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Sleeping Behavior and Associations in a Group of Captive Chimpanzees

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Abstract. The present study investigated the sleeping behavior and preferences of a group of six adolescent chimpanzees at the Delta Regional Primate Research Center in Louisiana, USA. The study sought to relate sleeping partner preferences to other aspects of social relationships. Comparative observations between those chimpanzee behaviors seen in the wild and in this group are noted.

Introduction

No prolonged, systematic study of captive chimpanzee sleeping habits has been reported in the literature, although night-time behavior was observed and recorded in a group of eleven adult chimpanzees on an island in Florida [GALE, in preparation]. NISSEN [1931], REYNOLDS and REYNOLDS [1965] and GOODALL [1962] and later VAN LAWICK-GOODALL [1968] have described nesting and sleeping behavior observed during studies of wild populations.

In the wild chimpanzees sleep at night on nests or platforms constructed from the branches of trees [GOODALL, 1962]. Each chimpanzee builds its own nest for the night with the exception of dependent youngsters who continue to sleep with their mothers. A nest usually takes between 3 and 5 min to construct; normally a new nest is made each night. Wild chimpanzees normally remain in their nests throughout the night, although they may move about, particularly in the moonlight [VAN LAWICK-GOODALL, 1968; VAN ORSHOVEN, personal commun.].

The present study on a group of adolescent and young adult chimpanzees

in captivity was undertaken in order to compare some aspects of their behavior at night with those of the wild individuals (such as time of retiring and arising, movement at night, cleanliness of sleeping site, etc.). In addition we were interested in the fact that, unlike their wild age peers, these chimpanzees continued to maintain close spacial proximity and often body contact during the night. How consistent were sleeping partner preferences over time, and what kinds of social factors influenced the choice of such a partner? In order to determine whether close proximity during the night was influenced by cramped sleeping quarters, we also wanted to observe their sleeping behavior when they were forced to sleep out of doors in a large enclosure. This enabled comparisons to be made between other kinds of night-time behavior in the indoor and outdoor conditions.

Material and Methods

The first author observed six wild-born adolescent chimpanzees at the Delta Regional Primate Research Center, Covington, La., from July through September, 1972. The group presently resides at the Stanford Outdoor Primate Facility (or Gombe West), at Stanford University, Calif. The group, at the time of the study, comprised two males (Shadow and Bandit) and four females (Gigi, Polly, Bido and Belle). The ages of the animals ranged from about 7.5 (Bandit) to 10 or 11 years (Gigi). Two months before the study began, Gigi gave birth to a female infant who remained with the group, dependent upon her mother, throughout the study period. The chimpanzees had been acquired through three animal importers when they were between 1 and 4 years of age; details of their history prior to arrival at Delta are not known.

For 4 years prior to the study the group had been maintained in a large outdoor enclosure of 30 by 120 m, fenced by chain link and sheet metal and open overhead. It was carpeted with natural herbaceous vegetation and, in addition to upright and fallen posts, contained three platforms: a 3-meter high central concrete one and two smaller wooden ones 10 m away on either side. Adjoining the enclosure were four sheet-metal cages which could be closed off from the enclosure by guillotine doors. Each cage ($1 \times 2.5 \times 2.5$ m) contained a wooden hutch box resting on a wooden ledge 0.75 m above the concrete floor. Each box ($0.85 \times 0.9 \times 0.6$ m) had a thermostatically controlled heating element, and each cage had a water faucet and dispenser for monkey chow. The animals received fresh fruit and vegetables three times daily. Normally 3 of the 4 hutches were open at all times during the day and night so that the chimpanzees could enter or leave them as they wished. Prior to the study the group had been observed to sleep outside on only three occasions.

During the 3-months study period Riss observed the chimpanzees under the following conditions: (1) a 12-day period when three cages were constantly available as was usual for the group. This served as a control period; (2) a 17-day period when the cages were constantly closed and unavailable to the chimpanzees during the day and the night; (3) a 5-day period when one cage only was available, (4) a final 17-day period when the original condition (3 cages continually accessible) again prevailed. All six animals were located in

the hutches or outdoors and their positions noted 15 min after the last one had retired, again between 22.00 and 24.00 each night and again before they arose the next morning.

Time of Retiring

Under the normal conditions (3 cages open) the chimpanzees moved inside slightly over 1.5 h before sunset. After entering the cages they often fed and drank for a while before settling down. Usually they fell asleep (lying motionless with eyes closed) about 10 min after major activities ceased. Individual mean retiring times in the hutches ranged from 17.48 to 18.05 (sunset was about 19.40). On a given day they usually retired within 5 min of each other.

When the chimpanzees were locked outside for the 17-day period, retiring time altered significantly. The chimpanzees settled down much later than when inside. The average retiring time was about 80 min later, but they continued to retire within 5 min or so of each other. When they were locked outside, the group typically foraged in the enclosure and slowly moved up onto one of the wooden platforms at about 19.05–19.20. Finally they all congregated on the concrete platform and soon afterwards appeared to fall asleep.

During the third condition, when for a 5-day period only one cage was made available to the entire group, all the chimpanzees crowded into it together, retiring late as they had been doing for the previous 17 evenings outside.

During the final 17 days of the study, with all three cages constantly available again, each chimpanzee slept outside at least twice, and many slept mainly outdoors. Mostly they continued to retire later than they had in the first phase of the indoor sleeping; only Bandit consistently retired early when he chose to sleep inside.

Behavior at Night

Whilst observations were not consistently maintained during the night, it seemed that the chimpanzees did not move much in the darkness. They were usually in the same sleeping places in the morning as those in which they had been left the previous night (checked after retiring and around midnight). When the chimpanzees were sleeping indoors with all three cages available, some individuals showed a preference as to which one they slept in, though mostly this varied. Since there were twice as many chimpanzees as there were

cages, two or more animals frequently shared the same sleeping quarters. Sometimes a chimpanzee moved in and out of the different cages as though checking as to who was inside before finally making his or her choice, so that the presence of a favored sleeping partner (see below) often seemed to determine where a given chimpanzee slept on a particular night. The probability of a chimpanzee sleeping in contact with another when sharing the same cage was high, but sometimes individual positional preferences (such as on vs. inside the wooden hutch) precluded such contact. When the group was locked out, the chimpanzees continued to sleep close to preferred partners on the concrete platform.

During the lockout period nesting material (branches and hay) was placed regularly in the enclosure to ascertain if the chimpanzees would attempt to construct night nests. Only two did so: Belle and Shadow. Shadow made two nests of branches using the material that was already on the concrete platform. Belle also made two nests; once she carried a pile of hay from the ground to the platform and made a small nest with it.

Time of Awakening

Chimpanzees were operationally defined as being awake when they sat up and looked about, engaged in an activity such as defecation, urination, or moved about. During the initial phase of the study, when the animals slept inside, they typically left their indoor quarters very soon after awakening. They usually awoke close to sunrise (about 06.10), with the mean averages for the group being 06.13. Usually there was a difference of only about 5 min between the first and the last animal to leave the cage on a given day. It is possible that some individuals might have slept later, but they were awakened by the sounds of their companions. The time of awakening differed significantly between indoor and outdoor sleeping in the first and second phase. The first signs of awakening out of doors were typically seen about 30 min later, and there was a greater difference between the time when the first and last individual awoke on a given day (16 as compared to 5 min). Quite often a chimpanzee awoke but then lay down and appeared to doze again.

During the 5 days when one cage only was available for sleeping, the chimpanzees continued to awaken later than they had during the previous period of indoor sleeping. When all cages were available again, however, the group reverted to awakening early if they slept inside, but continued to rise later when they chose to sleep out of doors.

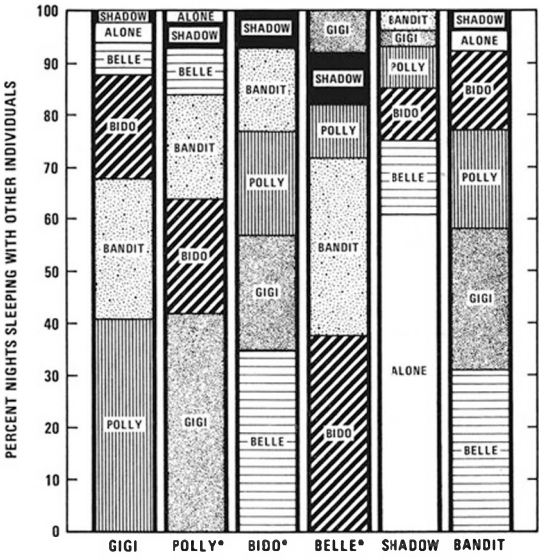

Fig. 1. Partner preferences during the first 17 days. * = Sexually cycling females.

Sleeping Partner Preferences

Figure 1 shows that sleeping partners were not chosen at random, but that definite preferences existed. Prior to this study sleeping partners had frequently been recorded, and the preferred companions of the different individuals were known (records by Dr. EMIL MENZEL and PALMER MIDGETT). With a few notable exceptions the chimpanzees continued to bed down with long-standing sleeping partners throughout this study. These preferences, for the most part, can be directly related to early rearing experiences.

After their initial arrival at Delta in 1965 and 1966, the chimpanzees lived in subgroups prior to combination into the large group in 1969. Gigi lived for 2 years with a male (not with the group during our study). For part of this time, Polly shared their cage; otherwise she was caged on her own. Bido lived for 2 years with another female to whom she was very attached, but who subsequently died. Bandit, Shadow, and Belle lived together for 2 years after their arrival at Delta. Figure 1 shows that Gigi and Polly were still frequent sleeping partners in 1972, as were Bandit and Belle. Shadow, although he had slept for many years with Bandit and Belle, by 1972 had begun to sleep quite often by himself. In reviewing the older male Shadow's sleeping partner

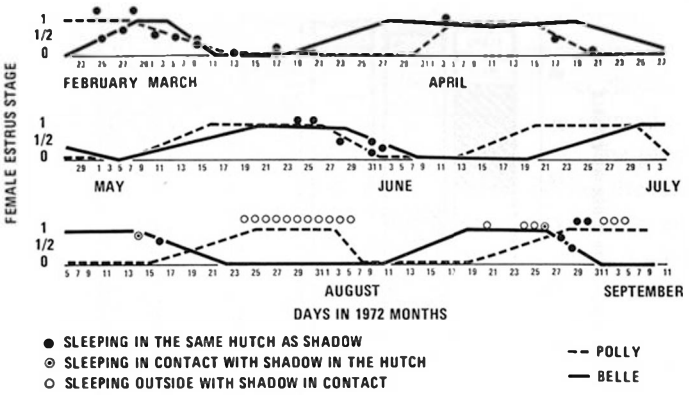

Fig. 2. Sexual cycles related to sleeping with the male Shadow.

preferences, an interesting finding emerged. On the first night of the lockout phase (August 24) Shadow and Polly slept touching one another (fig. 2). They continued to sleep in physical contact for the next 9 nights. This period coincided precisely with Polly's full sexual swelling. It is possible that Shadow, growing into adulthood as the dominant member of a small group, may have begun to consort Polly. Figure 2 shows the sexual cycles of 2 of the 4 females in the group, Polly and Belle, and their sleeping with the male Shadow. Whilst there is not a large amount of data, the fact that Shadow was seen to sleep with Polly during the two periods of swelling (and infrequently inbetween) and also to sleep with Belle when she too was in estrus, suggests that Shadow may have chosen his sleeping partners on a sexual basis. Subsequently, when a higher ranking male was returned to the group, he too frequently chose to sleep with a swollen female. This data has not yet been analyzed, but it is our subjective impression that sexual factors also influenced his sleeping partners.

To further examine the relationship between individuals, who frequently slept together, 55 additional hours of daytime data were collected on frequencies of social grooming and social play between diads during the lockout period. This data suggested that sleeping partners did not groom each other significantly more frequently (Spearman Rank correlation, $n = 15$, $r_s = 0.32$, $p < 0.10$) nor longer ($n = 15$, $r_s = 0.39$, $p > 0.10$) than did individuals who slept together rarely or not at all. Nor did sleeping partners play significantly more frequently ($n = 15$, $r_s = 0.14$, $p > 0.10$). Shadow and Polly, who slept together the most often at the time of the data collection, played together less than

Fig. 3. Shadow builds a nest on the ground from fresh leafy branches. Copyright by TUTIN and MCGREW.

any other diad in the group. Shadow and Bandit, Gigi and Shadow, and Shadow and Belle all slept together infrequently but played together often. Finally, there was no significant correlation for sleeping partners and duration of play bouts ($n = 15$, $r_s = 0.30$, $p > 0.10$).

Comparisons with Wild Chimpanzees

These chimpanzees obviously showed major differences in their sleeping behavior from that observed in free-living individuals, although there were some striking similarities. When sleeping hutches were available at the outset of the study, the chimpanzees retired some 90 min before sunset, much earlier than the normal nest-building time of wild individuals which is usually dusk. When they were locked outside, however, their behavior in this respect paralleled that of the wild chimpanzees much more closely. They did not make any move to retire until sunset, and they took between 5 and 15 min to settle down, occasionally self-grooming or stretching before falling to sleep, as do the chimpanzees at Gombe [GOODALL, 1962].

No trees were available to them in the enclosure, but nevertheless, the chimpanzees always chose to sleep off the ground as wild chimpanzees almost always do at night. The absence of night nest-building behavior in all but two of the captive group was surprising. BERNSTEIN [1962] demonstrated that wild-born captive chimpanzees, as opposed to captive-born individuals, almost always made nests if provided with 'suitable' nesting material, even with lengths of rubber hose and cardboard boxes. There are only three instances when wild chimpanzees were known to have spent the night without a nest; one chimpanzee in Uganda slept in the fork of a tree [REYNOLDS and REYNOLDS, 1965]; one old chimpanzee at Gombe failed to make a nest when she was very sick, but simply remained on the ground for several nights; and a male at Gombe slept on the ground, without a nest, when no suitable tree was available close to his consort (see below).

In common with wild chimpanzees, this captive group seldom moved about during the darkness. This was in marked contrast to the group of eleven adults studied by GALE [in preparation] in Florida. Her group frequently moved about their island at night, in darkness as well as moonlight, and engaged in a variety of behaviors including play and serious fighting.

On awakening in the morning, the captive chimpanzees defecated and urinated over the edge of the concrete platform, thus showing comparable behavior to wild chimpanzees who almost never foul their nests [GOODALL, 1962; VAN LAWICK-GOODALL, 1968]. If sleeping indoors, the chimpanzees would leave the compound upon awakening and would defecate and urinate outdoors rather than in the hutches. Often, after first awakening, the captive individuals relaxed again and sometimes seemed to sleep for a further 5–10 min. This behavior is also observed in the wild. Free-living chimpanzees, however, usually leave their nests close to dawn, whereas the captive group often remained on the platform for some 20 min after sunrise. Often they then left the platform together, but sometimes there were intervals of up to 30 min before the first and the last to leave, as reported in the wild. There was a late riser (Bido) in the group, just as there may be in the wild [GOODALL, 1962].

The captive group tended to arise later when it was raining, as is often the case at Gombe [GOODALL, 1962]. During this study, however, rain was recorded only when the chimpanzees were sleeping indoors, so that the motivation to stay within was quite understandable. It is harder to appreciate why a wild chimpanzee should continue to sit in his cold nest in the forest, quite unsheltered from the elements.

Perhaps the most striking contrast between the sleeping behavior of this group of adolescents and young adults and their wild counterparts is that

the chimpanzees in captivity continued to sleep in close proximity to one another, whereas those in the natural habitat usually begin to sleep in their own nests from 5 or 6 years of age. Certain observations made on the wild chimpanzees at Gombe are of interest here.

Independent nest-building, when a youngster constructs and sleeps in his own nest (usually close to that of his mother) usually coincides with the birth of a sibling. At this time the mother may actively prevent her older offspring from joining her for the night, should he or she try to do so. In one instance, however, a 5-year-old male (Flint) persisted in pushing into the nest of his old mother (Flo) after the birth of his sibling [VAN LAWICK-GOODALL, 1975]. When Flo tried to prevent this, Flint threw tantrums until his mother finally permitted him to join her. The infant died at the age of 3 months and Flo once again tolerated Flint in her nest each night. Presumably as a result of this continued tolerance, Flint was still sharing his mother's nest almost every night until the time of her death when he was almost 9 years old [THORNDAHL, in preparation].

The above observations, perhaps, help to explain the continued close proximity of the captive chimpanzees during the night; due to rearing conditions, they were peer-dependent, rather than mother-dependent. No maternal rejection occurred at the appropriate age which might have encouraged them to adopt more independent sleeping habits. It is unfortunate that we do not know the factors which initially encouraged Shadow to start sleeping by himself. This occurred at about the time of his adolescent growth spurt and corresponding increased aggression. It may have represented a preference for sleeping on his own, or a tendency on the part of his previously preferred partners to avoid him in the close confinement of a cage at night.

Finally, Shadow's close physical proximity to the two females, Polly and Belle, during their periods of estrus, is of interest in relation to consort behavior observed in the wild [VAN LAWICK-GOODALL, 1975; MCGINNIS, 1975; TUTIN, 1975]. When a male chimpanzee at Gombe travels with a female in estrus in a consort relationship, he typically makes his nest close to hers at night. On one occasion, when the female constructed a nest in the top of a palm tree in an open grassy clearing, there was no other tree suitable for nesting nearby. Her consort male spent the night on the ground at the foot of the tree [MCGINNIS; cited in VAN LAWICK-GOODALL, 1968].

Conditions prevailing in the captive group, where individual nests are not normally made, enable chimpanzees to maintain close proximity during the night with much more ease than is possible in the wild. One reason for independent nest-building in the natural environment is that difficulties might

be encountered in the construction of nests large enough for two fully adult individuals, although two adult male brothers (Figan and Faben) were observed to construct a common nest and to sleep in contact with one another throughout the night early in 1975 at Gombe National Park [VAN ZINNICQ-BERGMANN, personal commun.].

Summary

Six wild-born, captive-reared adolescent and young adult chimpanzees were observed at the Delta Regional Primate Research Center in Louisiana for a 3-month period in a large outdoor enclosure. The chimpanzees were locked outside of their normal cages for a 17-day period during which they arose and retired later than they did before their lockout from the cages. Early rearing experiences played a role in their sleeping partner preferences, and in the case of two older males, sexual factors may have influenced their partner preferences. Socially grooming or playing partners did not necessarily sleep together more frequently than did those chimpanzees that did not play or groom together often. The captive group showed both similar and differing sleeping behaviors to those observed of individuals in the wild habitat. Similar behaviors were more evident when they slept outdoors than when they slept indoors. A marked difference between the sleeping behavior of the captive group and their wild counterparts was that they continued to sleep in close proximity and even in contact with one another, whereas those in the natural habitat usually construct and sleep in independent nests by the age of 5 or 6 years.

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