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Short Notes

Employee Reactions to Continuous and Variable Ratio Reinforcement Schedules Involving a Monetary Incentive

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Employee performance and reactions to a monetary incentive administered on continuous and variable ratio four (VR-4) schedules of reinforcement were examined. Consistent with operant theory, the performance of mountain beaver trappers (N = 12) was higher on the VR-4 reinforcement schedule. The trappers were interviewed to determine what they viewed as differentiating the two schedules of reinforcement. Based on the interviews, a questionnaire was developed and administered to the trappers. The results of the questionnaire indicated that the VR-4 schedule was perceived as including job enrichment variables such as recognition, task variety, task accomplishment, and feedback whereas this was less likely to be the case when the incentive was paid on a continuous schedule.

The purpose of this study was threefold. First, employee reactions to continuous and variable ratio (VR) schedules of reinforcement were examined. Unless one knows why and/or how a reinforcement schedule works, it can be difficult, if not impossible, to predict accurately when it will work, or even that it will work under certain circumstances.

Second, performance on a continuous and a variable ratio reinforcement schedule was compared. To date, findings in the organizational literature have yielded mixed results. Yukl, Wexley, and Seymore (1972), in an organizational simulation, found that performance was greater on a VR schedule than on a continuous schedule. In a similar laboratory study, Berger, Cummings, and Heneman (1975) replicated the findings of Yukl et al. regarding the rank ordering of means for their incentive conditions. However, the difference in performance between the VR-2 condition and the continuous reinforcement condition was only marginally significant based on planned comparisons (Yukl & Latham, 1975).

In two field studies (Yukl & Latham, 1975; Yukl, Latham, & Pursell, 1976), no significant difference was found between performance on the two schedules. However, administrative problems precluded an adequate comparison.

In a third field study, Latham and Dossett (1978) compared continuous and VR-4 schedules of reinforcement with unionized trappers. It was found, consistent with animal laboratory studies on learning, that inexperienced employees performed better on the continuous reinforcement schedule and experienced employees performed better on the variable ratio schedule.

A third purpose of this study was to address an issue stressed by Hinrichs (1978), namely, that successful organizational interventions appear to be discarded by the organization over time. The investigation reported by Latham and Dossett was started in 1976. The intervention is ongoing in 1982. The present study shows the effectiveness of the program in 1980 when data were collected to allow a systematic evaluation and comparison between the two reinforcement schedules.

Method

Subjects

Twelve mountain beaver trappers who worked for a forest products company in southwestern Washington participated in this study. A mountain beaver is a large nocturnal rodent that eats newly planted tree seedlings causing thousands of dollars of loss to the woods products industry in the northwestern United States.

All the trappers were males with a high school

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education. All were members of a strong international union. The trappers' ages ranged from 21 to 40.

Procedure

Prior to the implementation of the study, the entire procedure was explained to the union. An agreement was made between the company and the union that the study was experimental in nature, it would not become an issue for negotiations (e.g., regarding the amount of money paid per rodent), and management or the union could terminate the study at any time, for any reason. This step has been repeated each year since 1976.

The trappers were paid $7 per hour prior to this study and continued to receive their hourly wage after the incentive program was initiated. This is a $2 hourly pay increase over what they were paid when Latham and Dossett (1978) conducted their study. The magnitude of the incentive has remained constant.

Baseline measures on number of rodents caught per hour were taken for four consecutive weeks prior to the implementation of the incentive program. Following this, the trappers were randomly divided into two groups. These two groups then alternated, on a weekly basis, on a continuous or a VR-4 schedule of reinforcement. This continued for a total of 12 weeks, which was the entire trapping season. When a trapper was on the continuous schedule of reinforcement, he received $1 for every rodent he caught. Alternatively, when a trapper was on the VR-4 schedule, he received $4 contingent on the response chain of presenting a rodent to the supervisor and correctly predicting twice whether the roll of a dice would yield an even or an odd number (one chance out of four). The dice rolling procedure was implemented in place of the marble drawing technique used by Latham and Dossett (1978). This was done because it had been determined that the trappers were able to distinguish which marble they were drawing by subtle size differences and/or the warmth of the marble from being held after previous drawings.

During the trapping season, one-on-one open-ended interviews were conducted with the trappers by the senior author. Each trapper was asked (a) what, if anything, about the incentive program motivated him to trap more rodents, (b) if he believed either schedule of reinforcement was effective, and (c) why a schedule was effective or ineffective. The interviews revealed that there were a number of items the trappers stated as differentiating the two schedules. Based on this information, a questionnaire was developed and administered in an attempt to understand the differences, if any, between the employees' cognitive reactions to the two reinforcement schedules.

The questionnaire contained 33 items identified in the interviews. These items described outcomes such as: takes the dullness out of my work, generates a lot of excitement, leads to getting attention from others when I do well, leads to friendly bragging, and gives me a feeling of accomplishment.

Each employee completed the questionnaire on the job site at the end of the trapping season. A trapper rated each outcome on the degree to which he felt the continuous schedule led to the outcome and the degree to which the VR-4 schedule led to the outcome. Each trapper also rated how important each outcome was to him. All ratings were made on a 5-point Likert-type scale.

Results

Performance

With regard to overall performance, the number of rodents trapped per hour increased significantly (premeasure $M = .52$, $SD = .08$) after the reinforcement program had been implemented ($M = .93$, $SD = .14$), $t(11) = 12.2$, $p < .05$. Performance on the continuous schedule ($M = .78$, $SD = .20$) was 50% greater than performance during the premeasure, whereas the VR-4 schedule ($M = 1.08$, $SD = .23$) resulted in a performance increase of 108%. It was found that performance was significantly higher on the VR-4 schedule than on the continuous schedule of reinforcement, $t(11) = 3.15$, $p < .05$.

Questionnaire

In examining employee reactions to the two schedules of reinforcement, the questionnaire findings should be viewed as at best descriptive. This is because the employment situation was very specialized, and the sample size was small.

It was found that the sum of the products of each of the 33 outcome ratings and their importance rating was significantly higher for the VR-4 schedule ($M = 567$, $SD = 175$) than for the continuous schedule of reinforcement ($M = 475$, $SD = 198$; sign test, $N = 12$, $p < .04$). In other words, the trappers rated the variable ratio schedule as more likely than the continuous schedule to lead to the 33 outcomes on the questionnaire. The internal consistencies (Cronbach's alpha) for the VR-4 and continuous outcome ratings were .98 and .99, respectively.

All 33 items on the questionnaire appeared to describe such things as task accomplishment, recognition, significance, feedback, variety, and

meaningfulness—variables described as motivators by job enrichment theorists (e.g., Herzberg, 1968; Hackman & Lawler, 1971). In order to determine whether personnel specialists would agree with our conclusion that the 33 outcomes rated higher for the VR-4 schedule of reinforcement were in fact job enrichment motivator variables, the questionnaire was expanded to include 47 additional randomly placed items that, according to the literature, do *not* describe job enrichment motivator variables. These items were developed by the authors and described such things as working conditions, pay, company policy, and job security—items that Herzberg (1968) stated were not motivator variables.

Each of the 80 items (33 original, 47 added) was then rated as either a job enrichment motivator variable (1) or not (0) by two personnel representatives from the company where this study was conducted. These individuals were familiar with job enrichment theory, but were not aware of which items had been included on the trapper questionnaire.

It was found that the 33 outcomes on the trapper questionnaire were in fact rated by the personnel representatives as more likely to be job enrichment motivator variables than the 47 items hypothesized as not being so ($M = .89$, $SD = .21$; $M = .13$, $SD = .27$, respectively), $t(78) = 14.5$, $p < .001$. There was significant agreement ($r = .64$, $p < .001$) between the two personnel representatives in their ratings.

Discussion

The major finding of this study was that there were variables viewed by the trappers as differentiating the VR-4 schedule from the continuous schedule of reinforcement. These items, which appear to be job enrichment motivator variables, may assist in explaining the employee reactions that differentiated the VR-4 schedule from the continuous schedule. Moreover, these aspects may explain why performance was higher on the variable ratio schedule of reinforcement.

A remaining question is why the variable schedule was viewed as having these aspects when the continuous schedule was not. Although questions like this could become infinitely regressive, it would appear that the gambling strategy for implementing a variable ratio schedule may create its own unique effects. However, since the present study did not systematically control for this factor, support for or an understanding of this hypothesis cannot be tested. However, the hypothesis can be advanced that job enrichment variables may reinforce behavior as effectively as money when administered on a VR-4 schedule (Blood, 1978). This hypothesis needs to be tested using larger samples from different populations.

The second finding of this research is that it replicates the work by Latham and Dossett (1978). Performance is higher on a variable ratio reinforcement schedule than on a continuous schedule. This finding is consistent with learning studies conducted with animals (Ferster & Skinner, 1957).

Third, the present study documents the fact that a systematic organizational intervention that was initiated in 1976 is not only ongoing at the present time, but is also effective.

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