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Research Notes

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# Rewards, Task Difficulty, and Intrinsic Motivation: A Test of Learned Industriousness Theory

The use of incentives in educational settings as a way to increase student motivation and performance is an issue that has generated a great deal of debate. Some researchers argue that rewards are harmful (Deci, Koestner, & Ryan, 1999; Kohn, 1993). The concern is that if a student is rewarded for performing an activity, the student will come to spend less time on the task, perform at a lower level, and enjoy the activity less once the rewards are no longer available. The claim is that rewards undermine students' intrinsic motivation. On the other side of the debate are researchers who argue that negative effects of rewards are limited and that when properly arranged, rewards can be used to enhance student motivation and performance (Cameron & Pierce, 2002; Dickinson, 1989; Flora & Flora, 1999).

Based on a meta-analytic review of 145 experiments on rewards and intrinsic motivation (Cameron, Banko, & Pierce, 2001) and on recent experiments on the topic (Eisenberger, Rhoades, & Cameron, 1999; Pierce, Cameron, Banko, & So, 2003), rewards have been found to produce negative effects when they signify failure or are loosely tied to performance. Positive effects are detected when the rewards are given for attaining specific performance standards. These findings suggest that rewards should be used in educational environments when students achieve set goals and standards. It is not clear, however, how rigorous the standards should be. The present experiment was designed to address this issue.

The purpose of this research was to examine how rewards affected motivation and performance when students were rewarded for succeeding at an easy task versus a moderately difficult task. The study was also designed to test Eisenberger's (1992) theory of learned industriousness. According to Eisenberger, individual differences in industriousness are learned. Learned industriousness theory is built on the concept of effort. From this perspective,

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industrious individuals are those who have in the past had to put high effort into activities in order to reap the benefits or rewards. When individuals are rewarded for expending a large amount of effort on an activity, learned industriousness theory proposes that the sensation of high effort acquires secondary reward properties, thereby increasing people's readiness to expend high effort on subsequent activities. In contrast, rewards given for low effort on a task condition produce sensations of low effort with secondary reward value and people spend little effort on later activities.

Based on learned industriousness theory, for the present study we predicted that students who were rewarded for succeeding at an easy task (low effort) would show reductions in performance and intrinsic motivation relative to a non-rewarded control group, whereas motivation and performance would increase for those who received rewards for succeeding at the moderately difficult task (high effort).

*Method*

As part of a more general design, the experiment reported here was a 2 x 2 factorial with two levels of reward (reward, no reward) and two levels of task difficulty (easy, difficult). Seventy-three undergraduate university students were randomly assigned to conditions and asked to work on three sets of five Find the Difference (FTD) problems that were programmed onto Macintosh computers. The object of the task was to find differences between two cartoons; for each problem there were six possible differences. This task has been used in earlier research and has been found to be interesting to university students (Eisenberger et al., 1999).

In a learning phase, participants in the low task difficulty condition were required to find two differences in each problem; those in the moderately high difficulty condition had to find four differences. In the reward conditions, participants were offered and given $2.00 for each set of five problems they successfully passed; the no reward groups were not offered or given money (they were paid $6.00, however, once the experiment was completed).

After the learning phase, participants were given a timed test made up of five new FTD problems; the test was followed by a free-choice period where they could continue to do more FTD problems or engage in alternative activities (e.g., reading magazines). No rewards were available during these phases. Performance on FTD during the test phase was measured as the number of correct solutions. Intrinsic motivation was measured during the free-choice period as time on FTD, free-choice performance (number correct on FTD puzzles), and self-reported task enjoyment (on a 7-point Likert scale).

*Results*

An ANOVA conducted on test performance indicated no main effects, but a significant interaction of reward by task difficulty, $F(1, 69)=4.8$, $p=.03$. Figure 1 portrays this interaction; participants rewarded for success on a moderately difficult task did better (more correct responses) on the test than those who were not rewarded. In contrast, participants rewarded for achievement on a task of low difficulty did worse on the test (fewer correct responses) than non-rewarded participants.

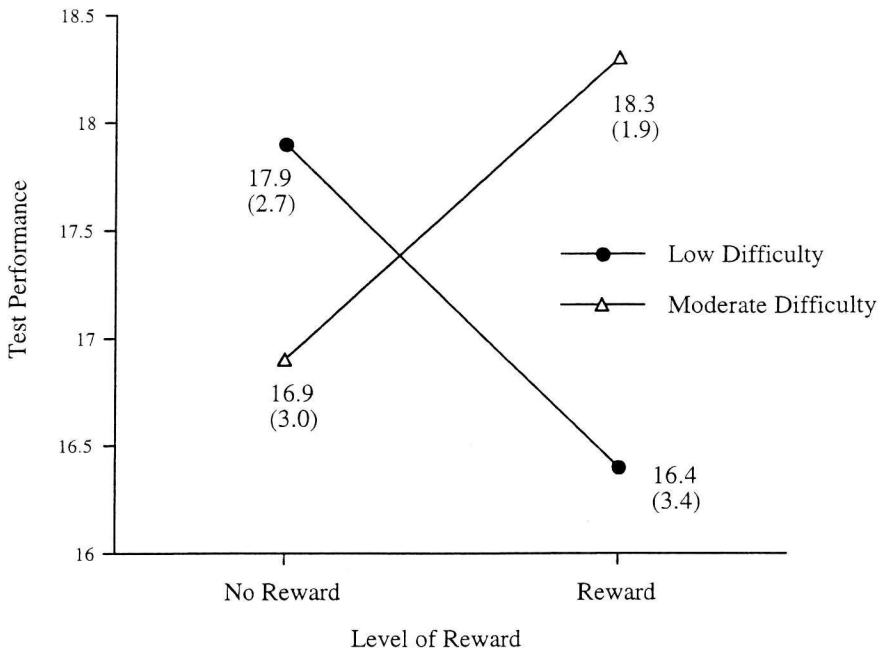


*Figure 1. The interaction effect of reward by task difficulty on test performance. Means and standard deviations (brackets) are shown for each condition.*

A MANOVA of the intrinsic motivation measure (free time on FTD, performance on FTD during the free-choice period, and task enjoyment) also detected a marginally significant interaction of reward by task difficulty, $F(3, 66)=2.51$, $p=.06$. The means for each of the variables that made up the intrinsic motivation measure are presented in Table 1, which shows that the means for performance on FTD during the free-choice period followed the same pattern as performance on the test. Among the moderately high difficulty groups, Table 1 shows that rewarded participants outperformed non-rewarded participants during the free-choice period. For the low difficulty groups, the non-rewarded participants outperformed the rewarded participants. Table 1 also indicates that participants rewarded on the low difficulty task spent less free time on FTD puzzles than non-rewarded controls, and that in the moderately difficult conditions, rewarded participants reported greater task enjoyment than those who did not receive a reward.

*Discussion*

The results indicate that performance on a test and intrinsic motivation increased when rewards were given for succeeding at a moderately difficult task. Rewards given for achievement on a task of low difficulty reduced performance and motivation. These findings are in accord with learned industriousness theory (Eisenberger, 1992). From this perspective, the more difficult task required high effort. The pairing of reward and high effort conditioned sensations of elevated effort with secondary reward value. Once sensations of high effort acquired reward value, participants rewarded for success on tasks of

Table 1
Means and Standard Deviations for Measures of Intrinsic Motivation (in Free-Choice Period) by Experimental Condition

| Condition | Free time on FTD | | Performance on FTD | | Task Enjoyment | |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| *Low Difficulty* | | | | | | |
| No reward (*N*=18) | 354.9 | 186.4 | 29.5 | 16.5 | 5.8 | .76 |
| Reward (*N*=18) | 351.1 | 194.1 | 25.8 | 15.2 | 5.8 | .83 |
| *Moderate Difficulty* | | | | | | |
| No reward (*N*=18) | 358.1 | 197.2 | 26.2 | 15.9 | 5.6 | .92 |
| Reward (*N*=18) | 356.6 | 194.1 | 29.6 | 20.1 | 6.1 | .76 |

Note. One participant (in the low difficulty, reward condition) did not fill in the task enjoyment questionnaire item and was omitted from the analysis. Means for the free-time measure are based on seconds (total possible = 480 sec.).

high difficulty generated these sensations by working hard on the task during the test and free-choice periods. On the other hand, the pairing of reward with low effort conditioned sensations of low effort with secondary reward value. Given this history, participants rewarded for achievement on tasks of low difficulty generated the valued sensations of low effort by doing little work on the task during the test and free-choice period.

Although the sample size in the present study was small and the power of the statistical tests was low, the results help to further our understanding of how rewards can be used most effectively in applied settings. It is important that our findings suggest that when rewards are tied to achieving a performance standard, performance and motivation will increase only when the standard is moderately difficult and challenging.

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*References*

Cameron, J., Banko, K.M., & Pierce, W.D. (2001). Pervasive negative effects of rewards on intrinsic motivation: The myth continues. *Behavior Analyst, 24*, 1-44.

Cameron, J., & Pierce, W.D. (2002). *Rewards and intrinsic motivation: Resolving the controversy*. Westport, CT: Bergin and Garvey, Greenwood.

Deci, E.L., Koestner, R., & Ryan, R.M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125*, 627-668.

Dickinson, A.M. (1989). The detrimental effects of extrinsic reinforcement on "intrinsic motivation." *Behavior Analyst, 12*, 1-15.

Eisenberger, R. (1992). Learned industriousness. *Psychological Review, 99*, 248-267.

Eisenberger, R., Rhoades, L., & Cameron, J. (1999). Does pay for performance increase or decrease self-determination and intrinsic motivation? *Journal of Personality and Social Psychology, 77*, 1026-1040.

Flora, S.R., & Flora, D.B. (1999). Effects of extrinsic reinforcement for reading during childhood on reported reading habits of college students. *Psychological Record, 49*, 3-14.

Kohn, A. (1993). *Punished by rewards*. Boston, MA: Houghton-Mifflin.

Pierce, W.D., Cameron, J., Banko, K.M., & So, S. (2003). Positive effects of rewards and performance standards on intrinsic motivation. *Psychological Record, 53*, 561-579.