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The Effectiveness of the Presentation and Removal of Money as Reward and Punishment in a Paired-Associate-Constant Order Learning Task

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THE EFFECTIVENESS OF THE PRESENTATION AND REMOVAL OF MONEY AS REWARD AND PUNISHMENT IN A PAIRED-ASSOCIATE-CONSTANT ORDER LEARNING TASK

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The majority of experiments dealing with the relative effects of reward and punishment have been conducted on the subhuman level with electric shock as the usual form of punishment. The results of many of these experiments report undesirable side-effects such as fear and neurotic disturbances due to the punishing agent. From these reports punishment seems to have been pushed to the background as a rather inappropriate method of bringing about a change in behavior, especially in human beings. This attitude seems to have generalized from the strong types of punishment like shock to milder forms such as the removal of a reward or verbal cues as to the incorrectness of a particular response. In a survey of the literature these undesirable side-effects have not been found to accompany the milder forms of punishment.

The present research was generated from an earlier unpublished paper by this experimenter (Baughman, 1966). The original experiment was primarily designed to determine the effectiveness of poker chips as rewards and punishers in facilitating learning. It was found that punishment was ineffective. In fact it was found to be detrimental when used alone. When combined with reward, however, learning was facilitated even more than reward alone. Reward was defined as the presentation of poker chips for correct responses while punishment was defined as the removal of poker

chips for incorrect responses. A survey of the literature was conducted to determine what other investigators had found and it appears that the combination of reward with punishment has not been intensively studied.

One area of human learning where milder forms of punishment have been explored rather extensively is in experiments dealing with verbal praise and reproof. One of the early experiments of this type was done by Gilchrist (1916). In this experiment two groups of students were given a test, and later each group was given a retest. In the interval between the test and the retest one group was told that they did rather well on the first test and the other group was told that they had done quite poorly. The group that was told they had done well improved significantly while the "poor" group did less well. The results of this early experiment suggested that praise was superior to reproof. Judged by present day standards this experiment must be considered to be poorly designed. The group that was told they had done poorly would probably change answers (regardless of whether they were initially correct) while the group that was told they had done well would probably have to be much more positive before a change was made.

In another early experiment done by Gates & Rissland (1923) similar results were found except the differences between the rewarded and punished groups were not nearly as

large. In addition a control group was added and found to be inferior to both the rewarded and the punished group. Possibly the relatively smaller difference between groups in this case was that the task involved motor coordination and would not be affected by a change in response of the "poor" group as suggested in Gilchrist's experiment.

Hurlock (1925) also used praise, reproof, and control groups in which tests in addition were given each day for five days. Again the praised group was superior to the other groups and the control group did the least well. In this experiment, unlike the earlier ones discussed, alternate forms were used which could account for the improvement in the status of the reproof group.

Thorndike was probably the major contributor in this area beginning with his early work on animal intelligence (Thorndike, 1911). From these experiments he formulated the "Law of Effect" which in essence stated that a satisfier (reward) following a response will strengthen the connection making that event more likely to recur while an annoyer (punishment) following a response will weaken the connection so that when the situation recurs the response will be less likely to recur.

Thorndike held on to this viewpoint until the early 1930's when he pointed out that due to a large body of experimental evidence the punishment portion of his law of

effect could no longer be supported. He showed that while rewards stamped in connections, punishment did not necessarily weaken them and in fact often also strengthened them (Thorndike, 1932). A typical experiment was one in which the subject would be shown a long list of words and be required to associate a number from one to ten with each word on the list. On the first trial as the subject tried to guess the correct association he was either ignored, rewarded by the verbal statement "right" or punished by the verbal statement "wrong". On subsequent trials the subject was instructed to learn which numbers went with which words. On the test trial Thorndike found that subjects tended to repeat their "correct" responses. However, they were also found to repeat "incorrect" responses above chance level expectancies.

Thorndike's truncated "Law of Effect" represented his final viewpoint on the relative effects of reward and punishment. Later it became evident that the issue had not been resolved by the large body of research which has been generated dealing with the law of effect.

Tilton (1939) was one of the first to take issue with Thorndike's truncated law of effect. He reviewed the published evidence on multiple choice experiments with human subjects and pointed out that it is not justifiable to measure the effect of "right" and "wrong" from a baseline

of calculated chance repetition. He demonstrated that there was a natural tendency on the part of the subject to repeat the response given on the previous trial irrespective of any condition following the response. When allowance was made for this tendency to repeat a previous response, Tilton demonstrated that punishment ("wrong") had a definite weakening effect.

Forlano & Axelrod (1937) gave students the Woodworth-Wells Number Cancellation Test. When the test was completed each subject was called to the desk individually to receive a mark of poor or good according to prearranged conditions. This procedure was repeated using an alternate form of the test. Immediately following, a third form of the test was administered to measure the effects of repeated praise and blame. The use of alternate forms may have cancelled out the tendency to repeat a response mentioned by Tilton. When this procedure was used the "blame" group performed significantly better than any other group. Thompson & Hunnicutt (1944), in a follow up study extended the praise and blame sessions and concluded that praise and blame were equally effective as an incentive and were both significantly more effective than a no incentive (control) condition.

Postman (1947) in an extensive review of the law of effect agreed with Tilton that Thorndike may have used an improper baseline for the probability of a response. In addition, he pointed out that in most of Thorndike's

experiments the connections to be learned are purely arbitrary and that it would be obvious to the subject that being right or wrong could not possibly reflect on his intelligence. He pointed out that the announcement of right or wrong may be purely informative in nature. If this were the case then it would be natural for "rewards" to be superior to "punishment" because of the quantity of information provided. That is, while the announcement of "wrong" tells what not to do the next time, it gives the subject no information of what to do. In contrast, "right" gives specific information on what to do as well as what not to do. Ammons (1956) has pointed out that knowledge of results is an important variable in learning tasks. Dand (1946) gave support to this viewpoint. He equated the number of right and wrong alternatives and subsequently found that the announcement of "wrong" had a definite weakening effect.

Stone (1948) in a critique of Postman's review of the law of effect pointed out that Postman probably misinterpreted Thorndike in regard to the effectiveness of punishment in learning situations. He quotes many instances in The Psychology of Wants, Interests and Attitudes (Thorndike, 1935) where Thorndike realized the effectiveness of punishment in certain situations. Stone points out that Thorndike is explicit in stating that although punishment does not directly weaken a connection, it does induce some

variability of behavior and thus may lead indirectly to an alternative rewarded or successful response. Stone further points out that when this alternative is not present there is a preponderance of experimental evidence to show that punishment is not effective in eliminating behavior.

Estes (1944) argued that the effect of punishment, in animals at least, was to produce a diffuse, generalized emotional state, and it was primarily this state which caused an immobilizing effect upon behavior which competed with bar pressing. It should be noted, however, that the punishment referred to by Estes was electric shock which is the extreme type of punishment referred to earlier in this study. It has been pointed out that the findings from this form of punishment should not be generalized to the milder types under consideration in this paper.

In an introduction to an experiment done by Stevenson & Snyder (1960) it is stated that "A rather consistent finding has been that verbal approval results in more efficient learning and higher performance on intellectual tasks than verbal reproof or a neutral condition." The review of the literature does not fully support this generalization.

To recapitulate, it seems that a large number of variables may have an effect on the relative effectiveness of reward and punishment. If reward and punishment act primarily as knowledge of results then reward will naturally

be more effective because of its more informative nature. Another problem seems to be that while some experimenters are trying to determine why punishment might or might not suppress a response, others are only concerned if the response is or is not suppressed. For example, as pointed out by Stone (1948), Thorndike apparently dropped punishment from his law of effect because it did not directly weaken a connection. He left the impression that punishment was therefore relatively useless in learning tasks. But he did report that under certain conditions it might be used as an additional aid in bringing about a desired change in behavior. For this reason alone it would seem that punishment deserves a more central position in experimental research than it has received in the past. Another important variable which should be considered when interpreting results dealing with punishment is whether the punishment is of the more extreme type, such as electric shock, or those of the milder type such as the ones under consideration in the present research. It has also been demonstrated that many other variables might have an effect on the relative effectiveness of reward and punishment in a learning situation. For example both Forlano & Axelrod (1937) and Thompson & Hunnicutt (1944) found that reward and punishment had a differential effect on introverts and extroverts. In the Forlano & Axelrod experiment the

extroverted blame group did the best on the test followed by the introverted blame group. When extroverts were compared it was found that the blamed group performed the task significantly better than the praised group. The introverted praise group showed little increase over the control group. Thompson & Hunnicutt (1944) extended the number of times the subjects were praised or blamed and found that the extroverted blame group obtained significantly higher scores than either the extroverted praise or the introverted blame group. They also found that the introverted praise group obtained higher scores than the extroverted praise or the introverted blame groups. The most recent review on punishment was done by Solomon (1964). The importance of his summarizing remarks seem worthy of quotation as they point out precautions which should be taken by those concerned about the effects of punishment. Solomon states that:

> If there is one idea I would have you retain, it is this: Our laboratory knowledge of the effects of punishment on instrumental and emotional behavior is still rudimentary--much too rudimentary to make an intelligent choice among conflicting ideas about it. The polarized doctrines are probably inadequate and in error. The popularized Skinnerian position concerning the inadequacy of punishment in suppressing instrumental behavior is, if correct at all, only conditionally correct.

It is evident from the foregoing discussion that an all encompassing theory of punishment lies in the future.

Much more research is needed on the multitude of variables affecting the outcomes of punishment before these variables may be pulled together and a reliable theory formulated.

One variable that seems to have been almost completely ignored until recently is the effectiveness of combining reward and punishment for correct responses or incorrect responses in the same learning task. Silverman (1957) seems to have been one of the first to consider this combination effect. He found no significant differences between groups when punishment and reward were used separately or combined; but it is important to note that his was an observational study using rather vaguely defined criteria. Since either reward or punishment often produces results superior to control conditions it would seem reasonable to expect that in future studies under better control a combination of reward and punishment would show superior results to either condition presented alone. Sears, Maccoby & Levin in their Patterns in Child Rearing (1957) conclude, in part, that punishment may be effective if it is combined with positive reward for some alternative response.

One of the first experimental studies using this combination was conducted by Brackbill & O'Hara (1958) and they found that the children learned the problem faster

when punishment was combined with reward than when rewarded alone. They did not, however, include a punishment alone group. In a more recent study performed by Meyer & Crum (1966) involving college freshmen similar results were obtained. In a follow up study of Brackbill & O'Hara (1958) done by Penny & Lupton (1961) a punishment alone group was added and found to be superior to even the combined group. In this study, however, it must be noted that the punishment was of the more extreme kind (a loud noxious tone) which is not under consideration in this paper. In their experiment verbal rewards or punishers were not used. Punishment instead consisted of a loud noxious tone while reward consisted of a jelly bean for each correct response.

It would seem appropriate to use other than verbal praise and reproof in determining the relative effectiveness of reward and punishment and their combination. In an introduction to an experiment conducted by Miller & Estes (1961) it was pointed out that knowledge of results may provide a basic incentive level sufficient to mask small accretions of reward and punishment. When Miller & Estes tabulated their results it was found that there was no significant difference between the group receiving the one cent rewards and the group receiving the fifty cent rewards. In addition it was found that they both performed the task in an inferior manner to the control group. It

should be noted that the task was visual discrimination and the subjects consisted of third and fourth grade pupils. As has been pointed out earlier, it probably would not be a valid assumption to transfer the meaning of this experiment to dissimilar situations. Offenbach (1964) found that when children were given marbles for correct responses and had them taken away for incorrect responses, they performed better than a control group but the magnitude of reward made no significant difference. Again, however, the same argument of small accretions might be applied. Stevenson, Morton & Zigler (1959) used the presentation or removal of animal and flower stickers as rewards and punishments. They clearly demonstrate that the removal of the stickers which had previously been found to be rewarding had a punishing effect and the level of incorrect responses was significantly lowered. Although candy, marbles, or animal and flower stickers might have a significantly increased incentive value above knowledge of results in the case of young children, it would probably be inaccurate to transfer such meanings to college students. It would seem then that in the case of college students a rather universal incentive sufficient to rise above knowledge of results could be the addition or subtraction of money. Weiner & Walker (1966) supported this contention as they found that when college students were

given a five cent reward for retention on a paired associate learning task they performed significantly better than those receiving a one cent reward or no reward. Pihl (1966) also demonstrated the rewarding effects of money in the learning of nonsense syllables. They found that learning was facilitated as a function of the magnitude of the reward which was the use of one cent, two cents, five cents, and ten cents.

The present experiment regards reward as the presentation of money and punishment as the removal of money. This procedure is in accordance with the experiment conducted by Wyer & Love (1966) where subjects were rewarded for correct guesses by the presentation of a penny and punished by the removal of a penny for incorrect guesses.

Available apparatus precluded the use of random-order presentation of the paired-associate learning task. Therefore, the pairs were presented in a constant order. While random-order presentation has been considered to be the preferred method (English & English, 1958), it is not the defining method. The term paired-associates embraces a family of methods of presenting the learning task. Paired-associates may be presented in pairs in the recall method or the response term may follow the stimulus term in the anticipation method. The ordering of presentation may be either random or constant for both of these con-

ditions. The present research used the serial-anticipation, constant-order presentation. That this method is considered to be an acceptable variation of the paired-associate learning paradigm there would seem to be no doubt, for recent studies have re-opened the question of whether or not a random-ordering is the preferred method. It would seem that no certain statement can be made to the effect that random ordering is preferred--for either empirical or theoretical reasons--and certainly no statement can be made to the effect that random-ordering defines the paired-associate learning task.

For example, Battig, Brown, & Nelson (1963) conducted a series of experiments on paired associate learning comparing random-order and constant-order presentation using both the anticipation and the recall method. In the fourth experiment (a refinement of the earlier three) they found no significant differences among the total overall errors of any of the various combinations. Martin & Saltz (1963) conducted an experiment in which the random-order group were presented the paired-associates in a different order for a certain number of trials while the constant order group were presented the list in the same order. After a given number of trials both groups were tested. When no significant difference was found between groups they hypothesized that this might have been due to the

difficulty of the task. A second experiment was conducted to test this hypothesis and the results did not support it. Faced with these results they stated " . . . the present studies . . . indicate that serial position cues are not an important factor in learning paired associates in a constant order."

In summing up the studies they state:

> The most important conclusion from the present studies is that, contrary to previous belief, it is not necessarily true that serial presentation of S-R pairs will facilitate learning. Nor is it clear under what conditions such facilitation will occur.

A more recent experiment by Carluccio & Crowder (1966) also compared constant order with random order in paired-associate learning and as in the case of the earlier studies cited, failed to find a significant difference between the learning of the two groups.

This study then is primarly designed to determine what differential effect (if any) the presentation (or withdrawal) of money will have on a paired associate-constant order learning task. It is hypothesized that (a) all experimental groups will perform the learning task in less trials than the control group; (b) there will be no significant difference between the reward-only and the punishment-only groups; (c) the groups receiving both reward and punishment will perform the learning task in less trials than any other group; and (d) the groups receiving

the greater amounts of reward or punishment will perform the learning task in fewer trials than the groups receiving the lesser amount.

METHOD

Subjects

The subjects consisted of fifty-six volunteers taken from undergraduate psychology classes at Central Washington State College during the summer session of 1967.

Apparatus

The paired associate-constant order learning task was presented on a Lafayette memory drum. The Russian and English word pairs were as follows: NOGA-FOOT, RYBA-FISH, TJOTJA-AUNT, OSEN-FALL, GOLOVA-HEAD, and DOROGA-ROAD. A supply of nickels and pennies was available. There was a recording sheet to list the number of trials to criterion and the total number of errors for each subject.

Procedure

Subjects were randomly divided into seven groups of eight as follows: reward-only one-cent group (Group 1), reward-only five-cent group (Group 2), punishment-only one-cent group (Group 3), punishment-only five-cent group (Group 4), reward and punishment one-cent group (Group 5), reward and punishment five-cent group (Group 6), and the control group, no reward or punishment (Group 7).

The following instructions were given to all groups except the control group:

In this learning experiment you will be playing sort of a game. The idea of the game is to end up with as much money as possible. You will be allowed to keep whatever money you have at the end of the experiment. In front of you is what is known as a memory drum. On the drum is a list of six Russian and six English words. Each Russian word will be followed by an English word meaning the same thing. When you see the Russian word you are to try and tell me what the English word will be before it appears which will follow in about two seconds. I will first run through the list once and on the second time around try to tell me what the English word following the Russian word will be. Please keep trying until I tell you to stop.

In addition to the general instructions, specific instructions were given to members of the individual groups.

For Group 1: You will be given one penny for each word you get correctly. There is no penalty for guessing. Are there any questions?

For Group 2: You will be given one nickel for each word you get correctly. There is no penalty for guessing. Are there any questions?

For Group 3: In front of you are fifty pennies. For each incorrect response one penny will be taken away. There is no penalty for guessing. Are there any questions?

For Group 4: In front of you are fifty nickels. For each incorrect response one nickel will be taken away. There is no penalty for guessing. Are there any questions?

For Group 5: In front of you are twenty pennies. You will be given an additional penny for each word you get correctly and I will take one penny away for each incorrect response. There is no penalty for guessing. Are there any questions?

For Group 6: In front of you are twenty nickels. You will be given an additional nickel for each word you get correctly and I will take one nickel away for each incorrect response. There is no penalty for

guessing. Are there any questions?

For Group 7: This is an experiment in learning. In front of you is what is known as a memory drum. There is a list of six Russian words followed by six English words. I will first run through the list once and on the second time around try to tell me what the English word following the Russian word will be before it appears which follow in about two seconds. Please keep trying until I tell you to stop. If you are not sure, please guess. Are there any questions?

When there were no further questions the memory drum was turned on and the experimental session begun. Each Russian word received a two second exposure in which time the subject was to verbally respond as to what the following English word would be. Immediately following, the correct English word would appear and remain for two seconds until the next Russian appeared. This continued until all six pairs of words were shown at which time there was a four second pause before the list was repeated. This procedure was continued until the list was learned to criterion which was two times through without error. Money was presented and removed manually by the experimenter. The money was transferred between two small dishes, one in front of the experimenter and one in front of the subject.

RESULTS

A simple one-way analysis of variance was computed to determine a possible overall difference among experimental and control groups. A summary of the results is presented in Table 1.

Table 1

Analysis of Variance for all Groups

Source of Variation	df	ss	ms	F
Treatments (A)	6	122.70	20.45	1.46
Within-groups	49	687.51	14.03	
Total	55	810.21		

For 6 and 49 degrees of freedom an F ratio of 3.77 or above is needed at the .05 level. There is no significant difference among the mean scores of the groups when taken as a whole. The mean scores for each of the groups were as follows: Group 1 (reward-only one cent), 10.00; Group 2 (reward-only five cents), 8.50; Group 3 (punishment-only one cent), 10.38; Group 4 (punishment-only five cents), 6.38; Group 5 (reward & punishment one cent), 10.63; Group 6 (reward & punishment five cents), 8.00; and Group 7 (control), 10.38.

In order to compare individually the control group (Group 7) with the various experimental groups, separate t-tests were computed. As shown in Table 2 the punishment-only five-cent group (Group 4), was found to perform the learning task in significantly fewer trials than the control group. Therefore the hypothesis that all experimental groups will perform the learning task in less trials than the control group is not supported.

Table 2

t-Tests Comparing the Various Experimental Groups to the Control Group

Comparison of experimental groups with control group	t Value
Group 1 (R-penny)	.154
Group 2 (R-nickel)	.827
Group 3 (P-penny)	.000
Group 4 (P-nickel)	2.237*
Group 5 (R&P-penny)	.095
Group 6 (R&P-nickel)	1.143

*$p < .05$

The second hypothesis, that there will be no significant difference between the reward-only and the punishment-only groups, was determined by a t-test. A t value of .260 was obtained and found to be nonsignificant. Therefore the null hypothesis was supported.

As can be seen in Table 2, the third hypothesis, stating that the groups receiving both reward and punishment will perform the learning task in less trials than any other group, was not supported.

The final hypothesis, stating that the groups receiving the greater amounts of reward or punishment will perform the learning task in fewer trials than the groups

receiving the lesser amount, was tested by a 2 X 3 factorial. The resulting F-ratios were found to be nonsignificant and the hypothesis is rejected. A summary of the results is presented in Table 3.

Table 3

Analysis of Variance for Experimental Conditions and Magnitude of Reward

Source of Variation	df	ss	ms	F
Columns	2	8.79	4.40	.701
Rows	1	88.02	88.02	14.04
Cells	(5)	(109.34)		
Rows X Columns	2	12.53	6.27	
Within Cells	42	548.30	13.05	
Total	47	657.64		

In addition to the trials to criterion measures reported, total errors were also scored for each group. The various tests revealed that the error measures were in accordance with the trials to criterion and therefore an analysis of the data is not presented.

DISCUSSION

The results of the present experiment do not support the findings by other investigators that money is an effective method of facilitating learning when used as reward

(Pihl, 1966; Weiner & Walker, 1966). The hypothesis that reward and punishment combined would be superior to either condition presented alone was also found to be contrary to findings of other investigators (Offenbach, 1964; Brackbill & O'Hara, 1958). Under punishment-alone conditions it was found that the five-cent group performed significantly better than the control group, but there was no significant difference between the one-cent group and the control group. The fact that the five-cent group performed significantly better than the control group is in agreement with the findings of Weiner & Walker (1966). The fact that the punishment-alone five-cent group was the only group that performed significantly better than the control group is more difficult to explain, however, and is not in agreement with the majority of other findings (Gates & Rissland, 1923; Hurlock, 1925; Thorndike, 1932; Thompson & Hunnicutt, 1944). The only investigators cited who found similar results (punishment superior to reward) were Forlano & Axelrod (1937) and Penny & Lupton (1961). The overall difference as to the magnitude of reward was not significant which is also a contradiction of the findings cited by Pihl (1966) and Weiner & Walker (1966). Reward conditions, however, were not found to have the detrimental effects suggested by the Miller & Estes (1961) experiment.

The results of the present research seem to do no more than further complicate previous findings. The importance of this research, however, may be seen in the identification of previously unmentioned variables which may have also been operating in earlier studies, and which could account in part for the conflicting findings.

The first problem that became apparent in the present research was in the difficulty of the association task. In a pilot study a mean number of trials to criterion was found to be 16. However, when the overall mean was computed for the subjects in the actual experimental situation it was found to be only 9.18. From this mean it can be seen that rather large differences with low treatment group variance would be needed to produce significant results. In light of this situation it should be noted that although there was no overall significant difference between the five-cent group and the one-cent or control group, the five-cent groups consistently showed a lower overall mean score than the one-cent group or control group regardless of the condition of reward and punishment.

Another problem became apparent in the learning of the material. Some subjects reported that they followed the instructions in trying to pair the words, others reported that they decided it would be easier to just

memorize the serial list of English words since this was all they were required to report. Random order presentation would not seem to control this variable as was pointed out by Martin & Saltz (1963). Although exact records were not kept of post-experimental interviews, it seemed that the largest portion of those reporting that they ignored the associations and merely learned the English list were those from the five-cent groups. This factor has some seemingly important implications. Could it be possible that the greater the reward involved in various tasks the more dishonest a person might become in the process of achieving mastery? On the other side of the coin it could be argued that the greater magnitude of reward might enhance a person's inventiveness and creativity in finding more expedient methods of task mastery. This would seem to be an important research topic.

One factor that may have contributed to the non-significance between the experimental and the control groups could have been the interference the experimenter provided the subject when presenting or removing the coins. Control subjects were usually observed as attending to the task. In contrast, experimental subjects were often seen glancing at the money dish (checking for correct reward or punishment?). If this were the case it could also account

for the failure to support the hypothesis that the combination group would be superior to the other experimental groups in that there would be more interference involved. One method of testing out this possibility might be to compare a group with each previous condition who would be told that their winnings would be recorded and the money would be presented at the end of the experimental session. Another variable which would have to be contended with here, however, would be that the reward would be further removed from the subject. Probably the ideal method would be the development of an automatic device which would present or remove money according to the subject's response whereby the experimenter could entirely remove himself from the situation and observe through a one way window.

Since previous studies cited (Pihl, 1966; Weiner & Walker, 1966) lend support to the hypothesis that money can be used as an effective method of facilitating learning, continued research needs to be conducted incorporating suggestions arising out of earlier investigations until the questions raised may be answered. This type of research is believed to be important because of the implications it would seem to have for educational techniques. For example, a program could be instituted at the high school level whereby students would be rewarded with money for maintaining a certain academic standard but punished by the

removal of a portion of this money for dropping below that standard. This technique might, in addition to facilitating their learning, act as a motivator in keeping them in school since many students drop out in order to make some money. Millions of dollars are spent getting and trying to keep dropouts in jobs. If it was found that money (or any other reward for that matter) could serve to reduce the number of school dropouts and facilitate their learning, then it would be a worthwhile, and a morally justified expenditure.

References

Ammons, R. B. Effects of knowledge of performance: A survey and tentative theoretical formulation. Journal of General Psychology, 1956, 54, 279-299.

Battig, W. F., Brown, S. C., & Nelson, D. Constant vs. varied serial order in paired-associate learning. Psychological Reports, 1963, 12, 695-721.

Baughman, J. B. Poker chips as a secondary reinforcer in a serial learning task. Unpublished study, Central Washington State College, 1966.

Brackbill, U., & O'Hara, J. The relative effectiveness of reward and punishment for discrimination learning in children. Journal of Comparative and Physiological Psychology, 1958, 51, 747-751.

Carluccio, L. & Crowder, R. G. Constant order of pairs in the presentation and testing of paired associates. Journal of Experimental Psychology, 1966, 72, 614-616.

Dand, A. "Reward" and "Punishment" in learning. British Journal of Psychology, 1946, 36, 83-87.

English, H. B. & English, Ava. A Comprehensive Dictionary of Psychological and Psychoanalytical Terms. New York: Longmans, Green & Co., 1958.

Estes, W. K. An experimental study of punishment. Psychological Monographs, 1944, 57, (3, whole no. 263).

Forlano, H. & Axelrod, C. The effects of repeated praise and blame on performance by introverts and extroverts. Journal of Educational Psychology, 1937, 28, 92-100.

Gates, Georginie & Rissland, Louise. The effect of encouragement and of discouragement upon performance. Journal of Educational Psychology, 1923, 14, 21-26.

Gilchrist, E. P. The extent to which praise and reproof affect a pupil's work. School and Society, 1916, 4, 872-874.

Hurlock, Elizabeth. An evaluation of certain incentives used in school work. Journal of Educational Psychology, 1925, 16, 145-159.

Martin, C. J. & Saltz, E. Serial versus random presentation of paired associates. Journal of Experimental Psychology, 1963, 65, 609-615.

Meyer, M. E. & Crum, D. M. Verbal conditioning with "positive" and "positive & negative" reinforcement. Psychonomic Science, 1966, 4, 59-60.

Miller, Louise & Estes, Betsy. Monetary reward and motivation in discrimination learning. Journal of Experimental Psychology, 1961, 61, (6), 501-504.

Offenbach, S. I. Effect of reward and punishment at two age levels. Child Development, 1964, 35, 709-715.

Penney, R. K., & Lupton, A. A. Children's discrimination learning as a function of reward and punishment. Journal of Comparative and Physiological Psychology, 1961, 54, 449-451.

Pihl, R. O. The effect of amount of reinforcement on the formation of the reinforcing value of a verbal stimulus. Dissertation Abstracts, 1966, 14, 1312-B.

Postman, L. The history and present status of the law of effect. Psychological Bulletin, 1947, 44, 489-563.

Sears, R. R., Maccoby, E. & Levin, H. Patterns of child rearing. New York: Harper & Row, 1957.

Silverman, H. F. Effects of praise and reproof on reading growth in a nonlaboratory classroom setting. Journal of Educational Psychology, 1957, 48, 199-206.

Solomon, R. L. Punishment. American Psychologist, 1964, 19, 239-253.

Stevenson, H. W. & Snyder, Leila. Performance as a function of the interaction of incentive conditions. Journal of Personality, 1960, 28, 1-11.

Stevenson, H. W., Weir, M. W., & Zigler, E. F. Discrimination learning in children as a function of motive-incentive conditions. Psychological Reports, 1959, 5, 95-98.

Stone, G. R. A note on Postman's review of the literature on the law of effect. Psychological Bulletin, 1948, 45, 151-160.

Thompson, G. G. & Hunnicutt, C. W. Effects of repeated praise or blame on work achievements of introverts and extroverts. Journal of Educational Psychology, 1944, 35, 257-266.

Thorndike, E. L. Animal Intelligence. New York: Macmillan, 1911.

Thorndike, E. L. The Fundamentals of Learning. New York: Teachers College, 1932.

Thorndike, E. L. The Psychology of Wants, Interests, and Attitudes. New York: Appleton-Century, 1935.

Tilton, J. W. The effect of "right" and "wrong" upon the learning of nonsense syllables in multiple choice arrangement. Journal of Educational Psychology, 1939, 30, 95-115.

Weiner, B. & Walker, E. L. Motivational factors in short term retention. Journal of Experimental Psychology, 1966, 71, (2), 190-193.

Wyer, R. S. & Love, J. M. Response speed following failure in a two-choice game as a function of reward, punishment, and response pattern. Journal of Experimental Psychology, 1966, 72, (4), 571-579.