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On the Motivational Effects of Positive Verbal Reinforcement on Performance: Toward an Inverted-*U* Relationship[1]

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The purpose of this study was to ascertain the motivational effects of positive verbal reinforcement on the performance of a qualitative task. Male subjects performed on a task consisting of 24 slides that allowed them to test their decision-making abilities in simulated situations. Subjects performed under one of five noncontingent verbal reinforcement ratios (.00, .25, .50, .75, or 1.00). Subjects' accuracy and reaction times to each of the 24 slide stimuli were recorded and transformed into a total performance index. In line with an inverted-U hypothesis, it was hypothesized that if motivational effects of positive verbal reinforcement exist, they should induce a curvilinear relationship between reinforcement ratio and performance. This hypothesis was supported by the results of a trend analysis that showed that only the quadratic curvilinear term was significant. Inspection of means revealed the presence of an inverted-U curve such that performance gradually increased from ratio 0 and reached a maximum at ratio .50, following which a decrease in performance was obtained for ratios .75 and 1.00. Results support a motivational interpretation of the effects of positive verbal reinforcement on performance. Findings are discussed in light of the interaction between motivational and attentional processes.

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Positive verbal reinforcement is one of the most commonly used means of effecting behavioral change in people. From the boss at the office to the teacher at school and the parent at home, people make great use of this important source of influence. Deservedly the effect of positive verbal reinforcement on performance has been studied extensively (see Baron, 1966; Stock, 1978, for reviews). Research has been conducted with various populations, including preschool and elementary school children (Terrell & Kennedy, 1957), high school students (McCaughan & Gimbert, 1981), and college students (Kirschenbaum & Smith, 1983). Research also has been carried out on both simple quantitative tasks that require little learning (e.g., the marble-dropping tasks; Hill & Stevenson, 1965) and qualitative tasks that involve much learning (e.g., the ball-rolling task; Martens, 1970, 1972).

While it is generally believed that positive verbal reinforcement in the form of praise or positive comments yield facilitative performance effects, research evidence does not entirely corroborate this popular belief. Indeed, it appears that positive verbal reinforcement increases performance relative to no reinforcement on quantitative tasks but that no clear-cut results seem to emerge on qualitative tasks (McCaughan & Gimbert, 1981). Results of studies on qualitative tasks reveal that positive verbal reinforcement generally produces two different types of effects. First, positive verbal reinforcement has been found to produce no performance effects compared to control groups (e.g., Martens, 1970, 1972; McCaughan, 1983; Roberts & Martens, 1970). And second, some positive performance effects have been reported (e.g., Martens, Burwitz, & Newell, 1972; McCaughan & Gimbert, 1981; Wankel, 1975), although not as often as the null effect.[3]

A better understanding of the mechanisms underlying the different performance effects of positive verbal reinforcement on qualitative tasks would appear important from both theoretical and practical perspectives. Indeed, being able to clearly delineate how the various effects of the positive verbal reinforcement are produced not only would lead to a more comprehensive

[3]Results of a recent study (Kirschenbaum & Smith, 1983) showed that positive verbal reinforcement may also produce negative performance effects. These findings, however, are atypical of findings in the literature. It is not entirely clear why such effects were found, although the nature of the task (a complex and novel task—underhand basketball free-throw) and of the verbal reinforcement (technical information) may have a part to play in these effects. These speculations are reinforced by the study findings showing that performance was generally low, thus indicating that learning was still in effect or at least that the task was still not learned well enough, so that verbal reinforcement was unable to facilitate performance. Further, the fact that the control group performed best tends to indicate that the verbal statements may have impaired performance, possibly by distracting subjects (see Kirschenbaum & Smith, 1983). Because of its peculiarity, the Kirschenbaum and Smith (1983) study is not discussed further in the present paper.

theory on verbal reinforcement but also might yield potential benefits for applied purposes.

An understanding of the effects of positive verbal reinforcement on performance seems to be related to the informational and motivational properties of verbal reinforcement (Martens, 1975; Martens et al., 1972). Martens (1975) suggested that positive verbal feedback facilitates performance on simple quantitative tasks because minimal learning occurs and verbal reinforcement may thus serve as an incentive to perform. With complex qualitative tasks, however, learning takes place. In this instance, subjects learning a complex task search for information concerning their performance in order to improve. Usually, knowledge of results, or visual kinesthetic feedback, is available to the subject. The informational value of the verbal feedback then becomes redundant, hence explaining its negligible influence on early performance. Once the task is learned, however, information is no longer useful and verbal feedback may then serve as an incentive, motivating individuals to perform better. Therefore, the effects of verbal reinforcement on the performance of a learned qualitative task should be similar to those obtained on a simple quantitative task.

This "information/motivation" explanation appears to account rather well for the findings reported previously. For instance, studies that reported no performance effects of the positive verbal reinforcement (e.g., Martens, 1970, 1972; McCaughan, 1983; Roberts & Martens, 1970) generally assessed such effects during the learning phase, while studies that reported positive performance effects revealed that such effects took place only after substantial learning had taken place (see Martens et al., 1972; McCaughan & Gimbert, 1981). However, direct tests of the informational/motivational hypothesis during the early and later stages of performance on qualitative tasks have yielded equivocal results. More specifically, Gill and Martens (1975) failed to find a motivational effect once the task was learned reasonably well. On the other hand, Wankel (1975) showed that positive verbal reinforcement did increase performance in the later, but not in the early, stage of performance. Thus, there appears to be a need to assess whether positive verbal reinforcement does produce motivational effects on qualitative tasks.

A point of importance concerning the information/motivation hypothesis is that if positive verbal reinforcement produces motivational effects once the task is well learned, performance should vary in line with known theories of motivation. More specifically, positive verbal reinforcement and performance should be related in an inverted-*U* fashion such that when an optimal amount of motivation (arousal) is induced by verbal reinforcement, performance should increase, whereas when a too high or too low level of arousal is induced, performance should decrease.

Results from various sources lend credence to this hypothesis. First, it has been suggested that verbal reinforcement acts as a social incentive (e.g.,

Hrycaiko, 1978; Martens, 1975; Wankel, 1975) and that social incentives do produce arousal effects (e.g., Elliot, 1969; Evans, 1972; Fowles, Fisher, & Trand, 1982). Second, Hutchison and Lair (1971) have shown that positive verbal reinforcement facilitates the performance of low-trait anxiety individuals relative to that of high-trait anxiety subjects. Since high-trait-anxiety subjects are characterized by higher levels of arousal in evaluative situations than are low-trait-anxiety individuals (Spielberger, 1966), one can infer, in line with the inverted-*U* hypothesis, that verbal reinforcement in the Hutchison and Lair study increased arousal in both types of subjects, thereby raising the low-trait-anxiety subjects' level of arousal to an optimum level but pushing that of the high-trait-anxiety subjects past the optimum level. Consequently, performance of low-trait-anxiety subjects was facilitated while that of high-trait-anxiety subjects was impaired. Finally, Videbeck and Maehr (1966, cited in Maehr, 1967) assessed the effect of various positive verbal reinforcement ratios (.15, .35, .50, .65, .90) on persistence on a novel task and reported that persistence was greatest at the .50 ratio.

Taken as a whole, the above findings suggest that the effects of positive verbal reinforcement on the performance of a well-learned qualitative task may be motivational in nature and appear to be best explained in terms of an inverted-*U* relationship between the ratio of verbal reinforcement provided and performance. The purpose of the present study was to ascertain the viability of this hypothesis. In order to achieve this end, individuals deemed experts on a qualitative task performed several trials while being presented with noncontingent positive verbal reinforcement at either a .00, .25, .50, .75, or 1.00 ratio. In line with the inverted-*U* hypothesis, it was hypothesized that performance would gradually increase from ratio .00 and reach a maximum at ratio .50. A gradual decrease in performance was also expected from ratio .50 to ratio 1.00. Thus, an inverted-*U* relationship between positive verbal reinforcement ratio and performance was expected.

METHOD

Subjects and Design

Fifty French-speaking male elite hockey players who were participants in two 1-week hockey camps served as subjects in this study. Subjects ranged in age from 13 to 16 years of age, with a mean age of 14.9 years. The use of experienced athletes was designed to serve two purposes. First, it was thought that using experts at a given activity should allow the motivational effects of positive verbal reinforcement to occur (see below). And second, the use of such subjects was designed to enhance the ecological validity of the study. Subjects were randomly assigned to one of five conditions where

they received either no verbal reinforcement (ratio .00) or 6 (ratio .25), 12 (ratio .50), 18 (ratio .75), or 24 (ratio 1.00) noncontingent positive verbal reinforcements over 24 trials. There were 10 subjects per condition.

Task

The task used in this study was specifically constructed by Thiffault (1980) in order to assess hockey players' decision-making abilities. It consists of 24 slides depicting a hockey player holding a puck in different situations. Subjects must decide and verbally indicate which of three alternatives among those of shooting, passing, or skating appears most appropriate for the situation at hand. The subject's answer stops a voice-reaction timer that is placed around his neck. This yields the subject's reaction time to the stimuli. Thus, two dependent variables were obtained: the accuracy (i.e., correct/incorrect) and the speed of the decision (at .001 sec). The task was selected because it represents a qualitative task that would appear to be well learned by the subjects of the study (elite hockey players). Since learning should be minimal on this task, this should allow motivational effects to occur. (For more details on the task see Thiffault, 1980.)

Procedure

Subjects were led individually to the laboratory by an assistant and were welcomed by a male experimenter who explained that they were about to be assessed on their decision-making abilities. Subjects were told that they would be shown 24 hockey slides depicting a hockey player with a puck in different situations. They would have to decide if the hockey player should shoot, pass, or skate, depending on the situation presented. Subjects were also told that they would have to choose the right decision while answering as quickly as possible. At the same moment, the experimenter placed around the subject's neck a voice-time recorder that would record the time it would take the subject to answer.

Subjects in the control group were then told that the experimenter would be very busy during the experimental session and consequently he would not be able to talk to them. Subjects in the positive verbal reinforcement groups, however, were told that from time to time the experimenter would act as a hockey coach and tell them how well they were doing. Following these explanations, the experimenter answered the subject's questions and then turned out the lights. Subjects were then given one practice trial, following which experimental treatment was imposed. Subjects in the control group were not told anything for the remainder of the trials, while subjects in the positive verbal reinforcement groups were provided with different ratios of bogus

positive task-related verbal reinforcement (.25, .50, .75, 1.00) depending on the condition. Verbal reinforcement was standardized across conditions and trials (i.e, reinforcements provided to the ratio .25 group were presented to other groups on the same trials, and so on) and was always provided after the slides (or trials). Reinforcements were of four types and dealt with speed (e.g., "Gee! You're really quick!"), accuracy (e.g., "In general, so far, you've made good decisions"), speed and accuracy combined (e.g., "Up to now it's really going well. Your answers are accurate and fast"), and general praise (e.g., "Have you done this before? You're really one of the best subjects I've had"). This diversity of verbal reinforcements was deemed necessary for two reasons. First, such diversity in reinforcement allowed the experimenter to remain believable in the eyes of subjects receiving a large amount of verbal reinforcement. Second, this diversity in reinforcement also prevented one performance component (i.e., accuracy or speed) from being facilitated at the expense of the other (see Gross & Gill, 1982). In the .25 ratio condition, reinforcement was presented after every 4 trials; in the .50 ratio condition, it was presented after every 2 trials; whereas in the .75 ratio condition, reinforcement was offered on 3 successive trials while not presented on the 4th trial. This sequence was repeated over the course of the 24 trials. Finally, in the 1.00 ratio condition, subjects received verbal reinforcements following each of the 24 trials.

Following performance on the task, subjects filled out questionnaires consisting of two questions that assessed, respectively, involvement in the task and perceptions of the veracity of the experimenter's feedback. These measures were "To what extent was the hockey task challenging?" and "To what extent do you agree with the experimenter's feedback on your performance?" Of course, this latter question was responded to only by subjects receiving some reinforcement. These two measures were scored on 7-point scales. Following completion of the questionnaire, subjects were debriefed and thanked for their participation.

RESULTS

Task Involvement and Perceptions of Experimenter's Feedback

Results of the question dealing with subjects' perceptions of the experimenter's feedback showed that subjects receiving some form of reinforcement agreed strongly with the experimenter's feedback on their performance ($M = 6.45$). Further, no differences existed among the various reinforcement groups ($F < 1$). Similarly, results on the question dealing with task involvement revealed that all subjects found the task highly challenging ($M = 6.42$) and that no significant differences existed among the reinforcement groups ($F < 1$). The present results will prove useful in explaining the find-

ings of this study and in ruling out plausible rival hypotheses to the motivational hypothesis.

Performance Analysis

An ecological approach to defining performance was adopted in this study. In real-life situations, performance is generally the reflection of various components. High levels of performance on certain components but not on others ensure less than optimal performance. In such instances, separate information on performance on these various components becomes meaningless. Thus, a global performance index is deemed necessary in order to capture this notion of performance from an ecological perspective. Such a global performance index was used to test the hypothesis of this study. It was obtained by transforming both the reaction time and accuracy scores (number of correct decisions over the number of trials) into Z scores and then subtracting reaction time scores from the accuracy scores. This transformation ensured that the performance index reflected the accuracy and speed dimensions of performance with equal importance. Thus, subjects with the best decisions (accuracy) and the fastest reaction times (speed) obtained the best performance scores. This (global) performance index is used in the analysis reported below.

In order to test for performance differences among the five groups, a one-way analysis of variance (ANOVA) was carried out, with performance scores, averaged over the 24 experimental trials, serving as the dependent

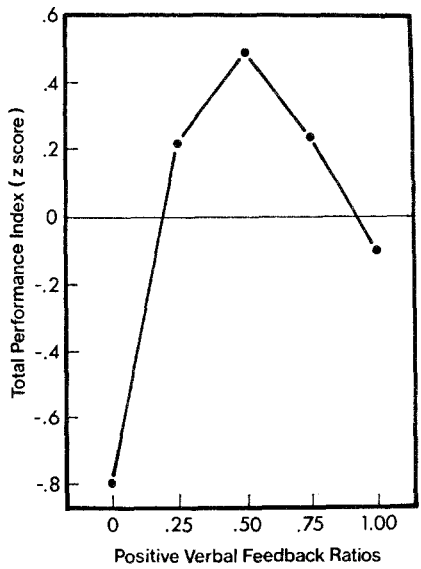

Fig. 1. Total performance as a function of positive verbal feedback ratios. Mean performance scores (in z scores) for ratio groups 0 to 1.00 were, respectively, $-.800$, .205, .494, .233, and $-.100$.

variable. Results of the analysis revealed a significant main effect ($F(4, 45) = 2.81, p < .04$). Means of all five conditions are presented at the bottom of Figure 1.

Because the group main effect was significant, it was possible to use trend analysis in order to test for the presence of an inverted-*U* relationship between the ratio of positive verbal reinforcement provided and performance. Thus, a polynomial trend analysis was performed. Results revealed the presence of a quadratic trend ($F(1, 45) = 8.47, p < .01$). All other trends were not significant ($p > .15$). Thus, the hypothesized inverted-*U* relationship was obtained (see Figure 1).

DISCUSSION

The present results reveal that an inverted-*U* function best describes the relationship between positive verbal reinforcement and performance on a qualitative task. These findings are important for two reasons. First, they show that the effects of positive verbal reinforcement on performance are not simply restricted to the presence or absence of such reinforcement but are highly dependent on the amount of reinforcement provided. It is interesting to note that in the literature very little attention is accorded to the latter variable. This is unfortunate because such a practice may potentially lead to unwarranted conclusions regarding the effect (or lack of effect) of positive verbal reinforcement on performance under certain conditions. Thus, amount of verbal feedback rather than the presence/absence of feedback should be the focus of increased attention of future studies in this area.

A second important implication is that the present results provide support for the motivational interpretation of the effects of positive verbal reinforcement on performance. Previous research showed equivocal support for this motivational effect. For instance, while Wankel (1975) did find support for the motivational effect, Gill and Martens (1975) did not. In these studies, subjects were provided with only one ratio of feedback. On the other hand, in using various amounts of positive verbal feedback, the present study was able to show that motivational effects do take place and that they vary in line with a quadratic trend. It is thus plausible that studies that have found support for the motivational effect of reinforcement may have provided subjects with an optimal level of reinforcement. On the other hand, studies that have not obtained support for the motivational effect may have provided either too low or too high a level of positive verbal reinforcement. Unfortunately, this hypothesis is impossible to evaluate in light of the various types of tasks and feedback ratios used in past studies. While an optimal level of performance was attained at a .50 ratio on the task used in the present study,

this may not necessarily mean that an optimal level of performance will be obtained at this ratio on all tasks. Rather, it is believed that what may constitute an optimal ratio of reinforcement will vary according to the nature of the task. Thus, future studies involving various types of tasks and various positive verbal reinforcement ratios are needed in order to be able to predict when motivational effects will take place on various tasks and activities.

It is interesting to speculate as to how the motivational effects of positive verbal feedback translate into performance increments and decrements. It is hypothesized that positive verbal reinforcement effects are due to the impact of arousal on attentional processes. In that vein, Easterbrook (1959) proposed that arousal affects attention in an inverted-*U* fashion. More specifically, he hypothesized that low levels of arousal lead individuals to attend to irrelevant environmental cues, while very high levels of arousal reduce the field of attention in such a way that important cues are not attended to. In either case, performance is reduced, since attention either is being distracted or is missing on some important cues. On the other hand, a moderate level of arousal allows attention to be focused only on important elements, thus facilitating performance.

Results from related research support the above hypothesis. For instance, social incentives have been found to increase arousal (e.g., Evans, 1972), to induce perceptual narrowing (Bahrick, Fitts, & Rankin, 1952), and thus to be related to performance in the fashion described above (see Landers, 1978, for a review on the relationship between arousal and attention and its effect on performance). With respect to the present study, it is suggested that positive verbal reinforcement provided at a .50 ratio produced a moderate amount of arousal and thus led to the best performance on the hockey-slide task. On the other hand, verbal reinforcement provided at a .25 ratio may not have been sufficient to increase arousal at a moderate level and performance, while improved compared to that of the control group (ratio 0), was not optimal. Finally, one of two things may have happened with ratio groups .75 and 1.00. A first possibility is that verbal reinforcement presented at such a high rate may have increased subjects' level of arousal beyond a moderate level, thus undermining performance. The second possibility is that when verbal reinforcement is used with such frequency, subjects get accustomed to its presentation and the effect on arousal is diminished, thus bringing arousal back *below* a moderate level and consequently undermining performance. Because arousal was not measured in this study, it is difficult to identify which hypothesis is correct. Future research should address this issue.

While discussion of the findings of this study is couched in motivational terms, one may wish to propose nonmotivational interpretations of the findings. The most likely candidate would appear to be the interpersonal posi-

tion proposed by Baron (1966). Baron suggests that an individual's past history of social reinforcement influences his receptivity to social reinforcement. This takes place through what Baron calls a mechanism of "mutual social control", whereby an individual monitors his performance in a way that leads the experimenter to provide a rate of social reinforcement that is in line with the individual's past history of social reinforcement. For instance, an individual used to receiving a high amount of verbal reinforcement may be willing to perform at very high levels in order to receive high rates of verbal reinforcement. Conversely, an individual with a history of low rate of reinforcements may want to diminish his performance in order to receive fewer reinforcements from the experimenter. It is felt that such an interpretation of the present findings is untenable for at least two reasons. First, results of the manipulation check questions revealed that subjects receiving verbal reinforcements were highly task-involved and agreed with the experimenter's comments on their performance. It is unlikely that individuals feeling that the experimenter is presenting too high or too low a rate of reinforcements would indicate such high levels of agreement with his comments and indicate being so absorbed in the task. Rather, one would expect disenchantment with the experimenter's feedback and lower levels of task involvement. Second and most important, if Baron (1966) is correct in his interpretation, one would expect subjects receiving the lower ratio of verbal reinforcement (ratio .25) to display the best performance in order to receive higher rates of reinforcement. Indeed, elite athletes such as the ones participating in this study are used to rather high ratios of positive verbal reinforcement and should be willing to perform extremely well (according to Baron) in order to generate such a high verbal reinforcement ratio. Results of the present study clearly disconfirmed this hypothesis, since subjects receiving the lower rate of reinforcements performed at a lower level than subjects receiving a moderate amount of verbal reinforcement (ratio .50). It thus appears that Baron's mutual social control hypothesis cannot account for the present set of data.

In conclusion, results of this study show that positive verbal reinforcement produces motivational effects on qualitative task performance. These findings provide support for the Martens (1975) "information/motivation" interpretation of the effect of positive verbal reinforcement on qualitative task performance. When a qualitative task is well learned, positive verbal reinforcement serves as a motivational source of influence and affects performance according to an inverted-*U* function. Future research should focus on assessing the generality of the present results with respect to other tasks and activities as well as attempting to delineate the psychological processes responsible for the motivational effects obtained. It is believed that such research should eventually further our understanding on the relationship be-

tween positive verbal reinforcement and human behavior, ultimately leading to better theorizing on this important motivational variable.

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