

Research Note 84-41

①

BOUNDARY CONDITIONS AND OPERATIONALIZATIONS
OF EXPECTANCY THEORY VARIABLES

Daniel R. Ilgen and Lawrence H. Peters
Purdue University

T. Owen Jacobs, Contracting Officer's Representative

Submitted by

Robert M. Sasnor, Director
BASIC RESEARCH

DTIC
S ELECTED
FEB 22 1984
A



U. S. Army

Research Institute for the Behavioral and Social Sciences

February 1984

Approved for public release; distribution unlimited.

This report, as submitted by the contractor, has been cleared for release to Defense Technical Information Center (DTIC) to comply with regulatory requirements. It has been given no primary distribution other than to DTIC and will be available only through DTIC or other reference services such as the National Technical Information Service (NTIS). The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other official documentation.

84 02 21 125

AD A138089

DTIC FILE COPY

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Research Note 84-41	2. GOVT ACCESSION NO. AD-4138089	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) BOUNDARY CONDITIONS AND OPERATIONALIZATIONS OF EXPECTANCY THEORY VARIABLES		5. TYPE OF REPORT & PERIOD COVERED Interim Report Series 1975-1976
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Daniel R. Ilgen and Lawrence H. Peters		8. CONTRACT OR GRANT NUMBER(s) DAHC19-74-G-0002
9. PERFORMING ORGANIZATION NAME AND ADDRESS Purdue Research Foundation Division of Sponsored Programs Hovede Hall, West LaFayette, IN 47907		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 2Q161102B74F
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Research Institute for the Behavioral and Social Sciences 5001 Eisenhower Ave. Alexandria, VA 22333		12. REPORT DATE February 1984
		13. NUMBER OF PAGES 19
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Expectancy theory model, expectancy variables, instrumentality variables, effort- performance, performance-outcome.		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Expectancy Theory measures were applied in a classroom setting for predicting test performance in order to compare amplitude and highest probability measures of expectancies and instrumentalities. In addition, an individual difference boundary condition reflecting the degree to which subjects realistically estimated their effort-performance expectancies was investigated. The results showed some support for the expanded expectancy model. In addition, the model was most predictive for subjects who underestimated their effort-performance. (continued)		

DD FORM 1473
1 JAN 73

EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

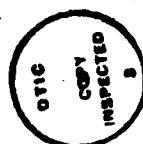
CONFIDENTIAL

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

expectancies. This report is third in a 1975-1976 series entitled "Sources and Effects of Accurate Work Perceptions."

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
Distribution/	
Availability Codes	
Avail and/or	
Dist	Special
<i>Handwritten mark</i>	



Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

Boundary Conditions and Operationalizations of Expectancy Theory Variables

The plethora of articles on Expectancy Theory over the last decade attests to its appeal for the study of work motivation. The interest in this theory has lead to several reviews (Behling, Schreisheim, & Tolliver, 1973; Campbell & Pritchard, 1975; Heneman & Schwab, 1972; Mitchell, 1974; Mitchell & Biglan, 1971; Wahba & House, 1974), three books (Lawler, 1971; Porter & Lawler, 1968; Vroom, 1964), and the major thrust of an Annual Review article (Miner & Dachler, 1973).

The surge of interest in the model has increased our general understanding of the cognitive processes involved in work motivation. Unfortunately, this interest has not led to an increase in the model's demonstrated utility for the prediction of effort or performance. Early researchers reported correlations between motivation (force) as defined by Expectancy Theory and performance which ranged from zero to around .40 (see for example, Gailbraith & Cummings, 1967; Graen, 1969; Hackman & Porter, 1968). With few exceptions, more current research based on some modifications of the original expectancy X valence model has failed to improve upon the strength of this motivation-performance relationship when motivation is measured by the model and performance is based upon some criteria other than the participant's own subjective estimate of his performance level.

Part of the problem of the expectancy model may be due to the varying conceptualizations of those variables in the model which deal with an individual's perception of the work environment. According to most expectancy models, there are two classes of variables which reflect one's perceptions of his immediate work environment (Campbell, Dunnette, Lawler, & Weick, 1970; Lawler, 1971; Porter & Lawler, 1968; Vroom, 1964). The first of these deals with the individual's perception of the extent to which various amounts of effort expenditure on his

part will result in the attainment of various levels of performance in that environment. This relationship, the expectancy term, is defined as a subjective probability ranging from 0.0 to 1.0. A high degree of consensus exists among the models and researchers on the conceptualization and operationalization of this effort-performance link.

On the other hand, the second major variable which reflects perceptions of the immediate work environment does not enjoy a high degree of agreement among researchers as to its conceptualization or its measurement. This second term most frequently has been labeled an instrumentality. It reflects the degree of perceived association between a given level of performance and the attainment of each set of outcomes. The problems associated with the measurement of instrumentalities have been thoroughly discussed in a recent monograph by Dachler and Mobley (1973).¹

Two major conceptual definitions with their associated methodologies have been employed to measure instrumentalities. In the first case, an instrumentality has been regarded as a subjective correlation between levels of performance and levels of a given outcome (see for example, Graen, 1969; Mitchell, 1972; Vroom, 1964). Like a correlation coefficient, it is said to range from -1.0, through 0, to +1.0. However, as Dachler and Mobley (1973) pointed out, the use of a subjective correlation to measure instrumentalities requires that performance be treated as a continuous variable, or at least as a set of ordered discrete performance levels. Therefore, the use of instrumentality ratings for a single level of

¹ The term instrumentality has been used by different researchers to describe two links in the model. The first is the performance level-outcomes link described above. The second is the link between an outcome such as pay and other outcomes associated with pay such as esteem (Campbell, Dunnette, Lawler, & Weick, 1970; Lawler, 1971). In the latter case, the performance-outcome link is termed an Expectancy II. For the purposes of this paper, instrumentality will refer only to the link between performance levels and outcomes.

performance, as has frequently been done, is inappropriate if one assumes a correlational relationship.

Secondly, an instrumentality has been regarded as a subjective probability that a given performance level will result in the attainment of a given outcome (see Campbell et al., 1970; Dachler & Mobley, 1973; Lawler, 1971). The probability ranges from 0 to 1.0. Although a subjective probability intuitively may be appealing as a measure of the strength of a relationship between a level of performance and an outcome, it also suffers from several limitations. Most frequently, subjective probability estimates for the degree to which a given level of performance will lead to a certain outcome are obtained from each participant. It is assumed that, across individuals for whom the outcome is equally valent, the higher the perceived probability that the given performance level will lead to the outcome, the greater the attractiveness of performance at that level.

However, it is our contention that such normative comparisons across persons for only one performance level are inappropriate when one is concerned with motivation. It seems more reasonable to assume that a perceived probability between one level of performance and a given outcome only takes on motivational consequences for an individual when it is compared to the perceived probabilities of other performance levels leading to the same given outcome. That is, the performance level-outcome probability has utility only when more than one level of performance is considered by each individual. For example, knowing that a person perceived a .90 probability that a high level of performance will lead to a high level of pay indicates nothing about his preference for performing at a high rather than a low level of performance. It must be known how he perceives the performance-pay probabilities for the other levels of performance. If low performance also is perceived to have a .90 probability of leading to high salary, all other things being equal, high performance will not be chosen over low performance assuming that the individual wants to maximize his return on the effort he invests in

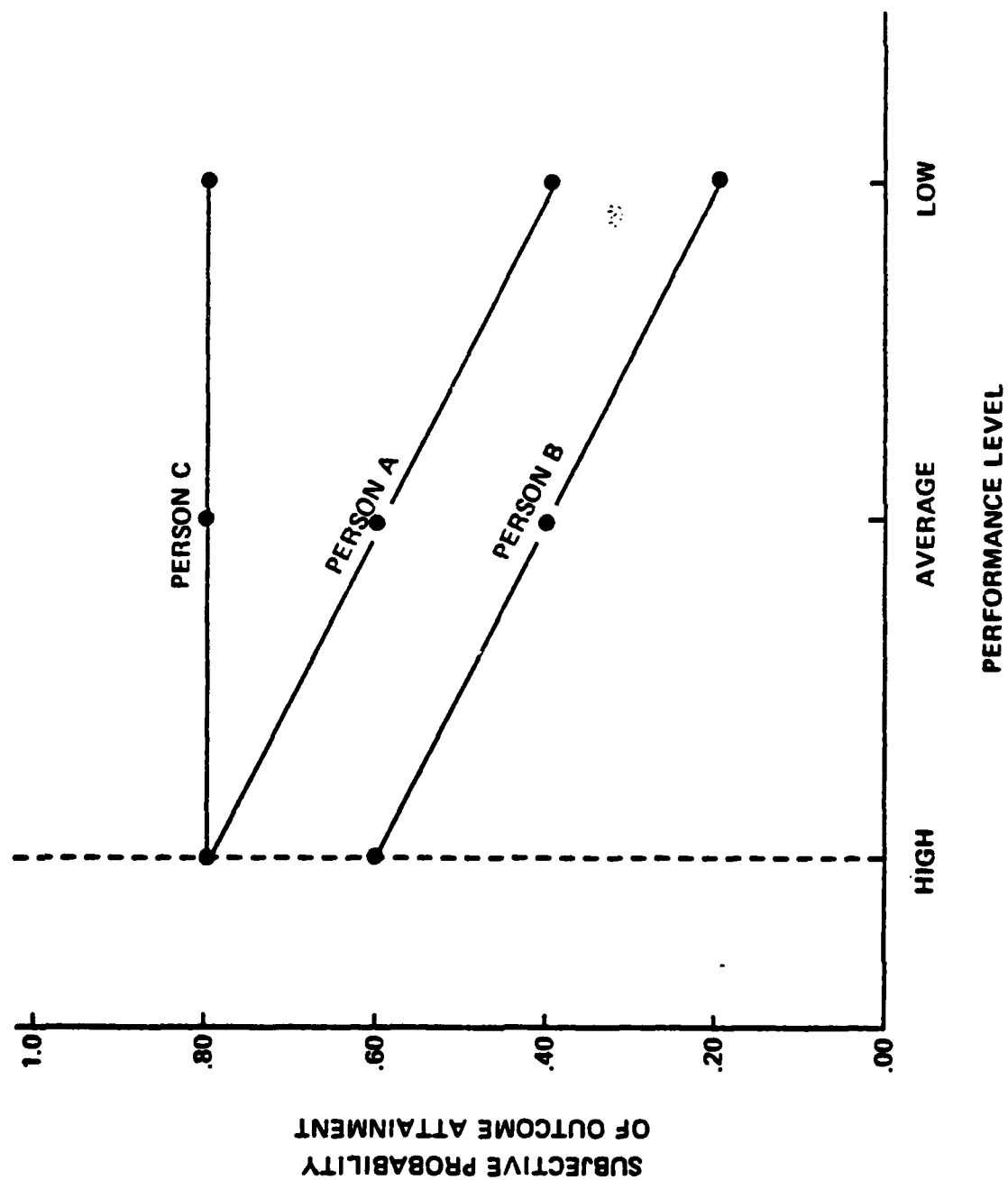
the task. In fact, given this rationale, if a normative comparison were made between this individual and another individual who had perceived probabilities for the attainment of the same outcome of .70 and .30 for high and low performance respectively, this latter individual should be more highly motivated for high performance in spite of the fact that the former perceives the attainment of the outcome as more probable.

Since the first person is just as likely to receive the outcome regardless of the level at which he performs, why should he be motivated to seek higher performance levels? The second individual, on the other hand, sees that if he were to increase his performance he would also increase his probability of receiving the outcome. Graen (1969) realized that the instrumentalities for various performance levels as seen by a single individual influenced motivation when he implied that comparisons should be made among performance levels. Similarly, Dachler and Mobley (1973) tried to incorporate intra-subject probabilities by obtaining probability ratings between various outcomes and a number of specific levels of performance.

Synthesis. In the pure sense, both the correlational and the subjective probability definitions of instrumentality have serious shortcomings. However, each method can be put into perspective if the perceived correlation definition of instrumentality proposed by Vroom (1964) is interpreted more broadly to mean a perceived functional relationship. Such an interpretation is meant to emphasize both the strength of relationship (without demanding a linear one) and the likelihood of outcome attainment. Figure 1 depicts how both the correlational and the subjective probability definitions carry motivational implications.

The data for person A and person B indicate the same correlational value (equal slopes) between performance and the outcome. Using the correlational definition of instrumentality, there would be no difference in the prediction

FIGURE 1



of motivation for each person. However, from Figure 1, assuming both persons value the outcome equally, person A should be more highly motivated toward high performance than person B because he perceives high performance to be more likely to lead to the outcome. The strict correlational definition fails to take into account this difference in the level of probability, but the function for the two lines obviously would be different by a constant reflecting the probability differences.

The typical probability definition of instrumentalities would differentiate between persons A and B but would not differentiate between persons A and C with respect to their motivation for high performance. A strict probability definition would predict that person C would find high performance just as attractive as person A, but from Figure 1, it is obvious that person C should not prefer high performance over the other two levels.

Figure 1 underscores the need to consider both the relationship between performance levels and outcomes as well as the likelihood of outcome attainment. Neither correlational nor probability definitions of instrumentality provides both. It is interesting, however, that recent research using probability estimates for instrumentalities has incorporated the relational notion for the treatment of the instrumentalities. For example, Dachler and Mobley (1973) obtained probability estimates for five performance levels and chose only the level with the highest utility as the level used in the model. Nebeker (1972, in press), and Nebeker and Mitchell (1974) also used five levels of one variable. In their case, they dealt with five levels of leader behavior. In one study, an index of "decision uncertainty" was constructed (Nebeker, in press) by calculating an expected utility for each level of the behavior then subtracting the level with the highest expected utility from the one with the lowest. The larger the difference between the highest and lowest expected utilities, the greater the decision

certainty. Nebeker referred to this difference as the amplitude of the curve for the individual on the behavior in question. Thus, amplitude was defined as a quasi-relational term which reflected to some extent the degree of covariation between two variables.

However, the amplitude measure above does not reflect the intercept value of a linear function for any of the lines. Indeed, due to the ordinal nature of the performance dimension, the exact location of such an intercept is undefined. Nevertheless, an estimate of this parameter can be made by noting the probability estimate given for high performance. Thus, the Y axis would, in effect, shift to the high performance level itself as indicated by the dotted line on the figure. In this manner, we could define a Y-intercept for each of the three lines as .80, .80, and .60 for Persons A, C, and B respectively. In effect, the Y-intercept would become the probability estimate that high performance will lead to the given outcome.

The above argument for defining instrumentalities in both amplitude and intercept terms can be extended to the expectancy model's other perceptual measure of the situation--the link between effort and performance. Vroom's (1964) model originally described this link as the subjective probability that an act (e.g., effort) will lead to a given outcome (e.g., performance), and virtually all expectancy models have used some form of subjective probability estimate to measure this. However, it is reasonable to assume that the link between effort and performance also could benefit from the inclusion of the degree of covariation between the two terms--effort and performance. As such, an expectancy would refer to the perceived relationship between a person's effort expenditure and his performance. As with the instrumentality term, an expectancy would range from -1.0, through 0.0, to +1.0. In essence, this term asks whether or not a person can influence his performance by exerting effort. It is only when a person

sees, to some extent, that increases in his effort will result in increases in his performance that motivation toward effective performance will exist.

Graen (1969) pointed out that there would be little reason to put forth high effort for a given level of performance which was attractive if low or average effort were as likely to lead to the same performance level. The use of a single probability to measure expectancy will not reflect the differences in the attractiveness of various levels described by Graen. Thus, the present study expands the model to incorporate the amplitude and intercept between effort and performance in addition to that between performance and outcomes.

A final issue concerning expectancy and instrumentality concepts involves the boundary conditions necessary for the model to have a reasonable degree of predictability. Graen (1969) reported that one boundary condition for the expectancy model was that the perceived instrumentalities were most predictive of performance when the situation presented actual contingencies so that individuals could form accurate perceived relationships between performance level and outcomes. The data of Dachler and Mobley (1973) supported this view when a comparison between two plants showed the model worked better in the plant which had the more visible instrumentalities. In a similar vein, the authors argued that employees with longer tenure would more accurately perceive the actual instrumentalities in the work environment. Their data supported this interpretation.

On the expectancy side, it is also reasonable to assume that persons who perceive more accurately the link between their effort and their performance will perform in line with the model more than those who hold inaccurate expectancies. Accuracy of expectancies should depend upon the individual's past experience in the same or similar performance situations so that he has some basis on which to judge how effort expenditure influences his own performance. The present study will investigate the effects of accuracy of effort-performance expectancies on the model's predictive ability.

Method

Sample

Eighty-seven students enrolled in an industrial psychology class participated in this study. All participation was voluntary. The sample contained the following student classifications: 8-sophomores; 36-juniors; 39-seniors; 4-graduate students.

Expectancy Theory Measures

1. Effort-performance probabilities (expectancy term). Students were asked to give their perceived probability that the expenditure of very high effort on their part would lead to high performance on the first classroom exam. High performance was described as that of obtaining an A on the exam. The students indicated their perceived chances in ten of reaching that level of performance if they were to put forth very high effort. They responded by placing one of the whole numbers 0 through 10 in a blank indicating their chances in ten. Thus, expectancies were measured on an eleven point scale ranging from zero to ten. The students then rated the probability that just an average amount of effort would lead to high performance using the same method to rate perceived probabilities. The left half of Table 1 illustrates the expectancy probabilities obtained in the study.²
2. Performance-outcome probabilities (instrumentality term). Students were asked to give their estimates of the probability that each level of performance (a grade of A, B, or C) would lead to each of eight outcomes. These instrumentality ratings were obtained using an eleven point probability scale (chances in ten). The right hand side of Table 1 lists the instrumentality measures obtained from the students.

² Similar expectancy measures were obtained for grades of B and C. However, since the high level of performance has been used most frequently in the literature, and since there were some conceptual difficulties for the subjects as they attempted to make the probability ratings for average and low performance, it was decided to deal only with expectancies for high performance.

Table 1

Subjective Probability Measures Obtained from Each Student

<u>Expectancy Measures</u>		<u>Instrumentality Measures</u>		
		Performance Level		
		<u>High</u>	<u>Average</u>	<u>Low</u>
		(Grade of an A)	(Grade of a B)	(Grade of a C)
High $p(A High)^a$	1	$p(1 A)^b$	$p(1 B)$	$p(1 C)$
Average $p(A Average)$	2	$p(2 A)$	$p(2 B)$	$p(2 C)$
	.	.	.	.
	.	.	.	.
	.	.	.	.
	8	$p(8 A)$	$p(8 B)$	$p(8 C)$

^a $p(A|High)$ = Subjective probability of an A given he put forth high effort.

^b $p(1|A)$ = Subjective probability of attaining outcome 1 given he obtained an A.

3. Outcome importance (valence term). Eight outcomes were used in this study.

There were: experiencing a feeling of accomplishment after having completed something, gaining some new knowledge from doing some task or studying some new material, being able to get a good job when finished with school, increasing the degree of acceptance from friends, receiving praise from members of one's family, being highly respected by one's friends, having a high level of self-confidence, and being admitted into graduate school. Students were asked to rate how important each outcome was to them on a five point rating scale. The scale had extreme anchors of "no importance" to "very important" with a score of 1 corresponding to the former and five with the latter.³

Amplitude Measures

Two measures of amplitude were constructed corresponding to the expectancy (E) and instrumentality (I) terms in the traditional Expectancy Theory model. These measures were designed to reflect the slope of the perceived functional relationship between the major variables in the model.

1. Recall that all subjects reported the perceived probabilities that both average effort and high effort on their part would result in high performance on the examination. The effort-performance amplitude term (D_E) was defined as the difference between the probability that average effort would lead to an A and the probability that high effort would lead to it. It was reasoned that the greater the difference, the stronger was the individual's belief that changes in his effort would result in changes in his performance on the examination.

³ The authors are aware of the limitations of importance measures of valence. Unfortunately, when the data were gathered, valences were being measured by both importance and desirability measures. However, the focus of the present study is on the instrumentalities and expectancies and any limitations presented by the valence measures should only have a conservative effect; they should not inflate the relationships found.

2. The instrumentality measures resulted in 24 subjective probabilities from each subject (see Table 1). Sixteen of these 24 were used to operationally define the amplitude of the performance-outcome instrumentalities. The performance-outcome amplitude term $(D_I)_j$ was defined by subtracting the instrumentality of the grade of a C for the attainment of a given outcome from the instrumentality of an A for the attainment of the same outcome. Eight performance-outcome amplitude measures were constructed for each student--one for each outcome. Thus, for any outcome j , $(D_I)_j$ reflected the degree to which the highest and lowest assessed levels of performance differed in their perceived likelihood of resulting in that outcome. As with D_E , it was reasoned that the greater the $(D_I)_j$ difference, the stronger was the individual's belief that changes in his performance were associated with changes in the probability of receiving that outcome.

Performance Measure

Performance was measured by the students' scores on the first classroom examination of the semester. The exam was composed of forty multiple-choice items each worth two points and four five-point short answer items. The examination covered all material presented in lectures and reading assignments during the first month of the course.

Subgroups

The sample was divided into three subsamples on the basis of the "accuracy" of the students' expectancy measures. It was assumed that those who realistically estimate their chances of obtaining an A by putting forth high effort should rate their chances of receiving an A in line with their past performance in an academic setting. It was also assumed that since all the students had had at least one year of experience in university classes, all students in the study had sufficient experience in similar settings to make such estimates. Therefore, their cumulative

grade point averages and their estimates of the probability of receiving an A as a result of high effort were standardized, and a difference score was constructed by subtracting the standardized expectancy rating from the standardized grade point average. The total sample was trichotomized on the difference variable to create three groups--Overestimators ($Z_{GPA} < Z_E$), Realistic Estimators ($Z_{GPA} = Z_E$), and Underestimators ($Z_{GPA} > Z_E$).

Procedure

Students met for three one hour class sessions per week for four weeks preceding the administration of the first examination. During the last twenty minutes of the class period immediately preceding the examination, a questionnaire which included the Expectancy Theory measures was administered. The students were told that the data would be used for research purposes and would also be used as part of a class demonstration later in the semester. They were also told that their responses would not affect their course grade and that their participation was voluntary. No student refused to participate.

Results

The valence of each of the eight outcomes was measured in terms of its perceived importance to each subject. Subjective probability estimates were taken for the instrumentality of each of three performance levels (the grades of A, B, and C) for the attainment of these outcomes, and for the expectancy that each of two levels of effort (very high and average effort) would result in high performance. Tables 2 and 3 present the means and standard deviations for these variables. Although data were obtained from 87 students, one subject did not report his cumulative grade point average. Therefore, all analyses requiring grade point averages were based on a total of N of 86.

Table 2

Means and Standard Deviations for
Outcome Valences and Instrumentalities

Outcome (O/C)	Valence		An A for Outcome j		A B for Outcome j		A C for Outcome j	
	$\bar{X}$	S.D.	$\bar{X}$	S.C.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Experiencing a feeling of accomplishment	4.33	.62	7.83	1.63	6.45	1.83	2.62	2.09
Gaining some new knowledge	3.90	.64	7.57	1.57	6.97	1.58	4.64	2.35
Being able to get a good job	4.31	.79	5.39	2.00	4.74	2.10	2.33	1.94
Increasing the degree of acceptance from friends	3.44	.84	3.09	2.24	2.66	2.22	1.63	1.69
Receiving praise from one's family	3.36	.88	6.36	2.54	4.61	2.60	1.73	1.85
Being highly respected by one's friends	3.73	.86	4.01	2.49	3.01	2.28	1.56	1.78
Having a high level of self-confidence	4.51	.68	7.27	1.95	5.20	2.37	1.83	1.87
Being admitted to graduate school	2.90	1.34	5.91	2.75	4.03	2.40	1.26	1.55

Table 3

Means and Standard Deviations for Expectancies

Expectancy that:	$\bar{X}^a$	S.D.
High effort will lead to an A	7.49	1.85
Average effort will lead to an A	3.02	2.35

^aN = 87

Three measures of motivation (force) were constructed from the expectancy, valence, and instrumentality terms of the traditional motivation model and from the difference terms of the newer conceptualizations. Each measure was correlated with test scores. Table 4 presents these correlations. The first entry in Table 4 shows the correlation of test performance with the most common Expectancy Theory model of motivation ($E \sum_{i=1}^n I_i V_i$) where subjective probabilities associated with an A were used to define both the expectancy and instrumentality terms. The second row operationalizes instrumentalities and expectancies solely in terms of the amplitude measures ((D_E) and $(D_I)_1$). Finally, amplitudes are weighed by the magnitude of the high performance probabilities for both the expectancy and the instrumentality terms.

Although none of the models as conceptualized differed significantly from each other using a one-tailed test for the difference between non-independent correlations (Glass & Stanley, 1970), there was a tendency ($p < .10$) for the last measure which included both an amplitude and a magnitude measure to predict more of the performance variance than the probability measures typically employed.

To investigate the individual differences in accuracy of expectancy ratings as they affected motivation-performance relationships, the three groups were Over-, Under-, and Realistic estimators. Table 5 presents the correlations between test performance and the motivational measures for the three groups of students. The table shows that the motivational models predicted performance best for Underestimators. Comparisons of the variances for each of the motivational variables and for the performance measure indicated that the differences in correlations were not due to restrictions in range on these variables within any of the groups.

Discussion

It was argued that Expectancy Theory formulations should take into account both the amplitude (slope) of the probability curves plotted across levels of

Table 4

Correlations of Expectancy Theory Models with Test Scores

<u>Models</u>	r^2	r^2
Standard		
Magnitude Measures		
$\sum_{i=1}^8 (E I_1 V_1)$	.32 ^b	.10
Amplitude Measures		
$\sum_{i=1}^8 ((D_E) I_1 (D_I)_1 V_1)$	.40	.16
Amplitude Times		
Magnitude Measures		
$\sum_{i=1}^8 (E(D_E) I_1 (D_I)_1 V_1)$	.41	.17

^aN = 86^bAll correlations are significantly different from zero at the $p < .001$ level.

Table 5

Correlations of Expectancy Theory Variables with Test Scores for Groups
Varying in the Degree to Which Expectancies were Based on Previous Experience

	Overestimators (Bottom 1/3 on ($Z_{GPA} - Z_E$))	Realistic Estimators (Middle 1/3 on (Z_{GPA} - Z_E))	Underestimators (Top 1/3 on ($Z_{GPA} - Z_E$))
	N = 29	N = 28	N = 29
<u>Models</u>			
Standard Magnitude			
Measures			
$(E \sum_{i=1}^8 I_i V_i)$	.11	.50**	.49**
Amplitude Measures			
$((D_E) \sum_{i=1}^8 (D_I)_i V_i)$	.45**	.29	.49**
Amplitude Times			
Magnitude Measures			
$(E (D_E) \sum_{i=1}^8 I_i (D_{Ii}) V_i)$	.44**	.35*	.58***
$\bar{r}$	.34	.38	.52

* $p < .05$ ** $p < .01$ *** $p < .001$

effort and levels of performance as well as the magnitude (intercept) of the perceived probabilities. The data provided only tentative support for this position. Performance was most predictable when both amplitude and magnitude components of expectancies and instrumentalities were included. However, there was only a tendency for this model to be superior to the model which measured both expectancies and instrumentalities with probabilities as is suggested by the models of Campbell, Dunnette, Lawler, and Weick (1970) and Lawler (1971). There was no difference between the complete model and that model which used only amplitudes.

The rank order of the three models in terms of their ability to predict performance implies that the amplitude measure is more important from a motivational standpoint than is the magnitude. Since the information reflected in the amplitude measure closely parallels that obtained from a subjective correlation measure, the data suggest that perhaps correlational measures should not be summarily dismissed at this time. This conclusion differs from that of recent reviews (e.g., Dachler and Mobley, 1973; Mitchell, 1974) which have implied that correlational measures are inadequate.

The major criticism of the subjective correlation measure of instrumentalities is that it does not reflect nonlinear relationships. Neither did our amplitude measures. However, the amplitude measures used may have been appropriate because of the nature of the classroom setting. For almost all of the subjects, a grade of A was seen as more instrumental for the attainment of valued outcomes than was a B; likewise, a B was more instrumental than a C. Therefore, if not a strictly linear relationship between performance level and outcome level, at least a monotonically increasing association existed. For other settings in which nonlinear relationships are more prevalent, such as those between leader behaviors and outcomes, measures of amplitude which reflect individual deviations from linearity may be more appropriate (cf., Nebeker, in press). On the other hand, it is quite likely

that the monotonic relationship which existed in the classroom also exists in a large number of performance settings. To the extent that this is true, elaborate measures may not be necessary. In fact, due to the unreliability of difference measures, the use of simple estimates of subjective correlation may be more appropriate. Clearly, research is needed which employs both correlational and probability estimates of amplitude to predict the same behavioral criteria in order to provide some estimate of the utility of each type of measure for Expectancy Theory measures of motivation.

The utility of Expectancy Theory models has been found to be dependent upon various boundary conditions which affect the degree to which instrumentality measures tend to reflect actual contingencies between performance and outcome attainment (Graen, 1969; Dachler & Mobley, 1973). The data presented here indicated the existence of an additional boundary condition. In the present study, it was possible to operationalize the degree to which effort-performance estimates were realistic by comparing each student's reported ability (cumulative grade point average) to his estimate of the extent to which his effort would result in high performance on the exam. It was argued that the more realistic such effort-performance estimates were, the better would be the prediction of actual performance. Such was not the case. The model predicted performance very similarly for Realistic estimators and Overestimators. On the other hand, the models worked best for those who underestimated their expectancies.

Although the groups did not differ as was predicted, the fact that the model's utility did differ across groups should not be ignored. All previous elaborations of Expectancy Theory models have emphasized the role of individual differences in motivation (see Dachler & Mobley, 1973; Graen, 1969; Lawler, 1971; Mitchell & Biglan, 1971; Porter & Lawler, 1968; Vroom, 1964). Lawler (1971), for example, has incorporated such individual difference variables as Internal-External Control directly

into the model. However, the individual differences were treated solely as sources for the determination of expectancies, valences, and instrumentalities. Given that individual differences operated to influence these key variables, it was assumed that all individuals would process these variables in an identical fashion (that specified by Expectancy Theory) in order to determine the amount of effort they would put forth. Our data suggest that individual differences are important not only in the determination of values for the variables of the model but also in the way in which these variables influence performance. Some individuals may direct their behavior in line with the model; others may not.

Unfortunately, no clear-cut support for why Underestimators were more predictable exists within the data. However, if one views performance as a function of motivation and ability, it could be argued that Underestimators, who tended to be higher performers than the other two groups, also had a larger motivation component to their grade point average than the other two groups. If the same were true in the class under consideration, the performance of Underestimators should have been more a function of their motivation than would the performance of realistic and Overestimators. To the extent that this occurred, one would expect a motivational model to predict better for the underestimators simply because there existed, in their performance, a larger motivational component to predict. Partial correlational analyses provided possible support for this argument. The data in Table 5 were reanalyzed with the grade point average component partialled out. The results of this analysis indicated that all three correlations for the Underestimators were significant at the $p < .05$ level ($\bar{r} = .38$) but none of the six correlations for the other two groups retained their significance. Presumably, variations due to ability and a characteristic level of motivation were eliminated equally from all three groups. Yet, the fact that the model

still predicted for the Underestimators indicated that there was more motivation variance to predict for that group than for the other two groups.⁴

In spite of the highly tentative nature of the explanations for group differences in predictability, the data demonstrated that the magnitude of the correlations between Expectancy Theory models of motivation and performance varies across groups. Further work needs to be done on defining the individual differences parameters which influence the effectiveness of the Expectancy Theory models of motivation as well as those which influence perceptions of specific variables within the model.

⁴ The authors are grateful to R. D. Pritchard for his suggestion of this interpretation.

References

- Behling, O., Schreisheim, C., & Tolliver, J. Present trends and new directions in theories of work effort. Journal Supplement Abstract Service, Ms. No. 67, American Psychological Association, 1973.
- Campbell, J. P., Dunnette, M. D., Lawler, E. E. III, & Weick, K. E. Managerial behavior, performance, and effectiveness. New York: McGraw-Hill, 1970.
- Campbell, J. P., & Pritchard, R. D. Human motivation. In M. D. Dunnette (Ed.), Handbook of industrial and organizational psychology. Chicago: Rand McNally, 1975.
- Dachler, H. P., & Mobley, W. Construct validation of an instrumentality-expectancy-task goal model of work motivation: Some theoretical boundary conditions. Journal of Applied Psychology, Monograph, 1973, 58, 397-418.
- Gailbraith, J., & Cummings, L. L. An empirical investigation of the motivational determinants of task performance: Interactive effects between instrumentality-valence and motivation-ability. Organizational Behavior and Human Performance, 1967, 2, 237-257.
- Glass, G. V., & Stanley, S. C. Statistical methods in education and psychology. Englewood Cliffs, NJ: Prentice-Hall, 1970.
- Graen, G. Instrumentality theory of work motivation: Some experimental results and suggested modifications. Journal of Applied Psychology, Monograph, 1969, 53 (Whole No. 2, Part 2).
- Hackman, J. R., & Porter, L. Expectancy theory predictions of work effectiveness. Organizational Behavior and Human Performance, 1968, 3, 417-426.
- Heneman, H. G. III, & Schwab, D. P. An evaluation of research on expectancy theory predictions of employee performance. Psychological Bulletin, 1972, 78, 1-9.
- Lawler, E. E. III. Pay and Organizational effectiveness: A psychological view. New York: McGraw-Hill, 1971.

- Miner, J. B., & Dachler, H. P. Personnel attitudes and motivation. Annual Review of Psychology, 1973, 25, 379-402.
- Mitchell, T. R. Expectancy models of job satisfaction, occupational preference, and effort: A theoretical, methodological, and empirical appraisal. Psychological Bulletin, 1974, 81, 1053-1077.
- Mitchell, T. R. Instrumentality theories: Conceptual and methodological problems. Journal Supplement Abstract Service, Ms. No. 109, American Psychological Association, 1972.
- Mitchell, T. R., & Biglan, A. Instrumentality theories: Current uses in psychology. Psychological Bulletin, 1971, 76, 432-454.
- Nebeker, D. M. A model for supervisory behavior: An integration of Fiedler's contingency model and expectancy theory. Unpublished doctoral dissertation, University of Washington, 1972.
- Nebeker, D. M. Situational favorability and perceived environmental uncertainty: An integrative approach. Administrative Science Quarterly, in press.
- Nebeker, D. M., & Mitchell, T. R. Leader behavior: An expectancy theory approach. Organizational Behavior and Human Performance, 1974, 11, 355-367.
- Porter, L., & Lawler, E. E. III. Managerial attitudes and performance. Homewood, IL: Irwin, 1968.
- Vroom, V. H. Work and motivation. New York: Wiley, 1964.
- Wahba, M. A., & House, R. J. Expectancy theory in work and motivation: Some logical and methodological issues. Human Relations, 1974, 27, 121-147.