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BRIEF REPORT

Temporal Effects of Mirror-Image Stimulation on Pecking and Peeping in Isolate, Pair- and Group-Reared Domestic Chicks

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The pecking and peeping behavior of isolate, pair- and group-reared chicks tested singly with and without mirrors were studied during 2-hr tests. Results supported the hypothesis that the social facilitation of pecking is disrupted by test novelty (discrepancy between testing and rearing conditions). Mirror exposure resulted in the greatest enhancement of pecking and least peeping in pair-reared chicks and in more moderate pecking increases and more peeping in group-reared chicks. Isolates initially avoided mirrors but after an hour peeped less and showed a social facilitation of pecking.

Social stimulation provided by chicks, mirrors, or models enhances the pecking of socially reared chicks (e.g., Tolman, 1964, 1965; Hogan and Abel, 1971). Findings with isolation-reared chicks are conflicting, social facilitation being found during long tests (e.g., 8 hr—Tolman, 1964) but not brief ones (e.g., 5 min—Brown and Kiely, 1974). It appears that novelty induces behavior incompatible with social facilitation and that during testing the isolates' unfamiliarity with social stimuli delays or precludes facilitation (Tolman, 1964; Brown and Kiely, 1974).

The temporal effects of visual social stimulation (mirror-image stimulation or MIS, Gallup, 1968) on pecking and peeping in isolate, pair-, and group-reared chicks 10 to 14 days after hatching were investigated in 2-hr tests, which were expected to permit a determination of the temporal onset of social facilitation among isolates. Novelty varies as a function of the discrepancy between rearing and test conditions, and the novelty hypothesis predicted that (1) isolates would peck less and peep more during initial exposure to a mirror than during the initial phase of no-

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mirror-tests and would peck more and peep less in the presence of a mirror as a function of time; (2) and pair-reared chicks would show the most pecking and least peeping in front of a mirror, because compared to other groups the rearing–testing discrepancy would be least for pair-reared chicks during mirror-tests, and would peck and peep at moderate levels during no-mirror-tests; and (3) group-reared chicks would show pecking and peeping levels intermediate to those of isolates and pair-reared chicks in the presence of a mirror and would peck at low rates and peep at high rates when tested alone without a mirror.

Eggs were incubated in a forced draft incubator for 18 days, at which time they were transferred to individual compartments in Western Curfew incubators. From within a few hours of hatching, chicks were reared in visual isolation (I), in pairs (P), or in groups (G) of six chicks (N in each condition = 12) in 36 × 30 × 16-cm plastic cages with *ad lib.* chick chow and water in containers at one end. Heat lamps were used continuously until 6 days after hatching, after which a 10- to 12-hr photoperiod of natural and artificial light was maintained.

On test days chicks were removed from rearing cages and placed singly into identical test cages in another room; 30 min later testing began, when a 16 × 15-cm mirror was placed directly behind the food container for half of the chicks; 24 hr later chicks that had been tested with the mirror were tested without it and vice versa. The frequency of (1) food pecks, (2) nonfood pecks (outside the container), (3) peeps, and (4) time spent on the food side of the cage were scored. Data collected during a series of 1-min periods, beginning at the start of testing, then after each 5-min interval for 30 min, and then after each 10 min for the next 30 min and after each 30 min for the next hour, yielded 12 min of recording per chick per test. Data were combined into four intervals of three 1-min periods from (1) 0 to 11 min, (2) 15 to 26 min, (3) 30 to 51 min, and (4) 60 to 121 min and were analyzed with three-way analyses of variance [rearing × (test × time × Ss)].

Chicks tended to peck more with time during mirror-tests, though not during no-mirror-tests (Fig. 1). The test × time interaction was significant for total pecks ($F = 3.35$, 3/99, $P < 0.05$) and approached significance for food pecks ($F = 2.59$, $df = 3/99$, $P < 0.10$). In the presence of a mirror, pair-reared chicks pecked most and peeped least, whereas group-reared chicks showed moderate increases in pecking and peeped more; isolates showed reduced peeping and a social enhancement of pecking during the second hr of mirror exposure as compared to no-mirror-tests ($t = 2.03$, $df = 11$, $P < 0.05$). As an apparent result of the isolates' increased pecking during the second hour, neither the rearing effect nor the rearing × time interaction was significant for total pecks or food pecks. Isolates needed about an hour of exposure before the reflection enhanced pecking, implying that social facilitation is unlikely to be found among isolates in brief

tests. In such tests they have been consistently found to peck more when tested alone than when tested socially (e.g., May and Dorr, 1968; Wilson, 1968; Brown and Kiely, 1974; cf. Tolman, 1965; Zajonc *et al.*, 1975).

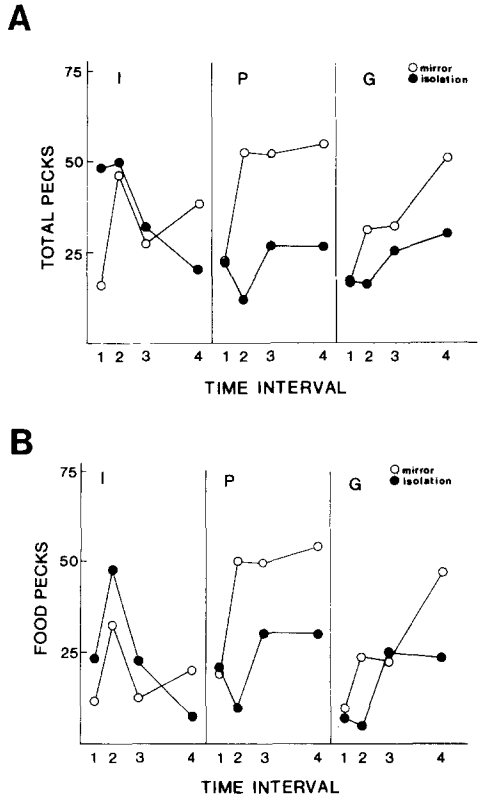

FIG. 1. Mean number of (A) total pecks and (B) food pecks of isolate, pair- and group-reared chicks during four (3-min) periods of 2 hr of mirror- and no-mirror-tests.

Mirror-image stimulation attracted chicks. All groups spent significantly more time on the food (mirror) side of the cage during mirror-tests than during no-mirror-tests ($F = 15.22$, $df = 1/33$, $P < 0.01$; Fig. 2). For socially reared chicks reflections apparently represented familiar (imprinted) stimuli that induced approach and maintenance of proximity (Hoffman, 1975). Isolates were attracted later, avoiding the mirror side of the cage during the first 30 min (Fig. 2). Such initial avoidance (or failure to approach) social stimuli by isolates could account for previous experimental failures to find facilitation effects during brief tests. Because precocial chicks tend to react more fearfully to novel stimuli with increasing age (e.g., Hoffman, 1975), age also influences the social responsive-

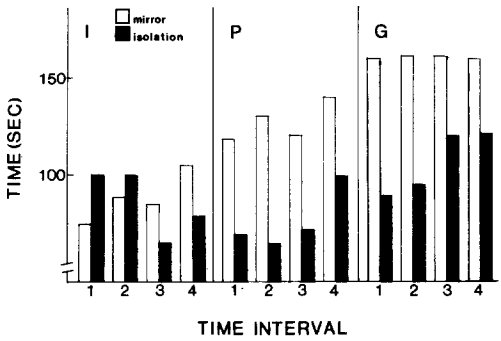

FIG. 2. Mean time (sec) spent on the food side of the test cage by isolate, pair- and group-reared chicks during four (3-min) periods of 2 hr of mirror- and no-mirror-tests.

ness of isolates. The present findings are probably generalizable to fowl from a few days to a few months of age [see Zajonc *et al.* (1975) for findings with younger chicks].

Isolates have been found to social peck frequently during brief tests, and it has been suggested that social (exploratory) pecking may compete with food pecking, accounting for failures to find facilitation in isolates (Zajonc *et al.*, 1975; Rajecki *et al.*, 1977). This suggestion cannot account for the ineffectiveness of MIS during the first hour of exposure, because isolates made the fewest nonfood (exploratory) pecks during the early phase of testing, and they increased both food pecking and exploratory pecking after an hour (Fig. 1).

In the present study negative associations between pecking and peeping were striking. Peeping levels were greater for group-reared than pair-reared chicks (cf. Hogan and Abel, 1971; Gaioni *et al.*, 1977), and the greater attractiveness of MIS for group-reared chicks concurs with this (Fig. 2). Yet MIS was not as effective in producing social facilitation for group-reared chicks as it was for pair-reared chicks, but since mirror-tests were most similar to pair-rearing conditions, these results follow from the predictions generated from the novelty hypothesis outlined above. Isolates peeped more during MIS exposure than pair-reared chicks in isolation, although not as much as group-reared chicks tested alone (Fig. 3).

Isolates and group-reared chicks peeped progressively less during a test, while pair-reared chicks peeped at constant low rates (Fig. 3). Isolates, as predicted and as previously demonstrated by Kaufman and Hinde (1961), peeped more when in the presence of a mirror than when not, while socialy reared chicks showed opposite tendencies (Fig. 3). The effects of rearing ($F = 5.01$, $df = 2/33$, $P < 0.01$) and time ($F = 4.40$, $df = 3/99$, $P < 0.05$) and the rearing × test interaction ($F = 10.90$, $df = 2/33$, $P < 0.01$) were all significant. Separation from familiar stimuli or novel stimulation induces peeping in precocial chicks of many species (Mon-

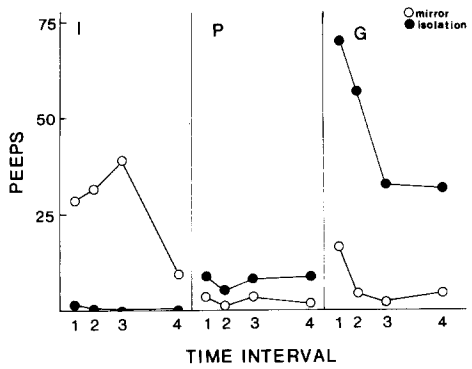

FIG. 3. Mean number of peeps given by isolate, pair- and group-reared chicks during four (3-min) periods of 2 hr mirror and no-mirror tests.

tevecchi, Gallup and Dunlap, 1973). It is concluded that developmental histories influenced the pecking and peeping behavior of chicks tested singly and with MIS in ways consistent with expectations based on the hypothesis that novelty induces behavior incompatible with social facilitation. Social facilitation effects among isolates can be explained in this context.

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