

THE ROLE OF COPULATORY BEHAVIOR WITHIN THE SOCIAL STRUCTURE IN BACHELOR GROUPS OF CAPTIVE WESTERN LOWLAND GORILLAS

Jan E. Mead-Moehring and Peer H. Moore-Jansen Ph.D
Department of Anthropology
Wichita State University

To date, there have been at least 450 species of animals, vertebrates and invertebrates, which have been acknowledged as exhibiting homosexual behaviors (MacFarlane and Markwell 2004). The most studied animal that exhibits these behaviors are the pygmy chimpanzees, or Bonobo's. These animals have a complex social structure and the sexual act has a purpose beyond reproduction (Kuroda 1980; Parish 1994). Chimpanzee and Gorilla sexual behaviors may give us insight into the sexual motivations of other animals.

Until the 1980's, the most pressing problem zoos encountered regarding the care of gorillas was the difficulty of breeding in captivity. Today, the number of captive gorilla births has greatly increased due to improved diets, enrichment activities and improved enclosures. Recently, there have been a greater number of male gorillas born in captivity than females. Zoos prefer to house single-male/multi-female family groups that include one silverback, many females and their sexually immature young. When young males move into sexual maturity, they become competition for the silverback and conflicts between males may arise (Symington 1993). For the protection of the young gorillas, they are removed from their natal groups and placed in a separate enclosure or sent to another facility.

It has been known for years that gorillas, in the wild, congregate into all-male groups and live in relative harmony. These males may live alone or in such groups for life (Harcourt 1979). Within the past decade, zoos have started to experiment with all-male groups because of the excess of sexually mature male gorillas. Zoos have had recent moderate success with producing cohesive all-male groups. However, an all-male group is more likely to live peacefully together if: 1) at least some of the males are from the same natal group, 2) there are no female gorillas within the vicinity, and 3) the gorillas are brought together between the adolescent ages of six and ten (Stoinski, Lukas et al. 2004). It is surmised that gorillas within this adolescent age group, when placed together, build stronger affiliative bonds than if they were introduced after the age of ten (Stoinski, Lukas et al. 2004).

The sexual behaviors of gorillas have been infrequently observed and documented, and are usually focused on female sexual behaviors. In heterosexual gorilla groupings, sexual encounters are typically initiated by females. The initiation of sexual activity has been linked to the female's reproductive cycle which greatly increases during the time of elevated fertility during a female's mid-cycle and visible tumescent condition (Nadler 1976; Fischer and Nadler 1978).

To date, there has been little data documenting male-male gorilla interactions in the wild (Stoinski, Lukas et al. 2004). Sexual behavior is often observed in captive, bachelor gorilla groups, but copulatory behaviors between males are rarely mentioned in scientific publications. The specifics about the activities are seldom discussed in detail; genital touching and investigation by others, masturbation, oral-genital contact and homosexual mounting occurs within these groups. In our political, moral and socially capricious society, it may be difficult for zoo staff to explain these sexual displays to the general public. Even in female-only gorilla groups, homosexual behaviors between dyads of females have been observed (Fischer and Nadler 1978). Since few other published studies have focused specifically on captive or wild male-male sexual interaction, this study addresses the role that copulatory behavior may play within bachelor gorilla group social dynamics.

Methods

Subjects and Housing

There are three separate all-male groups of gorillas housed within the Downing Gorilla Forest exhibit at the Sedgwick County Zoo in Wichita, Kansas. The Losako troop and the Mbote troop are each made up of two silverback males who range in age from thirteen to eighteen years. The focal group of this study, called the Melese troop, is made up of three seven-year-old adolescent males (Sampson, Jabir and Virgil), and a thirteen-year-old small black-back (Matt). All three seven-year-olds are from the same natal group at the Oklahoma City Zoo and are inter-related. Virgil was raised by the keepers at the Oklahoma City Zoo until fifteen months old because he was a twin with his sister Gracie. Matt, the oldest, was transferred to the Oklahoma City Zoo from Chicago at the age of two, and is unrelated to the other three. Matt has known the other three gorillas since they were born or introduced back into the family group at a young age.

There are two public display areas. Both are crescent-shaped areas with a wide bank of triple layered laminated safety glass which offers a panoramic view of the gorilla activities and allows the gorillas to be within inches of the public. The interior space is 2100 square feet with high platforms and hammocks for sleeping with fire hoses strung across for climbing. The outdoor space is almost an acre at 31,000 square feet. The outdoor area is not entirely accessible to the gorillas be-

cause of buffer zones of foliage to prevent the gorillas from escape. The area has natural landscaping with plants that the gorillas can eat. The ground is soft and covered with fescue grass and patches of dirt. There is a large clear water pond that is approximately two feet deep. The public may occasionally observe the gorillas playing in the water, at close proximity, from an outdoor balcony viewing area. There are two sets of natural scaffolding that have hammocks high up and provide shady areas underneath. The back of the outdoor enclosure has a small hill that the gorillas frequently visit. The hill offers extra opportunity for play and semi-privacy. There is a third group area off public display that is equivalent to the indoor public display room. There are also eight individual sleeping enclosures out of public view. The gorillas rotate two days on public view and one day off. This study was limited to the public display areas only.

Data Collection

Data was collected over fifteen non-consecutive days using five minute scan sampling with special consideration for affiliative behaviors. An Ethogram of frequently observed behaviors was constructed and facilitated note taking (addendum A). This observational study was focused on sexual behavior patterns. Special attention was given to interaction between individuals when they were approximately two meters apart or closer. Behaviors of interest included mounting, presenting, genital examination, genital touching, masturbation and displacement. Observations were taken in three hour blocks which spanned the morning to early afternoon hours.

Results and Discussion

Displacements

Stoinski, Kuhar, et al. concluded in their study that linear dominance in an all-male group is statistically difficult to document because of the small group sizes involved. In only two of the nine groups observed in this 2004 study was an individual recognized as clearly dominant over his group. By comparing the frequency of displacements, these researchers estimated the apparent dominance relationships within a dyad (Stoinski, Kuhar et al. 2004). Displacement is a non-aggressive avoidance maneuver. It is the approach of one individual which causes another, less dominant individual, to move to another area.

In the current study, displacement frequencies were used as an indicator of dominance within the group and between dyads. Matt was the most frequent displacer, and displaced the other three gorillas a total of twenty-two times. Matt is at least six years older than the other three, and is the largest gorilla in the group. Using displacement frequencies, age and size, Matt is the most dominant individual

within this focal study group. These observations are an indication only of his current rank within the group. It is unknown if his dominance will continue as the group matures.

The dominance of the three younger gorillas is more difficult to gauge. Jabir and Virgil had few displacements, and Sampson had no displacements during the observational period. Due to the number of times Sampson was displaced by the others, and his reserved nature, Sampson appears to be the least dominant within the group of four.

Table 1. Displacements

| Displacer → Displaced | Total |
|-----------------------|-------|
| Matt → Jabir | 8 |
| Matt → Virgil | 3 |
| Matt → Sampson | 11 |
| Jabir → Matt | 2 |
| Jabir → Virgil | 0 |
| Jabir → Sampson | 3 |
| Virgil → Matt | 0 |
| Virgil → Jabir | 0 |
| Virgil → Sampson | 2 |
| Sampson → Matt | 0 |
| Sampson → Jabir | 0 |
| Sampson → Virgil | 0 |

Copulatory Behavior

Most instances of copulatory behavior were observed between Sampson and Jabir. These instances of mounting and thrusting were visually observed to be true copulation with full anal penetration. Not all episodes of mounting and thrusting were visually verified to have penetration, but assumed that most were successful copulations. All copulation events between Sampson and Jabir were observed with Sampson as the insertive partner and Jabir as the receptive partner. This dyad copulated, or mounted and thrusting in the attempt to copulate, a total of twenty-seven times throughout the study. Most of the copulations were dorsal-ventral, with Jabir presenting, and Sampson mounting. The following observation is a typical session of sexual activity between Sampson and Jabir where there are many mountings in a relatively short block of time.

Observation 5a, 10:00 am, outdoor display: Jabir approaches Sampson, bows, and places his head in Sampson's lap. Sampson

touches his own genitals. Jabir turns to present for dorsal/ventral mounting; Sampson mounts and thrusts for approximately fifteen seconds then breaks away and sits down. Jabir sits up and is face-to-face with Sampson followed by a few seconds of open-mouth play (similar to kissing). After less than a minute, Sampson mounts Jabir again for approximately thirty seconds of thrusting. At 10:02 am, Jabir and Sampson buddy walk around the enclosure. At 10:06 am, Sampson and Jabir are back by the window. Sampson mounts Jabir then quickly breaks away. Jabir sits up, leans into Sampson, and receives a hug. Jabir touches Sampson's arm, bites it, and lies in a supine position on the ground. Sampson mounts Jabir in a ventral/ventral position. Penetration is not observed. Both get up and buddy-walk a few feet until Jabir pauses and presents. Sampson mounts in dorsal/ventral episode for approximately fifteen seconds. At 10:09 am, Sampson tries to mount Jabir again; Jabir sits down without presenting. Sampson pushes Jabir. Jabir then presents and Sampson mounts for approximately fifteen seconds; Jabir breaks contact and moves away to sit alone. Sampson does not follow.

During one observation period (*observation 7a, 9:32am*), Sampson and Jabir were in a ventral-ventral position with Sampson in the supine position lying on the ground and Jabir on top of Sampson. Jabir had mounted Sampson and was thrusting. It was first assumed that Jabir was the insertive partner and Sampson was the receptive partner. On further examination, it was discovered that Jabir was the receptive partner and controlling the copulation event by thrusting against Sampson who had an erection and lay motionless.

Virgil, the youngest of the four gorillas was observed as the receptive partner a total of five times; four times with Sampson and once with Jabir. Virgil was seen mounting and attempting copulation with Sampson and Jabir but was never successful during the observations. Both Sampson and Jabir broke contact when Virgil attempted to mount them. These attempts were not counted in the totals because the episodes were very brief and mounting with thrusting was not observed. Matt was never observed copulating with or attempting copulation with Virgil or vice versa. Matt was observed as the insertive partner when copulating with Jabir twice. No other combination was observed during this study.

Table 2. Copulation Events

| Insertive → Receptive | Total Copulation Events |
|-----------------------|-------------------------|
| Matt → Jabir | 2 |
| Matt → Virgil | 0 |
| Matt → Sampson | 0 |
| Jabir → Matt | 0 |
| Jabir → Virgil | 1 |
| Jabir → Sampson | 0 |
| Virgil → Matt | 0 |
| Virgil → Jabir | 0 |
| Virgil → Sampson | 0 |
| Sampson → Matt | 0 |
| Sampson → Jabir | 27 |
| Sampson → Virgil | 4 |

Dyad Relationships and Personality Traits

Sampson and Jabir have a tendency to stay in close proximity to one another. This may be primarily due to the fact that they were born only a few days apart, and may have learned to comfort each other from an early age. They both appear to be more reserved than Matt, and especially Virgil. Sampson is aloof and frequently uninvolved in group activities. He is more inclined to sit back and watch group play before joining in. In the Sampson and Jabir dyad, higher group rank most certainly belongs to Jabir. Jabir has been observed displacing Sampson three times. During an observation (*observation 7a at 9:40 am*), Jabir was observed grabbing food from Sampson. Sampson did not act in retaliation. This did not appear to be a cooperative food-sharing incident. When food is placed into the enclosure, Sampson collects as much food as he can carry, and eats faster than any of the other three gorillas. He has been observed hording piles of vegetables and biscuits in secluded areas. Eating has been observed to be a more relaxed activity for Matt, Virgil and Jabir.

Virgil is six years younger than Matt and less than a year younger than Sampson and Jabir. As noted, Matt was not observed mounting Virgil. This dyad plays and sleeps together daily and exhibits nurturing behaviors towards each other. During the observations, it was apparent that Matt and Virgil have a strong affinitive relationship which includes food sharing. Virgil was observed pulling leaves off a branch that Matt was eating without reprisal (*observation 12a, 9:04 am*). Their relationship may be why Matt has never been observed copulating with or soliciting copulation with Virgil; although, it cannot be stated that it has never happened or never will happen in the future. Their affinitive bond may be due to a few possible factors.

In wild mountain gorillas, variation has been observed in the tolerance levels of dominant adult males toward younger males within family groups (Harcourt 1979). Wild adult male gorillas infrequently interact with infants because of the time spent foraging for food. Yet in captivity, adult male and infant interactions have been observed regularly. It has been hypothesized that silverback-and-infant play increases the social bond between the mother of the infant and the silverback, allowing the possibility for future breeding opportunities (Tilford and Nadler 1978). Since there are no females in this group, Matt has little motivation in that regard. Even when the possible incentives are absent, bonding between adult and sub-adult gorillas is a normal and observed behavior.

Conclusion

Studies involving gorilla sexual activity have focused mainly on heterosexual mating, or female homosexual encounters, with emphasis on the female hormone cycle as the motivating factor for these activities (Nadler, 1976; Fischer and Nadler, 1978). From the observations of homosexual and heterosexual activities of Bonobo chimpanzees in the wild and in captivity, it is theorized that sexual activity is used as greetings, appeasement, play, to relieve group tensions and anxieties, and to facilitate food sharing (Kuroda 1980; Parish 1994). In a more recent study, male bonobo's were found to show submissive behaviors to large groups of females, leading to the hypothesis that Bonobo society is matriarchal (Parish 1994). This study concluded that the motivations behind heterosexual and homosexual encounters are related to the Bonobo hierarchical structure, the role of sex in keeping peaceful relations within Bonobo society, and the greater reproductive success of the species. The impetus for sexual behaviors within bachelor gorilla groups may be analogous to various sexual motivations within Bonobo society.

The routine occurrence of copulatory behaviors among the gorillas in this focal group leads to the conclusion that copulation is an important part of their socialization. Since sexual behavior in bachelor groups is not driven by females, the female reproductive cycle, or the need to reproduce, copulatory behavior within this group may be an important factor in the reduction of stress, for offering reassurance between individuals, and in the biological need for sexual release. The roles of insertive and receptive partners may not be exclusively based on dominance, but rather on the reassurance of one or both partners. At this time, it cannot be stated that presenting is necessarily a position of submission, but rather, may be a simple invitation and consent to the sexual act. The roles of insertive and receptive partners may have simply been chosen by individual preference. In the dyad between Sampson and Jabir, Jabir may be the more dominant of the two, yet Jabir was consistently observed in the role of the receiving partner. Acting as the receptive partner may allow him a higher rank within the group of four.

More research on wild and captive bachelor gorilla groups is needed to add to the body of knowledge necessary to understand the sexual behaviors of these beautiful and complex animals. Further investigations should be conducted with special attention given to the age of the individuals, group hierarchy, and the familial relationships of the male gorillas in the observed groups.

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Appendices

Addendum A - *Ethogram: Behavior categories and definitions

| Behavior | Definition |
|--------------------------------------|--|
| Masturbation | Rhythmic rubbing of genitalia with any part of own body or object |
| Genital Touching/ Examination | One individual touching of genitalia or examining the genitalia of another individual |
| Sexual Mounting | Mounting and thrusting, dorsal/ventral or dorsal/dorsal (may be unknown if penetration has occurred) |
| Presenting | Presenting rear for mounting or genital investigation by partner |
| Affinitive | Sitting close to another gorilla (≤ 2 meters) |
| Social Grooming/ Examination | Social grooming or touching of any body part except genitalia |
| Social Play - Run- ning/Chasing | One individual chasing another in play; brief touching and/or grabbing or no touching |
| Buddy Walk | Two walking together with arms around each other or holding hands/arms |
| Social Play – Wres- tling | Grabbing, biting, holding in play; may turn aggressive |
| Display | Throwing objects, swinging or running to hit glass, beating on chest or abdomen |
| Aggression | Any contact or display that leads to displacement |
| Displacement | An individual's departure of an area upon the approach of another individual (avoidance; dominance) |
| Solitary Sleeping/ Lounging | Sleeping or laying alone (≥ 2 meters from other gorillas) |
| Social Sleeping/ Lounging | Two or more individuals sleeping or laying near each other with little interaction; can have some contact (non-sexual) |
| Out of View | Animal is not visible to researcher |
| Interaction/Display Toward People | Any interaction with public such as banging window (display), sitting and watching, etc. |
| Solitary Activity | Playing, eating, sitting alone and ≥ 2 meters from other gorillas |

*Ethogram was compiled by behaviors observed by Jan Mead-Moehring and inspired by, and modified from, a series of gorilla ethograms compiled by the Gorilla Advisory Group at Primate Info Net <http://pin.primat.wisc.edu/aboutp/behavior/gorillas2.html>.

Pictures

*1) Dorsal-Ventral Mount
Sampson Insertive → Jabir Receptive*



*2) Ventral-Ventral Mount
Sampson Insertive (top) à Jabir Receptive (supine)*

