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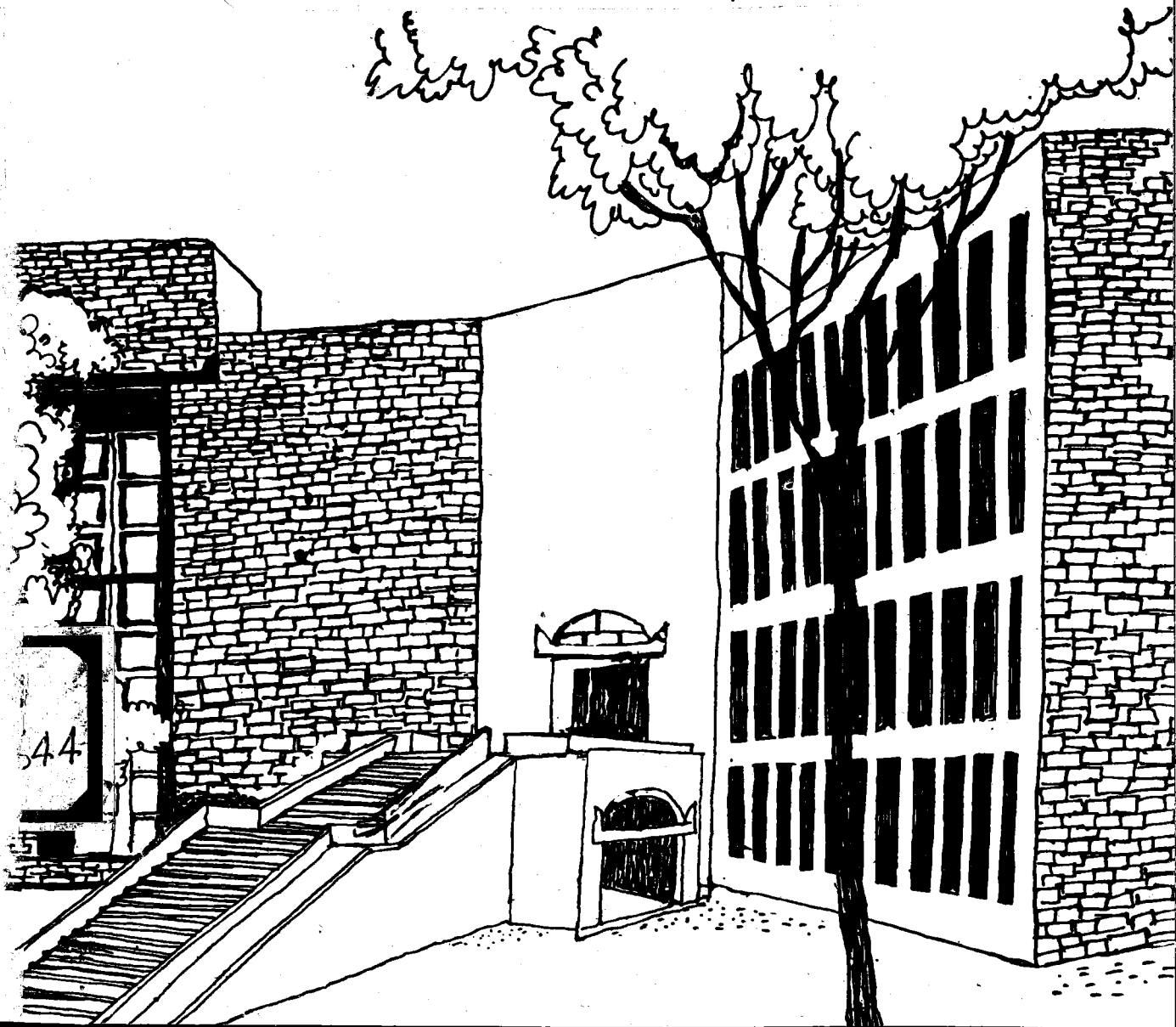
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Working Paper

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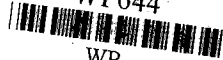


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Averaging Model Analyses of Teacher Expectations
of Performance from Students Varying in
Motivation and Ability

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Running Head: AVERAGING MODEL

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Abstract

Although there have been numerous studies of the impact of teacher expectations on student performance, the manner in which expectations are formed has remained unexplored. The present research tested the hypothesis that teachers develop expectation of student performance by averaging information about his or her motivation and ability. In two experiments on prediction of performance in nonacademic contest ($n = 60$) and academic exams ($n = 60$), manipulations of number of pieces of similar motivation information, availability of additional pieces of average motivation information, and unavailability of information about either motivation or ability all yielded results as prescribed by the averaging model. Motivation information received not only less importance than ability information but also got discounted when it differed markedly from that of ability information. As this result differs from those previously obtained from students and managers, the second hypothesis of role differences in expectation of performance was also supported. Theoretical, methodological, and applied implications of the results were discussed. Suggestions for future research were also made.

How do school teachers develop expectation of performance from students varying in motivation and ability? Since the publication of the Pygmalion in the Classroom (Rosenthal & Jacobson, 1968), there have been numerous studies of impact of teacher expectations and self-fulfilling prophecy on student performance (see for reviews Brophy, 1983; Dusek & Joseph, 1983). But the manner in which expectations are developed has remained unexplored. Brophy feels that there is an obvious need for research on how teachers form normative expectations from students in general. Similarly, Dusek and Joseph note, "... that research aimed at disentangling the aspect of cumulative folder information most important to the forming of expectations may be fruitful" (p. 333). The present research tested the hypothesis that school teachers average information about motivation and ability, the two principal items in student folders, while developing expectation of student performance.

The above hypothesis was suggested by two lines of evidence. First, there is an overwhelming support for the averaging process in the acquisition and change of attitudes (Anderson, 1973, 1981a; Simms, 1978). As the various items of student folders serve as cues for forming impression of the student, developing expectations may be speculated to obey the same rule as does formation of attitudes. Even evaluation of student performance follows the averaging rule (Levin, Ims, & Vilmain, 1980). Second, and perhaps more important, college professors in India have, in fact, been found to predict exam performance (Singh & Bhargava, 1985, Experiment 3) as well as job performance (Singh & Upadhyaya, 1986, Experiment 1) by averaging information about motivation and ability of the stimulus persons.

The same experiment which obtained evidence for the constant-weight averaging rule with college professors (Singh & Upadhyaya, 1986) also obtained evidence for the multiplying rule with industrial managers. The constant-weight averaging rule treats motivation and ability as compensatory; the multiplying rule treats them as necessary. In addition, the former implies that motivation is equally effective with persons of low through high ability, whereas the latter implies that motivation is more effective with persons of high than of low ability. Singh and Upadhyaya proposed, therefore, that teachers have an idealistic, developmental orientation but managers have a realistic, practical outlook on how to get things done. In other words, the pattern in the Motivation x Ability effect reflects on the role differences (Sarbin & Allen, 1968/1975) between teachers and managers. If this hypothesis of role differences in cognitive algebra of task performance has any merit, then school teachers can be expected to follow the averaging rule in prediction of student performance in all areas of school achievement. Accordingly, the present research obtained prediction of performance in nonacademic contests (Srivastava & Singh, 1986a; Surber, 1980) and academic exams (Gupta & Singh, 1981; Singh & Bhargava, 1985, 1986; Singh, Gupta, & Dalal, 1979; Singh & Mehta, 1986; Srivastava & Singh, 1986b; Surber, 1981a, 1981b, 1985) from school teachers in India.

The Averaging Model

According to Anderson's (1981b) averaging model, teacher expectation of student performance, EP, should be

$$EP = \frac{w_I I + w_M M + w_A A}{w_I + w_M + w_A}, \quad (1)$$

where I , M , and A are scale value of initial expectation of teachers, motivation and ability of students in order, and w_I , w_M , and w_A are their respective relative weights. This model make specific predictions about the effects of number of pieces of similar information, of addition of neutral or average pieces of information, and of unavailability of one of the two needed information. Since teachers form expectations based on school records and on what they hear about students from other teachers they are likely to encounter one or all of the three situations with available information. Three separate averaging tests were thus made in two experiments.

Test 1: Effects of Number of Pieces of Similar Motivation Information

Consider two students, one described by one piece of information about motivation as well as ability and another by three pieces of similar motivation information and one piece of ability information. Would teacher expectations of performance from these two students be different? If a teacher uses both pieces of given information in the first case and all the four pieces of information in the second case, then the averaging model predicts a difference in teacher expectations of performance from the two students. This can be seen in Model 2 which predicts that

$$EP = \frac{w_I I + n w_M M + w_A A}{w_I + n w_M + w_A}, \quad (2)$$

where the new term n is the number of pieces of similar motivation

Model 2 makes two specific predictions about the effect of number of pieces of similar motivation information. First, the greater the number of pieces of similar motivation information, the greater its effectiveness (Anderson, 1981b; pp. 130-144; Singh, in press; Singh et al., 1986). Second, the greater the number of pieces of similar motivation information, the less the effectiveness of ability information. This would happen because an increase in the number of pieces of similar motivation information would decrease the relative weight of ability information. No such test of the averaging model has yet been reported in the literature.

Model 2 also makes two predictions about the pattern in the factorial plot of the Motivation x Ability effect. First, the factorial plots of the Motivation x Ability effect from descriptions with one and three pieces of motivation information separately should have the same pattern. Parallelism will be obtained in each case under the condition of constant weighting of motivation and ability information (Gupta & Singh, 1981; Singh & Bhargava, 1985, 1986; Singh et al., 1979; Srivastava & Singh, 1986a, 1986b). With differential weighting, however, systematic nonparallelism (Singh & Mehta, 1986; Srivastava & Singh, 1986b; Surber, 1981a, 1981b, 1985) of the same form will be obtained in each case. Second, and more important, the common factorial plot of the Motivation x Ability effects from descriptions varying in the number of pieces of similar motivation information will show a different pattern. More specifically, the motivation curve with one piece of information will have steeper slope than that with three pieces of motivation information.

Test 2: Effects of Addition of Motivation
Information of Moderate (Average) value to
the Motivation x Ability Design

It is well known that addition of a piece of information of moderate value to the piece of information of high value pulls the response down but to the piece of information of low value pushes the response up. This occurs due to the averaging of the value of the two pieces of given information (Anderson, 1981b, pp. 113-118).

If information about motivation and ability are also averaged, then addition of two pieces of average motivation information to a two-way Motivation x Ability design should reduce the effectiveness of motivation as well as of ability information in a similar manner. Thus, the factorial plots of both the Number of pieces of average motivation information x Motivation and Number of pieces of average motivation information x Ability effects would exhibit a similar interaction. The pattern in the overall Motivation x Ability effect would again depend upon the weighting of motivation and ability information within the averaging model.

Test 3: Effects of Unavailable Information

According to Model 1, the effect of motivation or ability information presented alone should be greater than that of both motivation and ability information presented together. This would happen because the weight of the unavailable information would become zero in Model 1. Thus, the slope of the single-cue motivation-alone or ability-alone curve would generally be steeper than that of the two-cue, motivation-ability curve. There is ample evidence for this prescription of the averaging model with subjects

from nonteacher populations (Gupta & Singh, 1981; Singh & Bhargava, 1986; Singh et al., 1979; Srivastava & Singh, 1986b; Surber, 1980, 1981a, 1981b, 1985). Experiments 1 and 2 directly tested its plausibility with school teachers.

It should be noted that the above prediction of a steeper slope for motivation-alone or ability-alone curve than for two-cue motivation-ability curve rests on an important assumption that only the given pieces of information control the judgment. Doubt has recently been raised against such an assumption and hence the diagnostic power of this test (Singh, in press; Singh et al., 1979; Singh & Upadhyaya, 1986). If teachers impute a value to the unavailable needed information as a direct function of the value of available information and add or average the imputed and given values together, then slope of the single-cue curve would also be steeper than that of the two-cue curves. Singh and Bhargava (1986) have suggested, therefore, that averaging interpretation of the slope of the single-cue curve be made only when the averaging model is supported in at least Test 1 or 2 which contain both of the needed information. As both Experiments 1 and 2 employed four-cue as well as two-cue descriptions, they provided clear tests between the averaging and imputation interpretations of the slope of the single-cue curves.

Experiment 1: Tests 1 and 3

The main purpose of Experiment 1 was to make Tests 1 and 3 of the averaging model in expectation of student performance in three school contests, namely, puzzle-solving, singing, and drawing-painting. The three types of contests were included to extend generality of results to nonacademic tasks.

Method

Stimuli and designs. Descriptions of stimulus students were prepared on separate index cards. Each card contained information about both motivation and ability or about ability of the stimulus student. Both motivation and ability information were described along a comparable 7-point scale: Extremely low, very much below average, below average, average, above average, very much above average, and extremely high.

Motivation was defined as "one's willingness to do well in contest, prior practice, effort during previous contests, concentration, seriousness, and attempt to do one's best". Ability to solve puzzles was defined as intelligence, brightness, and creativity of each participating student. Musical ability referred to tenderness and clarity of voice of each participating student (Srivastava & Singh, 1986a). Painting ability referred to creativity, intelligence, and imagination of each student.

There were two stimulus designs. Design 1 was a $2 \times 3 \times 3$ (Number of pieces of similar motivation information \times Motivation \times Ability) factorial. The first factor had one (1) or three (3) identical pieces of motivation information, and the levels of motivation and ability were very much below average (VBA), average (AV), and very much above average (VAA). This design generated 18 descriptions, nine two-cue and nine four-cue.

Design 2 had just one piece of information about ability corresponding to the levels of ability in Design 1. In addition, there were nine filler and end anchor descriptions and 10 practice descriptions. They were based on levels more extreme or other than

those used in the regular 21 descriptions generated by Designs 1 and 2. They were intended to enable subject to use the entire response scale in uniform manner and also to serve as end anchors (Anderson, 1981b).

Procedure. Each teacher completed the task individually in a small room of the school. All of the teachers were instructed by the same female experimenter. In general, the judgmental task took about 45 minutes.

The moment the teacher entered the experimental room, the experimenter gave her name and described the purpose for which she was doing the research. She also asked the subject to complete a background information sheet. All conversation was in English.

Subject received a typed-sheet of instructions that described the nature of task as well as the role the subject was to play. The task was introduced as dealing with prediction of performance of 10-year-old students in puzzle-solving, singing, or drawing-painting contest to be organized in the school. It was emphasized that prediction of performance would be based on both motivation and ability information or just ability information alone. Motivation information came from one to four teachers. Whenever more than one piece of motivation information were available, the subject was asked to treat them as "equally important and valid". When information about motivation was unavailable, the subject was asked to indicate his or her expectation on the basis of given information about ability alone.

After reading the instruction sheet twice, each teacher worked with the practice examples. Information typed on the card was read

and then prediction of performance was made along a 21-step ladder which had digits 1-21 written on the corresponding steps.

After the practice session, the experimenter summarized the main points of instructions to the subject. She also answered all the queries that the subject had about the task. To get a general impression of the distribution of descriptions, the subject randomly picked up 8-10 descriptions and read them. Finally, the subject shuffled the main set of cards thoroughly and rated them three times in different orders. On each trial, the subject wrote the code number of the stimulus student and his or her expectation of the student performance on the response sheet supplied for the purpose. Data from all the three trials of judgment were analyzed.

Immediately after the data collection, the general purpose of the research was described to the subject. Each subject was also thanked for his or her cooperation in the research.

Subjects. Thirty male and 30 female teachers from eight central schools of Delhi: Kendriya Vidyalaya, I.N.A. Colony; Kendriya Vidyalaya, Cantt. 1; Kendriya Vidyalaya, Cantt. 2; Kendriya Vidyalaya, R.K. Puram, Sector IV; Kendriya Vidyalaya, R.K.Puram, Sector VIII; Kendriya Vidyalaya, Indian Institute of Technology, New Delhi; Kendriya Vidyalaya, Janakpuri; and Vishesh Kendriya Vidyalaya, Janakpuri served as subjects. They were randomly divided into three groups with equal number of males and females, and each group received one of the three contest tasks. The mean age of teachers in puzzle-solving, singing, and drawing-painting contests were 32 years, 34 years 7 months, and 33 years 4 months with the

respective ranges of 25 years 9 months to 42 years 3 months, 23 years 6 months to 47 years 3 months, and 22 years 10 months to 45 years 3 months.

Results

Figure 1 presents factorial plots of Number of pieces of similar motivation information x Motivation, Number of pieces of similar motivation information x Ability, Motivation x Ability, and Number of pieces of similar motivation information x Motivation x Ability effects from Design 1. The dashed curve of the rightmost graph of Figure 1 is based on expectations from information about ability alone (i.e., Design 2).

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 Figure 1 about here

Test 1. According to Test 1, the effect of motivation information should be greater when it came from three than from one teacher. Furthermore, the effect of ability information should be less when motivation information came from three than from one teacher.

The first two graphs of Figure 1 from left show support for both of these predictions. The curve based on three pieces of similar motivation information has steeper slope than that based on one piece of motivation information in the first graph. The reverse is true in the second graph as it is, in fact, expected to be. Thus, the Number of pieces of similar motivation information x Motivation and Number of pieces of similar motivation information x Ability effects were both statistically significant, $F(2,118) = 6.94$ and 4.34 , $p < .05$.

A closer examination discloses that the effect of the number of pieces of similar motivation information was restricted to the high level of motivation only. Consequently, three pieces of similar motivation information reduced the effectiveness of just the low level of ability. These results indicate that information about motivation and ability of students were indeed averaged by teachers in developing expectations of contest performance. Moreover, school teachers gave lower weight to high than to low and average pieces of motivation information. In other words, they needed more pieces of high than of low or average value of motivation. This result differs markedly from that obtained with students (Singh et al., 1986) in which the number of pieces of similar motivation information had uniform effect at both its low and high values.

School teachers also differ from students, college professors, and managers in their weighting of information about motivation and ability. While previous research found patterns of parallelism (Gupta & Singh, 1981; Singh & Bhargava, 1985, 1986; Singh et al., 1979; Srivastava & Singh, 1986a, 1986b), convergence (Surber, 1981a, 1985), and divergence (Anderson & Butzin, 1974; Kun, Parsons, & Ruble, 1974; Singh & Mehta, 1986; Srivastava & Singh, 1986a; Surber, 1980, adults' data, 1981b, text condition) in the Motivation x Ability effect, the present experiment obtained an altogether new pattern. Ability produced a more pronounced effect when motivation was low as well as high than when it was average. This can be seen in the third graph of Figure 1 from left. The bottom two curves clearly converge toward the right, whereas the top curves clearly diverge.

In statistical analyses of the data by Shanteau's (1977) POLYLIN program which calculates trend components in the interaction effects at the level of individual subject, clear support was present for the interpretations made above. The overall Motivation x Ability effect resided in the Linear x Quadratic and Quadratic x Linear trends, $E(1,59) = 4.38$ and 13.90 , $p < .05$, because the bottom two curves converged, $E(1,59) = 6.66$, $p < .05$, but the top two curves diverged, $E(1,59) = 26.05$, $p < .01$. The Linear x Quadratic trend was negligible in each comparison, $F(1,59) = 0.00$ and 0.65 , which shows that the convergence and divergence are perfect.

Model 2 also requires that the Motivation x Ability effect should have exactly the same trend when motivation information came from one and three teachers. The rightmost graph of Figure 1 which exhibits such plots provides support for such a requirement of the averaging model. The three solid curves with triangle have the Quadratic x Linear trend, $E(1, 59) = 13.11$, $p < .01$, as have three solid curves with circle, $E(1, 59) = 4.68$, $p < .05$. In the combined 2 x 3 (Motivation x Ability) analysis, however, the Quadratic x Linear trend failed to reach .05 level of significance, $E(1, 59) = 3.48$ but the Linear x Quadratic trend was statistically significant, $E(1, 59) = 4.71$, $p < .05$. Since the averaging model predicts emergence of new trend(s) in the combined analysis (Singh & Bhargava, 1986) it may be concluded that school teachers indeed averaged motivation and ability information.

Test 3. Results from Design 2 were exactly as prescribed by Test 3. The effect of information about ability alone was greater than that of information about both motivation and ability. This can be seen in the rightmost graph of Figure 1. The dashed curve

has the steepest slope, and it crosses over the middle solid curve with circle and with triangle convincingly, $F(2, 118) = 74.98$ and 107.14 , $p < .01$. This indicates that school teachers averaged information about motivation and ability. This averaging interpretation of the steeper slope of the dashed curve is not vulnerable to imputation interpretation, for Test 1 which included both of the needed information in stimulus descriptions also found evidence for the averaging rule.

Generality of results. Results from Tests 1 and 3 were readily generalizable to all the three kinds of contests as well as to both the male and female school teachers. The two between-subject factors did not interact at all with any of the manipulated within-subject factors or their combinations.

Interpretation of the Motivation x Ability effect. As already mentioned, the pattern in the Motivation x Ability effect on prediction of contest performance was different from those reported in the literature on judgment and decision (Srivastava & Singh, 1986a; Surber, 1980). What does this different pattern imply?

An examination of the pattern in the third graph of Figure 1 indicates that the effect of motivation information (vertical separation between top and bottom curves) has been markedly less than that of ability information (slope of the curves). In analysis of variance also, the main effects of motivation and ability accounted for 28.35% and 44.44% of the total variance, respectively. A simple interpretation of the pattern in the Motivation x Ability effect could thus be in terms of a systematic discounting of the motivation information as it departed more and more from the value of given information about ability. Because the weight of

motivation information of low value decreased as the value of ability increased, the bottom curve came closer to the middle curve on the right. In contrast, because of the systematic decrease in the weight of motivation information of high value as the value of ability information decreased, the top curve came closer to the middle on the left.

The foregoing discounting interpretation implies that school teachers have a dominant tendency to compare the value of the information of low importance with the value of information of high importance. Also, they have a strong tendency to further reduce the weight of information of low importance as it deviates more and more from the value of information of high importance. If the present interpretation is correct, then teachers who give greater importance to motivation than to ability in developing expectation of student performance should systematically discount the discrepant ability information.

The plausibility of this interpretation was assessed by classifying teachers who had given higher importance to ability and to motivation into two groups. Individual teacher analyses of expectations formed from one piece of motivation and ability information detected 46 teachers who had given greater importance to ability than to motivation and 14 teachers who had given greater importance to motivation than to ability. Separate analyses of variance for teachers of these two groups basically confirmed their classification into the two groups. The main effects of motivation and ability accounted 21.37% and 55.66% of the total variance, respectively in the first group of teachers. The corresponding values for motivation and ability were 43.34% and 30.46% in the second group of teachers.

Figure 2 presents factorial plots of the Motivation x Ability effects from these two groups of teachers. The first graph for 46 teachers who considered ability more important than motivation has much clearer emergence of the pattern originally displayed by the third graph of Figure 1. The bottom two curves come closer from left to right but the top two curves come closer from right to left.

 Figure 2 about here

A different trend is, however, present in the second graph for 14 teachers who considered motivation more important than ability. When motivation is low, the ability information of high value has been discounted. Thus, the difference between expectations from students of average and very much above average levels of ability is small at the very much below average level of motivation (i.e., the bottom curve). However, when motivation is high, the ability information of low value has been discounted. The small difference between expectations from students of very much below average and average levels of ability at the very much above average level of motivation (i.e., the top curve) clearly shows it. In this way, the discrepant ability information was systematically discounted by teachers who gave greater importance to motivation than to ability.

Because of these differences in the weighting of discrepant information of low importance, the two graphs of Figure 2 have markedly different patterns. While the left graph has just the Quadratic x Linear trend, $F(1,45) = 11.99$, $p < .01$, the right graph has just the Linear x Quadratic trend, $F(1,13) = 5.28$, $p < .05$. It appears that it is the discounted piece of information which

contributed to the emergence to the quadratic trend in the Motivation x Ability effect. From these analyses, it is clear that the novel pattern in the Motivation x Ability effect on teacher expectations of student performance arose from teachers' tendency to discount the information of low importance when it was discrepant from the information of high importance.

Discussion

There are three principal findings of Experiment 1. First, school teachers form expectations of student performance by averaging motivation and ability information as was originally hypothesized. Second, they need more positive than negative or average pieces of motivation information. Finally, the form of averaging is not constant-weight (Gupta & Singh, 1981; Singh & Bhargava, 1985, 1986; Singh et al., 1979; Srivastava & Singh, 1986a, 1986b; Surber, 1981b, lecture condition), negative differential-weight (Anderson & Butzin, 1974; Singh & Mehta, 1986; Srivastava & Singh, 1986a, Surber, 1981b, text condition), or positive differential-weight (Surber, 1981a, 1981b, recall condition, 1985) for they engender a pattern of parallelism, divergence, and convergence, respectively. Since information of low importance which departed widely from the value of information of high importance was discounted, the present form of averaging could be called discounted-weight averaging model.

The present evidence for the discounted-weight averaging model in teacher expectations of student performance in school context may be attributed to the nature of task (Singh & Bhargava, 1985; Surber, 1984) and to role differences between judges from the teacher and nonteacher populations. Since Srivastava and Singh

(1986a) did not obtain a pattern identical to the present one in prediction of performance in singing and puzzle-solving contests by high school students, the hypothesis of nature of task does not seem to be tenable. If the differences arose due to role differences between school teachers and subjects from other populations, then similar pattern in Motivation x Ability effect on expectation of exam performance should also be obtained. The next experiment further tested the plausibility of the hypothesis of role differences in forms of averaging process in prediction of exam performance.

Experiment 2 : Tests 1, 2, and 3

The chief objective of Experiment 2 was to replicate and extend the plausibility of the discounted-weight averaging model in teacher expectations of student performance in high school exams. Since all the previous experiments on prediction of performance in high school exam yielded evidence for a perfect pattern of parallelism and hence the constant-weight averaging model (Singh & Bhargava, 1985; Experiments 1 and 2, 1986, Experiments 2 and 3), test of the discounted-weight averaging model in this task was essential. Accordingly, all the three tests of the averaging model were made. Moreover, predictions were obtained from information about motivation alone as well as about ability alone, for they at times suggest different processes (Gupta & Singh, 1981; Singh et al. 1979; Singh & Upadhyaya, 1986).

Method

Stimuli and designs. There were four stimulus designs. Design 1 was similar to Design 1 of Experiment 1 but the three levels of motivation and ability were extremely low (EL), average (AV), and

extremely high (EH). These extreme levels of the informational scale were intended to allow emergence of a stronger effect of the number of pieces of similar motivation information.

Design 2 was a $2 \times 3 \times 3$ (Number of additional pieces of average motivation information \times Motivation \times Ability) factorial. The number of additional pieces of average motivation information in a description was either none (0) or two (2). The levels of motivation and ability factors were identical to those in Design 1. Design 2 required 18 descriptions, nine of which were already present in Design 1. Therefore, only nine new four-cue descriptions were prepared.

Design 3 and 4 had information about motivation alone and ability alone, respectively, with levels identical to those in Designs 1 and 2. There were four end anchor descriptions based on motivation information from four teachers and ability information from one teacher. The 12 practice examples included these four end anchors plus eight other descriptions from the set of 37 descriptions generated by the four designs mentioned earlier. A total of 49 (37 main and 12 practice) descriptions were thus made. Each description was typed on separate index card.

Procedure. The general procedure was same as in Experiment 1. However, there were three notable differences. First, teacher predicted performance of high school (i.e., Standard X) students in their forthcoming exam conducted by the All India Examination Board (Singh & Bhargava, 1985, 1986). Second, motivation was defined as student's "willingness and seriousness to do well in the exam". Ability information was estimated from a distribution of IQ scores of all the students of the class. They were supposedly taken from

student folders in the school, and were essentially opinions of different teachers. Finally, predictions of performance were taken from information about motivation alone as well as about ability alone.

Subjects. Twenty elementary, 20 junior, and 20 secondary school teachers served as subjects. Each group consisted of 10 males and 10 females. They were from the same population as in Experiment 1. The mean age for teachers of elementary, junior, and secondary school levels were 34 years, 33 years 10 months, and 37 years with the respective ranges of 25 years 9 months to 43 years 4 months, 24 years 4 months to 42 years 7 months, and 24 years to 59 years 1 month. Each teacher spent around 1 hour on the task.

Results and Discussion

Test 1. The manipulations of number of pieces of similar motivation information did not produce effects as prescribed by Test 1. The effects were very weak as well as highly irregular.

This can be seen in the first, second, and fourth graphs of Figure 3 which display Number of pieces of similar motivation information \times Motivation, Number of pieces of similar motivation information \times Ability, and Number of pieces of similar motivation information \times Ability effects, respectively. The two curves of the first two graphs are nearly the same, $F(2, 118) = 2.74$ and 2.57 although there is a slightly greater effect of three pieces than one piece of motivation information in the leftmost graph. Because of the highly inconsistent effects of the number of pieces of similar motivation information at the different levels of ability in the rightmost graph, the three-way interaction effect was statistically significant, $F(4, 236) = 4.49, p < .01$. These ambiguous results

simply indicate that school teachers are in general not as sensitive to the number of pieces of similar motivation information in prediction of exam performance as they were in prediction of contest performance.

Figure 3 about here

The discounted-weight averaging model, however, emerged as strongly as in the previous experiment. Look at the third graph of Figure 3 from left. Three trends stand out quite clearly. First, the bottom two curves converge toward the right. Second, the top two curves diverge toward the right. Finally, the top and the bottom curves also diverge toward the right. Statistically, therefore, each of the three comparisons yielded statistically significant Linear x Linear trend, $F(1, 59) = 8.63, 42.35, \text{ and } 10.43, p < .01$, but nonsignificant Linear x Quadratic trend, $F(1, 59) = 2.49, 1.17, \text{ and } 0.01$.

While the first two trends basically replicate and extend the results of Experiment 1, the third trend indicates a unique characteristic of prediction of exam performance. The divergence pattern in the top and bottom curves considered together shows that the discounting of high motivation at the discrepant level of ability is much more pronounced than that of low motivation. Thus, the overall Motivation x Ability effect had statistically significant Linear x Linear as well as Quadratic x Linear trend, $F(1, 59) = 13.88 \text{ and } 25.10, p < .01$.

Test 2. Results from Test 2 were exactly as prescribed by the averaging model. The availability of the two additional pieces of average motivation information to the student descriptions having

one piece of motivation as well as ability information reduced effectiveness of both motivation and ability information. This is quite obvious in the first two graphs of Figure 4 from left. The curve with open-circle had no additional piece of average motivation information and so its slope is markedly steeper than that of the curve with filled-circle. Both interaction effects had statistically significant Linear x Linear trend, $F(1, 59) = 7.89$ and 6.50 , $p < .01$, but nonsignificant Linear x Quadratic trend, $F(1, 59) = 0.14$ and 0.86 . This means that both crossovers are perfect.

Figure 4 about here

As the availability of average pieces of motivation information reduced the overall values of both motivation and ability information and the values shown in the third graph of Figure 4 are also averaged over two-cue and four-cue descriptions, the pattern required by the discounted-weight averaging model does not visually stand out as clearly as it did in the third graph of Figure 3. Nevertheless, there was a statistically significant Quadratic x Linear trend in the overall effect, $F(1, 59) = 7.28$, $p < .01$. In addition, the top two curves constituted a perfect Linear fan pattern. The Linear x Linear trend was highly significant, $F(1, 59) = 10.28$, $p < .01$, whereas the Linear x Quadratic trend was statistically nonsignificant, $F(1, 59) = 0.15$. More importantly, the 6×3 POLYLIN analysis of the Motivation x Ability effect shown in the rightside graph of Figure 5 yielded statistically significant Linear x Quadratic and Quadratic x Linear trends, $F(11, 59) = 4.06$ and 15.95 , $p < .05$, as required by the averaging hypothesis.

Figure 5 about here

The discounting of motivation information of high value when ability was low is most marked at the bottom two points on the right of the first graph and at the top two points on the left of the second graph of Figure 5. Expectation of performance from a student, having extremely high motivation and extremely low ability is nearly the same as from a student with the very two attributes plus two additional pieces of average information about motivation. Such discounting is not equally strong at other levels and so the three-way interaction effect was statistically significant, $F(4,236) = 8.19$, $p < .01$. Accordingly, the overall support for the discounted-weight averaging model from Test 2 can also be regarded as unambiguous.

Test 3. Results from Test 3 clearly supported the averaging model. The dashed curve of the leftside and rightside graphs of Figure 5 are based on information about motivation alone and ability alone listed on the horizontal axis, respectively. In both graphs, the dashed curve has markedly steeper slope than the middle two curves. Pairwise comparisons of the data of the two solid curves with filled- and open-circle with those of motivation-alone curve yielded statistically significant interaction effects, $F(2,118) = 11.21$ and 113.41 , $p < .01$. Similar comparisons with ability-alone data also obtained highly significant interaction effects, $F(2, 118) = 121.18$ and 165.63 , $p < .01$. It may be concluded, therefore, that teachers develop expectations of exam performance on the basis of only the given information.

It should be added that the above averaging interpretation of the steeper slope of the single-cue than two-cue and four-cue curves can also be defended on two other grounds. First, the two-cue and four-cue descriptions which contained both of the needed information but differed in the number of cues also yielded evidence of the averaging rule. Second, ability (69.05%) accounted for much more of the total variance than did motivation (19.27%) in the overall analysis of the two-cue data, and similar weighting was present in each of the 60 teachers also. Even expectations based on information about motivation alone and ability alone have the same weighting pattern. The ability-only curve has markedly steeper slope than the motivation-only curve, $F(2, 1118) = 56.79, p < .01$, which shows that the two types of information presented alone maintained the same importance as when they were presented together. So the slopes of the two single-cue curves are more consistent with the averaging than the imputation hypothesis.

It should also be added that the averaging rule requires the ability curve with three pieces of average motivation to have a shallower slope than that with one piece of average motivation information. But the two middle solid curves with filled- and open-circle in the right graph of Figure 5 are nearly the same, $F(2, 108) = 1.05$, though there is a hint for the crossover interaction predicted by the averaging model. This failure reflects on the discounting of similar pieces of motivation information as discussed in Test 1 and not on any weakness of the averaging process. Considered together, therefore, results of Experiment 2 clearly support the averaging model for teacher expectations of student performance.

Generality of results. Results from Test 1 through 3 were readily generalizable to male and female teachers of elementary, junior, and secondary school levels. The two between-subject classification factors of sex and level did not alter any of the main results. The one higher-order interaction, Sex x Level of teachers x Number of pieces of similar motivation information x Motivation x Ability effect, $F(8, 216) = 2.11, p < .05$, was due to the irregular effects of number of similar pieces of information about motivation as already noted.

General Discussion

Main contributions

Averaging model. The first main contribution of the present research lies in showing that Anderson's (1981b) averaging model could provide a reasonably good representation of teacher expectations of student performance. Manipulations of the number of pieces of similar motivation information, availability of additional pieces of average motivation information, and unavailability of information about either motivation or ability all produced results as prescribed by the averaging model (Singh, in press; Singh et al., 1986; Singh & Upadhyaya, 1986). Similar results from prediction of performance in nonacademic contests and academic exams further indicate the applicability of the same form of averaging rule to coordination by information from student folders. It may be stated, therefore, that school teachers in India indeed average information pertaining to motivation and ability of a student when they form expectation of his or her performance as was originally hypothesized.

However, the form of the averaging model was different from those reported in the sociopsychological literature. Past research with high school and undergraduate college students found evidence for a perfect pattern of parallelism specified by the constant-weight averaging model in prediction of performance in singing contest (Srivastava & Singh, 1986a; Experiments 1 and 2) as well as in high school exam (Singh & Bhargava, 1985, 1986). But the present two experiments yielded a uniform evidence for a pattern of nonparallelism engendered by the discounted-weight averaging model.

According to this discounted-weight averaging model, motivation information which is markedly different from the value of ability information receives less weight than that which is similar to the value of ability information. Thus, motivation information of low value loses its importance further when it is paired with ability information of high value but motivation information of high value loses its importance further when it is paired with ability information of low value. Experiment 2 also disclosed that motivation information of high value is more susceptible to discounting than that of low value at the discrepant level of ability. Perhaps school teachers feel greater difficulty in accepting that a student of low ability can have high motivation than in accepting that a student of high ability can have low motivation.

In their review of the literature on bases of teacher expectations, Dusek and Joseph (1983) found that the majority of studies had been directed at a single potential influence on teacher expectations. Studies which had considered multiple/interactive influences were relatively few. Dusek and Joseph suggested,

therefore, that "... much more research needs to be done" (p. 342). The present finding of the discounted-weight averaging rule for teacher expectations based on information about motivation and ability of students shows that interactive influences indeed deserve more consideration. Furthermore, averaging model can provide a penetrating approach to such interactive/noninteractive influences (Anderson, 1973; Levin et al., 1980; Simms, 1978).

Role differences. The second main contribution of the present research lies in illustrating role differences in the manner expectations of performance are developed. Integration of information about motivation and ability of students depends upon nature of task when Indian students are below 11 years (Srivastava & Singh, 1986a) or above 20 years (Bhargava, 1983; Singh & Bhargava, 1986; Singh et al., 1986) of age. Also, difficulty of exam alters pattern in the Motivation x Ability effect on expectation of performance by American (Surber, 1981b) but not Indian (Singh & Bhargava, 1985) undergraduate college students. Even within India, industrial managers employ a multiplying rule, whereas college professors employ a constant-weight averaging rule (Singh & Upadhyaya, 1986). The present research thus tested and found that school teachers differ from students, managers, and college professors (Singh & Bhargava, 1985; Singh & Upadhyaya, 1986) as well as from Indian parents (Singh & Mehta, 1986) in their way of expecting performance from persons varying in motivation and ability. This confirms the second hypothesis of the present research that professional roles that people play in their life determine cognitive algebra of their expectations of performance from others (Singh et al., 1986).

Why do school teachers give much more importance to ability than to motivation and discount the motivation information which is markedly different from the value of ability information? Perhaps developing capability in children is the main requirement of the role of a school teacher. In fact, discussions with 10 teachers of central school reinforced such a notion. They mentioned that most of the problems related to a student are usually explained by his or her potential or ability. Admissions to school also rely on assessment of ability. It is natural for them, therefore, to look at ability first and other characteristics later in forming expectations of performance.

The above interpretation suggests that the discounting of motivation information which departs widely from the value of ability information actually reflects on the relationship between information of low and high importance. The trends in discounting of discrepant ability information by the 14 teachers who considered motivation more important than ability in Experiment 1 basically confirms this proposition.

From this angle, the differences between roles of college teachers (Singh & Bhargava, 1985; Singh & Upadhyaya, 1986) and school teachers could be accounted for by the differences in their weighting strategies. But the differences between subjects from managerial (Singh et al., 1986; Singh & Upadhyaya, 1986) and nonmanagerial populations (Gupta & Singh, 1981; Singh & Bhargava, 1985; Singh et al., 1979; Singh & Mehta, 1986; Srivastava & Singh, 1986a, 1986b) could be explained by differences in cognitive algebra. This means that role differences may affect information processing, information integration, or both. For the purpose of

cognitive analyses, therefore, it is necessary to determine whether role differences occurred at the level of information processing, information integration, or both.

The present averaging model analyses of teacher expectations reveal that school teachers have four unique ways of processing information about motivation and ability. First, they are in general not very sensitive to the number of pieces of similar motivation information. If they consider number of pieces of similar motivation information at all, it is done under the condition of positive information alone. In other words, they give greater importance to negative than positive motivation information. This result is in sharp contrast with the results obtained from undergraduate and postgraduate students in India (Bhargava, 1983; Singh et al., 1986). Second, they render judgments on the basis of only the given information. They do not make any imputation about unavailable information contrary to what managers do (Singh & Upadhyaya, 1986). Third, they consider ability to be far more important than motivation as a determinant of performance. Finally, they discount motivation information if its value differs too much from the value of given ability information. Taken together, these four strategies of information processing suggest that school teachers in India have strong negativity and ability biases in forming expectations of student performance.

Theoretical, Methodological, and Applied Implications

Theoretical implications. In the literature on social cognition, prediction of performance from information about motivation and ability has been a topic of controversy. Heider

(1958) proposed a multiplying model, and work of Anderson and Butzin (1974) and Kun et al. (1974) basically supported it. Subsequent work in India (Gupta & Singh, 1981; Singh et al., 1979) obtained evidence for averaging rule. While Singh and his associates proposed a hypothesis of cultural difference between India and America, Surber proposed a hypothesis of difficulty of task.

When we consider all the available data on prediction of performance, it appears now that people employ a wider variety of models in prediction of performance. The models are multiplying rule (Anderson, 1983; Anderson & Butzin, 1974; Kun et al., 1974; Singh et al., 1986; Singh & Upadhyaya, 1986; Surber, 1980, adults' data), constant-weight averaging rule (Gupta & Singh, 1981; Kun et al., 1974, kindergarten and first grade data; Singh & Bhargava, 1985, 1986; Singh et al., 1979; Srivastava & Singh, 1986a, 1986b; Surber, 1981b, lecture condition), negative differential-weight averaging rule (Singh & Mehta, 1986; Srivastava & Singh, 1986a, kindergarten to sixth graders; Surber, 1981b, text condition), positive differential-weight averaging rule (Singh & Mehta, 1986; Singh & Srivastava 1986a; Surber, 1981a, 1981b, recall condition, 1985), and discounted-weight averaging rule as shown in the present work. To account for such a diversity in the models, it is now necessary to consider nature and difficulty of tasks as well as age, culture, and roles of subjects. Anyone of the hypotheses by itself would not be able to explain all the available data. Nevertheless, it is obvious that the multiplying model suggested by Heider (1958) and Vroom (1964) and assumed in so many current theories of motivation such as those of Hull and Tolman (cf. Anderson, 1974, p. 29) does not necessarily govern prediction of performance.

Methodological implications. Much of the sociopsychological research has relied on use of undergraduate college students as subjects (Carlson, 1984; Sears, 1986). This has created problems of external validity of the results as well as of theorizing with a very narrow data base. In educational research, the situation is little better, for most studies use teachers as subjects (cf. Dusek & Joseph, 1983, Tables 1, 2, and 3). Results from the present two experiments indicate that school teachers in fact handle the same judgmental tasks in a manner different than students (Singh & Bhargava, 1985, 1986; Srivastava & Singh, 1986a). It is necessary, therefore, to select realistic subject populations in applied research (Singh, 1985).

Another methodological implication of the present research concerns the use of multiple tests of the same model. Of the three tests of averaging model in Experiment 2, one failed because teachers were insensitive to the number of similar pieces of motivation information. Had only Test 1 been used, results could have been ambiguous about the underlying model. Fortunately, results from Tests 2 and 3 favored the averaging model and allowed the conclusion that the failure of Test 1 was attributable to teachers' insensitivity to multiple pieces of the same information. Accordingly, it would be necessary in future research to include multiple tests of the same model with the same group of subjects.

Applied implications. The ability and negativity biases exhibited by teachers in forming expectations of student performance need to be removed by training programs. It seems that the contents of teacher training programs must include materials pertaining to various determinants of performance (Weiner, 1979), and

that teachers be encouraged to consider not only ability but also effort, difficulty of task, and chance factors in forming expectations of student performance. With principal reliance on ability factor, they are likely to turn the good ones as better but the bad ones as worse via their self-fulfilling prophecy. Such an outcome would hardly be conducive to an egalitarian society. It is important, therefore, that teacher expectations be based on several factors that contribute to student performance.

The second input to the teacher training programs should be on the fallibility of data in student folders. At present, teachers seem to be more skeptical of positive than negative information. Their training materials must emphasize that negative information could be as fallible as positive information. Both types of information should, therefore, be obtained from as many sources as possible, and they should be paid equal attention.

To the above it may be added that decision tasks constructed from the method of information integration theory (Anderson, 1981b) appear to have high construct validity for measurement of managerial attitudes and value (Singh & Upadhyaya; 1986). The same approach could also be extended to teacher training and to measurement of training effectiveness.

Implications for Future Research

The present two experiments on teacher expectations of student performance are only a beginning. Numerous stimulus variables remain to be studied. These include age, sex, physical attractiveness, race, social class, and other overt characteristics of a student. These variables can all be studied by applying

the method of information integration theory as illustrated here. An advantage with a study of several variables at a time is that it allows delineation of not only interactive influences but also relative importance of the various cues that enter into the formation of expectations. Before such a comprehensive study is undertaken, however, it is necessary to check on the generality of the present results with teachers from other countries.

Another line of research on teacher expectations could be the determination of the effects of information reliability. Although research by Shavelson, Cadwell, and Izu (1977), Borko and Shavelson (1978), and Cooper (1979) provide some evidence on the degree to which teachers consider the reliability of information on which they form expectations of student performance, there is no study of how reliability of information of one kind affects effectiveness of information of another kind. The adding, averaging, multiplying, and two-stage averaging-multiplying models (Singh, in press; Singh & Bhargava, 1986; Singh et al., 1986; Singh & Upadhyaya, 1986; Surber, 1981a) all provide penetrating approach to analyses of the effects reliability of an information not only on its own effectiveness but also on the effectiveness of another information available for judgment. Thus, integration-theoretical analysis of the effects of information reliability on teacher expectations constitutes an important topic for future research.

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Figure Captions

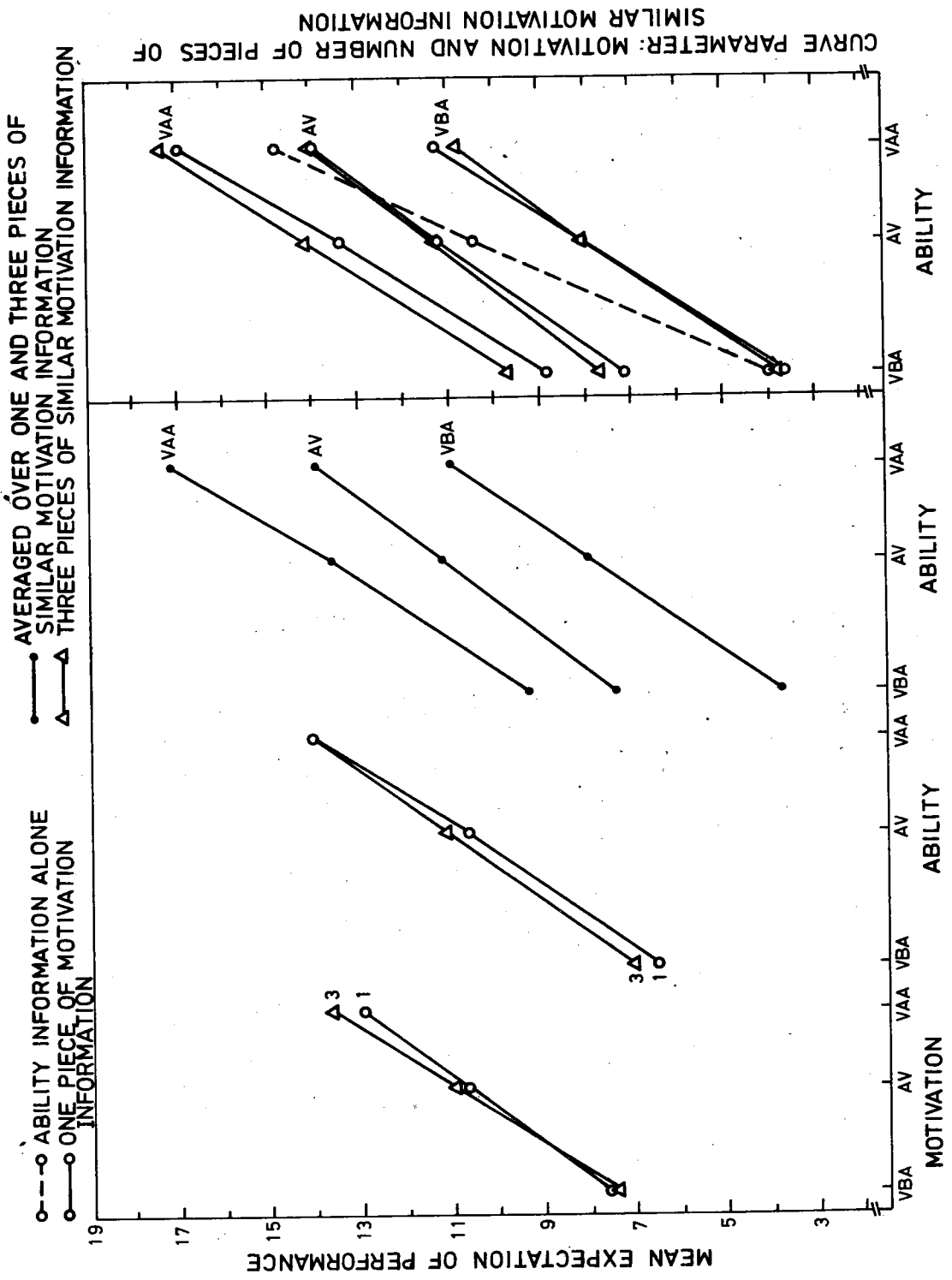
Figure 1. Factorial plots of Number of pieces of similar motivation information x Motivation, Number of pieces of similar motivation information x Ability, Motivation x Ability, and Number of pieces of similar motivation information x Motivation x Ability effects from Experiment 1. The dashed curve is based on information about ability alone. The abbreviations VBA, AV, and VAA refer to very much below average, average, and very much above average, respectively.

Figure 2. Mean expectation of performance as function of motivation (curve parameter) and ability (listed on the horizontal axis) for two groups of teachers in Experiment 1. The data from 46 teachers who gave greater importance to ability than to motivation are shown in the left graph. The right graph shows data from 14 teachers who gave greater importance to motivation than to ability.

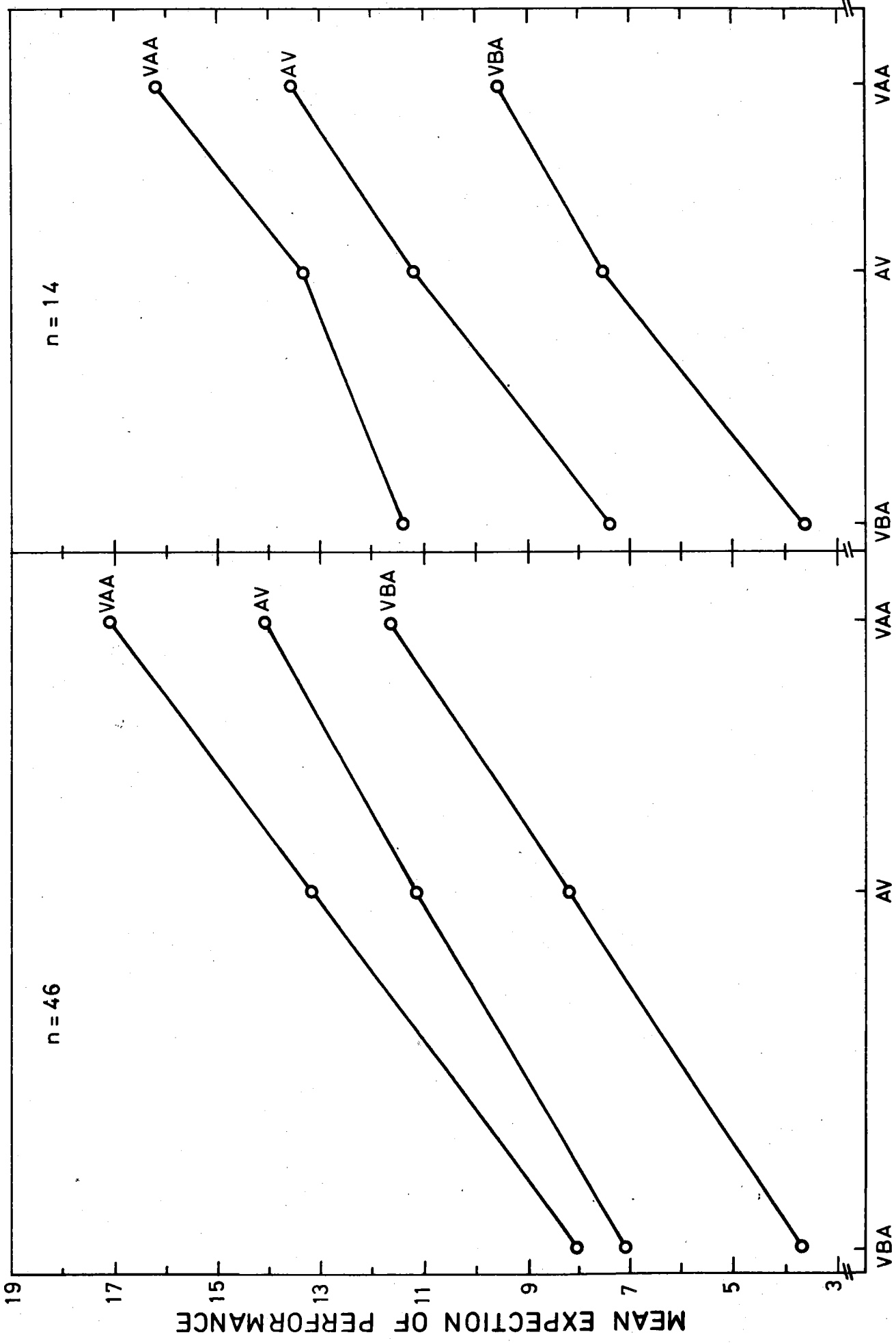
Figure 3. Factorial plots of Number of pieces of similar motivation information x Motivation, Number of pieces of similar motivation information x Ability, Motivation x Ability, Number of pieces of similar motivation information x Motivation x Ability effects from Test 1 of Experiment 2. The dashed curve is based on information about ability alone.

Figure 4. Factorial plots of Number of pieces of average motivation information x Motivation, Number of pieces of average Motivation information x Ability, and Motivation x Ability effects from Test 2 of Experiment 2.

Figure 5. Factorial plots of Ability x Number of pieces of average motivation information x Motivation and Motivation x Number of pieces of average motivation information x Ability effects from Test 2 of Experiment 2. The dashed curve is based on the information listed on the horizontal axis alone.



TEACHERS ASSIGNING WEIGHT TO MOTIVATION > ABILITY



n = 14

n = 46

MEAN EXPECTATION OF PERFORMANCE

ABILITY > MOTIVATION

MOTIVATION > ABILITY

VBA

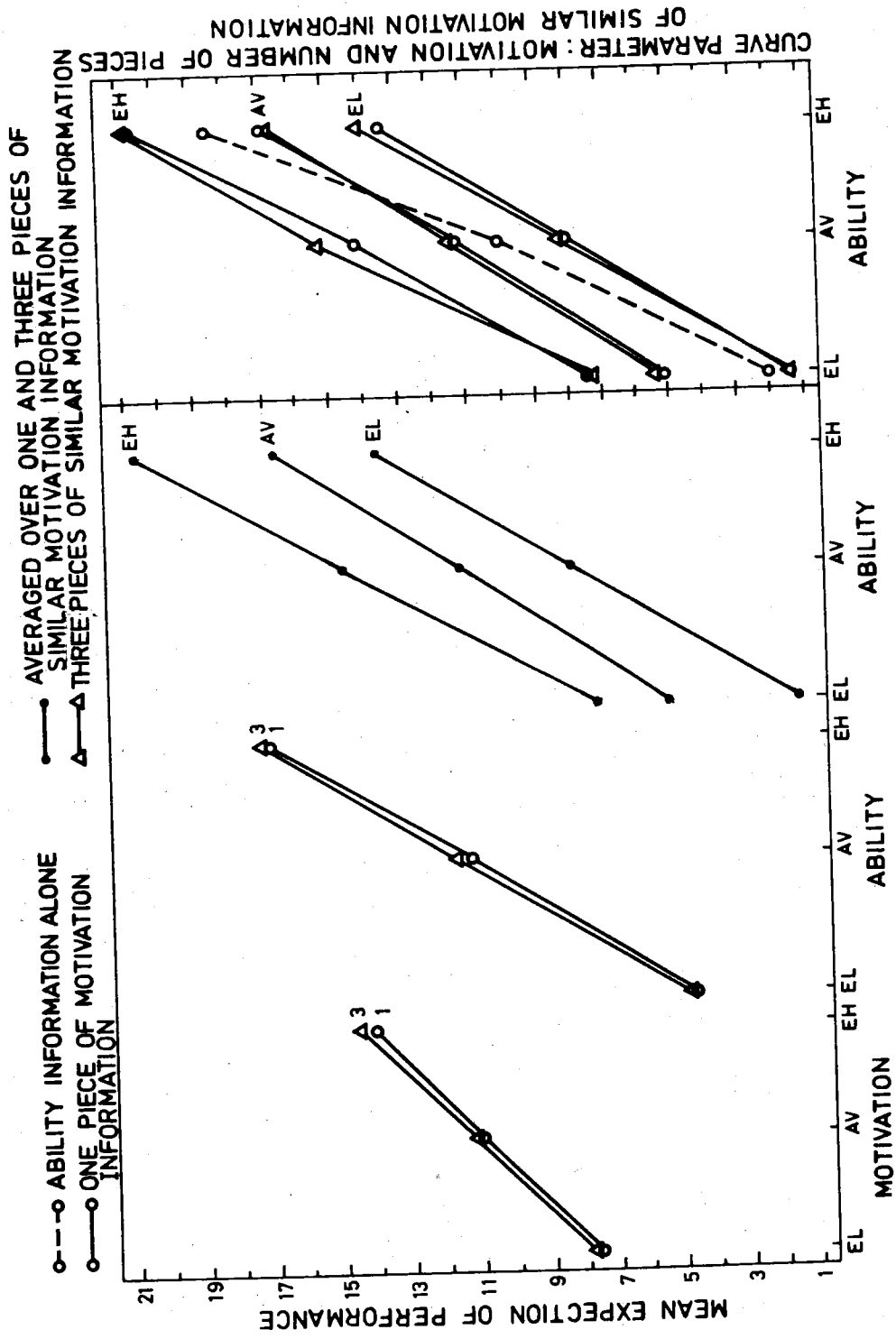
AV

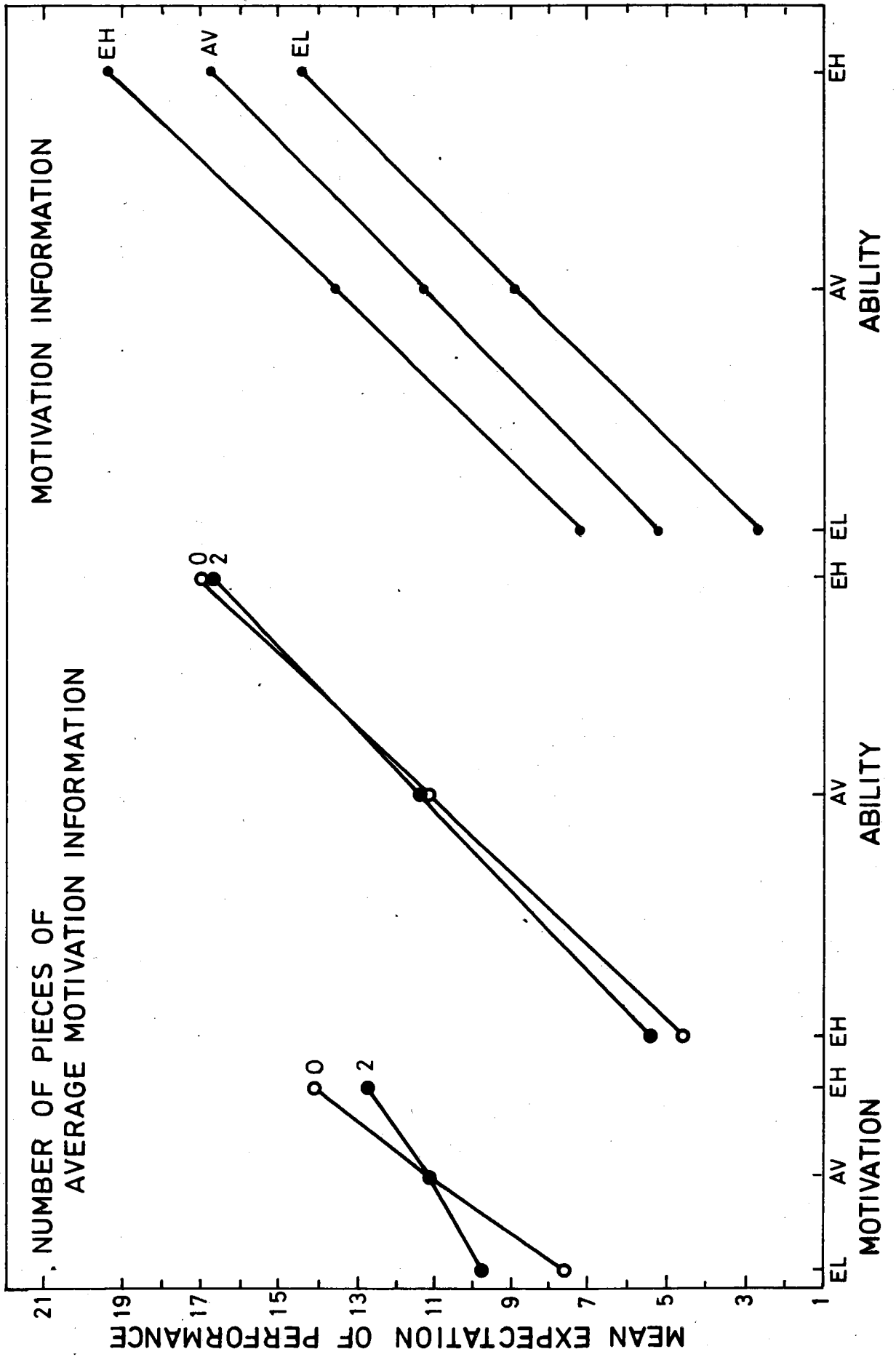
VAA

VBA

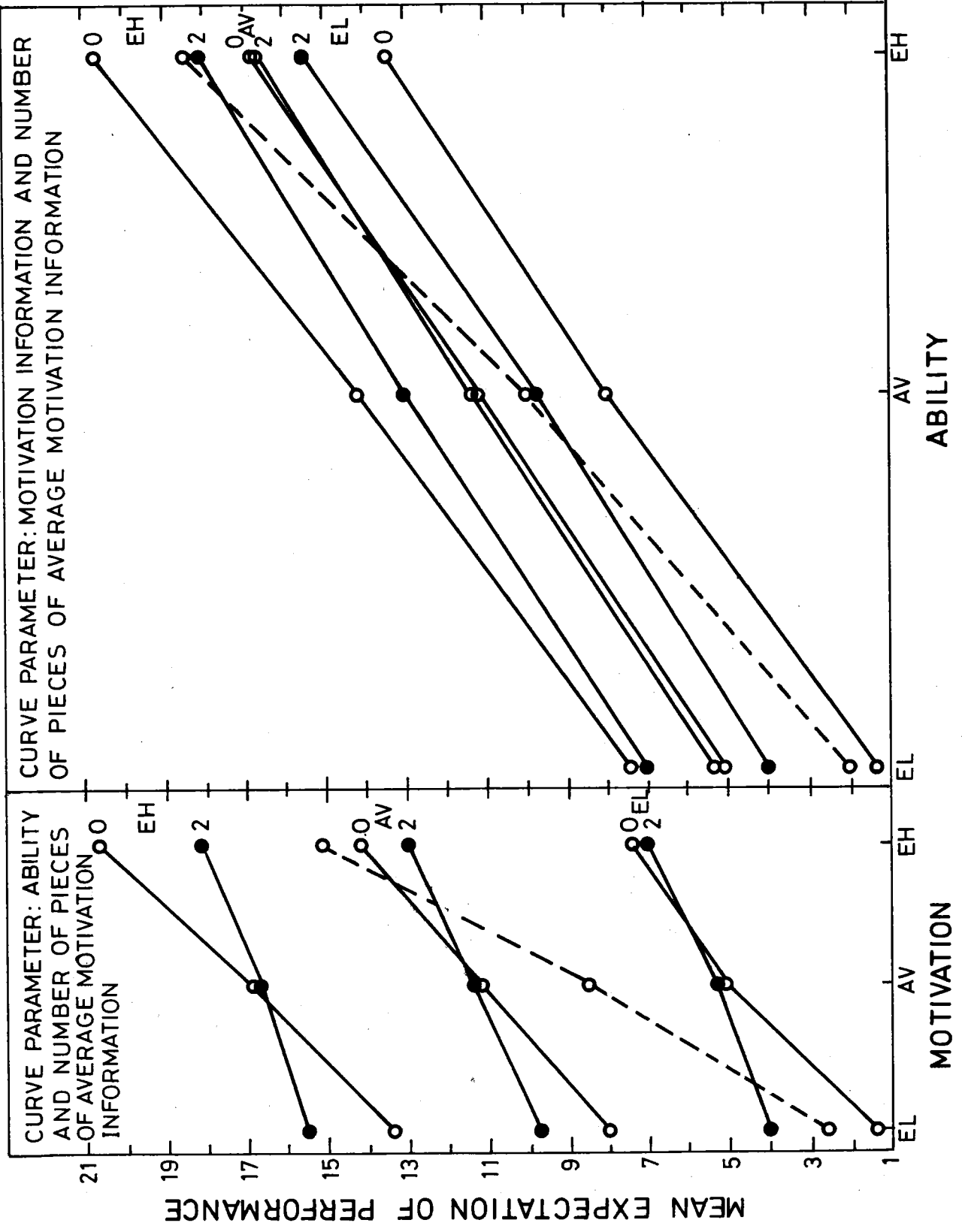
AV

VAA





○ ONE PIECE OF MOTIVATION INFORMATION
 ● TWO ADDITIONAL PIECES OF AVERAGE MOTIVATION INFORMATION



CURVE PARAMETER: MOTIVATION INFORMATION AND NUMBER OF PIECES OF AVERAGE MOTIVATION INFORMATION

CURVE PARAMETER: ABILITY AND NUMBER OF PIECES OF AVERAGE MOTIVATION INFORMATION

ABILITY

MOTIVATION