

CONCURRENT PERFORMANCES: A BASELINE FOR THE STUDY OF REINFORCEMENT MAGNITUDE¹

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When a pigeon's pecking on a single key was reinforced by a variable-interval (VI) schedule of reinforcement, the rate of pecking was insensitive to changes in the duration of reinforcement from 3 to 6 sec. When, however, the pigeon's pecking on each of two keys was concurrently reinforced by two independent VI schedules, one for each key, the rate of pecking was directly proportional to the duration of reinforcement.

A major problem in the investigation of the effect of duration or magnitude of reinforcement on performance is that, frequently, the effect is either small or transient. In a study by Jenkins and Clayton (1949), for example, the key-pecking of pigeons was reinforced on a variable-interval (VI) schedule of reinforcement, with a reinforcement duration of either 2 or 5 sec. Only a slight effect of duration, evident primarily on a statistical basis rather than in the data for each pigeon, was demonstrated. Another study, by Keesey and Kling (1961), also using VI reinforcement for the key-pecking of pigeons, demonstrated large differences in the rate of pecking with varying magnitudes of reinforcement, but only during the first few minutes of individual sessions or immediately following a change of procedure. The present experiment compares the effect of magnitude of reinforcement on the performance of pigeons in a single-key procedure with that in a two-key, or concurrent, procedure, and suggests the concurrent performance as an appropriate baseline for the study of the effects of magnitude of reinforcement on maintained performances.

METHOD

Subjects and Apparatus

Three adult, male, White Carneaux pigeons, maintained at about 80% of free-feed-

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ing body-weight, served in daily, 1-hr sessions in an experimental chamber similar to that described in a previous paper (Catania, 1962). Two translucent response-keys were mounted on one wall of the chamber and were illuminated from behind by yellow light. Centered below the keys was a standard pigeon feeder, which could make grain available for brief periods of time.

Procedure

Pecks on a given key were reinforced with grain 2 min, on the average, after a preceding reinforcement for a peck on that key, but the interval varied from one reinforcement to the next (VI 2-min). Reinforcement was programmed either on a single key or, by two independent VI schedules, on two keys (concurrent VI 2-min VI 2-min). When the single key was used, the other (that on the right) was covered with tape. The sequence of reinforcement durations with each procedure and the number of sessions for each are summarized in Table 1.

Table 1
Reinforcement durations (in seconds) in the single-key and in the concurrent procedures.

VI 2-min		Concurrent VI 2-min VI 2-min		
SINGLE KEY	Sessions	LEFT KEY	RIGHT KEY	Sessions
4.5	10	4.5	4.5	16
6.0	13	6.0	3.0	12
3.0	13	3.0	6.0	14
4.5	13	4.5	4.5	13

During the two-key procedure, a change-over delay (COD: Herrnstein, 1961) of 2 sec was in effect. Reinforcement could not occur

for 2 sec following each changeover from one key to the other. This delay separated in time a response on one key and reinforcement for a subsequent response on the other, and therefore prevented responding on one key from coming under the partial control of the reinforcement schedule for the other.

RESULTS

The open circles in Fig. 1 show, for each of the three pigeons, the rates of pecking on the single key. The rates are averages over the last three sessions with each duration. A change in duration from 3.0 to 6.0 sec had no systematic effect on the rate of key-pecking. Evidence that the change in duration did, however, change the magnitude of reinforcement (the amount of grain eaten) was that, for each pigeon, the gains in weight during each session were largest when reinforcement was 6 sec and smallest when reinforcement was 3 sec.

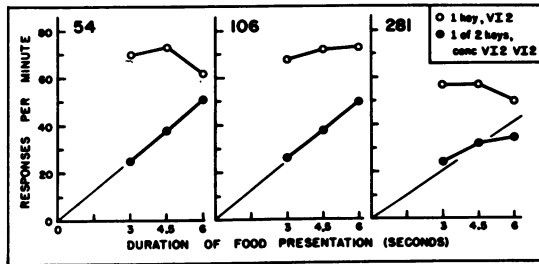


Fig. 1. The rate of responding, for three pigeons, maintained by three reinforcement durations. The open circles show responding on a single key; the closed show responding on one of two keys.

The closed circles in Fig. 1 show the rate of pecking on a key as a function of reinforcement duration in the concurrent procedure. For ease of presentation, the rate has been averaged across the two keys for each duration. With the concurrent procedure, response rate was linearly related to reinforcement duration. The exception, for Pigeon 281, may have been because this pigeon was performing, during

most of the sessions represented in the figure, with an injured wing.

DISCUSSION

The linear relationship between response rate and reinforcement duration is similar to that which holds between response rate and reinforcement rate (Herrnstein, 1961). For both reinforcement duration and reinforcement rate, the linear relationship depends in part upon interaction between the reinforcement schedules on the two keys. In the present data, this is reflected by the fact that the rate of pecking on one of two keys was consistently lower than the rate of pecking, maintained by the same schedule and reinforcement duration, on a single key. A quantitative account of these interactions has been suggested in a recent paper (Catania, 1963).

The present results point up the concurrent procedure as a useful tool, which permits the study of variables that are apparently without effect for the single key. Also, in showing that variables that seem irrelevant for the single key may have large effects when responding is reinforced concurrently on each of two keys, the results dictate careful control of experimental conditions for this procedure.

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LECTURA 2: EJECUCIONES CONCURRENTES: LINEA BASE PARA EL ESTUDIO DE LA MAGNITUD DEL REFORZAMIENTO (por A. C. Catania) ²

INTRODUCCIÓN

MÉTODO

Sujetos y aparatos

A tres pichones machos blancos, de cepa Carneaux, adultos, se les mantuvo aproximadamente al 80 % de su peso *ad libitum* y se les sometió a sesiones diarias de una hora en una cámara experimental... En una de las paredes de la cámara se montaron dos teclas de respuesta translúcidas, las cuales se iluminaban desde su parte posterior con una luz amarilla. En el centro y por debajo de las teclas se encontraba un alimentador estándar para pichones, que servía para administrar el grano durante períodos breves.

Procedimiento

Los picotazos a una de las teclas se reforzaban con grano cada dos minutos, en promedio, después del reforzamiento precedente que se daba por un picotazo de esta tecla; no obstante, el intervalo variaba de un reforzamiento al siguiente (IV 2 min.). El reforzamiento se programaba ya fuera respecto de una sola tecla o mediante dos programas de IV independientes, respecto de dos teclas (concurrente IV 2 min.-IV 2 min.). Cuando se usaba una sola tecla, la otra (situada a la derecha) se cubría con una cinta adhesiva. En la Tabla 2 se resume la secuencia de las duraciones de reforzamiento relativas a cada procedimiento así como el número de sesiones para cada una de ellas.

Durante el procedimiento de dos teclas, estuvo en funcionamiento un Retraso Sobre el Cambio (RSC) de dos segundos. El reforzamiento no podía darse hasta dos segundos después de cada cambio de una tecla a otra.

² Artículo original publicado en *Journal of the Experimental Analysis of Behavior*, 1963, 6, 299-300. Traducido al castellano en A. C. Catania, *Investigación contemporánea en conducta operante*, Mexico: Trillas, 1970.

IV 2 MIN		CONCURRENTE IV 2 MIN IV 2 MIN		
Tecla única	Sesiones	Tecla izquierda	Tecla derecha	Sesiones
4.5	10	4.5	4.5	16
6.0	13	6.0	3.0	12
3.0	13	3.0	6.0	14
4.5	13	4.5	4.5	13

Tabla 2.—Duraciones del reforzamiento (en segundos) relativas a los procedimientos de una sola tecla y concurrente.

Esta demora separaba, temporalmente, la respuesta dada sobre una tecla del reforzamiento de una respuesta subsecuente sobre la otra tecla, impidiendo así que el responder ante una de éstas cayera bajo el control parcial del programa de reforzamiento relativo a la otra.

RESULTADOS

Los círculos blancos de la Figura 2 muestran las tasas de picoteo sobre una sola tecla, correspondientes a cada uno de los tres pichones. Cada tasa

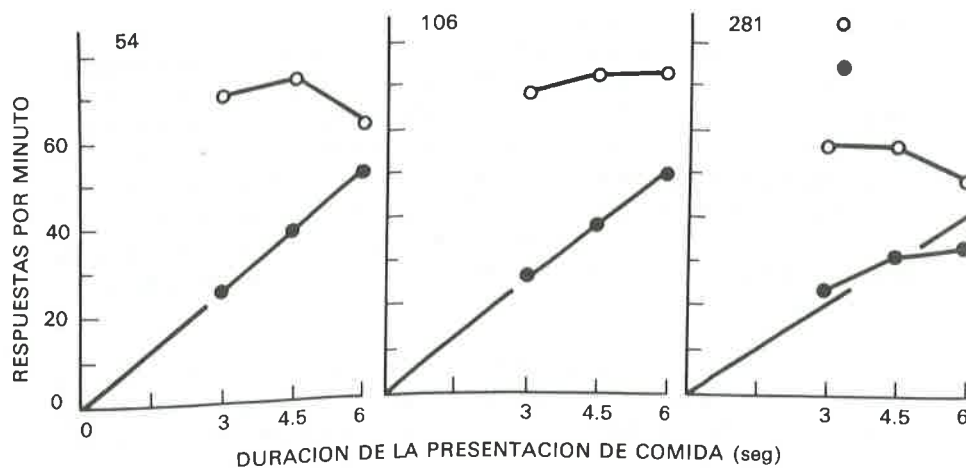


Figura 2.—Tasas de respuesta correspondientes a tres pichones mantenidos bajo tres duraciones de reforzamiento diferentes. Los círculos muestran las respuestas ante una tecla sola; los puntos, las respuestas ante una de las dos teclas.

es un promedio de las últimas tres sesiones relativas a cada duración. Los cambios de duración de 3.0 a 6.0 segundos no tuvieron efectos sistemáticos en la tasa de picotear la tecla. Una prueba de que el cambio en la duración modificó, sin embargo, la magnitud del reforzamiento (cantidad de grano digerida) consistió en que, para cada pichón, los aumentos de tiempo durante cada sesión fueron mayores cuando el reforzamiento era de 6 segundos y menores cuando éste era de tres.

Los círculos negros de la Figura 2 representan la tasa de picoteo a una tecla en función de la duración del reforzamiento, relativa al procedimiento concurrente. Para hacer más clara la exposición de los datos se promediaron las tasas correspondientes a las dos teclas respecto de cada duración. En cuanto al procedimiento concurrente, la tasa de respuestas estuvo directamente relacionada con la duración del reforzamiento. La excepción, respecto de la paloma 281, tal vez se haya debido a que, durante la mayoría de las sesiones que se representan en la figura, el pichón estuvo herido en un ala.

DISCUSIÓN