Acquisition and Transfer of Visual Go/No-go Discrimination by a Chimpanzee

MASAKI TOMONAGA and HIROHIKO OHTA
Osaka University

ABSTRACT. An adolescent female chimpanzee was trained to press a key in the presence of a computer-graphic geometric figure ("Go" stimulus) within 5 sec and not to press the key during 5-sec presentations of another figure ("No-go" stimulus) with food reinforcement. In the acquisition training, the accuracy of performance increased primarily as a result of learning to inhibit key presses in No-go trials. The chimpanzee acquired this "Go/No-go" visual discrimination task in 1,260 trials. She was then given 14 successive transfer problems. The results for these problems suggested that learning-set formation and repeated use of the same discriminative stimuli both influenced transfer to new problems.

Key Words: Go/No-go discrimination; Acquisition; Transfer; Learning-set formation; Repeated use of stimuli; Chimpanzee.

INTRODUCTION

Chimpanzees have frequently been used in experimental studies on complex learning and behavior because of their learning abilities and their close phyletic relation to man. Ape-language studies (ASANO et al., 1982; GARDNER & GARDNER, 1969; MATSUZAWA, 1985a, b; PREMACK, 1976; RUMBAUGH, 1977; TERRACE, 1979) are among the best known studies of such complex behavior. However, relatively few investigations have been concerned with the acquisition and transfer of simple discriminations, for example, learning-set formation (HAYES et al., 1953), serial discrimination-reversal (SCHUSTERMAN, 1962), and matching-to-sample (NISSEN et al., 1948; Murofushi, 1980). It is especially important to examine the chimpanzee’s matching-to-sample behavior because this procedure is vital in training chimpanzees to "name" objects in ape-language experiments.

Matching-to-sample involves two types of discrimination: one is the discrimination of samples presented successively, and the other is the discrimination of comparison stimuli presented simultaneously (CARTER & WERNER, 1978). Simultaneous discrimination in the chimpanzee has long been a subject of study (McCulloch & NISSEN, 1937; NISSEN & MCCULLOCH, 1937a, b), but successive discrimination has received little attention. In the present experiments, an adolescent female chimpanzee was given a visual Go/No-go discrimination problem, a successive discrimination task. To evaluate the transfer of such a discrimination task, she was also given 14 other discrimination problems.

Two factors appear to have an important influence on the transfer of discrimination. One is learning-set formation (HARLOW, 1949), and the other is the facilitation or interference of discrimination by the repeated use of a limited set of discriminative stimuli such as those
employed in studies on serial discrimination-reversal (e.g. Schusterman, 1962). The experiments reported here examined the effects of both these factors on the transfer of a visual discrimination.

METHODS

SUBJECT

A 7-year-old female chimpanzee (*Pan troglodytes*) served as the subject. She had been raised in the home cage, 180 × 265 × 290 cm in size, at the laboratory of the Department of Biological Anthropology and Human Ecology, Faculty of Human Sciences, Osaka University, for six years. Her health was periodically checked by a veterinarian. Although she had no experience as a subject in any formal psychological experiments, she had served in research on bipedal walking which was shaped and maintained with food reinforcement. She was maintained at her free-feeding weight during the experiments.

APPARATUS

The one-key panel measured 70 × 80 × 60 cm. The front panel had three lamps, 10 cm below the top, each 5 × 5 cm in size, and separated 12.5 cm horizontally from each other. In the present experiments, only the center lamp was used. This lamp indicated whether the response was correct or incorrect. The response key (2.5 × 2.5 cm) was mounted at a position 14.5 cm below the center lamp. A transparent Plexiglas window, 7.5 cm below the response key, 20 × 25 cm in size, was placed in front of a 14-inch computer monitor (Fujitsu MB27333, 640 × 400 dots) on which the stimuli could be presented. The food tray (8.5 × 14 cm) was mounted at the right bottom of the front panel. Cookies for human infants (1 cm in diameter) served as reinforcers. A self-made computer-controlled feeder delivered the cookies into the food tray.

This apparatus was attached 30 cm in front of the subject's home cage during each session. A microcomputer (Fujitsu FM-77L4) controlled all experimental events. A video system was employed to monitor the behavior of the subject during the experiments.

STIMULI

Six visual computer-graphic stimuli were used (Fig. 1). These white forms on a black background will be referred to here by the following names: Circle, Square, Dot, Block, Horizontal, and Oblique.

By pairing two stimuli, 15 problems were prepared (see Table 1). Since each stimulus was utilized five times, the number of times each stimulus was used as the "Go" stimulus and as the "No-go" stimulus was counterbalanced. The problem designated as Circle (Go stimulus)/Horizontal (No-go stimulus) was employed in acquisition training, and the other 14 problems served as transfer problems.

PROCEDURES

A discrete-trial Go/No-go discrimination task was used. A key press in the presence of the