Table 1
Minimum n Required for Each Descriptor for
Inclusion in the Analysis

Category*	Average Inter- rater Relia- bility	Z_r^{**}	$n^{\dagger}$		
			$\rho_o = .00$	$\rho_o = .25$	$\rho_o = .50$
1	.63	0.741	13	29	185
2	.72	0.908	9	17	54
3	.83	1.188	5	8	17
4	.90	1.472	4	5	9
5	.93	1.658	3	4	6
6	.98	2.298	2	2	3

*Based on a hypothetical data set.

** $Z_r = 0.5 \ln (1 + \rho)/(1 - \rho)$.

$^{\dagger}n$ was calculated for $\rho_o = .00, .25$, and $.50$. The final form of the equation for obtaining n was $n = 6.842/(Z\rho_o - Z_r)^2$. n was rounded up to the next whole number.

particular study. This can be based, presumably, on a number of explicit and implicit criteria. McGrew (1972, p. 24), for example, established .70 as a baseline value. Any reliability coefficient less than .70 was considered suspect. Setting the established baseline value equal to Z_r and given the overall N used in the reliability study, we can then calculate ρ_o using the above formula.

Table 1 contains the results of applying this decision rule to a set of hypothetical behavior categories for three possible values of ρ_o ($\rho_o = .00, \rho_o = .25, \rho_o = .50$). Thus, for Major Category 4 (for $\rho_o = .50$), a minimum of nine occurrences of any of its descriptors would be the required cutoff for inclusion in subsequent analyses in terms of the initial reliability estimate. If n is less than nine, we risk using a descriptor for which reliability could not be assessed in terms of the original average reliability estimate.

This rule allows us to reduce systematically a data set without necessarily excluding descriptors that have a low frequency count and without subjectively defining "how small is small." When calculating reliability, it provides a cutoff less subjective than an a priori statement such as "any descriptor with an n less than 7 was arbitrarily excluded." In terms of the problem of calculating interrater reliability coefficients for large descriptor sets, it suggests that a random sample of descriptors under each major category would be tested for reliability and that the results could be used for evaluating the remaining descriptors under each major category.

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NOTE

1. Intrarater reliability and measurements of internal consistency were not considered in this paper.

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A nonsurgical method for restraining the head during behavioral tests in primates*

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Behavioral and neurophysiological experiments with alert Ss sometimes necessitate the restriction of head movements. Biteplates, headrests, and chinrests are commonly employed with human Ss, but require cooperation and therefore are not suitable for use with animals. The present article considers a number of head-restraint techniques employed with monkeys, as well as some problems associated with these techniques, and then describes a nonsurgical method devised to effect restraint of head movements in an experiment on visual-motor coordination.

Surgical techniques have been described for restraining an awake monkey's head while electrical activity is recorded from the brain (Sheatz, 1961), while the animal is engaged in performing trained movements of the forelimbs in a prism-adaptation study (Bossom, 1964), and while single-unit activity is recorded from Ss engaged in performing trained movements of the wrists (Evarts, 1968a, b). Hobson (1972) described a similar method for restraining cats during single-unit recording. All of these techniques require drilling keyhole-shaped slots through the calvarium, passing stainless steel screws head down through the slots, attaching the screws to the skull with lock washers and nuts, and further securing the screws in the slots with dental cement. Metal plates are then fastened to the exposed shafts of the implanted screws and, when restriction of head movements is desired, the plates are secured with rigid couplings to appropriate fixed points (e.g., to the frame of the apparatus in which S is seated).

There are several problems associated with restraining the head by means of screws implanted in the skull: (1) Implementation of the technique requires the capability for surgery not available in many laboratories. (2) The surgery and anesthesia required place the animal at a risk which, though minor, may be more than is desired for animals made especially valuable by either long training or successful recovery from life-endangering procedures. (3) The possibility of infection renders long-range studies questionable.

A number of techniques were examined before arriving at an acceptable alternative to surgical restraint of head movement in rhesus monkeys. First, a variety of rigid, tight-fitting helmets, to which screws could be affixed, were developed. It was felt that in this manner the problems of securing screws directly into the skull would be circumvented. Individual helmets were made out of thermoplastic neoprene (Johnson & Johnson).

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Fig. 1. Schematic representation of head-restraint apparatus.

which, after heating, can be molded directly on the head; plaster of paris; or a room-temperature vulcanizing silicone compound (General Electric GP-2X). The latter was cast from a wax positive obtained from a moulage (Douglas & Sturgess Plastico) impression taken directly from the animal. However, these devices did not successfully achieve head immobilization, since the loose skin of the monkey, which easily shifts over the bony surfaces of the skull, permitted movement of the head within these helmets.

Another approach was to tightly apply physical restraints directly to the head. The apparatus is schematized in Fig. 1. It was attached to the top of a standard primate chair by means of a rectangular Plexiglas baseplate (30 x 15 x 0.9 cm). Two steel rods ($\frac{1}{2}$ in. in diam) were employed in exerting pressure on either side of the head to the zygomaticofacial (temple) region. The ends of the rods were padded by applying adhesive tape over a $\frac{1}{4}$ -in. layer of sponge rubber

Fig. 2. Monkey with padded helmet in head-restraint apparatus.

sheeting. A curved neoprene plate, which could be moved along a U-shaped slot in the baseplate, effected restraint at the back of the neck and head. A lens holder, designed for use in prism-adaptation experiments in this laboratory and also depicted in Fig. 1, could be placed in front of S's eyes by securing it to the two vertical supports which bore the restraint rods. This device rested on the bridge of S's nose and served to provide additional aid in preventing movement. All rods in the apparatus were connected and secured with Flexaframe fittings.

This apparatus was effective in obviating virtually all head movement. However, serious problems arose when behavioral responding was required. The animals were severely emotionalized and would not perform responses that had been well trained. These problems were resolved and a workable solution was achieved by introducing a soft helmet to serve as a buffer and to spread the pressure from the tight-fitting rods (see Fig. 2). This helmet was made for each S in the following fashion: The S was sedated (phencyclidine hydrochloride, 1.3 mg/kg, IM), and his head and neck were wrapped with two layers of cotton (Johnson & Johnson 9052 cast padding), leaving the eyes, nose, mouth, and lower jaw free. This padding was then completely covered with 6-in.-long strips of 1-in.-wide adhesive tape. Care was taken to firmly apply the adhesive strips to get the best possible conformation to the skull and, thus, a tight helmet. In most cases, the helmet could be worn for 3 to 4 weeks without replacement.

The head-restraint apparatus, in conjunction with the soft helmet, proved to be an appropriate alternative to surgical restraint. The equipment is easy to construct, requires no special machining, and uses components that are inexpensive and readily available. In addition, the monkeys adjust to it well. In experiments currently underway in this laboratory, the technique has been employed in over 50 consecutive 1- to 2½-h daily sessions for each of seven animals. Performance on the experimental task, which requires pointing at visual targets, has not been affected, and food reinforcements are readily accepted.

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