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This Week's Citation Classic™

Anger D. The dependence of interresponse times upon the relative reinforcement of different interresponse times. *J. Exp. Psychol.* **52**:145-61, 1956.
[Harvard University, Cambridge, MA]

Rats adjusted the time between their responses (interresponse times, IRTs) according to the relative reinforcement of different IRTs. Clear adjustment occurred when only certain IRTs were reinforced, and further evidence indicated adjustment was occurring during interval schedules, which favor reinforcement of certain IRTs. [The *Science Citation Index*® (*SCI*®) and the *Social Sciences Citation Index*® (*SSCI*®) indicate that this paper has been cited in over 245 publications since 1956]

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"When a response of an animal is reinforced with food on a ratio schedule, the animal responds at a higher rate than it does on an interval schedule. (Ratio schedules require a number of responses between reinforced responses; interval schedules require a time interval between.) My 1956 paper sought to clarify how a rat detects that subtle difference. Skinner[1] had mentioned that ratio schedules reinforce high response rates more than interval ones, and animals might discriminate that difference. One test of that possibility is to reinforce only certain response rates, or only certain interresponse times (IRTs), and measure whether rats change their response appropriately. (The term 'IRTs' was introduced in 1956.) Experiments in 1948 during my first semester as a Harvard University graduate student found that selective reinforcement of responses ending long IRTs slowed responses, even when slowing increased reinforcement frequency. After a diversion, I returned to this problem for a dissertation that became the 1956 paper. Further experiments confirmed the response adjustment to long-IRT reinforcement. They also showed that interval schedules quickly change behavior from an initial state with equal probability of different IRTs to unequal probabilities that roughly reflect the relative reinforcement of different IRTs by the schedule. Since interval schedules reinforce short IRTs less than ratio schedules, adjustment could be responsible for the lower response with interval schedules.

"The paper's citation frequency has probably been somewhat due to its theoretical significance: the demonstration that reinforcements can decrease as well as increase response, the suggestion of an inhibitory process, and evidence for IRT reinforcement mediating schedule effects. For a while, the paper stimulated investigations of IRT reinforcement effects with schedules, but the results were disappointing. No simple precise relation emerged, although a rough relation was found. As a result, other theories are dominant now and IRT analysis receives little attention. In my opinion, the evidence still indicates that differences in IRT reinforcement are an important source of the behavior differences controlled by schedules, but the relation is complex. The several different processes operating with schedules need clarification before the role of IRT reinforcement can be well defined.

"However, many more citations seem to have resulted from wide use of long-IRT reinforcement as a baseline for study of other factors: other treatment variables, drugs, physiological changes, etc. The procedure easily and reliably produces stable behavior whose sensitivity to variables is quite different from that of other common procedures. My paper has been a convenient initial one to reference for the procedure and its basic features. Though unexpected, that usefulness apparently did result from the attempt to show an unusual slowing or inhibitory effect of reinforcements. The 1956 study was published with no trouble; in contrast, a recent investigation[2] of a related problem encountered stiff resistance."

1. **Skinner B F.** *The behavior of organisms: an experimental analysis.* New York: Appleton-Century, 1938. 457 p.
2. **Anger D.** Reinforcement of inhibition. *J. Exp. Anal. Behav.* **39**:213-26, 1983.