THE EFFECTS OF
VERBAL AND MATERIAL REWARDS
AND PUNISHERS ON THE PERFORMANCE
OF IMPULSIVE AND REFLECTIVE
CHILDREN

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Impulsive and reflective children performed in a discrimination lear-- ning task which included four reinforcement conditions: verbal-reward, verbal-punishment, material-reward and material-punishment. The results revealed that verbal punishment resulted in the best scores and material punishment the poorest with the other two conditions falling between. Although impulsive children performed more poorly than reflectives in the reward condition, in the punishment condition the two groups of Ss scored equally well. In addition, impulsive Ss performed significantly better in the punishment than in the reward condition.

Kagan and his associates (Kagan, Rosman, Day, Albert and Phillips, 1964) have distinguished a dimension of cognitive style, reflectivity-impulsivity, which refers to a relatively consistent tendency for fast or slow decision times in situations of high uncertainty (Kagan, 1965 a,b,). The Matching Familiar Figures Test (MFF) is a measure of this dimension. On this test the impulsive child tends to respond quickly, reporting the first hypothesis that occurs to him and his response is often incorrect. The reflective child stops to consider alternatives before responding and thus has a higher likelihood of being correct. Typically, studies have reported that about 80% of subjects tested are either slow and correct or fast and wrong. The MFF then may be used to determine the conceptual tempo, reflective or impulsive child.

An area of research that has received relatively little atten- tion concerns the effects of reward and punishment with im- pulsive and reflective children. To the extent that impulsive and

reflective children have different cognitive attributes their responses to various reinforcers may also differ. Ward (1968) administered two forms of the MFF under conditions emphasizing correctness. The child was required to give only one response to each item. If he was correct he was given a marble, if he was incorrect he received no marble. Ward compared decision times for trials following success with those following failure. His results showed that all Ss chose more slowly after errors than after correct responses. Although he also found that more impulsives, as compared to reflectives, slowed down after making errors there was no concomitant improvement in accuracy of responding.

Massari and Schack (1972) studied the effects of different schedules of reinforcement with impulsive and reflective children. They suggested that negative consequences would lead to better performance for both groups of children since this condition should produce greater concern over response accuracy. To test this hypothesis they had their subjects participate in a marble dropping discrimination learning task. There were two schedules of social reinforcement: 70% positive, 30% negative and 70% negative and 30% positive. The results provided some support for their hypothesis. Ss in the high density negative reinforcement group chose the correct side more often than those in the high density positive condition. In addition, even though the reflective subjects performed better than the impulsives within each reinforcement condition the impulsive children in the negative condition performed as well as the reflectives in the positive condition.

Quite recently Hemry (1973) attempted to assess the effects of six reinforcement conditions on a discrimination learning task with impulsive and reflective children. Hemry looked at reward, punishment and a combination of reward plus punishment in both material and social modes. The social reinforcers and punishers were contingent verbal statements such as "right" and "wrong", while the material counterparts were, respectively, money and an aversive tone. The results revealed that performance in both of the reward conditions (right-blank and money-blank) was poorer than performance in the other conditions which did not differ from each other. In addition, impulsive Ss

performed more poorly than reflective Ss. However, there was no differential performance for reward and punishment based on cognitive style.

The present study also represents an attempt to compare the effects of reward, punishment and verbal and material reinforcement on the performance of impulsive and reflective children.

Method

Subjects — Out of an original sample of 119 grade three male children, and using performance on the MFF as the criterion, 48 reflective and 50 impulsive Ss were selected. For ease of analysis two Ss from the impulsive group, chosen at random, were dropped from the study. The Es were two young women.

Apparatus — The children's form of the MFF (Kagan et al, 1964) was used to measure reflection-impulsivity. This test consists of 12 standard pictures familiar to children, and 6 variants of each standard. The subject must point to that variant which is identical to the standard which remains in view. Both decision time and errors are recorded.

The experimental apparatus was adopted from Todd and Nakamura (1970). It consisted of a 9" x 6" x 3½" gray box with two holes in the top.   Another gray box without a top contained 100 red and 100 green marbles and a third gray box contained 100 red marbles. The task consisted of three successively more difficult discrimination problems. The total of scores across the three problems was the dependent measure. The first discrimination to be learned was a simple color alternation, that is, red marbles in the right hole and green marbles in the left. The second problem used only red marbles and involved position alternation. The third problem used red and green marbles and involved double alternation of position and color.

The criterion for learning each problem was eight consecutive correct responses. In order to prevent the experimental situation from becoming too long for the children a cut-off point of 40 trials was adopted for each problem.

Procedure — Each S was tested individually on the MFF to discover his standing on the reflection-impulsivity dimension.

Two scores were obtained for each S: a) the mean latency to the first response on each of the twelve test items, and b) the total number of errors on each item. The term "reflective" was applied to Ss who were above the median in response time and below the median in errors. Ss who were below the median on response time but above the median in number of errors were classified as "impulsive". Those Ss who were above or below the median on both variables were excluded. The mean response time for reflectives was 17.7 seconds and the mean number of errors was 8.7 errors. For impulsives the corresponding figures were 9.3 seconds and 16.8 errors. Equal numbers of impulsive and reflective Ss were then randomly placed into either the material-reward, material-punishment group, verbal-reward or verbal-punishment group. Each S participated in one condition only.

The S was seated in front of the apparatus while the E sat beside him giving directions. There were separate sets of instructions for each of the reinforcement conditions. Ss in the material-reward group were told that they were going to play three marble games. Each child was shown how to play the game and told that the object of the game was to see how quickly he could figure out how the marbles went into the holes. The experimenter told the child that he would give him a token every time he made a correct response and that at the end of the three games, depending on how many tokens he had collected, he would be able to trade them in for a toy. After the first incorrect response the experimenter explained that he had not given the child a token because he had put the marble in the wrong hole. One game followed immediately upon the termination of the other. Similar but shorter instructions were given for the other two games.

In the case of the material-punishment group it was explained to S that he would win a toy by cashing in tokens. He received a set number of tokens before the game started and had one token taken away for every incorrect response. When he made a correct response nothing was said, and when the first error was made the child was told why a token was to be taken away. At the end of the session, regardless of how many tokens remained each child was told that he had enough for a small toy and was allowed to choose one.

For the verbal-reward and verbal-punishment groups the Ss were given basically the same instructions but were told the experimenter would respond with "right" or "fine" when the S was responding correctly, or "not right" or "wrong" when S was responding incorrectly. No toys were offered as incentives in these conditions.

Results

A three way analysis of variance was conducted on the total of the scores across all three problems. The independent variables were Ss (impulsive and reflective), type of reinforcement (verbal and material) and valence of reinforcement (reward and punishment). A significant difference (F= 11.65, df = 1/94, p< .01) indicated that the overall performance for verbal reinforcement ($\bar{X}$ = 43.6) was superior to performance for material reinforcement ($\bar{X}$ = 55.9).

There was a significant valence x type of reinforcement interaction (F = 15.35, df = 1/46, p < .01) as depicted in Table 1. Duncan's Multiple Range Test revealed that performance in the verbal-punishment group was significantly superior to performance in the other three conditions (p < .05). In addition performance in the material-reward group was reliably better

Table 1

Mean Scores for Material and Verbal Reinforcement in
Reward and Punishment Groups

	Material	Verbal
Reward	50.4	52.2
Punishment	61.5	34.9

than performance in the material-punishment group (p < .05).

A significant Ss x valence interaction was also found (F = 5.19, df = 1/46, p < .05) and is presented in Table 2. Duncan's Multiple Range

Table 2

Mean Scores for Impulsive and Reflective Children
in the Reward and Punishment Groups

	Reward	Punishment
Impulsive	58.3	47.8
Reflective	44.3	49.5

Test revealed that in the reward conditions the performance of the impulsive Ss was significantly poorer than that of the reflective Ss ($p < .05$). Within the impulsive group punishment led to significantly better performance than reward ($p < .05$)

Discussion

In the present study punishment did not uniformly lead to faster learning than reward. The reliable reinforcement x valence interaction reveals that only in the verbal reinforcement condition did punishment lead to better performance than reward. The finding that verbal-punishment is more effective than reward replicates the results of several previous studies (Buss and Buss, 1956; Hemry, 1973; Meyer and Seidman, 1960, 1961). In the material reinforcement condition, on the other hand, punishment led to significantly poorer performance than reward. Hemry did not find this in his study. It is important to note, however, that Hemry used an aversive tone as a punisher whereas in the present study the removal of a token constituted the punishment. It may well be that the removal of a token is more distracting or disturbing than an aversive tone and thus would lead to poorer performance.

Impulsive Ss performed more poorly than reflective Ss in the reward condition but not in the punishment condition. In fact, impulsive Ss performed significantly better when punished than when rewarded. These findings might suggest that the use of reward as opposed to punishment is a more critical issue with impulsive children.

It will be recalled that Hemry did not find an interaction between cognitive style and reinforcement type and thus reports that the effectiveness of reinforcement conditions is not determined by the response style of a child. Again, it is possible that the procedural differences mentioned above lead to this discrepancy. The age of the Ss in the two studies also differed; Hemry's children were first graders whereas the children in the present study were third-graders. Unfortunately, it is impossible to compare the Ss in the two studies on the MFF scores used to classify them impulsive or reflective; it is conceivable that the degree of impulsivity and reflectivity of the Ss in the present study differed from those in Hemry's experiment. Hemry has emphasized the need for normative data to assist in the classification of children on this cognitive dimension.

The results of this study suggest that the effectiveness of reinforcement interventions may depend to some extent upon the cognitive style of the children being worked with as well as the type of reinforcements used. It is important to note that material reinforcement may not be as effective as verbal reinforcement in aiding the learning process. Because of the current popularity of token reinforcement programs it becomes particularly important to monitor closely the performance of individuals receiving material rewards. This continuous assessment would allow one to evaluate whether the reinforcement contingencies being used are optimal.

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