

## A Further Description of the Control Role in Pigtail Macaques, *Macaca nemestrina*

EUCLID O. SMITH  
*University of Georgia*

**ABSTRACT.** The control role of a dominant male in a captive group of pigtail macaques is described in this paper, with a particular emphasis on broadening this concept. A number of behavioral categories are shown to be highly correlated with the control role, making the concept of control role more useful in the study of non-human primate sociality.

### INTRODUCTION

The control role in non-human primate behavior has received wide description in the literature (BERNSTEIN, 1964, 1966, 1970; DEVORE & HALL, 1965; SCHALLER, 1965; VARLEY & SYMMES, 1966). The control role may be conceived of as the social role of defending the group against internal and external sources of disturbance. BERNSTEIN (1969) previously defined the control role for pigtail macaques, *Macaca nemestrina*. He demonstrated that pigtail macaques offer an excellent example of the long term stability of the control role. Additionally, BERNSTEIN (1964) defined the control role for rhesus monkeys, *Macaca mulatta*, and concluded that the control animal in some rhesus monkey groups protected the group from external challenges, by attacking the source of the disturbance, or by remaining between the source of the disturbance and the group, or by coming to the aid of a member in distress. The control male allows group members to approach him under stressful conditions. Ordinarily few animals approach his vicinity. BERNSTEIN and SHARPE (1965) report control behaviors in a rhesus monkey group, behaviors which were superimposed upon the characteristics of any large male in the group. The control animal served to check intragroup fighting by substituting himself for one of the animals in the fight. Also, the control animal provided a buffer to extra-group disturbance. The control animal was the focus for and influenced the social activities of the adult females. Furthermore, the control male was observed to have a low flight distance, i.e., would tolerate most subordinates in proximity, without any show of aggression during stressful situations; however, a few animals had a low flight distance with respect to him.

The term control animal is used rather than dominant animal for as the following behavioral categories indicate, the control role clearly exceeds certain minimal definitions relying on preferential access to incentives as employed by some researchers (CARPENTER, 1950, 1954; CRAWFORD, 1940; JAY, 1965; ZUCKERMAN, 1932). However, the use of the term control role is not new and has been used by other investigators (BERNSTEIN, 1964, 1966, 1970; DEVORE & HALL, 1965; HALL & DEVORE, 1965; KAUFMAN, 1967; KUMMER, 1968; ROWELL, 1967; SCHALLER, 1965; STRUHSAKER, 1967; VARLEY & SYMMES, 1966). In the categories of aggressive behavior done, sub-

missive behavior received, sexual presentations received, genital inspections done, lipsmacks received, and puckers done the control role clearly stands out.

This paper extends the existing data on the importance of the control role in *Macaca nemestrina*, by demonstrating the influence of this role in a wide variety of behaviors exhibited within the group, and broadens the model to cover a wider range of social activities of the group.

## METHOD AND PROCEDURE

A total of 32 pigtail monkeys were used in this study. The subjects were housed at the Field Station of the Yerkes Regional Primate Research Center in an outdoor compound with provisions for shelter and year round maintenance with minimal disturbance to the animals. Nineteen females and 13 males comprised the original group, but during the course of testing there were two deaths and one birth in the group. The death of an adult male, *R*, was the only event that altered the testing procedure. The other death and the birth did not involve animals under study.

The compound consisted of a 30.48 meter, square open enclosure surrounded on two sides by a 4.87 meter high sheet metal wall, and on two sides by a 1.82 meter chain link fence surmounted by a 3.05 meter sheet metal wall. All testing was conducted from the observation post inside the animal trailer. See SMITH (1972) for a more detailed description of the compound.

The subjects ranged in age from two months to approximately 14 years. Table 1 contains detailed information concerning the age composition of the group. For the purposes of this study the males were classified into age categories of behavioral development. The categories used are follows: as animals one year and younger were classed as infants, animals from one to four years were classed as juveniles, from four

**Table 1.** Ages of animals in the study group (Computed as of June 1, 1970).

Males		Females	
Animal identification	Age	Animal identification	Age
<i>Da</i>	14 yrs <sup>1)</sup>	<i>B</i>	13 yrs <sup>1)</sup>
<i>Q</i>	11 yrs <sup>1)</sup>	<i>J</i>	12 yrs <sup>1)</sup>
<i>R</i>	9 yrs <sup>1,2)</sup>	<i>Na</i>	12 yrs <sup>1)</sup>
<i>Ya</i>	5 yrs 11 mos	<i>L</i>	10 yrs <sup>1)</sup>
<i>Hb</i>	4 yrs 11 mos	<i>O</i>	10 yrs <sup>1)</sup>
<i>Kb</i>	4 yrs 1 mo	<i>N</i>	9 yrs <sup>1,2)</sup>
<i>Lb</i>	3 yrs 6 mos	<i>Db</i>	5 yrs 7 mos
<i>Rb</i>	2 yrs 10 mos	<i>Eb</i>	5 yrs 5 mos
<i>Tb</i>	2 yrs 6 mos	<i>Fb</i>	5 yrs 4 mos
<i>Yb</i>	1 yr 6 mos	<i>Gb</i>	5 yrs 3 mos
<i>Zb</i>	1 yr 6 mos	<i>Ib</i>	4 yrs 10 mos
<i>Ec</i>	1 yr 6 mos	<i>Jb</i>	4 yrs 4 mos
<i>Lc</i>	2 mos	<i>Mb</i>	3 yrs 9 mos
		<i>Nb</i>	3 yrs 6 mos
		<i>Vb</i>	2 yrs 6 mos
		<i>Cc</i>	1 yr 6 mos
		<i>Dc</i>	1 yr 6 mos
		<i>Gc</i>	8 mos
		<i>Nc</i>	1 mo <sup>3)</sup>

1) Age estimated on arrival at Yerkes. 2) Died during testing. 3) Born during testing.

to seven years as subadult, and over seven years as fully adult. More meaningful data analysis was possible by lumping the animals into these age categories.

Social behavior was scored on two types of data collection forms. The first was a frequency count sheet on which aggressive behavior, submissive behavior, sexual behavior, genital inspection, lipsmacking, and demonstration (see Appendix 1 for definitions) were scored as they occurred during 10,800 seconds, or 3 hours observation time per male in the study. Observations were divided into ten 1,000 second observation sessions; one 800 second observation interval was added for computational ease. All testing was begun only after a 10 to 15 minute waiting period allowing the test animals to become accustomed to the observer's presence.

The duration of grooming, play, maternal, and huddling behavior (see Appendix 2 for definitions) was recorded on the second form. A digital display synchronous motor clock was employed to time each observation session. The onset and the termination of the interactions were noted, so that the duration of the interactions could be calculated. The duration categories were scored for ten 1,000 second observation periods in order that the duration of behavior could be more easily expressed as a percentile. The only exception, an adult male *R*, was observed for only six sessions, or 6,000 seconds prior to his death by electrocution in an episode following his escape from the compound. The testing of the subjects was performed in a balanced order to assure randomness of observation time. During actual data collection the two forms were used simultaneously to facilitate testing operations. No testing was conducted when the outside temperature was above 26°C or below 10°C; temperatures outside this range clearly influence the expression of the behavioral categories under study (BERNSTEIN, in press). Most testing sessions occurred from daylight until midday. Testing was terminated under severe rainy conditions. During all testing sessions the animals had free access to food, water, and the indoor compartment.

The use of two types of data collection forms indicates that the frequency of some behavioral responses was considered important, while the duration of other behaviors seemed a more basic measure of primate sociality. It was felt that not only the frequency of interaction, but the duration of some other behavioral categories, as well, were necessary for an accurate description of primate behavior. Grooming, play, huddling, and maternal behavior are functional categories which do not comprise one specific motor pattern, but constitute a sequence or pattern in which the duration of interaction may be more important than its frequency. On the other hand, aggressive behavior, submissive behavior, sexual behavior, genital inspection, lipsmacking, and demonstration are short duration responses significant in terms of their frequency of occurrence.

## RESULTS

The top status animal in the group, an 11 year old male (code letter *Q*), was also the control animal. The control animal *Q* engaged in significantly more aggressive behavior ( $p < .05$ ) as compared to the group, as well as significantly more ( $p < .05$ ) than the next highest scoring male in the group. These results are understandable in that

the control male is involved in most of the aggressive encounters within the group either as a mediator or a buffer, therefore, it is expected that he would have the highest frequency of aggressive interactions. Among the rhesus monkeys (BERNSTEIN, 1966) the control animal checks intragroup fighting and conflict by substituting himself for one of the animals in the fight. Also, in the case of extra-group aggression, the control animal has been known to act as a buffer between the threat and the group. Additionally, the control male received a significantly greater number of submissions than other group animals ( $p < .01$ ), as well as significantly more ( $p < .01$ ) than the next highest scoring male.

*Q* received 94% of all the lipsmacks<sup>1)</sup> observed during testing, again receiving a significantly greater number than other members of the group, or the next highest scoring male ( $p < .05$ ). It is difficult to undertake a discussion of the functional importance of lipsmacking in primate social behavior for it appears in such a wide array of behavioral contexts, but, HALL and DEVORE (1965) and ANTHONY (1968) agree that lipsmacking constitutes a type of friendly greeting behavior, while VAN HOOFF (1962) sees lipsmacking in pigtailed as related to submissive behavior.

Other dimensions of the control role include puckers done, genital inspections done, and sexual presentations received. The control animal received a statistically significant greater portion of these behaviors than expected by chance ( $p < .05$ ). These behaviors indicate that the control role extends into behavioral categories of a much broader nature than simply the aggression, or the priority of incentives context. The control role is the most sharply differentiated role in a pigtail group, and in many cases, is central to the role performance of other group members. BERNSTEIN (1969), in his description of the control role in pigtailed, described the control role relationships to aggressive encounters. While not negating his work, this paper simply extends this role description to include a wider array of behaviors.

These results summarized in Table 2, are indicative of the control role in *Macaca*

**Table 2.** Frequency of selected behavioral responses.

Subject code letter	Aggressive behavior done	Submissive behavior received	Sex presents received	Genital inspections done	Lipsmacks received	Puckers done
<i>Q</i>	16	25	26	16	17	15
<i>R</i>	0	0	0	0	0	5
<i>Da</i>	0	0	0	2	0	3
<i>Ya</i>	4	0	0	1	0	2
<i>Hb</i>	0	1	0	1	0	3
<i>Kb</i>	11	2	4	3	1	2
<i>Lb</i>	4	3	1	5	0	2
<i>Rb</i>	6	1	0	4	0	3
<i>Tb</i>	3	1	1	0	0	0
<i>Yb</i>	2	1	0	1	0	1
<i>Zb</i>	3	0	1	3	0	1
<i>Ec</i>	1	0	0	0	0	2
<i>Lc</i>	0	0	0	2	0	3
Total	50	34	33	38	18	42

1) Lipsmacks were scored in all contexts (submissive gesture, enlisting aid, threat, etc.).

*nemestrina*. While they may not be applicable to other species, or for that matter other groups, they seem to be suggestive of a wider range of behaviors attributable to the control role than previously described. In broadening the concept of control role, it may prove a more useful notion for the study non-human primate sociality.

**Acknowledgements.** This research was supported by a grant from the National Science Foundation, GB 3008, and in part by NIH grant FR 00165. I would like to acknowledge my sincere indebtedness to Dr. IRWIN S. BERNSTEIN of the Yerkes Regional Primate Research Center, and the Departments of Psychology and Anthropology of the University of Georgia for his contribution to the development of the viewpoint implicit in this work. Also, I would like to thank Dr. FRANK E. POIRIER of the Anthropology Department of Ohio State University for the invaluable suggestions, criticisms, and corrections which he contributed to this work. However, I take sole responsibility for the contents of this work.

APPENDIX 1. The frequency count categories were defined as follows:

1. Threat – Mouth open, stares, occasional high or low pitched vocalizations. Animal may bob head or move ears, or slap in the direction of the target animal.
- 2\*. Lipsmack – Tongue and lip movement producing an audible sound.
3. Chase – Rapid pursuit of a fleeing animal, often associated with threat.
4. Submit – Includes avoid (withdrawal on approach of another animal), flee (running from an animal that does not pursue), crouch (passive prone position with arms and legs drawn to body), grimace (lips drawn back and retracted, teeth closed and exposed), and being chased (See definition 3).
- 5\*\*. Charge – Rapid approach to an animal who does not flee, also short dashes made toward an animal.
6. Bite – Animal bites another, if animal attempts to bite another but fails, it is scored as a threat, not scored if jaws are not closed.
7. Slap – Animal slaps another with its hand.
- 8\*\*. Kick – Animal kicks another with its foot.
9. Fight – Mutual biting, slapping, etc.
10. Genital investigation – An animal picks at or manipulates the genitals of another, or positions and holds another for close visual inspection of its genitalia.
11. Sex present – Animal elevates hind quarters toward another with tail averted.
12. Hip touch – Animal places its hands on the hips or waist of another.
13. Ankle clasp – Animal places its foot on ankles or calves of another, clasps the other's ankles or calves, with weight supported.
14. Thrust – Pelvic thrusting.
15. Intromission – Introduction of the penis into the vagina.
16. Demonstrate – Cage shaking on floor, wire supports, etc.—object banging, hitting metal fence, branch shaking, etc.

For purposes of analysis, threat, chase, charge, bite, slap, kick, and fight were subsumed under the category of aggressive behavior. The treatment of this category as a larger functional unit can be justified from two points of view: first, each of these discrete response categories can be combined into a logical sequence based on a similar functional context and combination because each response unit implies actual physical damage or the threat of physical damage; second, the discrete response categories are responses to the same stimulus in varying degrees of intensity.

What is termed sexual behavior is, in fact, comprised of hip touch, ankle clasp, thrust, and intromission. For the purposes of scoring though, these four categories were lumped together to derive the functional behavioral unit, sexual activity. Failure to lump these categories together would bias the data, since these four discrete units make up aspects of one single mounting sequence. Scoring them separately would be scoring the same event multiple times.

For that reason, hip touch plus thrusting with no hip touch were used as the diagnostic scores for sexual activity.

\*ANTHONEY (1968) states that lipsmacking is a misnomer. He further states that lipsmacking is accompanied by a smacking sound; however, animals can lipsmack without establishing contact between their lips.

\*\*Not observed during formal testing.

APPENDIX 2. The duration categories were defined as follows:

1. Grooming – Hair and skin manipulation usually by fingers, may be accompanied by lipsmacking.
2. Play – Interrupted, vigorous, usually silent activity, lacking full expression of other patterns. Two or more animals may be engaged and the activity may be interrupted frequently and momentarily.
3. Maternal – Ventral-ventral or dorsal-ventral contact, either full weight support of another animal, or clinging between animals, also carrying (lifting another animal completely off the ground with hands and arms alone—animals may or may not travel (locomotion over a full body length in distance).
4. Huddle – Extensive body contact with some weight support, but specifically excluding maternal, sexual, and play categories.

In the analysis of larger functional behavioral categories no other response categories were included within the confines of grooming and play.

## REFERENCES

- ANTHONEY, T. R., 1968. The ontogeny of greeting, grooming, and sexual patterns in captive baboons (superspecies *Papio cynocephalus*). *Behaviour*, 31: 358–372.
- BERNSTEIN, I. S., 1964. The role of dominant male rhesus in response to external challenges to the group. *J. comp. physiol. Psychol.*, 57: 404–406.
- , 1966. Analysis of a key role in a capuchin (*Cebus albifrons*) group. *Tulane Stud. Zool.*, 13: 49–54.
- , 1969. The stability of the status of hierarchy in a pigtail (*Macaca nemestrina*) group. *Anim. Behav.*, 17: 452–458.
- , 1970. Primate status hierarchies. In: *Primate Behavior: Developments in Field and Laboratory Research*, L. A. ROSENBLUM (ed.), Academic Press, New York. pp. 71–107.
- , in press. Daily activity cycles and weather influences on a pigtail monkey group. *Folia primat.*
- & L. G. SHARPE, 1965. Social roles in a rhesus monkey group. *Behaviour*, 26: 1–2.
- CARPENTER, C. R., 1950. Social behavior of non-human primates. *Structure et physiologie des sociétés animales*. Colloq. Int. Centre Nat. Rech. Sci., 34: 337–346.
- , 1954. Tentative generalizations on the grouping behavior of nonhuman primates. In: *The Non-Human Primates and Human Evolution*, J. A. GAVAN (ed.), Wayne State Univ. Press, Detroit, Michigan. pp. 91–98.
- CRAWFORD, M. P., 1940. The relation between social dominance and the menstrual cycle in the female chimpanzee. *J. comp. Psychol.*, 30: 483–513.
- DEVORE, I. & K. R. L. HALL, 1965. Baboon ecology. In: *Primate Behavior: Field Studies of Monkeys and Apes*, I. DEVORE (ed.), Holt, Rinehart, & Winston, New York, pp. 20–52.
- HALL, K. R. L. & I. DEVORE, 1965. Baboon social behavior. In: *Primate Behavior: Field Studies of Monkeys and Apes*, I. DEVORE (ed.), Holt, Rinehart, & Winston, New York, pp. 53–110.
- JAY, P. C., 1965. Field studies. In: *Behavior of Non-Human Primates*, A. M. SCHRIER, H. F. HARLOW, & F. STOLLNITZ (eds.), Academic Press, New York, pp. 197–249.

- KAUFMAN, J. H., 1967. Social relations of adult males in a free-ranging band of rhesus monkeys. In: *Social Communication among Primates*, S. A. ALTMANN (ed.), University of Chicago Press, Chicago, pp. 73-98.
- KUMMER, H., 1968. Two variations in the social organization of baboons. In: *Primates*, P. C. JAY (ed.), Holt, Rinehart, & Winston, New York, pp. 293-312.
- ROWELL, T. E., 1967. A quantitative comparison of the behavior of a wild and a caged baboon group. *Anim. Behav.*, 15: 499-509.
- SCHALLER, G. B., 1965. The behavior of the mountain gorilla. In: *Primate Behavior: Field Studies of Monkeys and Apes*, I. DeVORE (ed.), Holt, Rinehart, & Winston, New York, pp. 324-367.
- SMITH, E. O., 1972. The relationship of age and status to selected behavioral categories in male pigtail macaques (*Macaca nemestrina*). Unpublished Master Thesis, University of Georgia.
- STRUHSAKER, T. T., 1967. Behavior of vervet monkeys and other Cercopithecus. *Science*, 156: 1197-1203.
- VAN HOOFF, J. A. R. A. M., 1962. Facial expressions in higher primates. In: *Evolutionary Aspects of Animal Communication. Sym. zool. Soc. Lond.*, 8: 97-125.
- VARLEY, M. & D. SYMMES, 1966. The hierarchy of dominance in a group of macaques. *Behaviour*, 27: 54-75.
- ZUCKERMAN, S., 1932. *The Social Life of Monkeys and Apes*. Routledge & Kegan Paul, London.

—Received December 25, 1972; Accepted May 12, 1973.

Author's Present Address: EUCLID O. SMITH, *Department of Anthropology, Ohio State University, Columbus, Ohio 43201, U.S.A.*