species/Group	Age	Birthdate	Sex	Mother name (if in group)
Hank	Chimpanzee	18	11/30/90	M	-
Cashew	Chimpanzee	25	8/18/84	F	-
Kathy	Chimpanzee	19	9/2/90	F	-
Nana	Chimpanzee	15	1/20/94	F	-
Optimus	Chimpanzee	10	2/9/99	M	-
Chuckie	Chimpanzee	10	9/24/99	F	Kathy
Kwan	Gorilla	29	4/30/80	M	-
Kowali	Gorilla	31	1/9/78	F	-
Madini	Gorilla	13	6/20/96	F	-
Amare	Gorilla	4	7/26/05	M	Kowali
Bulera	Gorilla	20	1/22/89	F	-

1.2. *Fission-fusion social structure*

Chimpanzees live in communities whose members fission and fuse to form temporary parties that vary in size and composition. Within multi-male and female communities, individuals may form and reform smaller subgroups that may last anywhere from several minutes to several days. The most stable and long-term subgroup is a mother and her offspring. Adult males tend to dominate over females. In general, one male holds the dominant leadership position of a group. Males remain in

their natal community. Young females often emigrate to a neighboring community temporarily or permanently (Mitani, 2008).

1.3 *Gorilla social structure*

Most gorillas live in “harem” societies, comprehensive troops that contain a dominant mature male known as the silverback, and several adult females and their offspring. Bachelor groups may also occur. Maturing male gorillas, blackbacks (yet to develop the characteristic silverback graying), may leave their natal groups as an attempt to attract emigrating females and starting anew social group (Parnell 2002).

1.4 *Lincoln Park Zoo Housing*

Hank’s chimpanzee group’s “Home” was exhibit C of the three naturalistic primate exhibits at LPZ. Kwan’s exhibit (Exhibit B) at LPZ was a spacious naturalistic indoor and outdoor habitat for a combined living space of 29,000 square feet. Hank’s exhibit (Exhibit C) at LPZ was also a spacious naturalistic indoor and outdoor habitat for a combined living space of 29,000 square feet. Each enclosure was a complex physical environment with an assortment of furnishing and substrates: the indoor environment contained artificial trees, bamboo stalks, logs, outcrops, vines, standing dead trees, real rock outcrops climbing structures, nesting platforms, heavy duty plastic barrels, tires, and rope or fire house hammocks. The outdoor environment contained live trees, edible plants, stumps, oat grass, and climbing structures. The temperature range is 65-85° F

(indoor), and can tolerate temperatures to a minimum of 35° F. From 6:00 PM to 10:00 Am the groups were housed indoors in spacious caged with two or more elevated platforms, that opened directly into the indoor habitats. Straw was scattered in the indoor cages in the evening.

2.1 Methods

All data was collected over a two week period from August 17, 2009 to August 31, 2009. Observational sessions were 30 minutes in duration. All observational sessions occurred between the zoo hours of 10 AM and 5 PM. Behavioral data was collected using the scan sampling method on the group with a 30 second inter-sample interval. Under this method, we were able to record the activity of the focal individual at pre-selected time intervals. This allowed for clearly defined and structured research that allowed for a good representative sample of the behaviors taking place, but does not require 24 hour observation. During the session, information on the focal subject's behavior, location, and identity of other individuals within three meters of the focal animal was recorded. All observational data was collected via scan sampling. All observations were conducted from visitor areas at the Regenstein Center for African Apes (RCAA). Both exhibits (B and C) were located in the RCAA. The ethogram of behaviors for this study (Table 2) was based on gorilla research previously conducted at LPZ.

Table 2: Ethogram listing behaviors and definitions used in an examination of the differences in behaviors and interactions with dominant males.

Social Activity	Code	Operational Definition
Play	P	Playful activity with one another, such as touching, or chasing one another
Locomotive	L	In the process of moving (at least two feet)
Inactive	I	Motionless
Eating/ Drinking	E/D	Eating, chewing, food in mouth
Foraging	F	Actively involved in the process of locating food, either on the ground, or on the plattform
Out of View	OOV	Out of view, behavior not visible to observer
Other	O	Other activities
Object Manipulation	OM	Touching or breaking objects
Abnormal	A	Eating feces, or regurgitation
Social Grooming	SOCG	Picking through other animal's hair
Self Grooming	SLFG	Interacting with own hair or skin
Agonism	AG	Displays of aggression, or contact aggression

2.2 Data Analysis

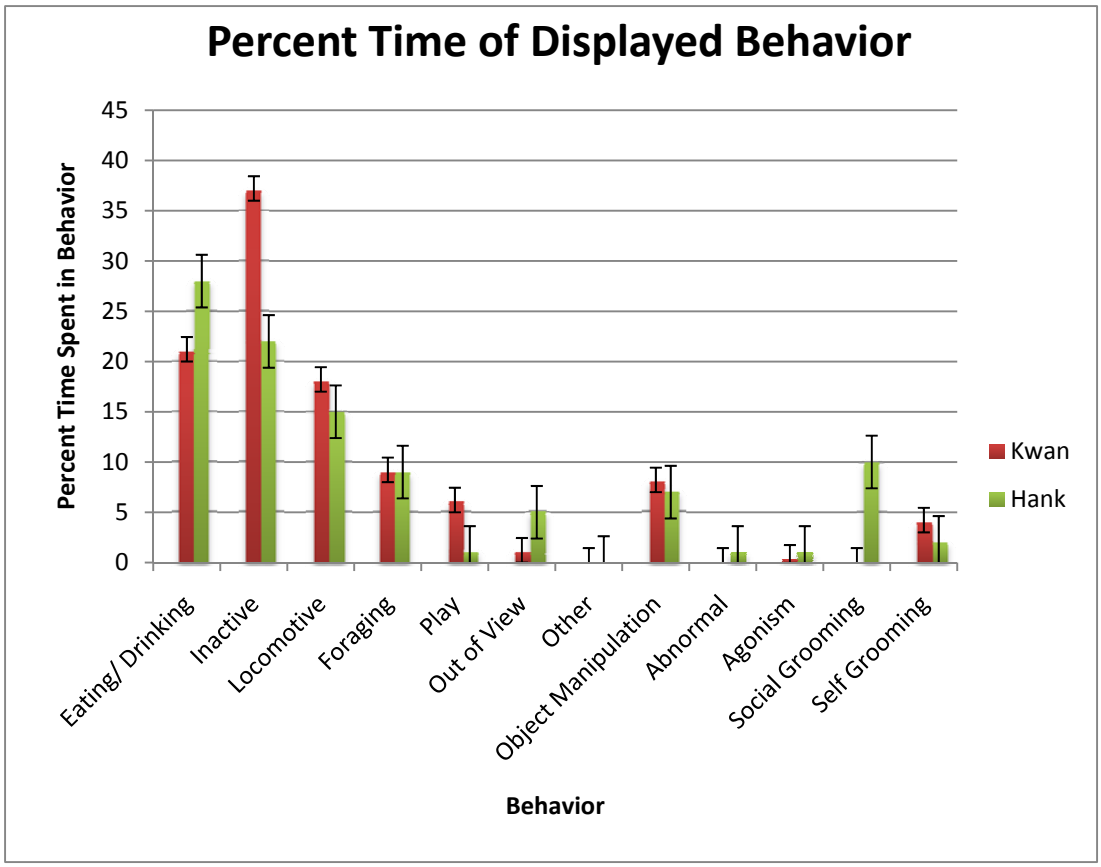
A total of 30 observation sessions were conducted on each group (15 AM sessions, 15 PM sessions). Behavioral observations taken involved common usage for most behaviors (i.e. eating/drinking, foraging, social grooming); other observations included identity of other animals (adult female, adult male, infant male, infant female) within 2 meters from the focal animal and the location of the focal animal in the exhibit. Daily order of observation was randomly determined. This methodology was chosen because the social behaviors in these groups tend to be long-lasting and easily scored with a

scan methodology and because interval sampling allows for the mathematical control of time spent out of view. To ensure that behavioral observations were accurate, 15 trial scan samples were done and reviewed by zoologists prior to actual scan samples.

3. Results

Of the several social behaviors measured, the most significant differences occurred in amount of time the focal animal spent in inactivity, and social grooming. The standard error of Inactivity ranged from 2.156 for Hank to 2.609 for Kwan. The standard error of Social Groom ranged from .816 for Hank to .306 for Kwan per 30 min observation. Every behavior was observed except for other.

Figure 1: Activity Budget



Kwan spent more time in contact (within 2 m) of adult females than Hank did. However, Hank was in contact with males (adult and infant) more than Kwan was. These observations stress the importance of male-male bonds in chimpanzee societies. Kinship and dominance rank influences the quality of relationships and the ability of males of to groom each other. Males of the same dominance rank, however, groomed each other more equitably than did unrelated males and males that were dissimilar in rank (Mitani, 2008). Male chimpanzees typically display nonrandom patterns of grooming and do not groom all members in their own community (Nishida & Hosaka 1996; Watts 2000; Arnold & Whiten 2003).

Figure 2 Identities of other Animals in Proximity to Focal Animal

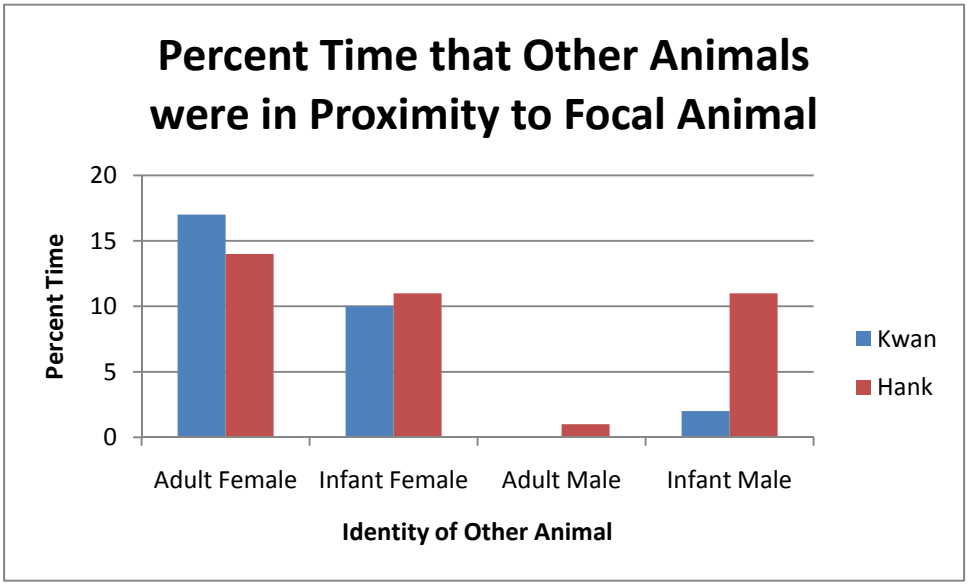
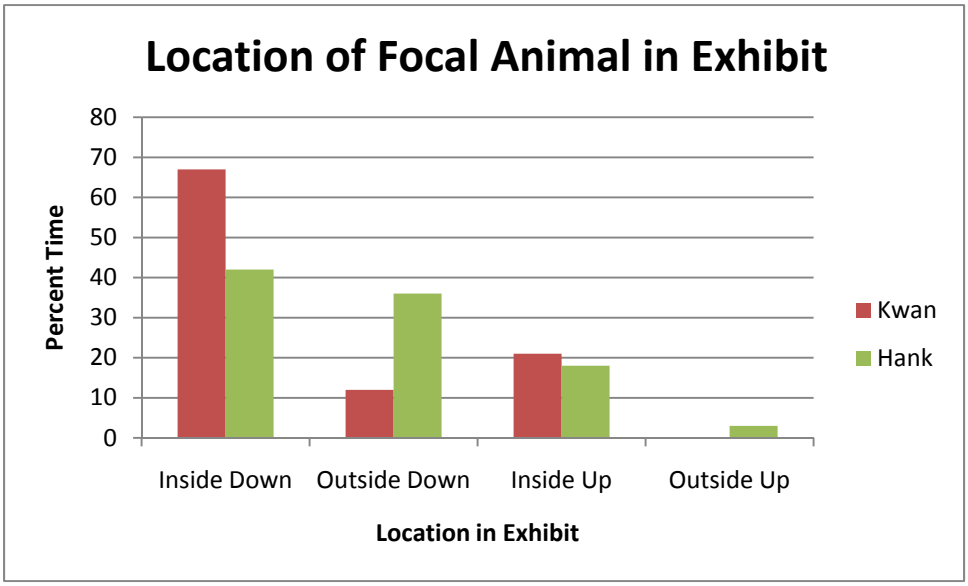


Figure three shows significant difference in the location of these two dominant males. Kwan spent the majority of his time inside his exhibit and on the ground. Hank spent the majority of his time inside as well, but he was observed outside more than Kwan was. When the two were outside it was evident that Hank spent more time up (in trees or swinging from branches). Kwan was never observed off of the ground while outside. This reinforces the fact that gorillas tend to use the lower tiers of exhibits much more so than those at higher heights. This is not surprising as gorillas are likely the least arboreal of the great ape species, and much less arboreal than chimpanzees that live in similar habitats in Africa (Remis, 1998).

Figure 3 Location of Focal Animal



4. Discussion

This study was conducted to examine the social behaviors that differed between dominant males in a gorilla and chimpanzee group in captivity. The research suggests that Kwan, the silverback gorilla, displayed more behaviors associated with inactivity. He spent the majority of his time watching over his troop. Members of his troop were the least bit inclined to disturb him, thus they did not have the authority to do so. There was a distinct dominance associated with Kwan. The same cannot be supported for Hank. Hank displayed less behavior associated with inactivity than Kwan did; he displayed more behaviors associated with social interaction. Additionally the study found that there was a significantly higher level of social grooming displays by Hank. This supported the hypothesis that chimpanzees live in a more egalitarian society than gorillas do.

5. Conclusion

The overall results of this study suggest a significant number of behavioral differences associated with the behavior of dominant males in chimpanzee and gorilla groups in captivity. The chimpanzee dominant male was more arboreal and associated more with the members in his group. The dominant male was less social and spent most of his time being inactive and inside. Thus, the data showed that even the most similar of animals can have vast differences.

6. Acknowledgements

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