Development of preference for differentially complex patterns by infant monkeys[1]

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Rhesus monkeys, reared in isolation, were exposed to differentially complex visual patterns from Day 5 through 39 after birth. Duration of visual and manual exploration served as a measure of stimulus preference. As the infant monkeys matured a gradual change in preference from simpler to more complex stimuli was observed. Compared with human infant behavior these data extend the phylogenetic generality of stimulus complexity as an important motivational variable in behavioral development, and reinforce the assumption that stimulus preferences proceed from simpler to more complex input as a function of age.

The response of human infants to visual complexity appears to follow a developmental course. Hershenson (1964) demonstrated that newly born infants prefer checkerboard stimuli of lower complexity. Fantz (1961) showed that stimuli of greater complexity are preferred as the human infant matures. A study by Brennan et al (1966), revealing changes in preference from simpler to more complex patterns by 3, 8, and 14 week old infants, also suggests a developmental interpretation. The present study tests the hypothesis that preferences in infant rhesus monkeys will shift from simpler to more complex visual input as a function of age.

Method

Four male and four female monkeys (*Macaca mulatta*) were placed individually into isolation environments within 12 hr. of birth. Three walls of the 24 x 28 x 28 in. wire cages, the ceiling, and the area below the wire floor were covered by Masonite or aluminum panels. The back wall contained a rear projection screen. This arrangement blocked all visual access to the environment outside of the constantly lighted cage. The Ss never saw another monkey, and saw no humans after a hand-feeding period during the first 5-9 days of life. Sound was not controlled.

Beginning on Day 5 each of the six visual stimuli shown at the top of Fig. 1 were projected on the screen for successive 2-min. periods. In each test session the order of the six stimuli was randomized. Each S received the six-stimulus series on at least two out of every five days until Day 40 after birth. The stimuli in Fig. 1 are arranged in increasing complexity from homogeneous black and white, to stripes, large checks, bull's eye, and small checks. Complexity is defined by the number of brightness changes per unit area. All stimuli were projected from 2 x 2 slides having an intermediate grey background.

The behavior of the Ss was observed through a one-way vision screen in one wall of the cage. The measure of stimulus preference was the duration, during each 2-min. stimulus exposure, of visual stimulus orientation and manual stimulus exploration. A single observer collected all data in the experiment. Interobserver reliabilities for these exploration measures between three observers in a pilot experiment ranged from .87 to .93.

Results

The mean visual and manual exploration time per 2-min. test, averaged in blocks of five days from Day 5 through 39, was employed in the data analysis. Analysis of variance revealed significant effects of stimuli and age blocks (both $p < .001$). When averaged over all age blocks the data revealed greater exploration of more complex over less complex patterns, and of less complex patterns over homogeneous stimuli. The mean exploration times per 2-min. test were black = 6.9 sec., white = 11.8, stripes = 22.2, large check = 28.4, bull's eye = 33.3, and small check = 32.3. Mean exploration time averaged

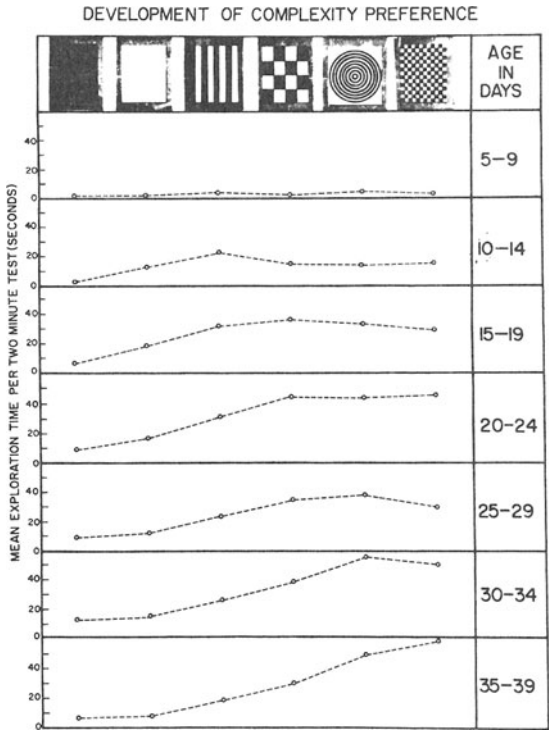

Fig. 1. The stimulus x age block interaction illustrating change in preference from simpler to more complex visual stimuli as the rhesus monkey Ss matured. The stimuli are shown in increasing complexity from homogeneous black and white to small check.

over all stimuli generally increased over the first four age blocks, the means being 2.4, 13.3, 25.8, 31.3, 23.6, 32.5, and 28.3 sec. for blocks 1-7.

The stimulus by age block interaction, shown in Fig. 1, was also significant ($p < .001$). During the first age block there was little responding by the immature Ss who slept during most of the test time. In the second block seven out of eight Ss explored white more than black. Also in block 2 the striped pattern received more exploration time than any other stimulus from seven out of eight Ss. By the third block, patterns were clearly explored more than homogeneous stimuli. On Days 16-25 the three most complex patterns had the highest exploration times. On the final two age blocks all eight Ss had their maximum exploration times for either the bull's eye or the small check stimulus.

Discussion

These data are in agreement with the results for human infants presented by Brennan et al (1966). In their study preferences of human infants changed from simpler to more complex stimuli, as did those of the rhesus monkey infants in this study. Taken together these researches support the hypothesis of change in choice behavior from simplicity to complexity with increased maturation, and extend the phylogenetic generality of stimulus complexity as an important motivational variable in behavioral development.

The results also support a theoretical analysis of the development of free choice behavior presented by Sackett (1965). It was hypothesized that commerce with differentially complex stimuli would lead to changes in preference to stimuli that are somewhat, but not too much, more complex than stimuli maximally preferred on previous occasions. This hypothesis leads to the prediction that preferences will gradually change upward along the complexity scale, rather than changing by sudden shifts from low to maximal complexity levels. The infant monkeys in this study did show a gradual change toward increasing complexity. All eight Ss maximally explored the striped or large check stimuli in at least one age block before preferences occurred for the bull's eye or large check patterns.

References

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