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The effects of extrinsic rewards on intrinsic motivation: Reinforcement theory or cognitive evaluation theory

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THE EFFECTS OF EXTRINSIC REWARDS ON INTRINSIC MOTIVATION: REINFORCEMENT THEORY OR COGNITIVE EVALUATION THEORY

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THESIS ACCEPTANCE

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The Effects of Extrinsic Rewards on Intrinsic Motivation: Reinforcement Theory or Cognitive Evaluation Theory

Intrinsically motivated behaviors are those for which there is no apparent reward except the activity itself. Such rewards are mediated within the individual. Rather than bringing about external rewards, intrinsically motivated behaviors bring about internal states that the individual finds rewarding (Deci, 1975a).

A similar phenomenon has been observed in animal studies. Berlyne (1950, 1955) found that rats will perform an operant task for the reward of novel stimulation. He postulated a "curiosity" or "exploratory" drive that may be equated with intrinsically motivated behavior. Harlow, Harlow, and Meyer (1950) observed monkeys working on a puzzle apparatus for no apparent reward and called this intrinsically motivated behavior a "manipulation drive".

Theorists such as Hebb (1955), Berlyne (1963, 1966) and Helson (1964) have also attempted to explain such behaviors. Though each theory is somewhat different, the general notion is that organisms seek to maintain an optimal level of arousal or incongruity. Thus, an intrinsically motivated activity is performed to increase or decrease the level of stimulation. Deci (1975a), however, disagrees with the theories of maintenance of optimal arousal. He asserts that individuals seek out situations that provide a reasonable challenge for the purpose of overcoming this challenge. Having overcome the challenge the individual will seek new challenging situations.

Intrinsic motivation may be viewed through an attributional analysis. Attribution theory isn't concerned with the objective causes of behavior, but with the individual's perception of causality (Bem, 1967; Heider, 1958, Jones and Davis, 1965; Kelley, 1967). According to the attribution view a person will be more likely to perceive himself as extrinsically motivated if he is presented with a salient reward for performance of an activity. Deci (1971, 1972a, 1975a) has developed a cognitive theory concerning the effects of extrinsic rewards on intrinsic motivation. The underlying assumptions of the theory are based on attribution theory.

In contrast, the content of the theory builds on notions set forth by DeCharms (1968). DeCharms has stated that when a person perceives himself to be the locus of causality for his own behavior he will consider himself to be intrinsically motivated. Satisfaction is derived from an activity which is perceived as intrinsically motivated because of a person's need to feel a sense of personal causation in his actions. Due to this need, presentation of extrinsic rewards for intrinsically motivated behavior will act to decrease intrinsic motivation. Extrinsic rewards cause a person to lose his feelings of personal causality and make him feel like a pawn controlled by the rewards.

These cognitive approaches are in opposition to a reinforcement position regarding the relationship between extrinsic rewards and intrinsically motivated behavior. Reinforcement theory (Kazdin & Bootzin, 1972) places prime emphasis on extrinsic factors in the

causation and explanation of behavior. Thus, any behavior explained as intrinsically motivated by a cognitive theorist will tend to be cited as externally controlled by a reinforcement theorist.

Deci's cognitive evaluation theory (1971, 1972a, 1975a) disputes the assertions made by reinforcement theory concerning extrinsic rewards and intrinsic motivation. The theory is a cognitive theory, thus it is built around the assumption that individuals make choices about how to perform based on processing information received from the environment, from memory, and from personal feelings. This framework may be contrasted with those reinforcement theories that typically regard human beings as mechanisms whose behavior is determined by reinforcement histories and contingencies in the present environment (e.g., Skinner, 1975).

Cognitive evaluation theory (Deci, 1971, 1972a, 1975a) states first that intrinsic motivation can be affected by a change in perceived locus of causality from internal to external. Such changes cause a decrease in intrinsic motivation. This situation typically occurs when one receives an extrinsic reward for an intrinsically motivated activity. A second process by which intrinsic motivation can be affected is a change in feelings of competence and self-determination. If these feelings are enhanced intrinsic motivation will increase. With their diminution intrinsic motivation will decrease. A third proposition is that every reward has two aspects, a controlling aspect and an informational aspect. The relative salience of the two aspects determines which process will be operative. If the control aspect is more salient changes are initiated in perceived locus of causality to external. If the information aspect is more salient changes in feelings

of competence and self-determination will be initiated. The information aspects may be positive or negative, positive leading to increases and negative leading to decreases in feelings of competence and self-determination. The result is an increase or decrease in intrinsic motivation.

Reasoning from these theoretical statements leads to specific predictions and prescriptions. Extrinsic rewards such as money presented contingently for intrinsically motivated activities will act to increase the salience of the control aspect of reward. The perceived locus of causality will become more external resulting in a decrement in intrinsic motivation. However, social reinforcement such as positive feedback are more salient in informational aspects and will act to increase feelings of competence and self-determination. The result is increased intrinsic motivation. Negative feedback is salient for information but will decrease feelings of competence, thus lowering intrinsic motivation (Deci, 1971, 1972, 1972a, 1975a).

A crucial issue is that of non-contingent rewards. In the non-contingent reward situation performance isn't tied directly to rewards, thus decreasing the control aspect of the reward. This situation should not have the detrimental effects on intrinsic motivation as in the contingent reward situation. Since the theory deals with intrinsically motivated activities, Deci (1972b, 1975a) advocates techniques of job enlargement and enrichment (e.g., Hackman & Lawler, 1971) to promote initial intrinsic motivation. Avoidance of decrements in intrinsic motivation may be accomplished using non-contingent pay systems.

Methodological Techniques

Because the implications of cognitive evaluation theory are so divergent from those of reinforcement theory a great deal of research has been generated. A brief review of this literature will be presented in order to examine the logic leading to the present study.

Deci (1971) employed a 3-session study with two groups of college students involving a cube puzzle called Soma. Soma is made up of seven pieces, each consisting of 3 or 4 1-inch cubes connected in different ways. The pieces may be fitted together to form configurations presented to subjects on drawings. The task is mentally challenging and presumed to be intrinsically interesting to college students. In each session subjects were asked to solve four puzzles, each with a 13-minute time limit.

In all sessions, subjects were seated at a table which had on it Soma, a series of task configurations, some extra configurations, and some popular magazines. Subjects were informed that the study was one testing problem solving ability. In each session, each subject tried to solve the task configurations within the time limit. After the first two puzzle attempts the experimenter informed the subject that the choice of the next two puzzles depended on his performance on the first two. The choice was said to require computer aid so the subject was left alone in the room for 10 minutes while the experimenter left to compile the data. Subjects were told to remain in the room and do anything they wished--read magazines, work on the extra configurations, or do nothing. This procedure was a ruse

designed to obtain measures of intrinsic motivation, operationally defined as the amount of time spent on the puzzles during this 10 minute "free period". Unknown to the subjects, they were being watched through a one-way mirror.

The experimenter returned and subjects attempted the last two puzzles. In the first session, no subjects were paid, the free period indicating baseline measures of intrinsic motivation. In the second session subjects in an experimental group were paid one dollar for each puzzle they solved within the time limit. The free period in this session wasn't analyzed in the data because presumably paid subjects would use the time to practice. In the final session the experimental subjects were informed that funds for paying subjects had been exhausted in the department, so procedures were identical to session 1. It should be noted that the configurations available during the free period were impossible, to eliminate reduction in free-time puzzle solving due to successful completion of all the puzzles. The relevant statistical comparison in the study was the difference in time spent in free period puzzle solving between sessions 1 and 3. Control (non-paid) subjects exhibited no significant difference in this measure. However, subjects paid in session 2 showed a considerable decrease in session 3 as compared to session 1. Deci interpreted these findings as supportive of cognitive evaluation theory. Paying subjects contingently was seen to reduce intrinsic motivation for the task, resulting in less interest, thus less free time activity on the task.

In 1972 Deci (1972a) employed a 1-session paradigm. The Soma puzzle was used and procedures were similar to the initial study

except that subjects worked on all four puzzles in turn before the free period. After completion of this phase subjects were told to wait while the experimenter analyzed their performance in order to determine an appropriate questionnaire to be filled out. This ruse allowed another experimenter to unobtrusively observe the subject for an 8-minute free period. The experimental manipulations in the study were contingent or non-contingent rewards, threats of punishment (a loud buzzer) for poor performance, positive or negative feedback on performance level, and a no-treatment control. The data supported cognitive evaluation theory. Subjects verbally reinforced spent more time in the free period working with Soma than controls, non-contingent subjects were not different from controls, punishment threats acted to reduce free period activity relative to controls, and contingent pay reduced free period activity.

Methodological Criticisms

The Deci studies (1971, 1972a, 1972b) have received some criticisms to which Deci and his colleagues have replied. Calder and Staw (1975a) listed a number of methodological criticisms relating to the entire series of studies testing cognitive evaluation theory. They pointed out that no performance data were reported during the experimental (paid or not paid, etc.) sessions, thus differences in performance may act as a mediator and affect free time performance. Contingent subjects probably increased effort resulting in possible fatigue or satiation, thereby reducing free time activity. Calder and Staw (1975) also mentioned some contradictory findings (Kruglanski, Friedman, and Zeevi, 1971) in which non-contingent rewards reduced intrinsic motivation relative to nonpaid controls.

Deci, Cascio, and Krusell (1975) attempted to defend the original interpretations of the studies noting that there were no significant differences in performance during experimental sessions for paid and nonpaid subjects. This disclosure would seem to rule out differences in paid subjects due to fatigue and satiation. However, Deci et al. (1975) did agree that the issue is still in some doubt concerning the effects of non-contingent reward relative to non-paid controls. However, the original contention concerning the effects of contingent reward was strongly defended.

Scott (1975) also criticized Deci's (1971, 1972a, 1972b) interpretations on the same grounds as Calder and Staw (1975a), that no performance data were presented for subjects in the experimental sessions. His alternative explanation was that subjects who solved more puzzles in this session, regardless of pay contingency would experience differential conditioning as compared to subjects solving fewer puzzles. Within a reinforcement theory framework, those solving more puzzles should go on to spend more free period time working on the puzzles. In response to this, Deci (1975b) pointed out the different methodological framework within which Scott (1975) was reinterpreting the findings. Deci explains behavior according to a cognitive framework in which internal events, cognitions, and affective states do affect and cause behavior. Reinforcement theory employes a functional analysis of behavior, viewing man as a mechanistic being responding differently in different reinforcement situations. As such, the interpretations of data will be quite different. In regard to Scott's (1975) methodological critique, Deci pointed out that

while solving more puzzles could act to increase feelings of competence and thus act to increase intrinsic motivation, this effect may have occurred only at the individual level and post hoc analysis showed no systematic distribution of such an effect across treatment cells. There was a correlation of .14 (non-significant) between the number of correct solutions in the experimental session and amount of time spent on the task in the free period.

Calder and Staw (1975b) manipulated both intrinsic and extrinsic factors as independent variables and measured the effects on dependent variables of intrinsic motivation different from those typically employed by Deci. They hypothesized that when a task involves high intrinsic interest, introduction of an extrinsic reward may lead to the self-perception that one is performing the activity to obtain the extrinsic reward, thus decreasing intrinsic motivation. However, when a task involves less intrinsic interest this self-perception is not expected to apply. In such an instance a direct relationship between extrinsic rewards and intrinsic motivation may apply, which would be in support of reinforcement theory. A task was selected that could be varied along the dimension of intrinsic interest. Some subjects built jig-saw puzzles that had an attractive picture (high in intrinsic interest) while others built puzzles consisting of pieces that had identical shapes as the first condition but the pieces were blank. The other manipulation was pay or no pay. The dependent variables were questionnaire

items; one a measure of task satisfaction and the other a measure of the amount of time a subject would volunteer to spend in a similar (unpaid) study in the future.

The hypotheses were supported--for an interesting task ratings of satisfaction decreased and for a non-interesting task ratings of satisfaction increased with monetary rewards. The same pattern was noted for volunteer time, but the interaction was not significant. This is supportive of Deci in that the extrinsic reward/intrinsic motivation interaction is predicted explicitly for intrinsically rewarding activities.

Lepper and Greene (1975) examined the effects of adult surveillance on children's subsequent task interest in a natural classroom setting. Reward expectation was either present or not. It was predicted that both surveillance and expectation of reward would decrease the level of intrinsic interest in the task. The task involved six interesting puzzles. The reward was access to some "very fun" toys. In the expected reward the toys were within view at the end of the table on which the puzzles were presented. Subjects were told that the better they performed on the puzzles, the longer time they could spend with the toys (a contingent reward). For the unexpected reward condition, the toys were hidden behind a screen, and presented non-contingently after the puzzle task.

Surveillance was accomplished using a closed circuit T.V. camera trained directly on and placed right next to the child. Low

surveillance was defined as use of the camera on 1 of the 6 puzzles; high surveillance was defined as camera use on 4 of the 6 puzzles. The dependent measure of subsequent interest in the puzzle was obtained 1 to 3 weeks later in an open classroom situation in which the puzzles were set out along with the normal classroom activities. The results showed main effects for both variables. Low surveillance led to a subsequent higher interest level (more time spent on the puzzles) than high surveillance. Unexpected-noncontingent reward led to a higher interest level than expected-contingent reward. The reward effects are directly supportive of cognitive evaluation theory. The effects of surveillance are interpretable within the Deci model. Surveillance is typically an external control. Where one's locus of causality is shifted to external, the theory predicts a reduction in intrinsic motivation.

Ross (1975) varied salience of reward in order to test the hypothesis that perceptions of external control are more likely if one is provided with a salient reward for an activity. The experimenter varied salience of reward by manipulating the conspicuousness of the reward. The subjects were children, aged 3 to 4. The task involved playing a drum. In the high salient reward condition, a box containing the reward was placed directly in front of the subject. For low salience, the reward was not present, though it was expected. Following this procedure, a free period was offered in which other

toys were also present. The drum was played more often and played longer by subjects in the low salience reward condition and a non-rewarded control. A delayed (4-5 weeks later) free period session resulted in comparable results for the duration of play dependent measure only. The results clarify the parameters of cognitive evaluation theory. With increases in the salience of a reward, subsequent interest in a task is diminished.

Some studies have yielded data counter to predictions made by cognitive evaluation theory. Farr (1976) conducted an experiment utilizing elements from Hackman and Lawler's (1971) Job Characteristics Model. This model lists five core job dimensions: 1) task significance, 2) task identity, 3) task variety, 4) feedback, and 5) autonomy. A job high in these dimensions, according to the model, will foster increased motivation and satisfaction. The core job dimensions were varied in the following manner: 1) low in core dimensions, 2) high except for feedback, and 3) high in all dimensions. Monetary pay was awarded contingently or non-contingently. The dependent measures were four measures of intrinsic motivation: 1) subjects' willingness to volunteer for an extra unpaid session, 2) productivity during this unpaid session, 3) a satisfaction questionnaire, and 4) a questionnaire on the locus of causality of task motivation. The task involved erector set assemblies, an activity in which core job dimensions were easily varied. Analysis of the data revealed more contingently paid subjects volunteering for an extra session than non-contingently paid subjects. This is directly

counter to the Deci predictions. The volunteer rate for subjects experiencing core job dimensions with feedback was not significantly greater than that of subjects not receiving feedback. The feedback in this study was positive and cognitive evaluation theory predicts enhanced intrinsic interest for those with such feedback. Also, non-contingent pay did not lead to a greater degree of internal attributions of performance causality relative to contingent pay, though Deci would predict such a difference. Farr speculated that the task may have lacked a high degree of qualities leading to intrinsic motivation, thus the contradictory results. Furthermore, pay levels were lower than those typically administered in the Deci studies, which led him to speculate about possible interactive effects of pay level.

In a follow-up study Farr, Vance, and McIntyre (1971) investigated the possible mediating effects of pay level. The basic 1-session paradigm (Deci, 1972a) with the Soma puzzle was used with pay awarded contingently or non-contingently. Contingently paid subjects received either $.50, $1.00, or $1.50 per puzzle, while non-contingently paid subjects received either $1.00, $2.00, or $3.00 just for participating. The free period dependent measure of intrinsic motivation was used along with a satisfaction questionnaire. The authors also analyzed performance during the experimental session. As cognitive evaluation theory predicts, contingently paid subjects spent significantly less free period time playing with Soma than non-contingently paid subjects. However, the questionnaire measures of

interest revealed different results. There were no significant differences among the different pay levels for contingent or non-contingent groups.

Noting a bimodal distribution of free time activity, the authors postulated some mediating personality variables to be investigated in a second study. Moderating on the locus of control and self-esteem scales revealed no systematic differences in free period activity. The authors performed a post hoc analysis of the data employing a non-parametric statistical test assumed to be more appropriate for bimodal data. The data were analyzed to see if those subjects who solved more puzzles during the experimental session went on to spend more free time on Soma. However, significant relationships were found only for the first study. This result offers evidence supporting reinforcement theory, in that solving more puzzles is more reinforcing, thus behavior is more likely to persist.

Enzle and Ross (1978) tested cognitive evaluation theory, concentrating on the salience of the control or competence aspect of the reward contingencies. They reasoned that money paid contingent on a skill-related criterion of performance would increase the salience of the competence information aspect. Conversely, paying subjects simply to perform the task should increase the salience of the control aspect of the reward. Furthermore, only high reward levels should bring about these changes in salience

of the different aspects of reward. This reasoning derives from the postulates of cognitive evaluation theory yet the interpretations are different from those of Deci (1971, 1972a, 1975a).

The authors predicted that 1) subjects receiving high reward just for performance of a task (non-contingent) will be less intrinsically motivated than control subjects getting an unexpected payment of equal value, 2) subjects receiving high payment contingent on a skill related criterion will be more motivated than highly paid control subjects receiving unexpected pay, 3) low rewarded subjects should demonstrate no differences between conditions, and 4) there will be main effects due to reward level depending on the reward aspect salience. The experimental sessions were similar to the Deci (1971, 1972a, 1972b) studies except the dependent measures of intrinsic motivation were questionnaire items concerning how interesting the puzzle task was and how much a person would play with it if he owned it. All predictions were supported. High pay for non-contingent performance lowered intrinsic motivation relative to controls, high pay for criterion contingent performance raised intrinsic motivation relative to controls, and no differences were exhibited when pay was low. High pay for criterion contingent performance resulted in higher intrinsic motivation level than low pay for this condition. High pay for non-contingent performance resulted in lower intrinsic motivation levels than low pay for this condition.

Overall, the support for Deci (1971, 1972a, 1975a) has been rather extensive yet the disconfirming studies indicate the necessity to further investigate cognitive evaluation theory. The greatest antagonists toward the theory have been those proponents of reinforcement theory.

Statement of the Problem

The most damaging evidence counter to cognitive evaluation theory has been that of Farr, Vance, and McIntyre (19771). Having failed to obtain results predicted by the theory, the authors analyzed the data to see if task performance during the experimental session were the crucial variable affecting free period task activity. This proved to be the case, but for only one of their experiments. Another important point was the observation of typically bimodal data on free period task activity. Many students spent considerable free period time working with the task while many spent very little time. These authors looked at several studies in the Deci series (1971, 1972a, 1972b) and noted the existence of typically bimodal data in these. The appropriate statistical procedure for such data is non-parametric. When Farr, et al. (1977) analyzed the data from the three Deci studies using non-parametric statistics the results were non-significant for the 1972a study only.

These discrepancies indicate the need to execute a study that has specific differential predictions for cognitive evaluation theory and reinforcement theory. The general concensus among supporters of

reinforcement theory is that those performing at higher levels during experimental treatment sessions go on to spend more free period activity on the task due to persistence resulting from the high reinforcement value of high performance (Farr et al., 1977, Scott, 1975). While Deci (1975b) has stated that this effect has not appeared in his data, he contends that high performance during experimental sessions could generate feelings of competence which may increase intrinsic motivation. In effect Deci has allowed for predictions made by reinforcement theory within the bounds of cognitive evaluation theory. In order to make the predictions discrepant, a study would have to hold constant these feelings of competence to see if experimental session performance is the relevant variable differentiating free period activity. If feelings of competence were held constant and high performers went on to spend more free period activity at the task, such results could not be interpreted within a cognitive evaluation theory framework. If pay contingency is the important variable, then performance level should have no effect and cognitive evaluation theory would be supported.

Though the general argument between Deci and the proponents of reinforcement theory is concerned with the effects of performance during test trials, it should be mentioned that reinforcement theory specifically predicts that individuals paid (reinforced) for task performance will persist in that task when reward is removed. Thus, reinforcement theory predicts that individuals paid during test trials will go on to spend more free period time at the task than those not being paid.

Although Deci (1975a) has stated that high performance will generally lead to greater feelings of competence, this may not always be the case. Weiner, Freize, Kukla, Reed, Rest, and Rosenbaum (1971) have shown that individuals low in achievement motivation have an inability to attribute successful performance to internal factors, whereas high achievers tend to view their success as internally caused. The only way an individual can experience pride in his successful performance is by attributing the outcome to internal factors such as ability or effort. It follows that an individual will probably not feel competent in a task if he believes that his high performance was due to external factors such as task ease or luck. Without increased feelings of competence, intrinsic motivation will not be enhanced.

Since attributions may mediate feelings of competence, Deci's theoretical statements concerning competence may need qualification. The present study explored the possible relationships between attributions and feelings of competence to aid in clarifying and interpreting any findings concerning performance, competence, and intrinsic motivation.

Experimental Design

The present study was designed to separate the predictions made by cognitive evaluation theory and reinforcement theory. A pay versus no pay variable was included in the design to test the Deci prediction that pay for an interesting task would lower intrinsic motivation and suppress intrinsically motivated behaviors. A low versus high performance variable (achieved by blocking) was included to test the

reinforcement hypothesis that successful task performances act as reinforcers, thus increasing the probability of similar behavioral occurrences. Since cognitive evaluation theory allows for this prediction by alluding to increased feelings of competence with high performance, a third variable was introduced intended to equalize feelings of competence at different levels of performance (i.e., at different reinforcement levels). Consequently, the design allowed for separating predictions made by cognitive evaluation theory and reinforcement theory. In this manner the separate effects of performance and feelings of competence were analyzed. Thus the experiment was a 2 (pay/no pay) X 2 (low performance/high performance) X 2 (competence equalization/no competence equalization) factorial design.

Hypotheses

The rewards for task performance in this study were both expected and contingent for all paid subjects. Since cognitive evaluation theory predicts a decrement in intrinsic motivation for this system of payment, it was hypothesized that those receiving pay would go on to spend less time at the task during a free period than those not getting paid. Paid subjects should also indicate that they enjoyed the task less, and would be less willing to volunteer for a similar (unpaid) experiment in the future than non-paid subjects.

Deci (1975b) has stated that high performance on a task will lead to increased feelings of competence, thus increasing intrinsic motivation. Therefore, it was hypothesized that high performers would spend more free period activity at the task than low performers. It was also

predicted that high performers would indicate greater task enjoyment and willingness to participate in the future than low performers.

The competence equalization condition was included in the study to modify feelings of competence at different performance levels. Cognitive evaluation theory makes no predictions for a variable such as this. Therefore, predictions for this manipulation can only be stated in terms of how it should modify the hypotheses concerning performance. It was hypothesized that differences resulting from performance would be found only for subjects in the no competence-equalization condition. Subjects experiencing competence equalization should not differ in free period task activity, enjoyment of the task, or willingness to repeat a similar experiment in the future as a function of performance level.

The greater portion of the Deci studies have dealt with the effects of pay (Deci, 1971, 1972b) or positive and negative feedback (Deci, 1972a). Since the effects of performance level and competence were mentioned incidentally (Deci, 1975b), it may be assumed that cognitive evaluation theory views pay as the more potent determinant of intrinsic motivation.

Based on the hypotheses, the predictions for the intrinsic motivation dependent variables (free period activity, task enjoyment, and willingness to volunteer in the future) may be ordered for the eight conditions in the following manner (where P = pay, NP = no pay, CE = competence equalization, NCE = no competence equalization, Lo = low performance, and Hi = high performance): NP, Hi, NCE > NP, Hi, CE = NP, Lo, CE > NP, Lo, NCE > P, Hi, NCE > P, Hi, CE = P, Lo, CE > P, Lo, NCE.

Subjects' attributions of causality for task performance were included in the design to aid in clarification and interpretation of the results. Therefore, no hypotheses were generated for responses to attribution questionnaire items.

Method

Subjects

The subjects were 89 undergraduate female students from the University of Nebraska at Omaha. They participated voluntarily in order to receive extra credit in undergraduate psychology courses.

Sex has been found to be an important factor in spatial relations tasks (McGlone & Kertesz, 1973). Typically males perform better at such tasks than females. The task used in the present study was the puzzle game Soma, which involves spatial relations. A pilot study was performed in order to find a series of puzzles in which half the subjects performed well and half performed poorly. Female subjects displayed far greater variability in performance level than males. Since the use of female subjects appeared to be more conducive to blocking by performance, it was decided to use only this sex.

Task

The task employed was the Parker Brothers cube puzzle game called Soma. Soma has seven different pieces, each piece made up of 3 or 4 1-inch cubes connected in different patterns. The task involves constructing configurations using various combinations of the Soma pieces. Stimulus materials consisted of drawings of the configurations to be made. There were three different test drawings and a sample drawing. In addition, there were two other configurations that were

insoluble that were available to subjects during a free period. The study took place in a room equipped with a table and a one-way mirror through which the experimenter could observe subjects.

Procedure and Independent Variables

The procedure was very similar to Deci's (1972a, 1972b) one-session, one subject per session paradigm. When a subject reported to the designated area she was met be an experimenter who took her into the experimental room and asked her to sit at the table. Then she was presented with a consent form briefly describing the procedures she would be experiencing. For half the subjects the consent form indicated that she would earn $1.25 for each puzzle successfully solved within a 5-minute time limit, while the remaining subjects were not provided with any pay information. Those subjects consenting to participate (no subjects declined) were asked to sign the form, and the study began.

To the immediate left of the subjects were the three test drawings and the sample drawings. To the subject's right were the additional drawings, the insoluble ones. On the far side of the table were recent issues of two women's magazines, Bazaar and Cosmopolitan. In a far corner of the room (out of the subject's seated view) sat a female experimental assistant. During the entire session she appeared busy coding data. The presence of this assistant was an ethical consideration. The experiment required covert surveillance for an 8-minute period and the experimenter did not wish to covertly observe subjects who believed themselves to be alone in the room. When later asked what the subjects thought of the assistant's presence, practically all subjects expressed the belif that she was either a subject on some other experimental

phase or was helping the experimenter with some aspect of the data. During the debriefing stage no subject indicated that the presence of the assistant affected her behavior during any phase of the study.

The experimenter then read the instructions. Each subject was asked to attempt to solve three separate puzzles, each with a 5-minute time limit. During the instructions the experimenter demonstrated how puzzles should match the drawing, using the sample configuration. Paid subjects were informed of the piece-rate pay system and were told that all earnings would be paid in cash immediately after the entire session was over.

Subjects than worked on each of the test puzzles in turn with the experimenter timing each one. For each puzzle successfully solved the experimenter stated, "That's exactly right," and he then recorded the solution time. Each paid subject was given a cumulative statement of her earnings after each successful solution. With each unsuccessful attempt the experimenter said, "That's time," and immediately showed the subject the solution. This let subjects know that all test configurations were possible and helped to eliminate the Ziegarnik effect (Ziegarnik, 1927). After all three test puzzles had been attempted, the paid subjects were told how much they had earned.

At this point half the subjects received the competence equalization (CE) feedback. Despite the performance level, each subject receiving CE was told that she performed "about average" in comparison with the other subjects in the study. For subjects solving few puzzles (0-1) the experimenter informed them that this particular series of

puzzles appeared to be quite difficult and almost everyone had performed at the same level. For subjects solving 2 to 3 puzzles the experimenter informed them that this puzzle series was rather easy and most had performed at this high level. Subjects in the no competence equalization condition were not given feedback of any kind.

Next all subjects were told that the final phase of the study involved a questionnaire to be completed. Each subject was told that a number of different questionnaire forms existed, and that only one was appropriate for that particular subject. To select the most appropriate form, data from the test session would be fed into a computer terminal. To do this the experimenter would have to leave the room for a short time, about 10 minutes. The experimenter told each subject, "Please just wait around til I get back. You can do whatever you want while I'm gone. There are magzaines to read and even extra puzzles if you'd like to play with them." This was a ruse designed to leave the subject in the room, free to do whatever she liked. In actuality, all questionnaires were identical.

The experimenter then left the room and quietly entered an adjacent room with a one-way mirror through which subjects were observed. The experimenter started a timer immediately upon first sight of the subject. The subject was viewed for eight minutes during which a stopwatch was used to record how much of this eight minute free period the subject spent playing with the available (insoluble) puzzles.

Dependent Variables

Intrinsic motivation for the Soma task was defined as the amount of time a subject spent working on the task during this free period. The extra configurations were impossible to solve to avoid the possibility that solution of a configuration would influence whether or not a subject spent more time working on the puzzles. Dependent measures of intrinsic motivation were also included in a questionnaire (see Appendix A). Since subjects were led to believe that the study was primarily concerned with spatial relations, the first two questionnaire items (7-point Likert scales) pertained to problem solving strategies. The next two items (also 7-point Likert scales) dealt with intrinsic motivation toward the Soma task, one concerned task enjoyment, and the other, a query on the willingness of a subject to volunteer for a similar experiment in the future. The fifth item (7-point Likert scale) asked subjects how competent they felt about their performance. This question allowed for a manipulation check concerning one of the independent variables, that of inducing equated feelings of competence in half the low and half the high performers. Also included in the questionnaire were two series of items concerning causal attributions that people typically cite for their task performance: 1) task difficulty, 2) luck, 3) ability, and 4) effort. These were both 7-point bipolar scales, and subjects' assessment of the percent to which each causal factor contributed to their performance.

After the eight minute period the experimenter returned to the experimental room with the questionnaire and had subjects fill it out.

Having completed the questionnaire, the pay subjects were given their earnings in cash. At this point all subjects were debriefed, asked their feelings concerning the study, and thanked for their participation. The data for one subject had to be dropped because she had figured out, almost perfectly, the various details and ruses involved in the study.

Results

Manipulation Check

The manipulation check, questionnaire item E (concerning how competent subjects felt in their performance), indicated that the competence equalization feedback did not induce the intended feelings. It was predicted that there should be a significant Performance X CE interaction in which low performers with no CE felt rather low in competence, high performers with no CE felt rather high in competence, and both low and high performers with CE felt about average in competence. Figure 1 illustrates this predicted interaction.

Insert Figure 1 here

For the item on Competence there was a significant main effect for CE, $F_{(1,81)} = 5.41$, $p < .05$. Subjects receiving CE felt more competent ($M = 3.52$) than subjects not receiving CE ($M = 2.96$). This item also yielded a significant main effect for Performance, $F_{(1,81)} = 29.93$, $p < .01$. High performers indicated that they felt more competent ($M = 4.03$) than low performers ($M = 2.7$). Figure 2 indicates that for low performers the CE manipulation had the intended effect. Low performers administered CE felt more competent than those not receiving CE. $t(52) = 2.28$, $p < .05$.

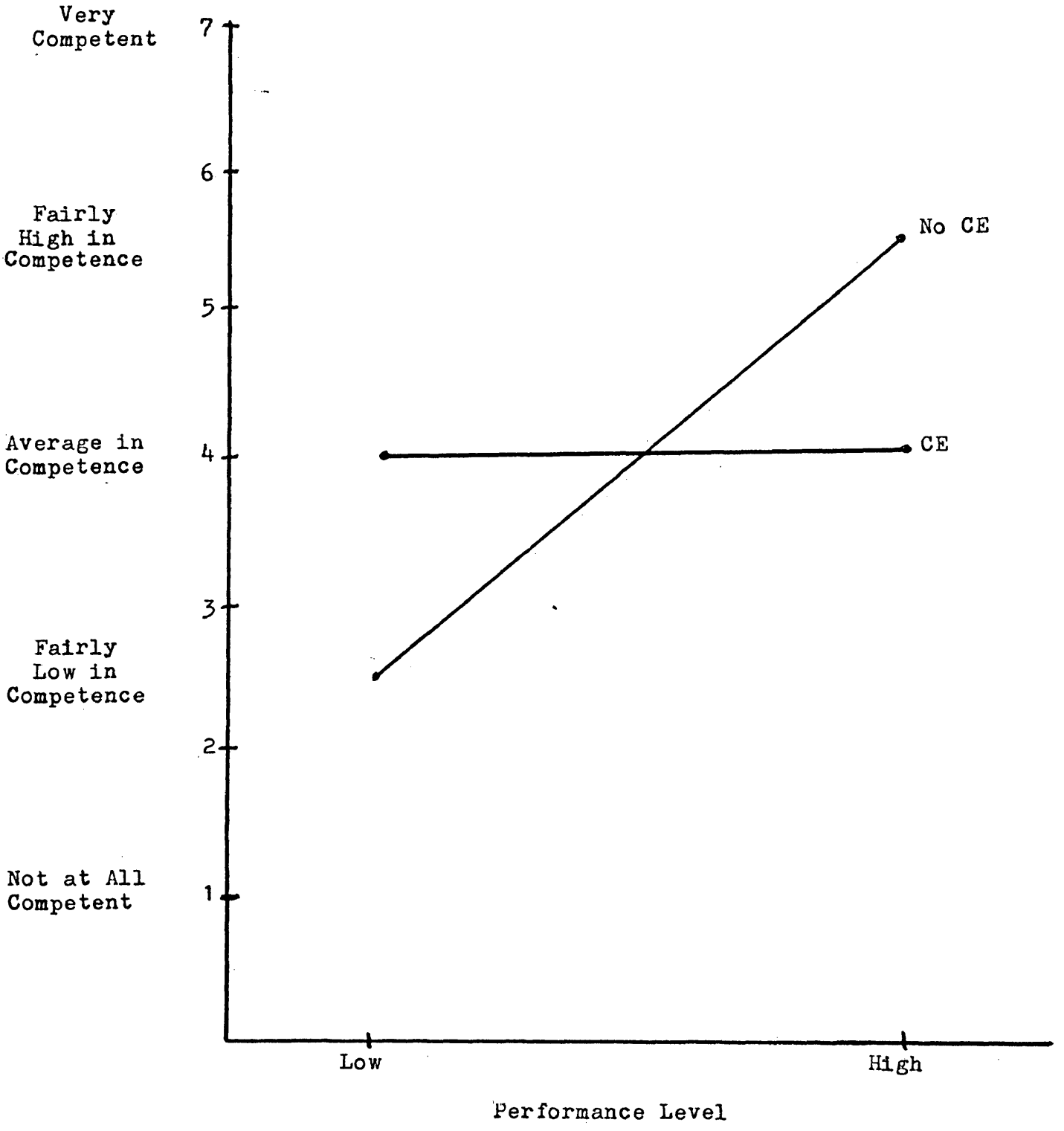

Figure 1. The Hypothesized Interaction of CE and Performance on Feelings of Competence

However, for high performers CE had no significant effect on feelings of competence, $t(34) = .81$, n.s. Administering CE to high performers was intended to reduce their feelings of competence relative to those not receiving CE.

Insert Figure 2 here

The measure of competence was found to be related to the total number of puzzles solved. This was tested by a one way analysis of variance, $F(3,40) = 13.14$, $p < .001$. Each successive number of puzzles solved resulted in a significant ($p < .05$) increase in feelings of competence when analyzed by a Newman-Keuls pair-wise procedure: for no puzzles solved M = 1.92, for one solution M = 2.71, for two solutions M = 3.64, and for three puzzles solved M = 4.75. This preceding analysis was performed only for subjects not receiving CE, since CE systematically raised feelings of competence for low performers.

Measures of Intrinsic Motivation

For the dependent measure of free time puzzle activity the within cell distributions were extremely bimodal, the modal points tending to fall at the 0 minute and 8 minute points. The distributions were transformed to a more normal shape by the equation: Time = 1/Time + 1. For this dependent measure no significant differences were obtained.

In an attempt to locate the source of variance for the free time variable, the test session puzzle-solving data were regrouped in a new manner. It may be recalled that subjects attempted to solve three separate puzzles during the test sessions. A number of different performance patterns based on the number and ordinal position of solutions

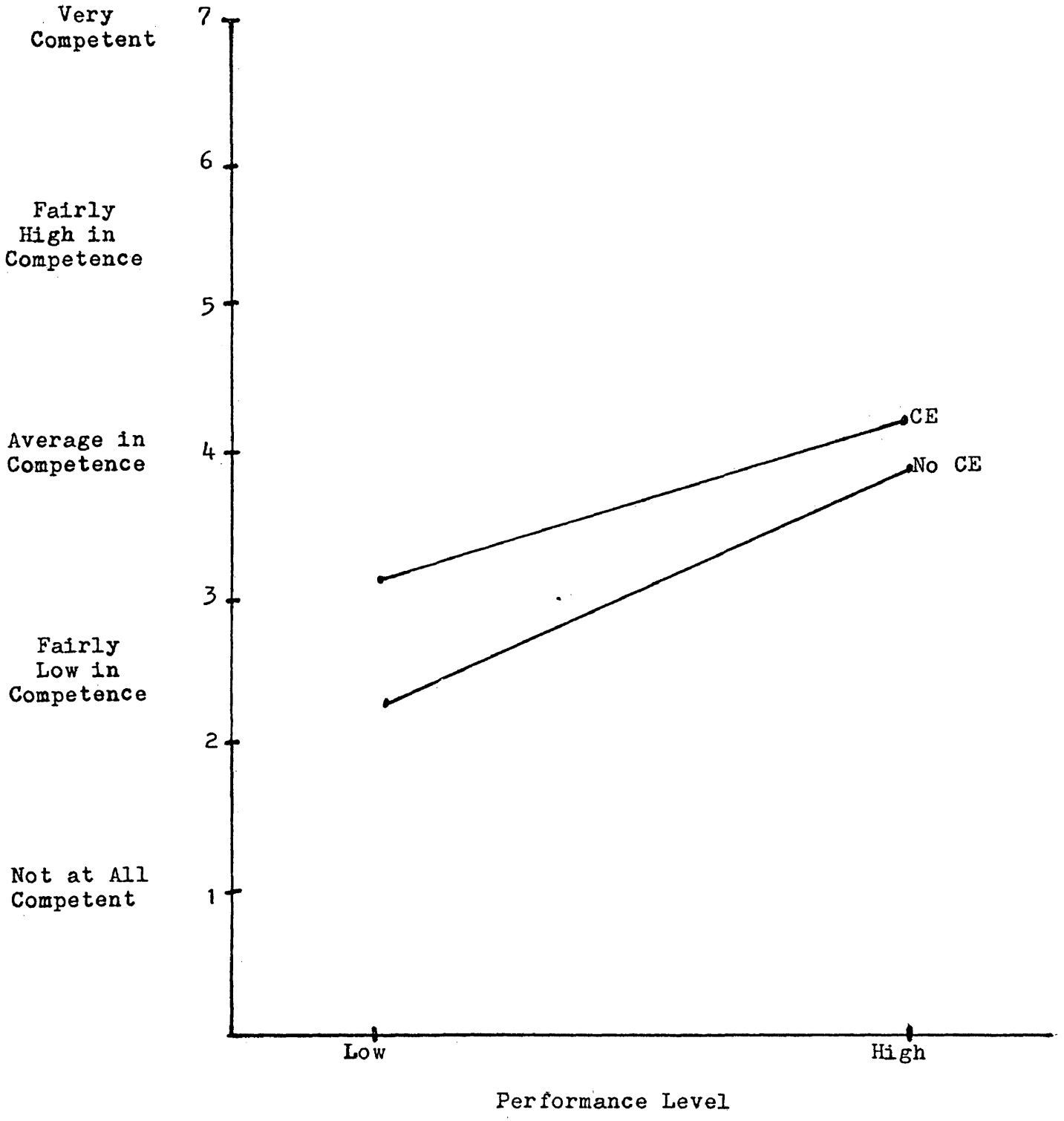

Figure 2: The Joint Effects of CE and Performance on Feelings of Competence

were displayed. Some subjects solved none of the puzzles. Subjects solving only one puzzle of the series displayed three patterns: solution of the 1st, the 2nd, or the 3rd puzzle. Subjects solving two puzzles either solved the 1st and 2nd, 1st and 3rd, or 2nd and 3rd puzzles. Of the 89 subjects, only five solved all three of the puzzles.

Based on these data, three groups were formed for a post hoc analysis. One group (n = 17) consisted of subjects who demonstrated improvement across the three puzzles. Improvement was defined as failure in solving either the 1st, or the 1st and 2nd puzzles, and solving the remaining puzzles. A second group (n = 27) was designated as a no improvement group, consisting of subjects solving either all or none of the puzzles. A third group (n = 20) consisted of subjects demonstrating a decrement in performance across the puzzle series. Decrement was defined as solving the 1st, or the 1st and 2nd puzzles, and not solving the remainder. Certain patterns were displayed that could not be assigned to conditions based on the above group definitions. A single solution of the second puzzle or solutions of the 1st and 3rd puzzles represented patterns that did not meet any of the requirements for the above groupings. In this post hoc analysis, data for 25 of the 89 subjects were not used.

An analysis of free time activity based on the post hoc groupings revealed significant differences, $F(2,52) = 3.83$, $p < .05$. Improving subjects spent the greatest amount of time at the task ($M = 4.65$), non-improving subjects were intermediate ($M = 2.99$), and subjects displaying a decrement spent the least time at the task ($M = 1.36$).

Figure 3 graphically displays the linear trend across these conditions. A Newman-Keuls comparison test indicated significant

Insert Figure 3 here

differences between only the improvement and decrement groups ($p<.05$). The linearity in the free time measure was also evidenced when separating the non-improvement condition into it's two component groups, those solving no puzzles and those solving three puzzles. The analysis of variance statistic was significant, $F(2,52) = 2.70$, $p<.05$, and the test for the linear trend was also significant, $F(2,52) = 2.76$, $p<.05$. The test for the quadratic trend was not significant at the .05 level, $F(2,52)<1.00$, nor was the cubic trend, $F(2.25)<1.00$. Since the data were not normally distributed, a non-parametric test, χ^2, was also applied. This was found to be significant, $\chi^2(2) = 10.00$, $p<.01$. This analysis confirmed the finding that subjects in the Improvement condition spent more time on the puzzles in the free period than Decrement subjects. This newly created independent variable did not interact significantly with CE or Pay conditions.

For the questionnaire item on task enjoyment there was a significant main effect for performance, $F(1,81) = 4.74$, $p<.05$. High performers tended to enjoy the task ($M = 5.53$) more than low performers ($M = 4.68$). There were no other significant effects for this variable. For the item on willingness to volunteer for a future experiment there were no significant effects.

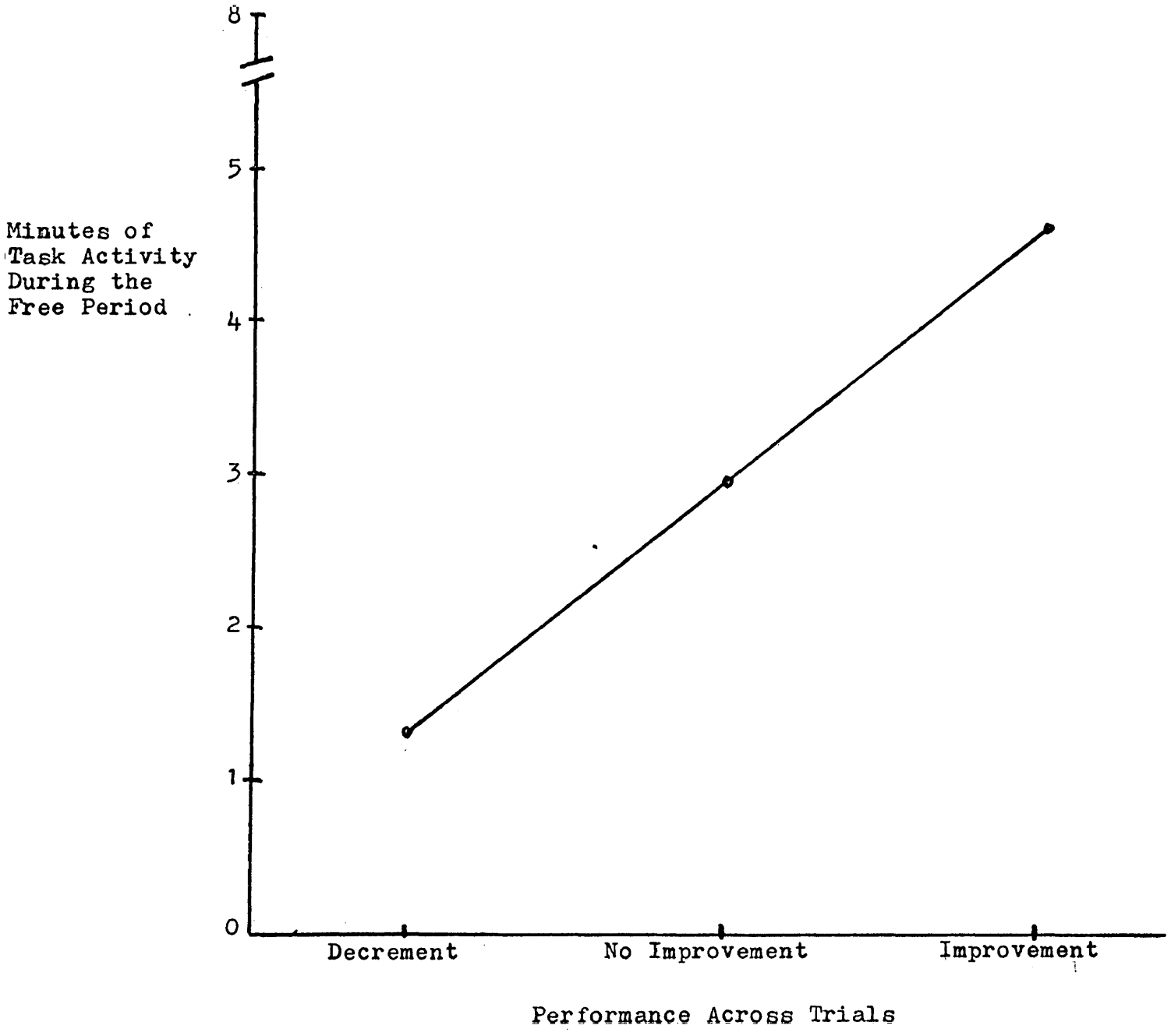

Figure 3: Free Period Activity Time as a Function of Improvement

In the various studies supportive of Deci (Calder & Staw, 1975b; Deci, 1971, 1972a, 1972b) different measures of intrinsic motivation were employed (e.g., free period task activity, numerous questionnaire items on task interest and enjoyment). If it can be assumed that all of these variables measure intrinsic motivation, then the various dependent measures should intercorrelate significantly. This was found to be only partially supported. It was found that free period task activity correlated positively with task enjoyment ($r = .22$, $p < .05$), task enjoyment correlated positively with willingness to volunteer ($r = .54$, $p < .001$), but free period time did not correlate with willingness to volunteer ($r = .07$, n.s.). These data indicate the questionable reliability and comparability for the different measures of intrinsic motivation used in this and other studies. These and other correlations among dependent variables are presented in Appendix C.

Causal Attributions

It was initially intended to employ the two separate series of attribution items as a reliability check. However, the items dealing with percentage attribution of performance to the four causal elements presented problems in the context of this experiment. The main problem is concerned with the ambiguous meanings of responses as a function of different performance levels. For example, a high performer attributing a high proportion of causality to ability might indicate attributions of high ability whereas a low performer attributing this same proportion may be indicating attributions of low ability. These inconsistencies prohibited the use of the two separate series of items as reliability checks on each other.

Furthermore, the data on percentage attribution items are difficult to interpret and will, therefore, not be presented in the body of this text (see Appendix B for these data).

For the questionnaire item concerning causal attributions of luck there was a significant main effect for performance, $F(1,81) = 33.01$, $p < .001$. Low performers tended to make attributions toward the bad luck end of the continuum ($M = 4.08$) whereas high performers tended to make attributions toward the good luck end of the continuum ($M = 3.00$). There were no other significant effects for this variable.

For task attributions there was a significant main effect for CE, $F(1,81) = 6.94$, $p < .01$. Subjects receiving CE tended to make attributions more toward the hard task end of the continuum ($M = 3.02$) than those receiving no CE ($M = 3.58$). There was also a significant main effect for performance, $F(1,81) = 7.99$, $p < .01$. Low performers made attributions more in the direction of hard task ($M = 3.06$) than high performers ($M = 3.67$). No other effects were significant.

For effort attributions there was a significant main effect for performance, $F(1,81) = 5.53$, $p < .05$. High performers tended to make greater attributions of high effort ($M = 5.58$) than low performers ($M = 5.06$). There was also a significant triple interaction of Pay X CE X Performance, $F(1,81) = 8.35$, $p < .01$. The test for eta squared revealed that 9% of the variance in the dependent variable was accounted for by this triple interaction. Figure 4 illustrates the manner in which the three independent variables interacted. There were no other significant effects.

Insert Figure 4 here

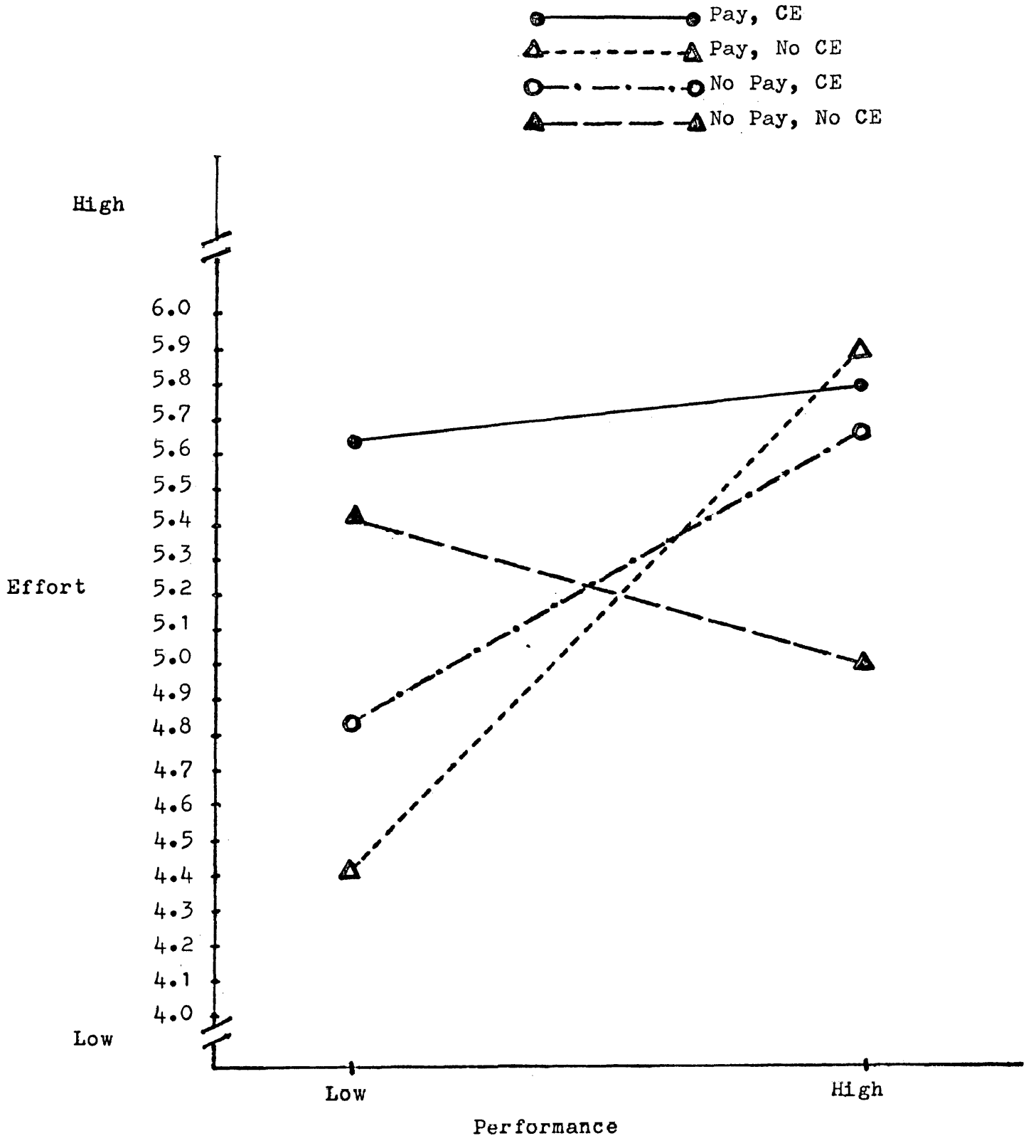

Figure 4: The Interaction of Pay X CE X Performance on Attributions of Effort

For ability attributions there was a significant main effect for Performance, $F(1,81) = 16.67$, $p < .001$. High performers tended to make attributions of high ability ($M = 3.64$) whereas low performers' attributions were more toward the low ability end of the scale ($M = 4.53$). This was the only significant effect for this variable.

Also, a number of attribution items correlated with intrinsic motivation items (see Appendix C). For example, those who felt competent at the task tended to attribute performance to high ability ($r = .51$, $p < .001$).

Discussion

Due to the failure of the CE manipulation it is difficult to make interpretations pertaining to the original hypotheses. However, a number of interesting effects were displayed that warrant discussion.

Though the CE manipulation did not have the intended effects on feelings of competence, this manipulation did systematically affect the competence questionnaire item. As predicted, telling low performers that their performance was average increased their feelings of competence. However, telling high performers that they were average did not significantly affect their feelings of competence, though it would be expected to lower these feelings (actually CE acted to elevate feelings of competence for high performers slightly, though this difference was not significant).

One possible explanation of this phenomenon is differential salience of information for high and low performers. For low performers the information that they had performed average was salient. In an achievement situation such as this it seems likely that subjects welcomed information that made their performance seem better than the raw

score would indicate. For high performers the raw score was the salient information. Having solved at least two of the three puzzles, the subjects preferred to view themselves as competent based on their individual performance, whereas low performing subjects were eager to base their competence ratings on their performance in relation to others. This explanation assumes that the subjects have some degree of achievement motivation. Given the population of subjects drawn from, college students who are constantly subjected to achievement situations, this explanation seems quite plausible.

The predictions based on cognitive evaluation theory were only partially supported, and the failure of the CE manipulation prohibits an explanation solely within the framework of the Deci theory. Though the three measures of intrinsic motivation correlated somewhat, the pay condition was found to be unrelated to any of these. This finding agrees with other studies (Farr et al., 1977) that are nonsupportive of cognitive evaluation theory.

The hypotheses that high performers would exhibit higher levels of intrinsic motivation than low performers was supported, but only for the questionnaire item on enjoyment of the task. The explanation for this effect based on cognitive evaluation theory would be that high performers felt more competent at the task, and as a result, displayed greater levels of intrinsic motivation. While it is true that high performers felt more competent than low performers, there are other possible explanations of the effect of performance level on enjoyment. Since feelings of competence at different performance levels and differential reinforcement are confounded, a reinforcement explanation

is just as likely. Reinforcement theory predicts that paid subjects would to on to spend more free period time at the task than non-paid subjects due to persistence after a conditioning session. This effect was not evidenced in the data.

The post hoc analysis of the free period activity data offers some basis upon which to explain the variability in this measure. Though the distinctions in the groups were labelled as an improvement difference, they may be seen as differences in scheduling of reinforcements. The "improve" condition represents a period of non-reinforcement followed by reinforcement, and the free period may be thought of as an extinction period in which no rewards are presented for performance. The "decrement" group may be seen as an initial reinforcement period followed by extinction (the remaining unsuccessful trials and the free period). The non-improvement group was not found to be significantly different from the other two more extreme groups, so only those need to be mentioned.

Capaldi (1967) has developed a sequential hypothesis pertaining to schedules of reinforcement and their relation to resistence to extinction. In it's simplest form the theory states that organisms experiencing non-rewarded trials followed by rewarded trials (labelled N-R transitions) exhibit the greatest degree of resistance to extinction. Capaldi explains that organisms experiencing this N-R sequence become conditioned to responding in the presence of non-reward and are thus more likely to persist during extinction than those undergoing other sequences, especially an R-N sequence. The extreme two groups represent the two most pure forms of this sequence, the "improve" group being the N-R transition and the "decrement" group, the R-N transition. The results

of this study could have been predicted on the basis of Capaldi's theory: The N-R group ("improve") went on to persist in the behavior during extinction and the R-N group ("decrement") displayed little resistance to extinction. It should be emphasized that Capaldi's theory is a reinforcement theory.

Since this analysis is made post hoc, an extended exploration into the intracacies of the sequential hypothesis hardly seems warranted. It is possible that alternative explanations based on a cognitive viewpoint could also be applied. Of greater relevance, in view of the questions asked at the outset, is the finding that only performance differences can be found to account for differences in any variable assumed to measure intrinsic motivation. This is fairly strong evidence nonsupportive of Deci since this theory deals primarily with pay and informational feedback. Differences due to performance were only casually mentioned in response to the damaging evidence by Farr et al. (1977).

Another post hoc analysis was performed concerning the relationship between competence and free period task activity. As mentioned earlier competence was found to be a direct function of the number of puzzles solved, where CE was not delivered. There were no differences in time spent in the free period as a function of the number of puzzle solutions, $F(3,40) < 1.00$. As reported earlier, free period activity was found to be related to the sequence of puzzle solutions. An analysis of variance was performed to test the differences in feelings of competence at different levels of improvement (i.e., sequence differences). The statistic was significant, $F(3,29) = 12.36$, $p < .001$. However, the

differences in competence based on improvement level, were not linear, as the differences in free time activity were (see Figure 5). Feelings of competence did not increase with schedules more conducive to persistence. Therefore, it appears that two separate and independent mechanisms were operating. The persistence (free period activity) data seem to reflect an operant scheduling mechanism, whereas feelings of competence may have a more cognitive orientation, based on the number of puzzle solutions.

Insert Figure 5 here

This study may also demonstrate inadequacies in the apparatus usually employed by Deci. Of the 89 subjects, 56 spent no free period activity with Soma. This would not be expected if the task were intrinsically motivating to begin with. Since cognitive evaluation theory only applies to tasks that are intrinsically interesting, any predictions made where Soma is the activity may not be applicable. There exists the possibility that differences in the subject population could account for the present lack of evidence of the enjoyability of Soma. To eliminate any doubt, however, it is recommended that the activity to be measured be validated as intrinsically interesting. Lepper et al. (1973) accomplished this by selecting subjects who demonstrated an initial interest in the activity.

The data on subject's attributions is mostly consistent with findings from other studies. Weiner et al. (1971) have stated that subjects may look at their performance outcome to infer various causes of their performance. This notion is consistent with the self-perception theory of Bem (1967). Weiner et al. (1971) found that failure often

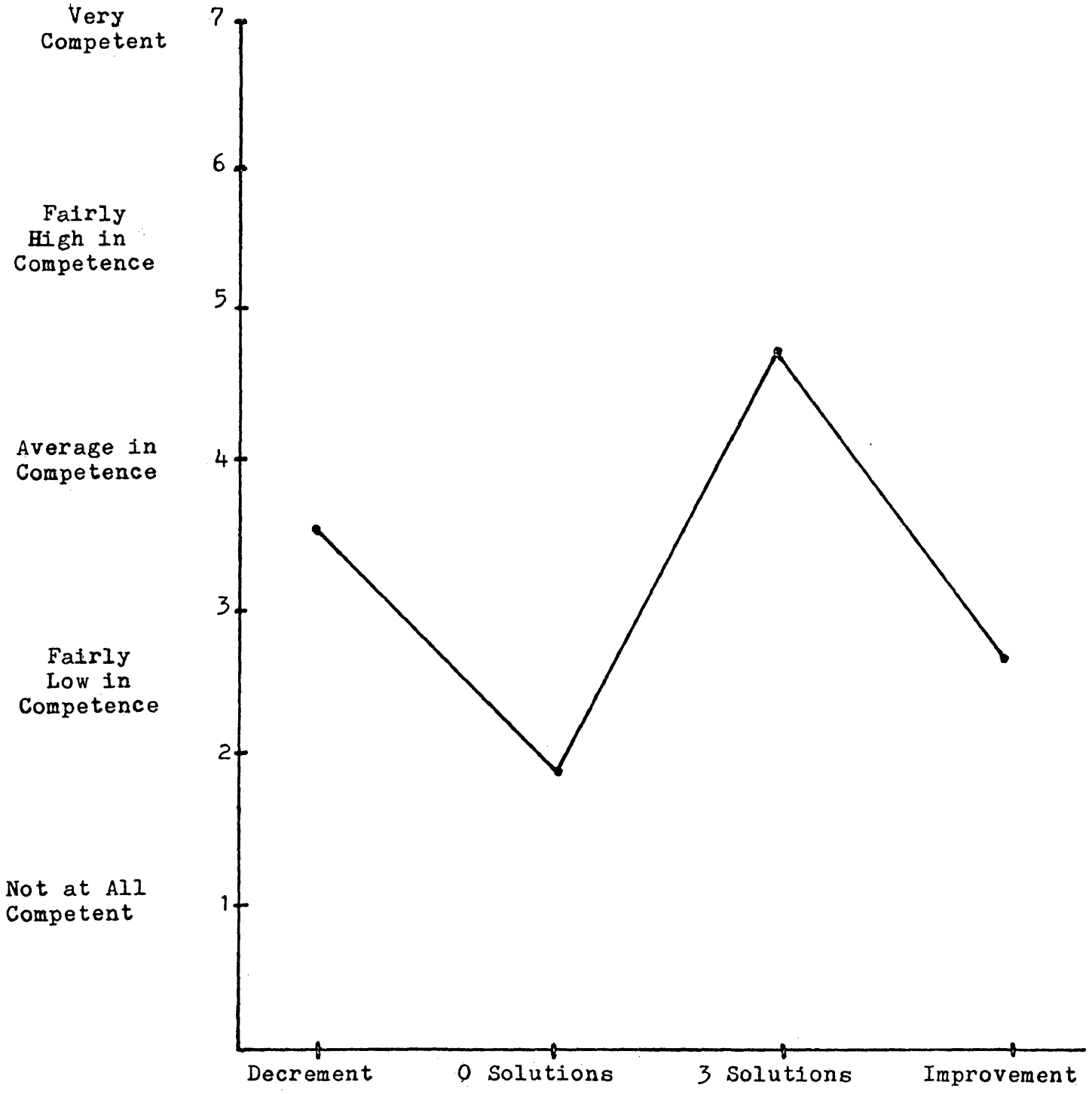

Figure 5: The Effects of Puzzle Solution Sequence on Feelings of Competence

results in attributions of bad luck, a self-defensive response. This is consistent with the present findings. Also consistent with Weiner were the findings that successful performance brings about greater attributions of high effort and ability than unsuccessful performance.

Other data on attribution items seem to further illustrate the achievement motivation differences in females and males. Feather and Simon (1974) found that females tend to take little personal credit for success and often attribute failure to low ability. They accounted for these findings by citing socialization experiences common to women. The present study found that successful female performers had a tendency to attribute their performance to, among other things, an easy task and good luck, both external factors. In addition, low performers believed their performance to be due, in part, to low ability.

Despite the special attributions that women often make, many of the relationships found are indicative of achievement motivation. Weiner et al. (1971) defines achievement motivation as the capacity for perceiving success as caused by internal factors. In the present study successful performance was perceived to be due, among other things, to ability and effort. Those perceiving this relationship felt competent at the task and enjoyed it, an indication that they felt pride due to the internally attributed causations of their success.

In summary, performance, not pay, seems to be the main variable accounting for differences in this study. Furthermore, it is questionable whether any findings can be used as supportive or non-supportive of cognitive evaluation theory due to the use of a task that may not be initially intrinsically motivating.

Any replication of this experiment would have to overcome the problem of differential salience of information occurring for subjects in the CE condition. This might be accomplished by increasing the difficulty of the task. For example, if nine puzzles could be presented with a difficulty factor such that only about five could maximally be solved, the experimenter could define high performance as 3, 4 or 5 solutions and low performanse as 0, 1, or 2 solutions. In this ambiguous situation a subject solving as many as five puzzles would not have salient information on his or her performance based solely on the proportion of solutions. Higher performers in this type of task would probably be more susceptible to feedback information of average performance. Also, as indicated earlier, an experiment such as this may be more successful if a more enjoyable task is selected, preferrably one not involving spatial relations so that males and females could be tested.

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Appendix A

Questionnaire

Please answer the following questions by checking the number which indicates how you feel.

A) Did you attempt solutions by trying to fit pieces by trial and error?

1	2	3	4	5	6	7
No; Disagree Completely	Disagree for the Most Part		Neutral; Neither Agree nor Disagree		Agree for the Most Part	Yes; Agree Completely

B) Did you attempt to plan strategies for solutions by first looking at the pieces and then thinking about how they might fit together?

1	2	3	4	5	6	7
No; Disagree Completely	Disagree for the Most Part		Neutral; Neither Agree nor Disagree		Agree for the Most Part	Yes; Agree Completely

C) Did you enjoy working with the puzzles?

1	2	3	4	5	6	7
No; Disagree Completely	Disagree for the Most Part		Neutral; Neither Agree nor Disagree		Agree for the Most Part	Yes; Agree Completely

D) Would you be willing to volunteer for a future experiment dealing with these puzzles in which you will neither get experimental credit or money?

1	2	3	4	5	6	7
No; Disagree Completely	Disagree for the Most Part		Neutral; Neither Agree nor Disagree		Agree for the Most Part	Yes; Agree Completely

E) How competent did you feel you were in solving the puzzles?

1	2	3	4	5	6	7
Not At All Competent	Fairly Low in Competence		Average in Competence		Fairly High in Competence	Very Competent

The following items pertain to your performance in the 3 initial puzzles: Place a check mark (✓) in the space which best represents your evaluation.

I think my performance was due to:

Good Luck : _____ : _____ : _____ : _____ : _____ : _____ : Bad Luck

Hard Task : _____ : _____ : _____ : _____ : _____ : _____ : Easy Task

Lack of Effort : _____ : _____ : _____ : _____ : _____ : _____ : High Effort

High Ability : _____ : _____ : _____ : _____ : _____ : _____ : Lack of Ability

Below are four factors that may have contributed to your performance in attempting the puzzles. Assume that 100% of your performance can be accounted for by these factors. Please assign percentages to each of these. BE SURE THAT THE SUM OF THESE PERCENTAGES EQUAL 100%. Luck ___% Ability ___% Effort ___% Task Difficulty ___%

TOTAL = 100%

Appendix B

Analysis of Variance Summary Tables

Analysis of Variance Summary for Time Spent in the Free Period

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	14.94	0.17	
Pay	1	0.09	0.09	< 1.00
CE	1	0.16	0.16	< 1.00
Performance	1	0.01	0.01	< 1.00
Pay X CE	1	0.00	0.00	< 1.00
Pay X Perf	1	0.26	0.26	1.48
CE X Perf	1	0.03	0.03	< 1.00
Pay X CE X Perf	1	0.06	0.06	< 1.00
Residual	81	14.34	0.17	

Analysis of Variance Summary Table for Time Spent in the Free Period (Post Hoc)

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	63	841.77	13.36	
Improve	2	100.23	50.11	3.83*
Pay	1	0.00	0.00	< 1.00
CE	1	3.70	3.70	< 1.00
Improve X Pay	2	5.78	2.89	< 1.00
Improve X CE	2	16.63	8.31	< 1.00
Pay X CE	1	0.78	0.78	< 1.00
Improve X Pay X CE	2	29.33	14.66	1.12
Residual	52	680.99	13.10	

*$p < .05$

Analysis of Variance Summary for

Volunteering for an Experiment

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	298.99	3.40	
Pay	1	3.34	3.34	< 1.00
CE	1	1.40	1.40	< 1.00
Performance	1	0.03	0.03	< 1.00
Pay X CE	1	0.30	0.30	< 1.00
Pay X Perf	1	1.19	1.19	< 1.00
CE X Perf	1	2.72	2.72	< 1.00
Pay X CE X Perf	1	0.17	0.17	< 1.00
Residual	81	290.00	3.58	

Analysis of Variance Summary for

Feelings of Competence

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	156.04	1.77	
Pay	1	1.84	1.84	1.44
CE	1	6.93	6.93	5.41**
Performance	1	38.29	38.29	29.93*
Pay X CE	1	4.11	4.11	3.21
Pay X Perf	1	0.16	0.16	< 1.00
CE X Perf	1	1.39	1.39	1.09
Pay X CE X Perf	1	0.36	0.36	< 1.00
Residual	81	103.65	1.28	

*$p < .001$
**$p < .05$

Analysis of Variance Summary for

Luck Attributions

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	90.49	1.03	
Pay	1	0.47	0.47	< 1.00
CE	1	0.40	0.40	< 1.00
Performance	1	25.00	25.00	33.01*
Pay X CE	1	0.77	0.77	1.02
Pay X Perf	1	0.55	0.55	< 1.00
CE X Perf	1	0.09	0.09	< 1.00
Pay X CE X Perf	1	2.07	2.07	2.73
Residual	81	61.34	1.03	

*$p < .001$

Analysis of Variance Summary for

Task Attributions

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	*F
Total	88	100.81	1.15	
Pay	1	0.03	0.03	< 1.00
CE	1	7.00	7.00	6.94*
Performance	1	8.06	8.06	7.99*
Pay X CE	1	0.30	0.30	< 1.00
Pay X Perf	1	0.02	0.02	< 1.00
CE X Perf	1	3.15	3.15	3.12
Pay X CE X Perf	1	0.71	0.71	< 1.00
Residual	81	81.72	1.01	

*$p < .01$

Analysis of Variance Summary for

Effort Attributions

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	111.53	1.27	
Pay	1	0.39	0.39	< 1.00
CE	1	2.92	2.92	2.69
Performance	1	6.00	6.00	5.53*
Pay X CE	1	3.25	3.25	3.00
Pay X Perf	1	2.00	2.00	1.84
CE X Perf	1	0.06	0.06	< 1.00
Pay X CE X Perf	1	9.05	9.05	8.35**
Residual	81	87.84	1.08	

*$p < .05$
**$p < .01$

Analysis of Variance Summary for

Ability Attributions

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	104.47	1.19	
Pay	1	0.16	0.16	< 1.00
CE	1	0.48	0.48	< 1.00
Performance	1	17.02	17.02	16.67*
Pay X CE	1	0.46	0.46	< 1.00
Pay X Perf	1	0.30	0.30	< 1.00
CE X Perf	1	1.56	1.56	1.53
Pay X CE X Perf	1	1.93	1.93	1.89
Residual	81	82.72	1.02	

*$p < .001$

Analysis of Variance Summary for

% Luck Attribution

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	3.21	0.04	
Pay	1	0.02	0.02	< 1.00
CE	1	0.00	0.00	< 1.00
Performance	1	0.20	0.20	5.94*
Pay X CE	1	0.02	0.02	< 1.00
Pay X Perf	1	0.01	0.01	< 1.00
CE X Perf	1	0.06	0.06	1.89
Pay X CE X Perf	1	0.17	0.17	5.13*
Residual	81	2.73	0.03	

*$p < .05$

Analysis of Variance Summary for

% Ability Attributions

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	1.24	0.02	
Pay	1	0.02	0.02	1.51
CE	1	0.08	0.08	5.73*
Performance	1	0.00	0.00	< 1.00
Pay X CE	1	0.00	0.00	< 1.00
Pay X Perf	1	0.00	0.00	< 1.00
CE X Perf	1	0.00	0.00	< 1.00
Pay X CE X Perf	1	0.01	0.01	< 1.00
Residual	81	1.12	0.01	

*$p < .05$

Analysis of Variance Summary Table for

Enjoyment of the Task

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	305.95	3.48	
Pay	1	5.35	5.35	1.57
CE	1	2.84	2.84	<1.00
Performance	1	16.13	16.13	4.74*
Pay X CE	1	0.66	0.66	<1.00
Pay X Perf	1	4.81	4.81	1.42
CE X Perf	1	1.43	1.43	<1.00
Pay X CE X Perf	1	0.00	0.00	<1.00
Residual	81	275.58	3.40	<1.00

*$p < .05$

Analysis of Variance Summary for

% Effort Attribution

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	1.74	0.02	
Pay	1	0.03	0.03	1.38
CE	1	0.04	0.04	2.09
Performance	1	0.02	0.02	1.16
Pay X CE	1	0.00	0.00	< 1.00
Pay X Perf	1	0.01	0.01	< 1.00
CE X Perf	1	0.00	0.00	< 1.00
Pay X CE X Perf	1	0.01	0.01	< 1.00
Residual	81	1.62	0.02	

Analysis of Variance Summary for

% Task Attribution

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	88	2.81	0.03	
Pay	1	0.02	0.02	< 1.00
CE	1	0.01	0.01	< 1.00
Performance	1	0.44	0.44	16.14*
Pay X CE	1	0.02	0.02	< 1.00
Pay X Perf	1	0.00	0.00	< 1.00
CE X Perf	1	0.04	0.04	1.25
Pay X CE X Perf	1	0.06	0.06	2.03
Residual	81	2.23	0.03	

*$p < .001$

Appendix C

Pearson Correlation Coefficients

Among Dependent Variables

Pearson Correlation Coefficients

Among Dependent Variables

	Time	Enjoy	Volunteer	Competence
Time	1.00	.22	.07	-.04
Enjoy	.22*	1.00	.54*	.47*
Volunteer	.07	.54*	1.00	.22*
Competence	-.04	.47*	.22*	1.00
Luck	.03	-.19	.00	-.43*
Task	-.14	.16	.14	.17
Effort	.08	.43*	.17	.23
Ability	.19	-.21*	-.19	-.51*
% Luck	-.10	.16	.07	.29*
% Ability	.03	-.25	-.13	-.11
% Effort	.07	.38*	.13	.24*
% Task	.03	-.31*	-.09	-.42*

*$p < .05$

	Luck	Task	Effort	Ability
Time	.03	-.14	.08	.19
Enjoy	-.19	.16	.43*	-.21*
Volunteer	.00	.14	.17	-.19
Competence	-.43*	.17	.23*	-.51*
Luck	1.00	-.14	-.22*	.28*
Task	-.14	1.00	-.11	-.03
Effort	-.22*	-.11	1.00	-.29*
Ability	.28*	-.03	-.29*	1.00
% Luck	-.38*	.25*	-.03	-.22*
% Ability	.16	.21*	-.14	.06
% Effort	-.14	.06	.35*	.16
% Task	.41*	-.46*	-.15	.32*

*$p < .05$

	% Luck	% Ability	% Effort	% Task
Time	-.10	.03	.06	.03
Enjoy	.16	-.25*	.38*	-.31*
Volunteer	.07	-.13	.13	-.09
Competence	.29*	-.11	.24*	-.42*
Luck	-.38*	.16	-.13	.41*
Task	.25*	.21*	.06	-.46*
Effort	-.03	-.14	.34*	-.15
Ability	-.22*	.06	-.16	.32*
% Luck	1.00	-.44*	-.21*	-.61*
% Ability	-.44*	1.00	-.22*	-.02
% Effort	-.21*	-.22*	1.00	-.42*
% Task	-.61*	-.02	-.42*	1.00

*$p < .05$

Appendix D

Means and Standard Deviations of Dependent Variables

	Pay, CE, High Performance (n = 9)	Pay, CE Low Performance (n = 14)	Pay, no CE High Performance (n = 9)	Pay, no CE Low Performance (n = 15)
Time	3.53 (4.19)	2.38 (3.70)	2.45 (3.72)	1.56 (2.86)
Enjoy	6.00 (1.66)	4.93 (2.24)	6.11 (1.27)	4.53 (2.07)
Volunteer	5.79 (1.39)	5.07 (2.06)	4.89 (1.69	5.07 (2.12)
Competence	4.22 (1.56)	2.93 (1.44)	4.22 (0.83)	2.67 (0.98)
Luck	3.00 (1.00)	4.00 (1.04)	2.67 (1.00)	4.13 (0.64)
Task	3.79 (1.20)	2.57 (0.94)	3.56 (0.88)	3.47 (0.83)
Effort	5.79 (1.20)	5.64 (0.93)	5.89 (0.60)	4.40 (1.18)
Ability	4.00 (0.87)	4.21 (0.98)	3.33 (0.71)	4.67 (1.05)
% Luck	0.22 (0.27)	0.18 (0.22)	0.29 (0.16)	0.18 (0.19)
% Ability	0.18 (0.10)	0.16 (0.11)	0.22 (0.10)	0.22 (0.18)
% Effort	0.38 (0.18)	0.32 (0.15)	0.33 (0.10)	0.29 (0.13)
% Task	0.21 (0.16)	0.34 (0.18)	0.16 (0.07)	0.30 (0.22)

Note: Parenthetical values are standard deviations.

	No Pay, CE, High Performance (n = 9)	No Pay, CE Low Performance (n = 12)	No Pay, No CE, High Performance (n = 9)	No Pay, No CE, Low Performance (n = 12)
Time	1.77 (3.05)	3.47 (3.66)	2.05 (3.21)	2.74 (3.90)
Enjoy	5.11 (1.69)	5.00 (1.65)	4.89 (1.96)	4.25 (1.71)
Volunteer	4.89 (1.54)	4.83 (1.99)	4.44 (2.24)	4.92 (1.68)
Competence	4.11 (0.60)	3.25 (1.29)	3.56 (0.88)	1.92 (1.00)
Luck	2.79 (0.83)	4.08 (0.67)	3.56 (0.73)	4.08 (1.00)
Task	3.44 (0.73)	2.67 (1.07)	3.89 (1.45)	3.50 (0.90)
Effort	5.67 (1.00)	4.83 (0.94)	5.00 (1.41)	5.42 (0.90)
Ability	3.44 (0.73)	4.50 (0.67)	3.78 (1.64)	4.75 (1.14)
% Luck	0.36 (0.20)	0.09 (0.10)	0.15 (0.11)	0.18 (0.18)
% Ability	0.19 (0.08)	0.19 (0.09)	0.29 (0.06)	0.25 (0.13)
% Effort	0.30 (0.12)	0.33 (0.14)	0.29 (0.10)	0.25 (0.18)
% Task	0.15 (0.15)	0.39 (0.11)	0.27 (0.18)	0.32 (0.18)

Note: Parenthetical values are standard deviations