Comparative observations on *Macaca speciosa* and *Macaca mulatta* as laboratory subjects¹

D. SYMMES AND K. V. ANDERSON²

YALE UNIVERSITY SCHOOL OF MEDICINE

The stump-tailed monkey (*Macaca speciosa*) is found to be equal to the familiar rhesus monkey (*Macaca mulatta*) in discrimination learning and superior in acquisition of simple responses and general investigative behavior. These characteristics coupled with the docility of young stump-tailed monkeys make them the subject of choice for some behavioral research.

Several years ago Orbach & Kling (1964) pointed out some advantages of the stump-tailed macaque (*Macaca speciosa*) for behavioral research with primates. Great interest in these animals as experimental Ss was generated and several reports have appeared which generally support the original conclusion that they are more docile than *Macaca mulatta* and perform about as well on discrimination learning set problems as the latter animals do (Schrier, 1966; Gross, 1966). Some of these studies have been based on rather small numbers of animals, however, and in at least one instance (Gross, 1966) an unfavorable finding was cited (without supporting data) as to the ability of stump-tailed monkeys to learn visual discriminations.

It is the purpose of this communication to summarize experience in two laboratories on the relative performance of immature *Macaca speciosa* and *Macaca mulatta* on a variety of behavioral measures.³ Data from a total of 33 stump-tailed and 107 rhesus monkeys are reported, and emphasis will be placed on those findings for which no comparative information has so far been published. These include behavior directed toward or motivated by stimulus change, and the learning of relatively difficult visual and auditory discriminations.

Acquiring Useful Laboratory Responses

Our comparative studies on rate of acquisition of common laboratory responses confirm those of Schrier (1965). We have used both a lever pressing and a key pressing response in different animals, and have followed the practice of placing the monkey in a suitable test chamber provided with the manipulandum wired to a food delivery mechanism so as to provide a reward pellet for every press.⁴ If spontaneous learning does not occur after a standard exposure to this situation (five sessions of 30-45 min. duration) active shaping of the desired response by the experimenter is begun. The occurrence of spontaneous learning and the need for shaping procedures for the two species are shown in Table 1. It is clear that stump-tailed monkeys are much more likely to acquire lever pressing and key pressing responses as a

result of spontaneous investigation of the test chamber ($p < .01$, Mann-Whitney U Test), a finding which places them in a preferred position as Ss in studies in which shaping procedures are difficult to carry out or precluded on experimental grounds.

Stimulus Change Behavior

Responses can be acquired without the use of organic-drive related rewards such as food, and considerable interest has been shown recently in classes of behavior which are dependent on novelty seeking motives or curiosity (Schrier, Harlow, & Stollnitz, 1965). A very simple form of such behavior is seen in the effects on lever pressing of a consequent change in the general level of illumination. Such changes increase rate of responding and suggest that the change itself is rewarding, although the theoretical issues surrounding these observations remain unresolved. Of relevance here is the accessibility of this type of behavior, particularly in naive laboratory monkeys. If investigative or novelty seeking behavior of monkeys is of prime concern to an experimenter, perhaps in connection with neurological or psychopharmacological studies in which it is the dependent variable, the behavior must be easily obtained without recourse to use of primary rewards. Accordingly a study was conducted comparing the performance of matched groups of stump-tailed and rhesus monkeys on a light onset problem.⁵ All animals were naive, adjusted to the transport cage as before, and placed in a dark test chamber containing a large flat lever. Food was never presented in the chamber.

Six daily 1-hr. sessions were given all animals, and the sessions alternated between the "operant" condition, in which lever presses had no effect on

Table 1.
Response Acquisition by *Macaca Speciosa* and *Macaca Mulatta*

Lever pressing response	<i>Macaca speciosa</i>	<i>Macaca mulatta</i>
learned spontaneously, first session	6	2
learned spontaneously, within 5 sessions	0	15
required shaping	0	15
Total N	6	32
Key pressing response		
learned spontaneously, first session	8	2
learned spontaneously within 5 sessions	6	13
required shaping	0	23
Total N	14	38

Table 2. Rate of Responding in Light Onset Problem by Two Matched Groups Expressed as Mean Responses per hour

	<i>Macaca mulatta</i>			<i>Macaca speciosa</i>	
	3 operant sessions	3 onset sessions		3 operant sessions	3 onset sessions
Rh 1	0	1.0	Sp 1	18.7	53.3
Rh 2	48.0	91.0	Sp 2	2.7	21.3
Rh 3	123.0	382.0	Sp 3	282.0	210.0
Rh 4	3.7	2.3	Sp 4	19.7	48.7
Rh 5	0.3	4.0	Sp 5	210.7	922.7
Rh 6	1.0	0.3	Sp 6	217.3	591.7
Group Means	29.3	80.1		125.2	424.6

light level and produced only a faint clicking noise, and the "onset" condition, in which each lever press illuminated the chamber diffusely from recessed incandescent bulbs which produced a level of 12 ft.-c. on the floor. Each press produced a uniform .5-sec. light pulse. The results are shown in Table 2, and reveal, in general, a much higher rate of responding among the stump-tailed monkeys, and a significant effect of light onset in this group ($t=2.82$, $df=5$, $p<.05$). Only two of the rhesus monkeys displayed useful response levels, and they also increased response rate under the "onset" condition. It seems reasonable to conclude, then, that light change reinforcement can be demonstrated in both species of monkey, but much more readily among stump-tailed monkeys because of their higher spontaneous rate of responding, and hence greater opportunity for associating the response with its environmental consequences.

Discrimination Learning

Groups of stump-tailed and rhesus monkeys were given training on a number of discrimination tasks and the results of two of these are presented in Table 3. Prior laboratory experience was minimal and was equated for the groups. The methods of training and stimuli to be discriminated have been described elsewhere (Symmes, 1965, 1966), but briefly stated they consisted of training to detect the presence of intermittence in a visual or auditory signal by the method of successive stimulus presentations (go-no go).

Table 3. Visual and Auditory Discrimination by *Macaca Speciosa* and *Macaca Mulatta*

	N	Mean trials to criterion	Median trials to criterion
Intermittent Light discrimination			
<i>Macaca speciosa</i>	6	610	560
<i>Macaca mulatta</i>	21	806	660
Intermittent Noise discrimination			
<i>Macaca speciosa</i>	7	1684	1060
<i>Macaca mulatta</i>	13	1721	1520

A steady white light or white noise was established as the approach stimulus and the same source interrupted 10 times per sec. established as the negative stimulus for half of each group assigned to a problem while the other half were trained to approach the intermittent stimulus. Forty trials per day were given (plus correction trials) until a criterion of 90 errorless trials in a consecutive block of 100 was reached. Neither the criterion scores nor the rate of approach to asymptotic learning differentiated the groups. We may therefore add to our accumulating knowledge of the behavioral capacities of stump-tailed monkeys, the information that they can master difficult discriminations involving lengthy training and repeated withholding of rewards as well as the familiar rhesus.

In summary, our experiments suggest that stump-tailed monkeys are indeed excellent laboratory Ss, and especially so in studies where rapid acquisition of responses and high investigative tendencies are helpful. The docility of the immature stump-tailed monkey is unquestioned, and there is a substantial reduction in the probability of bites and scratches from them among inexperienced handlers. Our experience in performing various brain ablations on a total of 16 stump-tailed monkeys suggests also that their response to anesthetics, tolerance of surgery, and recovery capacity are also equal in every way to those of rhesus.

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Notes

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- Present address: Department of Anatomy, Emory University, Atlanta, Georgia.
- Department of Psychology, Brown University and Department of Physiology, Yale University Medical School.
- The lever was $\frac{3}{4}$ x $\frac{1}{2}$ in. and protruded 2 in. The key was a Grason-Stadler Model 8670 response button. They were mounted interchangeably on one wall of a 2 x 2 x 2 ft. sound isolated test chamber.
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