

## DIFFERENCES FOLLOWING SELF- AND EXTERNAL- REINFORCEMENT AS A FUNCTION OF LOCUS OF CONTROL AND AGE: A SOCIAL LEARNING ANALYSIS\*

JULIAN BARLING and MONICA PATZ

School of Psychology, University of the Witwatersrand, Johannesburg 2001, South Africa

(Received 12 June 1979)

**Summary**—Studies investigating the relative efficacy of self-reinforcement (SR) and external reinforcement (ER) have failed to yield significant differences between the two techniques. It is argued that this may be due to inadequate operationalizing of the theory and the neglect of subject characteristics. Thus, the present study assessed whether any differential effects of SR and ER may be dependent on variables that precede the administration of the reward. A  $2 \times 2 \times 2$  (grade  $\times$  locus of control  $\times$  reinforcement) MANOVA on children's arithmetic task persistence (time-at-task and number of problems attempted) and accuracy (number of correct solutions) yielded a significant three-way interaction; and the same phenomenon prevailed when the three univariate dependent variables were analyzed separately. Older internally-oriented children persisted longer and performed more accurately under SR than their internal counterparts working under ER, although older externals' qualitative and quantitative performance was enhanced significantly when receiving ER. No such interactions were yielded for the younger children. These results provide some support for social learning theory predictions regarding differences generated by self- and external reinforcement.

An issue of some importance within a social learning theory framework is the differences generated by self- and external reinforcement (cf. Bandura, 1976). In this regard, research has demonstrated consistently that self- and external reinforcement are equally effective over a wide range of behaviors, subjects and settings. For example, although both self-reinforcement (SR) and external reinforcement (ER) were more effective than a no-reinforcement control condition, they did not influence normal children's wheel-cranking responses differently in a laboratory situation (Bandura and Perloff, 1967; Liebert *et al.*, 1970). SR and ER have also not differentially influenced inattentive (Johnson, 1970), disruptive (Frederiksen and Frederiksen, 1975) or severely disordered behavior in the classroom (Drabman, 1973). This phenomenon extends to ninth-grade normal school-girls' history and geography performance (Glynn, 1970), fifth-grade normal school-children's verbal behavior (Barling and Fincham, in press) as well as undergraduates' arithmetic performance (Spiedel, 1974). In an extension of this research, Grusec and Kuczyinski (1977) demonstrated further that self- and externally imposed punishment were equally effective in obtaining children's compliance. Finally, the implementation of SR and ER in an adult weight-reduction program did not produce significantly different outcomes (Jeffrey, 1974), while Wilson *et al.* (1975) demonstrated that self- and externally administered punishment did not influence the drinking behavior of chronic alcoholics differently in an experimental situation.

Consequently, that there were no significant differences between self- and externally administered reinforcement (and punishment) is rather consistent across diverse behaviors, settings and subjects. That this phenomenon should prevail is perhaps surprising as social learning theory predicts that self-administered contingencies may be more effective (cf. Bandura, 1976). However, this social learning theory perspective contends that any

\* Requests for reprints of this article should be addressed to Julian Barling, School of Psychology, University of the Witwatersrand, 1 Jan Smuts Avenue, Johannesburg 2001, South Africa.

differences between ER and SR extend beyond the *agency* of reinforcement. Rather, any differences would emerge *prior* to the administration of the reward. Consequently, it is possible that research demonstrating SR and ER to be equally effective reflects an inadequate operationalizing of social learning theory: It is questionable whether single factor studies can investigate this theoretical hypothesis adequately. What would be required, therefore, is a factorial design which accounts for those variables which *precede* the actual administration of the reward. Thus, when Barling (1979) assessed the effects of self- and externally-administered performance standards and reinforcement on children's academic performance in a factorial design, ER was more effective than SR in terms of arithmetic and verbal persistence and arithmetic accuracy, but only when prior performance standards were externally imposed.

A further factor which may account for SR and ER being equally effective is the neglect of individual differences. In this regard, Achenbach (1978) has proposed that subject characteristics be investigated, as the amount of systematic variance explained might be increased. Within a social learning analysis, the attribution of behavior change is of some import (Karoly, 1977; Rehm, 1977). Indeed, Bellack and Hersen maintain that "...beliefs about contingencies can sometimes supercede the actual contingencies in effect" (1977, p. 98). Within this formulation, individuals who perceive themselves as active determinors of their own lives will benefit more from self-regulatory programs than those who view themselves in a more passive role. Empirical research has demonstrated that internally-oriented adults are more likely to self-reinforce appropriately (Barling and Fincham, 1978) and benefit from SR (Schallow, 1975); while attributional style has been shown to mediate the efficacy of self-regulatory strategies (Bugental *et al.*, 1977; Davison *et al.*, 1973; Davison and Valins, 1969; Ollendick and Murphy, 1977).

Nonetheless, only one study has investigated locus of control (LOC) orientation and self- vs external reinforcement on children (Morris and Messer, 1978). They found that externally-oriented children performed better under ER, while internally-oriented children's academic performance was enhanced under SR conditions. However, their results are limited for a number of reasons. First, they combined arithmetic and grammar tasks into a single variable. Since such diverse tasks may differ considerably in difficulty (cf. Barling, 1979), while perceived task difficulty influences subsequent persistence (Masters and Santrock, 1976), the combination of these two tasks may conceal any differential effects of self-regulatory strategies. Second, Morris and Messer (1978) only investigated task persistence. Yet self-regulatory strategies influence task persistence and task accuracy differently (Barling, 1979). Finally, Morris and Messer (1978) did not investigate the influence of the child's age. This may have important consequences for two reasons. First, in terms of social learning theory, SR is dependent on cognitive functions (Bandura, 1976; Masters and Mokros, 1974), and it is plausible, therefore, that not all children can benefit from SR. Indeed, it has been questioned whether any children can benefit from SR procedures (Klein, 1976). Second, there is considerable evidence suggesting that LOC itself is an age-related variable (Phares, 1976).

Consequently, the present study assessed whether the child's age and LOC attribution would mediate the differential efficacy of children's SR and ER. Moreover, children's academic task persistence (time-at-task and number of problems attempted) as well as task accuracy (number of problems solved correctly) were investigated.

## METHOD

### *Subjects*

One hundred and twenty White school children ( $M$  age = 112.31 months,  $S.D.$  = 23.33; 57 boys, 63 girls) initially served as subjects. They comprised three second-grade classes and three sixth-grade classes from the same school. From this group, 56 children ( $M$  age = 112.39 months,  $S.D.$  = 23.82; 32 boys and 24 girls) were selected to participate in the second part of the study on the basis of their LOC scores.

### *Experimental design*

A  $2 \times 2 \times 2$  (grade  $\times$  LOC  $\times$  reinforcement) factorial design was employed in the second part of this study. The grade factor consisted of grade two ( $M$  age = 89.75 months) and grade six ( $M$  age = 134.87 months) children. LOC comprised internally and externally oriented children, while reinforcement consisted of self- and externally imposed reinforcement. There were seven subjects in each cell.

### *Instruments*

Two different tests were administered, viz. the Intellectual Achievement Responsibility Questionnaire for Children (IAR) (Crandall *et al.*, 1965), and the Scholastic Achievement Test in Arithmetic (SATA) (Scholastic Achievement Test in Arithmetic, 1974). Accordingly, these two tests will be discussed separately.

The IAR was used to categorize the children as internally or externally oriented. The scale consists of 34 forced-choice items, and caters for children from the third grade and above. Consequently, a pilot study was conducted to assess whether it would be suitable for the second grade children in the present study. It was apparent that although they could understand the meaning of the individual items, they could not concentrate for the time required to complete all 34 items. Consequently, only the first 20 items were used with the second grade children. Cronbach's alpha for the sixth grade children (34 items) was 0.67, and 0.66 for the second grade children (20 items). The grade two children were tested individually, while the sixth grade children completed the test group settings. Finally, the IAR was chosen in preference to other scales that may have been more relevant for children of the present age since it assesses specific LOC expectancies regarding academic performance.

The SATA is a grade-appropriate, standardized, 60-item paper-and-pencil test and assesses arithmetic achievement. The SATA comprises three equal-length subtests. The first deals with the four fundamental arithmetic operations, the second with the child's comprehension of arithmetic subject matter, while the final subtest assesses the ability to cope with grade-appropriate problems presented in verbal format. No time limit was imposed as measures of time-at-task and the number of problems attempted were required. Time-at-task was measured on a stop-watch, and did not include the time required for explaining the items. Finally, subjects were not permitted to change their initial responses as they were receiving immediate feedback regarding the accuracy thereof.

### *Procedure*

There were two sections to this study. In the first, the IAR was completed by all 120 children. On the basis of extreme scores, 14 internals and 14 externals were selected from each grade to participate in the second part of the study. Within each grade ( $n = 28$  in both groups), half of the children were internally-oriented ( $n = 14$ ), the remainder being externally-oriented ( $n = 14$ ). In addition, half the children in each group self-reinforced each correct response, while the rest received externally-administered reinforcement (i.e. they were yoked to children in the SR condition).

The actual testing situation (phase two of the study) commenced with each child being brought individually to the testing room when he/she received the following instructions, which were used by Brownell *et al.* (1977), and are based on those used initially by Felixbrod and O'Leary (1974):

When people do a job of work, they are paid for what they do. You are going to earn stars which you can use to buy prizes. In order to earn stars, only correct answers will count (Repeat). Your job is to answer as many questions as you want to. Each time you get an answer correct, this light will go on (Demonstrate). When this light goes on, it means that you have got the answer correct.

At this stage, the groups received different experimental manipulations. Children in the SR condition—regardless of grade or LOC orientation—received the following instruc-

tions in addition to those just described above:

You may then take, if you want it and feel you deserve it, one star. When we have finished you will be able to exchange your stars for prizes. Let us take a look at the prizes and I will show you what I mean. (Starting with the lowest prize describe to the child how much each star is worth, and then concentrate on the highest.) Do you understand? (Repeat if necessary.)\*

The children were not required initially to select a performance standard to which they would have to adhere, a procedure followed in other studies (cf. Felixbrod and O'Leary, 1974). Instead, they were free to modify the standards continually according to their performance for which they were receiving immediate feedback. This constitutes a more naturalistic situation in which the individual's standards often undergo modification following immediate feedback regarding their performance (cf. Bandura, 1976).

Each child in the ER condition was matched to a child in the SR condition of the same age and LOC orientation. He/she was then yoked to this child so that the stringency of performance standards† was the same; and only the locus of administration of the reward had changed. Subjects in the ER condition were then told:

Sometimes you will receive stars for correct answers. When we have finished, you will be able to exchange stars for prizes. Let us take a look at the prizes and I will show you what I mean. (Starting with the lowest prize, describe to the child how much each prize is worth, and then concentrate on the highest.) Do you understand? (Repeat if necessary.)

The experimenter remained in the testing situation for all groups to provide immediate feedback concerning the accuracy of the responses. In addition, she evaluated performance and administered rewards when the yoked standards had been achieved for children in the ER condition. Finally, since the subjective perception of the value of the reward rather than its objective value determines its reinforcing properties (Moore *et al.*, 1976), a choice of rewards was available. Thus, a variety of sweets, pencils, sharpeners, erasers and so forth were offered in exchange for stars at the completion of the experimental task.

## RESULTS

Since a high correlation was yielded between the three dependent variables (time-at-task/task persistence:  $r(54) = 0.81$ ,  $p < 0.001$ ); time-at-task/task accuracy:  $r(54) = 0.72$ ,  $p < 0.001$ ; and task persistence/task accuracy:  $r(54) = 0.90$ ,  $p < 0.001$ ), a MANOVA was necessitated (Kaplan and Litrownik, 1976; O'Leary and Turkewitz, 1978). A  $2 \times 2 \times 2$  (grade  $\times$  LOC  $\times$  reinforcement) MANOVA using the Pillai Bartlett Trace  $F$  approximation (Olson, 1976) was thus computed. This analysis yielded a significant  $2 \times 2 \times 2$  interaction [ $F(3,46) = 3.86$ ,  $p < 0.02$ ], as a result of which all other interactions as well as main effects were disregarded.

To determine the relative contribution of each of the three univariate dependent variables to the significant multivariate interaction, separate univariate ANOVAs were computed (Spector, 1977). However, Cochran's  $C$  statistic was first generated to assess whether the homogeneity of variance assumption was satisfied in each instance. This assumption was satisfied for all three dependent variables (time-at-task:  $C = 0.31$ ,  $p > 0.05$ ; task persistence:  $C = 0.26$ ,  $p > 0.05$ ; and task accuracy:  $C = 0.25$ ,  $p > 0.05$ ). The three separate analyses all yielded significant three-way interactions [time-at-task:  $F(1,48) = 10.14$ ,  $p < 0.005$ ; task persistence:  $F(1,48) = 10.04$ ,  $p < 0.025$ ]; task accuracy:  $F(1,48) = 5.38$ ,  $p < 0.025$ ). It can be seen (see Fig. 1) that in each instance, no interactions emerged for the second-grade children. However, the sixth-grade internals performed better under SR conditions, while their external counterparts' performance was enhanced when reinforcement was externally imposed.

\* Reinforcement, whether self- or externally administered, was only permitted after correct responses (which necessitated immediate feedback), as the definition of SR requires it to be contingent on adequate performance (cf. Bandura, 1976).

† Performance standards were calculated according to the formula:

$$\frac{\text{Number of self-reinforcements}}{\text{Total number of correct responses}} \times 100$$

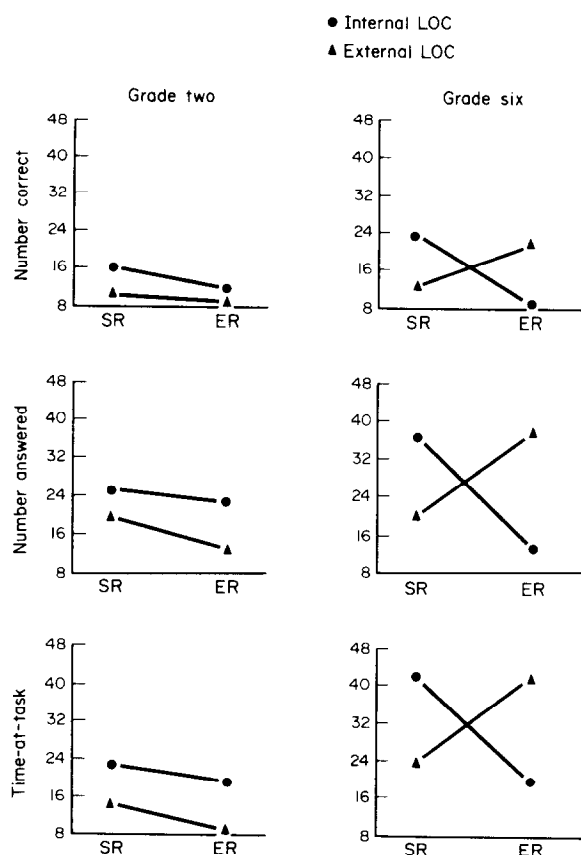


Fig. 1. Interaction of grade, LOC and reinforcement on univariate dependent variables.

## DISCUSSION

The present study demonstrates that differential effects may accrue to SR and ER if variables that are effective prior to the administration of the actual reward are accounted for. Specifically, SR is more effective for children with an internal LOC attribution, while their counterparts who are externally oriented benefitted more from ER. However, these results do not pertain to all children. Rather, this disordinal interaction (see Fig. 1) emerged only for the sixth grade children. On the other hand, no such phenomenon characterized the behavior of second grade children. These results have a number of interesting implications.

First of all, these results are of some theoretical import. Within a social learning theory perspective, the attribution of behavior change is considered a crucial variable. The present results demonstrate that, under certain conditions, SR would be more effective than ER if (a) the children possessed a self-attributional style, and (b) were at least in the sixth grade. It is possible that by the time a child reaches this age, he/she may possess the cognitive abilities required to benefit from SR (cf. Klein, 1976; Masters and Mokros, 1974). Consequently, social learning theory predictions about the nature of differential effects of SR and ER are supported: Any differential effects arising were a function of variables that were operative *prior* to the administration of the reinforcement, in this instance LOC orientation and age.

From a social learning perspective, the second important consequences to emerge from the present results is the match suggested between motivational style and cognitive abilities. These results are consistent with Ducette and Wolk's (1973) cognitive motivational interpretation of LOC orientation. Since internals have been shown to be superior to externals in many aspects of cognitive processing, for example sensitivity to environmental cues, extraction recall and utilization of information from feedback (cf. Ducette and

Wolk, 1973; Lefcourt, 1976), it may be presumed that they have the cognitive capacity to benefit from any type of reinforcement procedure. However, Ducette and Wolk (1973) have shown that abilities to extract or use information do not provide a *complete* explanation of behavior. Rather, they state that "... it must be remembered that any behavior is a function of at least a two stage process: First, can the behavior be performed? Second, will it be performed?" (1973, p. 425). Execution of the requisite behavior thus depends on motivational orientation as well as the cognitive expectation regarding the possible completion of successful performance.

Third, the present results are consistent with findings that demonstrate that the matching of treatment regimen with subject variables may maximize therapeutic effectiveness (Achenbach, 1978; Bugental *et al.*, 1977; Davison *et al.*, 1973; Ollendick and Murphy, 1977; Steele and Barling, 1979). It demonstrates the advantages that may accrue to matching the subject's motivational orientation with the nature of the treatment program. For example, Steele and Barling (1979) have questioned whether all learning disabled children can benefit from self-instructional statements: They showed that the use of self-guiding statements was highly related to an internal LOC orientation. Together with previous findings, therefore, the present results demonstrate that the particular treatment or program used—whether in the classroom or clinical context—should be matched carefully with the child's attributional orientation to maximize treatment effectiveness. Thus, the present results are consistent with a reciprocal determinism interpretation, a hallmark of social learning theory (Bandura, 1978).

The significant three-way interaction pertained to all three dependent variables in the present study. In other words, the results were consistent across both task persistence and task accuracy. This contrasts somewhat with previous research which suggested that self-regulatory strategies may influence persistence and accuracy differently (Barling, 1979; Masters and Santrock, 1976; Wilbur and Thoresen, 1977). Two factors may account for these discrepancies. In the first instance, the present study assessed only one academic task, viz., arithmetic performance. Although children have been shown to experience far more difficulty with arithmetic rather than verbal tasks (Barling, 1979), the present study assessed arithmetic performance only. It is possible, therefore, that the children's *perceived* difficulty level may not have been that great. Future studies might examine, therefore, whether the consistent three-way interaction yielded in the present study (see Fig. 1) would pertain across other academic tasks. Second, since the present study involved a matching of motivational orientation (LOC) and self- and externally-imposed reinforcement, it is possible that accuracy deficiencies may have been alleviated more than when reinforcement alone is utilized.

One final issue necessitates elaboration. The SR condition in the present study required the experimenter to be present to deliver immediate feedback regarding the adequacy of the response. However, Jones *et al.* (1977) maintain that this factor may increase the salience of external factors. The possibility of detrimental effects arising from the experimenter's presence in this study is discounted for two reasons, however. First, all the children in the SR treatment were subjected to the same experimental conditions. Second, since the significant three-way interactions were consistent across all three univariate dependent variables, it is conceivable that the removal of this potential confound would *increase* the salience of the interaction.

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