position responses would be the same as the easily mastered parallel string problem. Recently, however, Fife & Kamback (1970) report data that shows best performance on patterns similar to Patterns 3, 6, 9 and pseudocross in comparison with Patterns 4 and 8. As these patterns were presented randomly, it is highly probable that the animals learned to make a position response rather than responding to the string patterns. From the present data, it can be argued that the learned position response is not the sole explanation of the patterned string problem performance. It may be suggested that the performance could also be in part a function of the animals' visual acuity in that they have difficulty on the more complex patterns that they are attempting to trace visually.

The relationship between visual acuity and performance on patterned string problems by infrahuman primates

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Data from previous visual acuity studies on the chimpanzee, cebus, rhesus, and squirrel monkeys were compared to data from patterned string performance by these species. The hypothesis that visual acuity may be a component in the performance of patterned string problems by infrahuman primates was suggested.

Finch (1941) suggested a correlation within the primate order between level of cortical development and performance on patterned string tests. Using Harlow & Settlage's (1934) Series II patterns, Finch reported that the chimp was superior to the monkey on all problems.

The experimental literature has not, however, discussed the possible relationship between infrahuman primates' visual acuity and performance on string problems. The purpose of this report was to examine the association between the performance on patterned string problems and the visual acuity data.

METHOD

Data relating to visual acuity and to performance on patterned string problems were available for the cebus monkey, the squirrel monkey, the rhesus monkey, and the chimpanzee. The acuity data for all four species have been summarized by Woodburne (1965) and were based on the method

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of minimal separate lines. The performance data on the patterned string problems for the chimpanzee was from Finch (1941), for the cebus and rhesus monkeys from Harlow & Settlage (1934), and for the squirrel monkey from Harris & Meyer (1971). All the various investigations used Harlow & Settlage's Series II and presented the patterns in the same systematic sequence.

RESULTS AND DISCUSSION

In his discussion of visual acuity among infrahuman primates, Woodburne reported the acuity of the chimpanzee as .57 min of visual angle, the rhesus as .67 min, the squirrel monkey as .87 min, and the cebus as .95 min of visual angle. The comparative performance of the four species on the patterned string problems was ranked and is given in Table 1, with the rank of 1 associated with the lowest percent of error and 4, the highest.

Kendall coefficient of concordance W (Siegel, 1956) was computed, using

Table 1
The Rankings of Species on Individual String Patterns and Visual Acuity

Pattern	Chimpanzee	Rhesus	Saimiri	Cebus
1	1	2	3	4
2 /	1	2	3	4
3 J	1	2	3	4
4 X	1	2	3	4
5 H	1	2	3	4
6 <	1	3	2	4
7 <	1	3	4	2
8 *	1	2	4	3
9 *	1	3	2	4
10 H	1	2	3	4
Acuity	1	2	3	4

species acuity scores as one set of rankings and the rank performance on the 10 patterns as the other. This measure of association was used in order that the four species could be compared simultaneously. The obtained coefficient of concordance was found to be significant ($W = .83$, $p < .05$). While there are certain hazards in comparing data derived from various studies, the obtained high and significant coefficient firmly suggests an association between performance and acuity.

Comparing the acuity rankings for the various species on each pattern resulted in significant Spearman coefficients (Siegel, 1956) for Patterns 1, 2, 3, 4, 5, and 10 ($r_s = 1.00$, $p < .05$). For all other patterns, the coefficients were not statistically significant: Patterns 6, 8, and 9 ($r_s = .80$, $p > .05$) and Pattern 7 ($r_s = .40$, $p > .05$). From Table 1, it can be observed that all significant relationships occurred with the noncrossed or single-crossed patterns. When the patterns resulted in more than single cross, the relationships, while positive, are not statistically significant. While the visual acuity hypothesis does not account for all the performance on the various string pattern problems, it is apparent that visual acuity is one factor that does play a major role in the performance of infrahumans on these tasks.

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