Measurement of Posture in Japanese Monkey *(Macaca fuscata)* by Telemetry

Telemetrical methods have been used to measure the location of various animal species[1]. However, studies on the posture of mammals, using telemetrical techniques, have not yet been done. The present experiments were, therefore, carried out to investigate telemetrically monkey posture. The results obtained were compared with those made by direct observation. It is concluded that the telemetrical technique faithfully reproduces simian postures. Moreover, the monkeys studied here spent appreciably more time in the orthograde posture than in the pronograde posture.

A total of 4 Japanese monkeys (*Macaca fuscata*), 7 years old, were used. Since this group had been 'constructed' about 1 year before these experiments, social stability had already been established. Measurements by telemetry and direct observation were carried in a room 340 cm wide, 380 cm deep, 193 cm high, and in which there were wooden parallel bars 130 cm, 130 cm and 100 cm long. Food was given to the monkeys only between 10.00 and 11.00 h each day. A 12-h day, from 6.00 to 18.00 h, was maintained with a simple fluorescent light. The temperature in the room was maintained between 20 and 25 °C.

The telemetrical experiments were carried out between September 10th, 1972 and November 25th, 1972. Monkeys wore body harnesses, allowing as much freedom of movement as possible. The harnesses were made of a special synthetic fibre (Commercial name: Kurarieno, Teijin Corporation, Japan) that is resistant to moisture and damage caused by the animal subject. A transmitter was then fixed to the harness on the back of the monkeys. In order to judge whether or not posture was affected by the harness itself and by the anesthetic used to immobilize the monkey for harness attachment, observations on the pre-telemetric experimental animals were made. Between September 1st, 1972 and September 7th, 1972, two 1-h observation periods 9.00 to 10.00 h, and 15.00 to 16.00 h were utilized. A transmitting circuit, battery and glass tube were packed within a plastic box, 30 mm: 40 mm: 12 mm, weighing 40 g. 2 silver wires were fixed parallel to each other and a drop of mercury was enclosed within the glass tube. When a drop of mercury made contact simultaneously with the 2 silver wires, the switch was 'on' and pulses were sent from the transmitter. With the particular mass of mercury, distance between the parallel 2 wires, and the length of the wires controlled, the switch become 'on' for a particular angle of the glass tube relative to ground. Gravity, the glass tube, the amount of mercury, therefore defined the 'on' state. With the switch 'on', pulses at 524 MHz were received and recorded continuously on an automatic pen recorder through a D-A converter for 7–8 days. The monkeys were anesthetized with Nembutal, 1 mg/kg of body weight.

Analysis of the telemetry data. Figure 1 shows the average percentage of time spent in the pronograde posture during each 24-h recording period over the 7 days for the 4 monkeys. During the 1st day, much time in the pronograde posture, that is, when the transmitter was 'on', was recorded from all the subjects. The pronograde mean time was 22.1%; S.D. $\pm$ 2.5%; $n = 4$. However, after more than 2 days, pronograde time reached an equilibrium value with mean, 9.6%; S.D. $\pm$ 0.8%; $n = 4$, over 6 days after the 2nd day. Moreover, as shown later, the value obtained from the monkeys without the harness differed from that obtained during the experimental subject's the first day. It approximated the value obtained in the second day and later days. Therefore, the value in the first day may be considered transient, while data thereafter indicates a steady state value for pronograde posture time.

Circadian rhythm of monkey posture. A typical example of the circadian rhythm in monkey posture can be seen in Figure 2. In general, the pronograde percentage increased during the day and decreased during night. Orthograde time is generally low during day periods and begins to increase between 17.00 and 18.00 h and reaches peak between 21.00 and 22.00 h. The highest level of pronograde percentage was in the period between 09.00 and 18.00 h; the lowest level was between 21.00 and

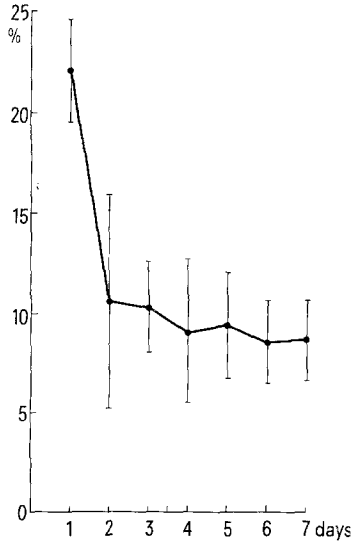

Fig. 1. Changes in the percentage of time spent in pronograde posture over the 7-day experimental period. Each plot represents mean value obtained for 4 monkeys. Vertical bars represent twice the S.D. of the mean.

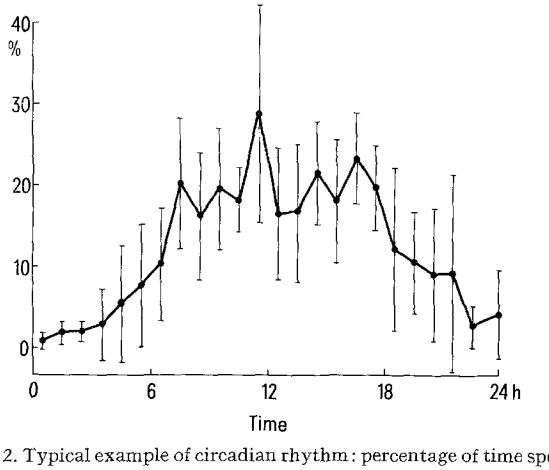

Fig. 2. Typical example of circadian rhythm: percentage of time spent in pronograde posture. Each plot represents mean value for the 6-days, between the 2nd and the 7th day, per subject. Vertical bars represent the S.D. of the mean.

[1] K. S. Rawson and R. H. Hartline, Science *146*, 1596 (1964). – H. S. Fitch and H. W. Shirer, Am. Midland Nature *84*, 170 (1970). – O. J. Rongstad and J. R. Tester, J. Wildl. Manage *35*, 338 (1971).

sleeping during the night and active during the day. The fact that monkeys maintained the orthograde posture during the night means that monkeys sleep in a sitting rather than prone posture.

Correspondence between telemetry and direct observation techniques. The data obtained by these 2 different methods were compared. As mentioned above, between 09.00 to 10.00 h and 15.00 to 16.00 h, the posture of the monkeys was directly observed. These data were compared with telemetry data obtained in the same time period for each day. There was no significant difference between the pronograde percentages obtained by the 2 different methods ($P > 0.05$, t-test; Table).

The percentage of posture, orthograde or pronograde, could be easily estimated from the telemetrical data. The monkeys displayed primarily sitting posture, lying posture and quadrupedal standing posture most of the time. The frequency of other monkey postures is extremely low. Therefore these 3 posture types may be sufficient for a postural analysis in monkeys. For the present experiment, lying posture and quadrupedal standing posture could not be telemetrically distinguished. However it is important to distinguish lying posture from quadrupedal standing posture. With 2 transmitters, simultaneously attached to the back and leg, the problem 05.00 h. There was little difference in the posture circadian rhythms between different subjects. Because there is little change in body posture, as determined telemetrically, during sleep, it is easy to judge whether or not the subject is asleep. In the present experiments, the monkeys were might be easily resolved. Orthograde posture recorded in the present experiments included sitting and bipedal upright posture. It is morphologically and ecologically interesting to understand how much time a monkey spends in bipedal upright posture. Therefore, by direct observation, measurement of time spent in bipedal upright posture during the day was attempted. However, the monkeys were seldom in this posture and the time spent was too short to be measured. Therefore, the orthograde posture recorded in the present experiment is primarily sitting posture.

Pronograde time for the 6 days, between the 2nd and the 7th day, in the telemetry experiments, became stable. Moreover, the direct observation data was very similar to that recorded telemetrically. This suggests that the monkey postures, between the 2nd and 7th day, were not affected by the harness or anesthetizing drugs. These experiments show that telemetry can record the general changes in simian posture. However, the data were collected under highly controlled, and stable conditions, which is not found in the natural habitat of primates.

Comparison of percentage of time spent in pronograde posture for 4 monkeys by telemetry and observation

Monkey	Telemetry (%)	Observation (%)
1	25.7	29.0
2	11.2	11.3
3	24.4	19.3
4	14.4	16.9
Mean	18.9	19.1
± S.D.	7.2	7.3

Zusammenfassung. Ein auf dem Rücken befestigter Telemetriesender erlaubte bei Japanmakaken (*Macaca fuscata*) in guter Übereinstimmung mit Direktbeobachtungen die andauernde Registrierung ortho- bzw. pronograder Körperhaltung.

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CONSTRUCTIONES

European Training Awards in Brain and Behaviour Research

In cooperation with the Organization for Economic Cooperation and Development, a group of European Scientists have initiated an experimental schema under which younger scientists working on Brain and Behaviour can apply for awards to enable them to acquire training in a specialized area. The money to finance this training program has been provided by the Max-Planck-Gesellschaft. Successful applicants will receive travel and living expenses to enable them to study in selected laboratories. The normal duration of an award will be three months, but some longer term awards can be made.

Eligibility. To be eligible for an award, a candidate must already by undertaking research in the field of Brain or Behaviour in a laboratory situated in a member country of O.E.C.D. Applicants must produce evidence that their own research will benefit by the training for which they apply. In making the awards, preference will be given to candidates applying for a type of training that will assist them to follow an interdisciplinary approach in their own research. Candidates are expected to return to their original laboratory at the expiry of their training.

Nature of training courses. Some of the training programs incorporate formal course work, others involve the learning of techniques whilst undertaking closely supervised research on a particular problem. Training programs exist in the following subjects: Animal behaviour, brain biochemistry, brain modelling, ethology, experimental psychology, histochemistry, morphology, neuroanatomy, neuropharmacology, neurophysiology etc.

Method of application. Further details of the scheme (including a list of laboratories participating in the training programs) and application forms can be obtained from:

The Executive Office, Foundation FUNGO, Laan van Meerdervoort 53D, Den Haag (The Netherlands).