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Key area versus number of keys in the pigeon's preference for free choice over forced choice: A preliminary study

Area de la tecla versus número de teclas en la preferencia del pichón por elección libre sobre elección forzada: Un estudio preliminar[1]

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ABSTRACT

Concurrent-chain schedules have demonstrated the pigeon's preference for two keys (free choice) over one key (forced choice), even with the two-key and one-key conditions equated on the basis of time per reinforcer, responses per reinforcer, and other variables. This study shows that the preference occurs with the conditions equated in terms of area available for pecking. Thus, the preference is based upon the availability of two response classes (operants) and not on the opportunity for more variable responding.

DESCRIPTORS: free choice, forced choice, preference, concurrent-chain schedule, key area, number of keys, pigeon.

RESUMEN

Los programas concurrentes encadenados han demostrado la preferencia del pichón por dos teclas (elección libre) sobre una tecla (elección forzada), aún cuando se igualan las condiciones de una y de dos teclas en cuanto al tiempo por reforzador, respuestas por reforzador, y otras variables. Este estudio demuestra que la preferencia ocurre cuando las condiciones son iguales en términos del área disponible para picotear. De esta manera, la preferencia está basada en la disponibilidad de dos clases de respuesta (operantes) y no en la oportunidad para respuestas más variables.

DESCRIPTORES: elección libre, elección forzada, preferencia, programa concurrente encadenado, área de la tecla, número de teclas, pichón.

Previous research has demonstrated the pigeon's preference for free choice over forced choice (Catania, 1975, 1980; Catania & Sagvolden, 1980). The

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free-choice condition consisted of two lit pigeon keys; at the end of a fixed-interval (Ferster & Skinner, 1957), the first peck on either key produced a food reinforcer. The forced-choice condition consisted of one lit pigeon key; at the end of the fixed interval, the first peck on this single key produced a food reinforcer. These two conditions were arranged as the terminal links of concurrent-chain schedules (Herrnstein, 1964). The initial links were two concurrent variable-interval schedules that operated independently on two other keys: pecks on one occasionally produced the free-choice terminal link whereas those on the other occasionally produced the forced-choice choice terminal link. Preference was determined on the basic of changes in relative rates of pecking the initial-link keys as a function of which of them respectively produced the free-choice and force-choice terminal links.

Free-choice was consistently preferred to forced choice, but in a later experiment that varied the number of free-choice keys from two to four (Catania, 1980, Figures 12 and 13), the magnitude of preference did not vary as a function of the number of keys. The difference between one key and more than one key is sufficient to produce the preference, without regard to the number by which one key is exceeded. An implication is that the total area available for pecking is not a critical dimension upon which the preference is based. The present experiment examines the role of area more directly, by arranging terminal links in which large keys are pitted against small keys or in which one large key is pitted against two small keys of equal total area.

METHOD

Subjects and apparatus

Three adult male pigeons, one a White Carneau (Pigeon 10) with a history in concurrent-chain procedures and the other two Silver Kings (Pigeons 81 and 88) with histories in other types of schedules, were maintained at about 80% of free-feeding weights. They served in the apparatus described in Catania (1975): the six-key chamber included a top row of four standard pigeon keys that could be lit red or green and a bottom row of two keys that could be lit white. Aluminum masks were used in some conditions to reduce the keys from their standard 2.0-cm diameter to about 1.4-cm diameter. When reduced in size in this way, the sum of the areas of two keys roughly equalled the area of a key that had not been masked.

Procedure

The details of procedure were similar to those described in earlier research (Catania & Sagvolden, 1980). Left terminal links were arranged either on the

single extreme left top key (forced choice) or on the two leftmost top keys (free choice); these keys were lit red when operable. Right terminal links were arranged either on the single extreme right top key (forced choice) or on the two rightmost top keys (free choice); these keys were lit green when operable. In terminal links, a 15-sec fixed-interval (FI 15-sec) schedule operated for the first peck on the single lit key in force choice or on either of the two lit keys in free choice. This peck produced a 3-sec food delivery followed by reinstatement of the initial links.

During initial links, both bottom keys were lit white. Independent 30-sec variable-interval (VI 30-sec) schedules operated concurrently for these keys, the left bottom key occasionally producing left terminal links and the right occasionally producing right terminal links. All pecks including those after a changeover from one initial-link key to the other were eligible to produce terminal links as scheduled. After either VI schedule made a terminal link available, that schedule stopped operating until the terminal link was produced and completed. Neither VI schedule operated during terminal links or reinforcer deliveries.

Daily sessions consisted of 30 min to 45 min of initial links, adjusted so that each pigeon received as much as possible of its daily food ration within the concurrent-chain procedures. After a series of exploratory procedures, simple free-choice versus forced-choice comparisons, and baseline conditions with forced choice of standard-size keys in each terminal link, the right forced-choice key was masked to reduce it in size. In blocks of five to seven sessions, the mask was switched to the left key, the right key, and again to the left key. Other conditions intervened, and the successive conditions of free-choice versus forced-choice were arranged, also in blocks of five to seven sessions each. The forced-choice key was always of standard size. The successive conditions were free choice in the right terminal link, first with reduced-size keys and then with standard-size keys, followed by free choice in the left terminal link, first with standard-size keys and then with reduced-size keys.

RESULTS

The findings are summarized in Figure 1. The successive conditions are shown schematically from top to bottom along the y-axis. The x-axis is a scale arranged so that shifts in preference toward the left terminal link or toward the right terminal link are shown respectively as shifts of the data respectively to the left or to the right. The measure, relative initial-link responding, is calculated as left initial-link pecks divided by total (left plus right) initial-link pecks. Thus, this measure increases as relative left pecks increase, and decreases as they decrease; in the coordinates of Figure 1, x-axis values increase from right to left, and a separate scale is provided for each pigeon.

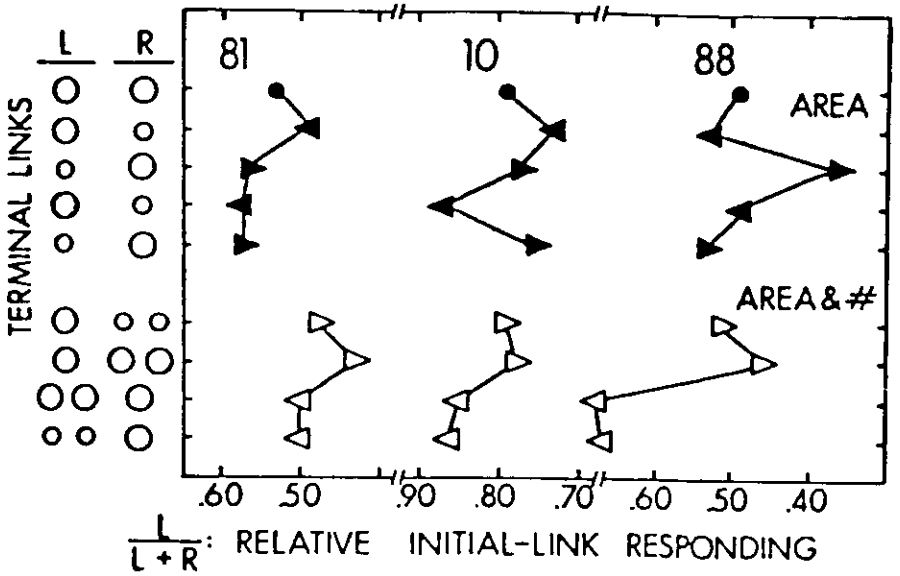

Fig. 1. Effects of key area and key number on preferences of three pigeons within a concurrent-chain procedure. Details in text.

Each point is a plot of the mean relative initial-link rate over the last three sessions of a condition. The filled symbols show data from the procedure in which key area was varied with forced choice in both terminal links. The circles provide baseline data, and the triangles in the subsequent four conditions point in the direction corresponding to the larger key area. Preference for larger keys would be demonstrated by preference shifts that consistently followed the directions in which the arrows pointed, and those for smaller keys by shifts that were consistently opposite to those directions. The preferences were unsystematic. For Pigeon 81, they shifted in accordance with small-key preference in the first two comparisons, but were thereafter virtually unaffected by key size. Pigeon 10 began with a preference corresponding to the early preference of Pigeon 81, but over the last three conditions the data were consistent with large-key preference. Pigeon 88 began with data consistent with large-key preference over the first three conditions, but a slight opposite preference emerged in the final condition. Thus, although some of the preference shifts were large in magnitude, they did not demonstrate either a consistent large-key preference or a consistent small-key preference.

Pigeon 10 showed a substantial position bias toward left terminal links, as shown by its relative initial-link rates, which ranged from about .75 almost to .90 during the present study. When these relative rates approached .90, this pigeon was losing up to 15%of the total reinforcers that it could

have earned in a session (in other words, 30% of the reinforcers that would have been scheduled for the right key if each right terminal link had been produced promptly after it was made available). Nevertheless, its preferences, superimposed on this bias, were in general comparable to those of other pigeons in these and other procedures.

The unfilled triangles show data from the free-choice versus forced-choice conditions. In these cases, the arrows point in the direction of free choice. In the first two conditions, the change from small to standard keys in the right free-choice terminal link produced an increase in preference for the right terminal link for all three pigeons. When free choice was moved to the left, however, preference shifted to the left for all three pigeons and remained so shifted in the final condition when the left free-choice keys were reduced in size. The shift in preference for Pigeon 81 was small, but the direction of preference was consistente across the three pigeons and was comparable in magnitude to free-choice preferences obtained in earlier studies (Catania, 1980, Table III) Thus, key area alone did not produce systematic preferences, but free choice did so even with key areas equated.

DISCUSSION

The findings have implications for the definition of behavioral units. What counts as a choice is not the opportunity for more variable pecking that is provided either by a larger key or by two keys, but rather the availability of two classes of responses, or two operants (Skinner, 1938), each of which is defined by its relation to a discriminative stimulus and a consequence (in this instance, the light behind a given key, and the food delivery sometimes produced by a peck on that key). These implications justify a more detailed study of the effects of key area, including a more extensive sequence of reversals, controls for position of the free-choice and forced-choice keys, and explorations of other aspects of the area parameter. For example, forced-choice keys in the present study were always located at the two outermost ends of the top row of four keys, and never at the middle two locations; this variable was not found to be important in the earlier research, but it does not follow that it cannot operate in other concurrent-chain procedures. The present experiments equated two small free-choice keys to the area of a standard forced-choice key, but it would also be appropriate to present a larger forced-choice key the area of which matched that of two standard free-choice keys, on the possibility that preference might vary as a nonlinear function of key area, Furthermore, given that pigeons sometimes peck around the edges of keys, key perimeter or some other dimension of the key might be more relevant than that of area. These various considerations indicate why the present results are considered preliminary; additional research is planned and in progress.

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