W. P. : 322

Working Paper

INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD

AN INTEGRATION-THEORETICAL ANALYSIS OF CULTURAL AND DEVELOPMENTAL DIFFERENCES IN ATTRIBUTION OF PERFORMANCE

By

Meenakshi Gupta

&

Ramadhar Singh

W P No. 322

July 1980

The main objective of the working paper series of the IIMA is to help faculty members to test out their research findings at the pre-publication stage.

INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD

An Integration-Theoretical Analysis of Cultural and Developmental Differences in Attribution of Performance

Meenakshi Gupta
National Institute of Training in Industrial Engineering
Bombay, India

Ramadhar Singh
Indian Institute of Management
Ahmedabad, India

Running Head: Attribution of Performance

Footnote

Preparation of this paper was facilitated by the Research and Publications Fund of the Indian Institute of Management, Ahmedabad. This paper is adapted from the first author's doctoral dissertation under the direction of the second author submitted to the Department of Humanities and Social Sciences, Indian Institute of Technology, Kanpur, India. The authors are grateful to Principal D.S. Bajpei, Central School and Principal J.N. Mattoo, Campus School for their cooperation in data collection and to C. Shyam Prasad and Anil K. Vaya for their assistance in the reanalyses of the data.

Requests for reprints should be sent to Ramadhar Singh, Organizational Behavior Area, Indian Institute of Management, Ahmedabad-380 015, Gujarat, India.

Abstract

Singh, Gupta, and Dalal proposed that American and Indian college students differ in their cultural outlook on how motivation and ability determine performance. Americans follow a multiplying rule which implies that effort will be more effective with persons of high than low ability. In contrast, Indians follow a constant-weight averaging which implies that effort will be equally effective with persons of low and high ability. The present study made a more thorough test of this cultural-difference hypothesis, using subjects from five age groups. As predicted, subjects averaged information about past performance, motivation, and ability of the stimulus student in attribution of his performance. There was no support for Heider's suggestion and American finding that Performance = Motivation x Ability. Developmental differences appeared at the level of information processing and integrational capacity. These results illustrate the potential power that information integration theory provides for cross-cultural and cross-age comparisons in social perception.

An Integration-Theoretical Analysis of Cultural and Developmental Differences in Attribution of Performance

How do people integrate information about motivation and ability of a person when they predict his performance? Heider (1958) suggested the multiplying rule:

$$\text{Performance} = \text{Motivation} \times \text{Ability}. \qquad (1)$$

Anderson's (1974, 1980) theory of functional measurement shows that such a multiplying rule implies a linear fan pattern in the factorial plot of the Motivation x Ability effect. This prediction has been supported in the United States but not in India.

In a study of college students, Anderson and Butzin (1974) presented information about motivation and ability of target persons, applicants to graduate school or athletes trying out for college track, and asked subjects to predict their performance. The factorial plot of the Motivation x Ability judgments was indeed a diverging fan of straight lines. In a developmental study, Kun, Parsons, and Ruble (1974) also obtained evidence for a linear fan shape. Although judgments by the youngest children showed a parallelism pattern, as if an adding-type rule was operative, judgments by second graders showed clear linear fan shape. Therefore, the authors suggested that a multiplying rule develops out of an adding rule.

However, the multiplying process failed to appear in a series of three experiments performed on Indian college students by Singh, Gupta, and Dalal (1979). Contrary to the predicted linear fan shape, they found a pattern of parallelism in the factorial plot of Motivation x Ability data. Moreover, when information about past performance was also supplied, all the three two-way interactions showed parallelism. In other words, subjects followed the three-term averaging rule:

$$\text{Predicted Performance} = \text{Past Performance} + \text{Motivation} + \text{Ability}. \quad (2)$$

Accordingly, Singh et al argued that integration rules underlying achievement judgments are culture-specific, and that Indian college students average motivation and ability information in attribution of future performance.

Does the difference between the equal-weight averaging rule and the multiplying rule point to any important difference in cultural outlook between India and America? Singh et al (1979) suggested that the two cultures differ in their outlook on how motivation and ability determine performance. Americans follow a multiplying rule. They seem to believe that trying or effort will be more effective with persons of high than low ability. In contrast, Indian college students believe that trying or effort will be equally effective with persons of low and high ability. Perhaps they feel that each person, regardless of native ability, has equal opportunity to improve upon his or her lot.

The purpose of the present research was two-fold. One purpose was to provide a more thorough test of the cultural-difference hypothesis referred above. The experiment was patterned after Experiment 3 of Singh et al (1979), and subjects were selected from five age groups. This yields greater generality of the results, and also direct comparison with Kun et al (1974) on the development of cognitive algebra.

The second purpose was to make distinguishing tests between adding and averaging rules as well as between multiplying and conjunctive averaging rules. As already noted, Singh et al (1979) found support for an averaging process. Anderson and Butzin (1974) also suggested the conjunctive averaging rule as an alternative interpretation for their linear fan result. However, neither they nor Kun et al (1974) included a test to distinguish multiplying from conjunctive averaging. Accordingly, the present experiment included certain "crossover tests" for this purpose.

Method

Stimuli and Designs

There were two main stimulus designs. The first design was a 3 x 3 x 3 (Past Performance x Motivation x Ability) factorial that yielded descriptions of 27 stimulus students. The three levels of past performance were did not do well (BAD), did slightly well (OK), and did very well (GOOD) in the previous grade. The three levels of motivation were defined by time spent over study at home: Does not study at all (LO), studies slightly (MED), and studies very much (HI). The ability of the stimulus students was defined by their potential for learning. The three levels of ability were not at all good in studies (NG), slightly good in studies (SG), and very good in studies (VG).

The second design was 3 x 3 (Motivation x Ability) factorial. The levels of the two factors were the same as in the three-cue design. Pairing of the levels of these two factors produced nine two-cue stimulus students.

There were six single-cue stimulus persons also. Three were based on one of the three levels of motivation factor; three were based on one of the three levels of ability factor.

Eighteen practice examples were constructed. Of the 18 practice examples, five were single-cue, three were two-cue, and ten were three-cue. In the latter, four had stimuli more extreme than the regular levels of the three factors; hence, they served as end anchors. These practice stimulus persons were intended to enable the subjects develop a uniform scale and to orient them toward the use of the entire judgment scale (Anderson, 1974, 1980).

All these stimulus students were judged by each subject. Each person's description was typed on a separate index card.

Subjects

The subjects consisted of 96 children and 24 college students. The children were from Standard II, IV, VI, and VIII of the Campus School and Central School of the Indian Institute of Technology, Kanpur, India. There were 24 children in each grade group, selected according to a 2 x 2 (Sex x Annual Income: Below Rs. 6,000 vs. Above Rs. 12,000) design with six subjects per cell. Mean ages for the four grade groups were 6 years 9 months, 8 years 7 months, 10 years 7 months, and 12 years 10 months, with respective ranges of 6-7 years, 8-9 years, 10-11 years, and 12-13 years.

The twenty-four adults (12 male and 12 female) were from an introduction to psychology course at the Indian Institute of Technology, Kanpur, India. Mean age was 17 years 10 months, with range of 17-19 years. Participation fulfilled their course requirement.

Procedure

Each child was run individually in a small room of the school over two consecutive days.

Day 1. The moment the child entered the experimental room, the experimenter gave her name, asked the child's name, and appreciated its attractiveness. All conversation was in Hindi or English, depending upon the language proficiency of the child.

The experimental task was introduced to the child as one dealing with the prediction of future performance of several unknown students of same sex and age as the subject. It was emphasized that some students would be described by three cues, some by two cues, and some by only one cue. Therefore, prediction of future performance of a student must be based on only the information given about him (her).

The response scale consisted of nine squares, arranged in their increasing size of 1-9 cm. The experimenter placed the response scale in front of the child, and urged him (her) to treat the row of squares as a continuous scale. Furthermore, she described the smallest square as poorest performance, the biggest square as par excellent, and squares of intermediate sizes as performance denoting intermediate levels. She demonstrated use of the scale by asking six different questions. Children did not have any difficulty in using the scale as has been seen earlier also (e.g., Singh, Sidana, & Saluja, 1978).

To make the task clear and meaningful, the experimenter gave 18 practice examples described earlier. She read information about each student, and asked the subject to indicate how the so-described student would perform in his (her) next annual examination. Subjects were trained to indicate their response by pointing at one of the nine squares. Any misunderstandings resulted in the child being given further instruction.

After practice session, the main points of the instructions were summarized by the experimenter, and all queries about the task were answered. Finally, the main experimental stimuli were presented. The experimenter read the information printed on each card, and required the subject to tell what she had read. Once the child was able to reproduce the read information, he (she) was asked to make his (her) judgment of future performance. Ratings of all the 42 stimulus students were made in this way. The orders of presentation of the three cues and two cues about each student were balanced over equal number of subjects of each group. For data analysis, the row of squares was treated as rating scale, corresponding to digits 1-9.

Once the subject rated all the 42 stimulus students, the experimenter gave five toffees to him (her) for cooperation in the experiment. She thanked the child, and asked him (her) to show up the next day for further experimentation.

Day 2. Procedures of Day 2 were similar to those of Day 1. Subjects received detailed instructions, worked on 18 practice examples, and finally rated the 42 stimulus persons twice in different shuffled orders. As on Day 1, the subject received five toffees and thanks for his (her) cooperation in the experiment.

Adult subjects. Each adult was run individually in the Psychology Laboratory, using the same experimental materials. They were told that their responses would be used as standard to evaluate judgments by young children. The stimulus persons were described as students of Standard II. Data for all the three replications of the designs were collected during just one session.

Both children and adults rated the experimental stimuli thrice. The first replication was considered as additional practice, and only the data from the second and third replications were coded and analyzed.

Results

Parallelism versus Linear Fan Shape

Since there are three pieces of information, there are three integration rules to consider. The upper part of Figure 1 shows the two-way graph for Past Performance x Motivation for each of the five age groups. The upward slope of the curves represents the effect of information about past performance, while the vertical separation of the curves represents the effect of information about motivation. The three curves are essentially parallel at all five age levels. Although the parallelism is not perfect, as shown by the interaction tests below, the overall picture is one of strong support for an adding-type rule for integration of information about past performance and motivation.

Figure 1 about here

A quite similar picture emerges in the lower part of Figure 1, which plots the two-way graphs for Past Performance x Ability. Again the three curves for each age group are approximately parallel. This means that integration of information about past performance and ability also follows an adding-type rule.

Most important for cross-cultural comparison are the two-way graphs for Motivation x Ability. These are shown in Figure 2, for the three-cue design in the upper panel and for the two-cue design in the lower panel. The general shape of the curves from the two designs is essentially the same, and all ten graphs exhibit a prevailing pattern of near-parallelism. This pattern of near-parallelism supports an adding-type rule.

<u>Figure 2 about here</u>

According to the multiplying rule, all ten graphs should diverge toward right. However, there is no sign of this diverging linear fan shape. Heider's (1958) suggestion and the American finding of Performance = Motivation x Ability (Anderson & Butzin, 1974; Kun et al, 1974) is thus not borne out by the data at all. Evidently, Indian students at all ages coordinate information pertaining to motivation and ability in a way quite different from that of their American counterparts.

A strict adding-type rule requires parallelism in the factorial graph, and hence a nonsignificant interaction term in the analysis of variance. In analyses of variance of the three- and two-cue design data[1], however, the interaction terms were generally significant for the graphs of Figures 1 and 2. Closer examination of the graphs for children of all the four age groups suggests that the deviations from parallelism reflect end effects in the response scale. There is a tendency for the lowest point to be too low and the highest point to be too high, as though children had a preference for the two end categories of the response scale. In any case, the deviations from parallelism are relatively small. Therefore, they do not seem to require any serious qualification on the adding-type rule.

Distinguishing Tests for Adding, Averaging, and Multiplying Rules

Both the adding and averaging rules can account for the pattern of parallelism in Figures 1 and 2. Figure 3 presents distinguishing tests between adding and averaging rules for motivation and ability across the five age groups. In each graph, the curve connected by circles is based on the single cue listed on the horizontal axis, namely, motivation in upper panel and ability in the lower panel. The other two curves are based on main effect of the very same cue from the two- and three-cue designs.

Figure 3 about here

The adding hypothesis requires the three curves in each graph to exhibit parallelism. The reason is simple: The added information would have the same directional effect across the three levels of the factor listed on the horizontal axis. Figure 3 shows no sign of parallelism at all. Instead, all ten graphs show crossovers. These crossovers are strong evidence against the adding rule.

The averaging rule predicts the crossover interaction that is present in all ten graphs of Figure 3. The two-cue curve crosses over the three-cue one clearly in eight cases. Similarly, the single-cue curve crosses over the two- and three-cue curves in nine and ten cases, respectively. All statistical tests[2] of crossover interaction were highly significant. It seems reasonable to conclude, therefore, that subjects averaged the three pieces of information in attribution of performance.

The logic of the crossover test can be understood by looking at the upper left graph for 6-7-year-olds. The curve joined by circles is based on low, moderate, and high levels of motivation alone. The curve connected by triangles is based on the very same three levels of motivation, together with the added piece of information that ability is moderate. The average of low motivation and moderate ability is higher than the average of low motivation alone; therefore, the two-cue curve is higher at the left end. Similarly, the average of high motivation and moderate ability is lower than the high motivation alone; therefore, the two-cue curve is lower at the right end. The three-cue curve represents averaging of two moderate pieces of information, one about ability and one about past performance, with the given motivation information. Therefore, it is less negative at the left end and less positive at the right end in relation to the two-cue curve. Other crossover interactions can be accounted for in the same way.

Two minor exceptions to the crossover pattern may be found in Figure 3. The 6-7-year-olds in the lower left graph show a reverse crossover for the two- and three-cue curves, $F(2, 46) = 3.51$, $p < .05$. Its meaning is not clear, although it may perhaps result from the partial utilization of the three cues in this age-group noted in Table-1. Also, the adults in the upper right graph show parallelism for the one- and two-cue curves, $F(2, 46) = 0.56$, a result that is consistent with a tendency for adults to make an implicit inference about ability when it is not specified (Singh et al, 1979). A similar developmental trend for implicit inferences has been noted by Leon (1980) in moral judgment.

Information Utilization

Developmental trends in capacity to utilize all three pieces of information were examined in the individual subject analyses. Since each subject rated the stimuli twice, an analysis of variance was run for each subject (Singh et al, 1979). The number of subjects who had one, two, and three statistically significant main effects at each age are listed in Table 1.

Table 1 about here

Table 1 shows that most subjects of all ages except the youngest utilized all three pieces of information. In 6-7-year-old group, however, five subjects used just one cue, five used two cues, and the remaining fourteen used all three cues. This result agrees with previous work showing that preoperational children differ in their integrational capacity (Anderson & Butzin, 1978; Anderson & Cuneo, 1978). Furthermore, preoperational children of the United States and India seem to be similar with respect to their integrational capacity.

Individual child analyses disclosed another interesting result. The five children who used just one cue all used motivation, although this information appeared in the stimulus descriptions at different serial positions. Perhaps those children believed that motivation is all that is important for performance. Of the five subjects who used two cues, three utilized information about motivation and ability, and two utilized information about motivation and past performance. All these five subjects also used motivation information. In this way, all twenty-four preoperational children considered motivation as an important determinant of performance. This indicates that belief in the power of trying to improve upon one's lot develops in Indian children at quite early age.

Discussion

Cultural Differences

Cultural-difference hypothesis. The chief finding of the present research is that attribution of performance obeys an averaging rule.

Not only adults but also preoperational children average information about motivation and ability when they predict performance. This result confirms the previous finding with adults (Singh et al, 1979), and extends the averaging process to children as young as six years of age. The present results, therefore, provide further support for the cultural-difference hypothesis.

However, the averaging result is inconsistent with the multiplying model suggested by Heider (1958) and supported by Anderson and Butzin (1974) with American adults and by Kun et al (1974) with older American children. Only a few of the Indian subjects (6%) showed any suggestion of a multiplying rule, and even these conformed to the crossover prediction of the averaging model (Gupta, 1979). In India, therefore, attribution of performance cannot be described as a multiplicative function of motivation and ability.

Alternative interpretations. Can the difference between Indian and American results be explained in ways other than the cultural-difference hypothesis? At least three other reasons may be suggested. First, perhaps subjects did not understand the instructions or task. Second, Indian subjects may lack the ability to use a multiplying rule. Finally, they may have simplified the experimental task as did American subjects in postdiction of motivation and ability (Anderson & Butzin, 1974). Let us examine the plausibility of these alternative interpretations.

The experimenter took pains to ensure understanding of the experimental task. She gave extensive practice on Days 1-2, and required subjects to recall information about each stimulus student before rating. She also removed misunderstanding of task by giving detailed instructions and demonstration. Moreover, the single subject analyses showed that most of the children took account of all pieces of information in a sensible way. Misunderstanding of the task thus seems most unlikely.

Results from a study of attribution of gift size eliminate the second interpretation. Singh (Note 1) presented information about generosity and annual income of various persons, and asked subjects to predict how much those persons would contribute to a family whose house had burned down. This experiment parallels that of Graesser and Anderson (1974) on Gift Size = Generosity × Income, and exactly similar results were obtained: Judgments of gift size showed a di diverging fan pattern, as though a multiplying model was operative, just as in the American studies. This shows that Indian subjects are able to employ the same integration rule as the Americans.

The possibility of task simplification can also be ruled out on the basis of the multiplying-type result from the gift-size experiment just mentioned. Furthermore, task simplification would be expected to yield an additive rule, and not the more complex averaging rule which has received good support in the present and previous developmental studies of Indian children (Singh et al 1978; Singh, Sidana & Srivastava, 1978). It can thus be said that the discrepancy between American and Indian results reflects a genuine difference in cultural outlook on how motivation and ability determine scholastic performance.

<u>Developmental Differences</u>

The present integration-theoretical analysis detected two age-related differences in attribution of performance. They are discussed briefly below.

<u>Information utilization</u>. Preoperational children do vary in their integrational capacity. Approximately 40 per cent of the preoperational children failed to utilize all the three given pieces of information. However, the capacity to integrate three pieces of information was present in most of the 8-9-year-old children. This bolsters the result of Anderson and Butzin (1978) who found all of their 8-year-olds to integrate four pieces of information in judgments of equity.

The finding that preoperational children differ in their capacity to integrate several pieces of information has one important methodological implication. The analysis of data at the group level may hide real differences in integrational capacity (Anderson, 1980; Anderson & Butzin, 1978). It will often be desirable, therefore, to design the experiment so as to allow analyses for each individual child.

Implicit-inference averaging. Children and adults also differed with respect to their capacity to infer the value of missing information. Adults imputed some value to the missing ability information and integrated the inferred value with the other pieces of information. It is interesting to note that adults inferred below average ability when no information was given. That means that the missing ability information is interpreted in a negative way. Children always rendered their judgments on the basis of the information given. Indeed, some preoperational children did not even use all the given information as already noted. This suggests that children and adults differ in their information processing strategy, and not in their integration strategy. Once stimuli are processed, both children and adults integrate them according to the averaging rule.

Concluding Comments

Cultural and developmental differences in social perception and cognition are difficult to study. The same stimuli may have different meanings in different cultures, or at different ages within the same culture. Even if equal-interval scales can be obtained, the numbers may not be comparable because the zero point and unit of such scales are arbitrary, as with the Celsius and Farenheit scales. Information integration theory resolves many of these problems, and so provides a useful framework for analyses of cultural and developmental differences.

The basic aim of the theory is to diagnose the integration rule underlying judgments. An important advantage with the integration rules is that they deal with <u>pattern</u> of responses, not the numerical value of single responses. This aspect is vital for comparison between different ages or cultures. No a priori knowledge of value of stimuli or origin and unit of personal response scale is required. Groups as well as individuals are readily comparable with respect to the <u>pattern</u> in their judgments of stimuli constructed from factorial design. Search for integration rule also permits comparison of groups along the criteria of information utilization and information processing. The present analyses of cultural and developmental differences were based on the criteria of information integration and information valuation and processing, respectively. The present work, therefore, illustrates the potential power of the integration-theoretical analysis in the study of social perception and cognition.

Reference Note

1. Singh, R. *Multiplying versus differential-weight averaging as integration rule in attribution of gift size.* In C.M. Bhatia (Chair), *Dimensions of information processing.* Symposium presented at the 67th annual meeting of the Indian Science Congress Association, Calcutta, India, February 1980.

References

Anderson, N.H. Information integration theory : A brief survey. In D.H. Krantz, R.C. Atkinson, R.C. Luce, and P. Suppes (Eds.), Contemporary developments in mathematical psychology (Vol. 2). San Fransisco: Freeman, 1974.

Anderson, N.H. Information integration theory in developmental psychology. In F. Wilkening, J. Becker, and T. Trabasso (Eds.), Information integration by children. Hillsdale, New Jersey: Erlbaum, 1980.

Anderson, N.H. & Butzin, C.A. Performance = Motivation x Ability : An integration theoretical analysis. Journal of Personality and Social Psychology, 1974, 30, 598-604.

Anderson, N.H. & Butzin, C.A. Integration theory applied to children's judgments of equity. Developmental Psychology, 1978, 14, 593-606.

Anderson, N.H. & Cuneo, D.O. The height and width rule in children's judgments of quantity. Journal of Experimental Psychology: General, 1978, 107, 335-378.

Graesser, C.C. & Anderson, N.H. Cognitive algebra of the equation : Gift Size = Generosity x Income. Journal of Experimental Psychology, 1974, 103, 692-699.

Gupta, M. An information integration analysis of developmental trends in attribution of scholastic performance. Unpublished doctoral dissertation, Indian Institute of Technology, Kanpur, 1979.

Heider, F. The Psychology of interpersonal relations. New York: Wiley, 1958.

Kun, A., Parsons, J.E., & Ruble, D.N. Development of integration processes using ability and effort information to predict outcome. Developmental Psychology, 1974, 10, 721-732.

Leon, M. Coordination of intent and consequence information in children's moral judgments. In F. Wilkening, J. Becker, and T. Trabasso (Eds.), Information integration by children. Hillsdale, New Jersey: Erlbaum, 1980.

Singh, R., Gupta, M., & Dalal, A.K. Cultural difference in attribution of performance : An integration-theoretical analysis. Journal of Personality and Social Psychology, 1974, 37, 1342-1351.

Singh, R., Sidana, U.R., & Saluja, S.K. Playgroup attractiveness studied with information integration theory. Journal of Experimental Child Psychology, 1978, 25, 429-436.

Singh, R., Sidana, U.R., & Srivastava, P. Averaging processes in children's judgments of happiness. Journal of Social Psychology, 1978, 104, 123-132.

Technical Footnotes

1. Data of the three- and two-cue designs were subjected to a 24 x 2 x 3 x 3 x 3 (Subjects x Replications x Past Performance x Motivation x Ability) and a 24 x 2 x 3 x 3 (Subjects x Replications x Motivation x Ability) analysis of variance, respectively. Each _F_ test had different error term, and the degrees of freedom for the 2-way interactions were 4/92. Of the 20 two-way interactions shown in Figures 1 and 2, only three were statistically nonsignificant as required by the adding-type rule. They are Past Performance x Motivation effect, $F\,(4, 92) = 1.60$, for 6-7-year olds in the upper left panel of Figure 1 and Motivation x Ability effect for adults in three- and two-cue designs, $F\,(4, 92) = 1.86$ and 1.70, shown in Figure 2. Other 17 two-way interactions were statistically significant.

2. The main effects of motivation and ability factors were obtained for each subject from the single subject analysis of variance of the one-, two- and three-cue design data. They were further subjected to a 24 x 3 x 3 (Subjects x Number of Cues x Nature of Cue) analysis of variance for the ability and motivation factor separately. In these analyses, the degrees of freedom for the crossover tests were 4/92. In pairwise comparisons of curves, the degrees of freedom were 2/46.

Table 1

Number of Subjects having One, Two, and Three Significant Main Effects at Each Age Level

Number of Significant Main Effects	Age				
	6–7	8–9	10–11	12–13	Adults
1	5	0	2	1	0
2	5	1	1	2	2
3	14	23	21	21	22

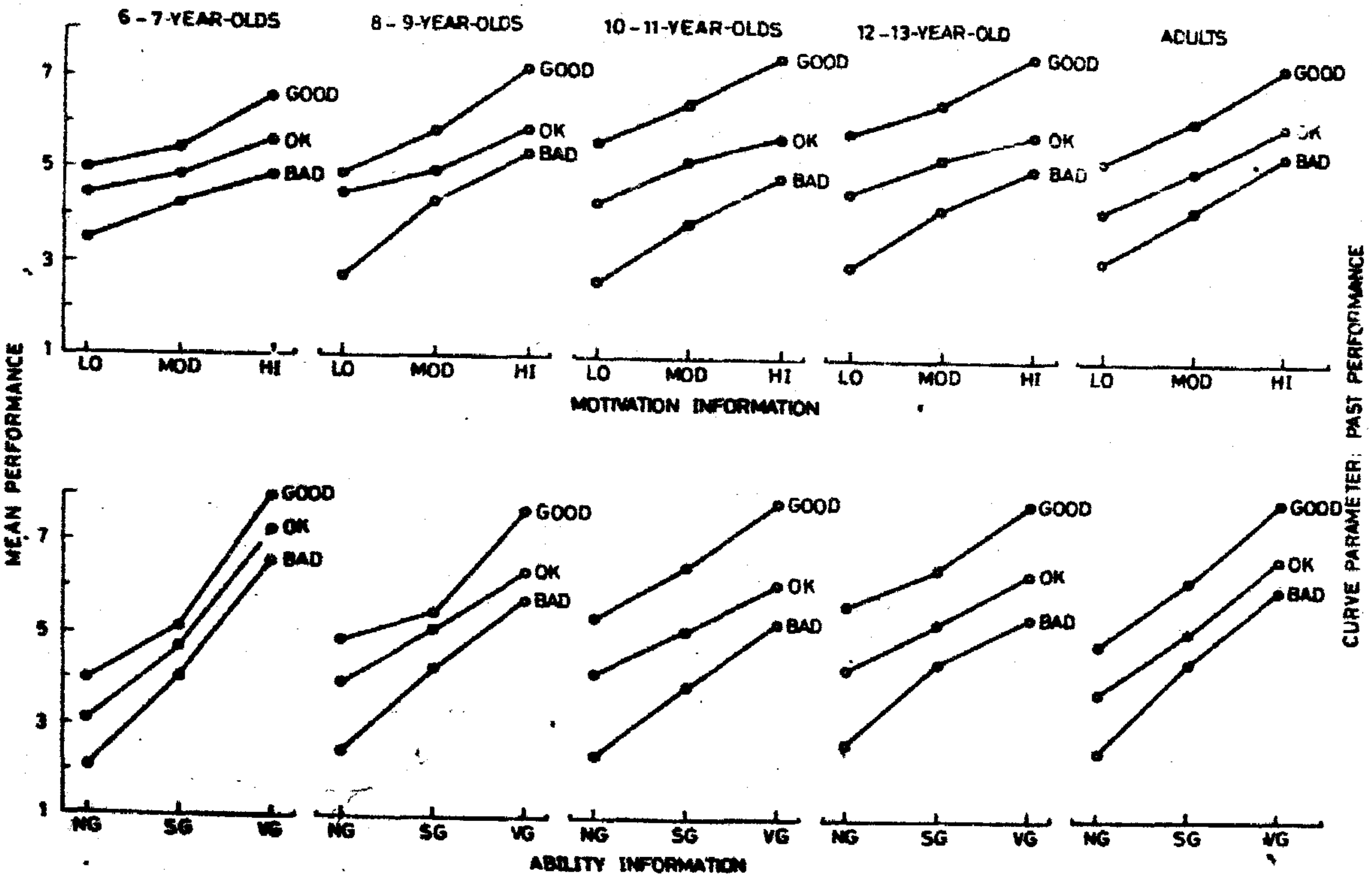
Note. The *df* for each main effect was 2/26.

Figure Captions

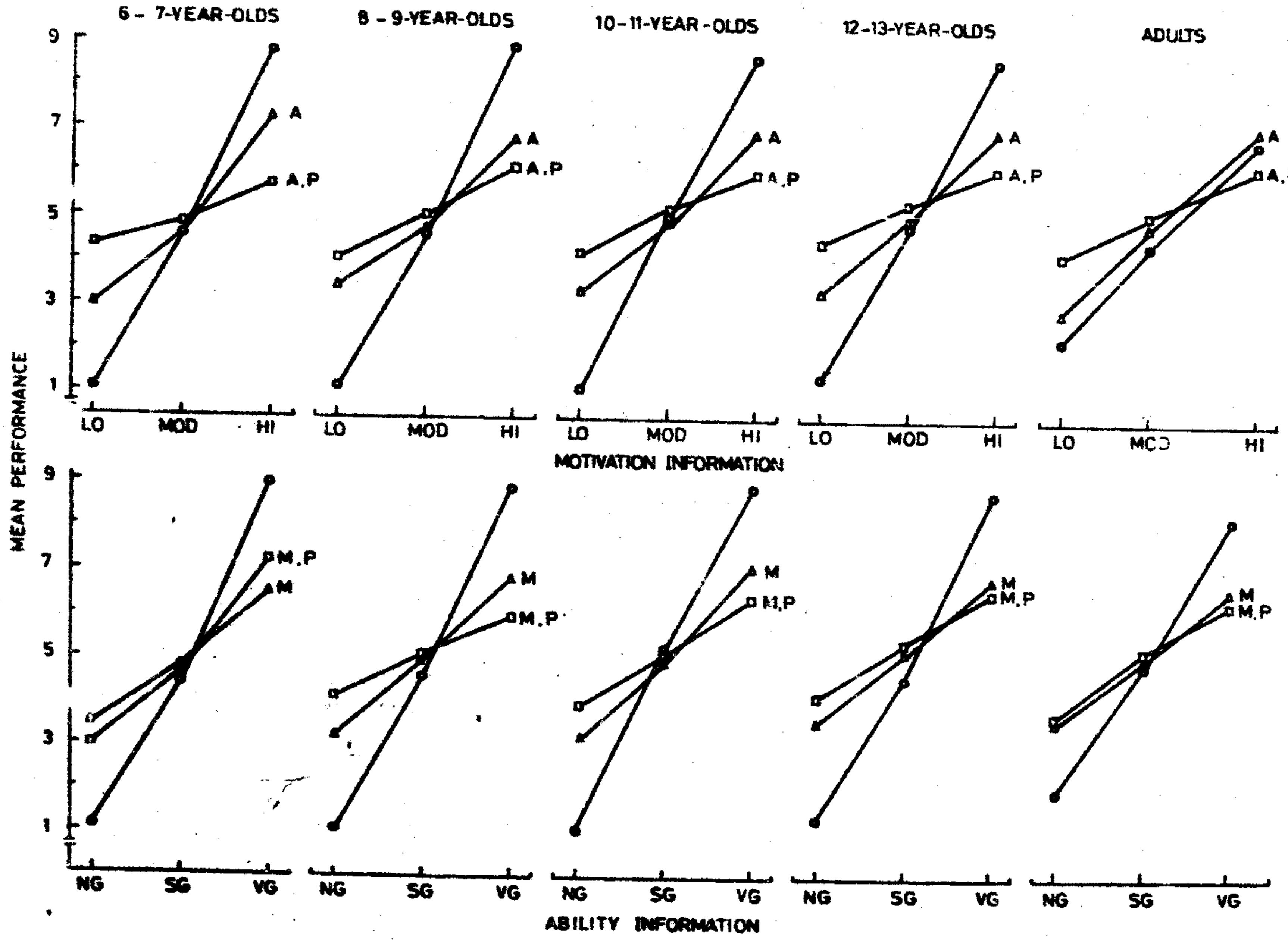
Figure 1. Mean prediction of performance as a function of past performance and motivation (upper part) and past performance and ability (lower part) for each of the five age groups, three-cue design.

Figure 2. Mean prediction of performance as a function of motivation and ability for each of the five age groups. The upper sets of curves are from the main three-cue design; the lower sets of curves are from the two-cue design.

Figure 3. Distinguishing tests between alternative rules of information integration in attribution of performance at each of the five age levels. The upper sets of curves show how the subjects integrated information about ability (A) and past performance (P) with information about motivation (M). The lower sets of curves show how subjects integrated information about ability. The curves connected by circles, by triangles, and by squares are based on the main effect of the factor listed on the horizontal axis in single-, two-, and three-cue designs, respectively.



6 - 7-YEAR-OLDS
8 - 9-YEAR-OLDS
10 - 11-YEAR-OLDS
12 - 13-YEAR-OLD
ADULTS
MEAN PERFORMANCE
GOOD
OK
BAD
LO
MOD
HI
MOTIVATION INFORMATION
NG
SG
VG
ABILITY INFORMATION
CURVE PARAMETER: PAST PERFORMANCE


6 - 7-YEAR-OLDS
8 - 9-YEAR-OLDS
10-11-YEAR-OLDS
12-13-YEAR-OLDS
ADULTS
MEAN PERFORMANCE
9
7
5
3
1
A
A, P
M
M, P
LO
MOD
HI
MOTIVATION INFORMATION
NG
SG
VG
ABILITY INFORMATION