

Informational Influence in Group Discussion¹

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An informational influence explanation of group-induced shift on choice dilemma items was examined by experimental manipulation and by a mathematical model based on information weighing assumptions. Although the exchange of arguments in an interactive discussion context produced significant response change, passive reading of arguments did not. Examination of the model revealed that at a molar level the mean model prediction for an item corresponded closely with the mean shift observed on that item following discussion. At a more molecular level, the informational model failed to predict the magnitude of specific group shifts on particular items. A suggestion as to how the informational influence explanation could be refined to accommodate these findings was taken from theory and research on the role of cognitive learning and cognitive rehearsal in attitude change.

A large amount of recent research on individual and group responses to choice dilemma items indicates that discussion tends to enhance or polarize choice tendencies initially valued in the subject population (cf. Pruitt, 1971a,b). Although the main focus of past research has been on the dependent variable, risk-taking as measured by the choice dilemmas questionnaire (hence the label "risky-shift" phenomenon), investigators are increasingly thinking in broader theoretical terms about the independent variables producing response shifts. From this emerging perspective the choice dilemmas questionnaire has been useful as a window for viewing some dynamics and effects of interaction in small groups. Accordingly, the completion of our conceptual understanding of group-induced shift on choice dilemma items is desirable in order that we may better define other conditions under which group interaction may and may not be expected to elicit response change.

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Current theoretical controversy centers on whether group-induced response changes are primarily the product of normative social influence (resulting from social comparison processes of some sort, cf. Brown, 1965) or informational influence (resulting from the exchange of arguments, cf. Vinokur, 1971). The present study explores the latter, information-processing, approach to understanding these effects of group discussion.

The most recent formulation of the information influence hypothesis (Vinokur, 1971; Vinokur & Burnstein, in press) states that for each item there exists a pool of persuasive arguments for each alternative course of action. These arguments vary in their persuasiveness relative to a particular alternative and also in the probability that they will be considered by the average subject when he makes his initial response. The extremity of the subject's initial response will depend on the number, direction, and quality of the arguments he possesses for each alternative. It is highly unlikely that any one subject will have at his command all of the potential arguments for an item when he makes his initial response. Thus different people will usually bring different arguments into the discussion. During the discussion these arguments will be exchanged and new ones generated. The group members will then reevaluate their positions and make their final responses in light of all arguments now available to them. The amount of response change will be determined by the extent to which expressed arguments tend to favor one alternative over the other, the persuasiveness of each argument, and the degree to which each argument is shared by the group members before discussion.

The present research tested this hypothesis in two ways: through the use of an experimental manipulation and by means of a mathematical model derived from this informational influence theory.

In the experiment three conditions were used to separate the exchange of arguments from the other components of the discussion process: a standard discussion-without-consensus condition, a pretest-posttest control condition (to provide baseline shifts resulting from discussion and from retesting), and a third condition in which the exchange of arguments was isolated from the discussion process. If the sharing of persuasive arguments is the crucial element of the discussion effect, then shift in this condition should be in the direction of the shift in the discussion condition and significantly greater than control shift.

METHOD

Subjects

Subjects were 116 volunteers from introductory psychology classes at Hope College. They signed up five for a time in same sex groups which

were randomly assigned to conditions, except that if only three persons showed the group was assigned to the noninteracting control condition. In all there were six five-person, fourteen four-person, and ten three-person groups. There were four male groups and six female groups in each condition.

Materials

Stimulus materials consisted of four choice dilemma items: two of which have shown a shift to risk in past research (#4 in the Kogan-Wallach set, Pruitt, 1971a, and #2 from Myers, 1967) and two of which have shown a shift to caution (#10 from Myers, 1967, and a life insurance risk problem modified from Nordhoy, 1962). Each of these contained ten choice alternatives ranging from "If the chances are 1-in-10" to "If the chances are 10-in-10."

In addition, a booklet containing eight pages of writing space (two pages for each item) was provided each subject. Each page was divided into two wide columns down the middle with each column further subdivided into small horizontal boxes, each of which provided space for listing one argument. Subjects were instructed to place arguments in favor of the risky alternative in the left column and arguments favoring the cautious alternative in the right column.

Procedure

Upon arrival subjects were seated around a table and given booklets containing the four choice dilemma items along with the booklets in which to list arguments. The cover page of the items booklet contained instructions for responding to the items, a sample item, and instructions to "list, after responding to each item, the arguments which you thought of to support each alternative," with one argument per box.

To establish a common baseline, all conditions underwent this initial procedure with experimental manipulations diverging as indicated below.

Discussion condition. Both the booklets of items and the argument booklets were collected and fresh booklets of items were distributed with instructions to discuss each item until the experimenter intervened after four minutes, unless a consensus emerged prior to that.

Argument exchange condition. The items booklets were collected but subjects retained their arguments booklets. Fresh booklets of items were then distributed with instructions to share written ideas about each of the situations by passing the booklets to the right until everyone had an opportunity to read everyone else's ideas and each booklet returned to its author. After this nonverbal exchange of arguments on each item, subjects responded again to the item in the new booklet.

Control condition. Both the items booklets and the arguments booklets

were collected and fresh booklets of items were distributed with instructions to reconsider each item and respond again.

RESULTS

Treatment Effects

For each group the means of initial and final responses were computed for each item. Table 1 presents for each condition the average of these group mean responses to each item type and the average difference (shift) between these initial and final group scores. First it may be seen that the expected shifts to risk on "risky" items and to caution on "cautious" items occurred in the discussion condition. A look at the individual group shift scores revealed that of 20 shift scores for risky items (2 items \times 10 groups), there were 19 shifts to increased risk, no shifts to caution, and one zero shift score. On the cautious items there were 16 group shifts in the cautious direction, one shift in the risky direction, and three zero shift scores. This replicates previous findings that on items where subjects prefer the risky alternative before discussion they tend, on the average, to favor it even more after discussion, and that on items where caution is the dominant initial tendency this average tendency toward caution tends to be enhanced.

Table 1 indicates that the data do not confirm the hypothesis that shift in the argument exchange condition would be comparable to shift in the discussion condition. While the shifts for the argument exchange condition were in the expected directions, their magnitude was quite small and statistically nonsignificant. An analysis of variance indicated that the conditions differed from one another in observed shift ($F(2,27) = 14.10$, $p < .001$ for interaction between condition and item type). Subsequent

TABLE 1
MEANS BY ITEM AND CONDITION

Condition	Initial	Final	Shift	<i>t</i>
Discussion				
Risky items	3.64	2.49	1.15	3.88*
Cautious items	7.60	8.69	-1.08	5.15**
Argument exchange				
Risky items	3.36	3.18	0.18	0.97
Cautious items	7.55	7.76	-0.21	1.31
Control				
Risky items	3.75	3.65	0.10	0.59
Cautious items	7.90	7.68	0.22	1.19

* $p < .01$.

** $p < .001$.

pair-wise comparison of conditions revealed that the discussion condition shift scores differed significantly from those of the other two conditions, which did not differ significantly from each other. The lack of shift in the control condition may be taken as a replication of previous findings (cf. Pruitt, 1971a) that mere familiarization with the items does not produce shift.

A Mathematical Model of Informational Influence

In addition to examining informational influence by experimental manipulation, a mathematical model for predicting shift was developed based on the informational influence hypothesis. On the basis of each argument's persuasiveness and the degree to which the argument was held in common by the group members before discussion, the model computes an index to the direction and amount of shift as follows:

$$s = \sum_{i=1}^N (1 - O_i)P_i,$$

where s is the index to predicted shift in a particular discussion, N is the number of arguments to which the group members were exposed either through discussion or written argument exchange, O_i is the proportion of group members who considered argument i before discussion or argument exchange, and P_i is the rated persuasiveness of argument i in relation to the risky alternative. For the purposes of this study P will be positive for arguments favoring the risky alternative and negative for arguments favoring the cautious alternative.

The quantity $(1 - O_i)$ is the proportion of group members not yet influenced by argument i . The relationship between $(1 - O_i)$ and persuasiveness, P_i , is multiplicative since the potency of an argument is postulated to be the result of an interaction between these two factors. Thus the potency of an argument will be zero if either the rated persuasiveness is zero or if all group members considered it before discussion. When an argument's persuasiveness is high and few members considered that argument before group interaction, the argument is predicted to be quite effective. In essence, the model states that predicted shift is a linear function of the sum of the potency scores of the risky arguments minus the sum potency of arguments offered for the cautious alternative. Although we have couched this explanation in terms of risky and cautious alternatives, the model is a general one for predicting discussion-induced shift given the potency of information generated in support of each of two opposing alternatives.

The question has been raised in relation to linear models, such as the above, whether an adding model or some type of averaging model is more appropriate (Anderson, 1971). Thus in addition to the above model, which is essentially an adding model, two variations of this model were also tested. The first was a simple averaging model defined as

$$s' = \frac{1}{N} \sum_{i=1}^N (1 - O_i) P_i.$$

The second was a weighted averaging model based on assumptions drawn from congruity theory (Osgood, Suci, & Tannenbaum, 1958). Since these yielded conclusions similar to those of the adding model, above, only the results from the adding model will be discussed.²

In order to empirically evaluate the model it was necessary to determine which arguments were considered by which subjects during the pre-test and which arguments were exchanged during the group interaction. This was accomplished by having two observers independently go over the arguments booklets and transcripts made from tapes of the discussions and make comprehensive lists of the distinct arguments listed or brought up during the discussion. The observers were instructed to use as many categories as necessary to make adequate distinctions between arguments. The resulting lists from each observer were then collapsed into a single master list for each alternative of each item. The arguments were numbered sequentially for each item and using the master lists two observers went through the arguments booklets and transcripts a second time, coding each argument by its number on the master list.

Persuasiveness ratings. To evaluate the model it was also necessary to have ratings of the persuasiveness of each argument. The raters were 41

²These models are closely related to Anderson's (1971) Integration Theory and can be derived from his general linear model. In general, P_i in the above models corresponds to the s_i (scale value) term in Anderson's model; W_i is represented in the above models by 1, in the case of the adding model; $1/N$, in the case of the averaging model; and $P_i/\sum_{i=1}^N P_i$ in the case of the congruity extension model. The $(1 - O_i)$ term in the models for group shift result from consideration of the distribution of arguments in the group and has no correspondent in Anderson's model as his model is concerned with individual judgments only. The rationale behind our molecular approach to predicting group discussion effects is nicely summarized by Anderson's (1971) observation that a communication "will usually have a more or less complex structure, containing various separate statements and arguments, and its molar effect will itself result from information integration . . . On this analysis . . . each means-end argument counts as one piece of information to be integrated into the overall opinion." (p. 197).

developmental psychology students paid \$2 each for participating. The ratings were made in two sessions with about 20 raters in each session. Upon arrival the raters were seated at tables and given booklets containing the four items each followed by the comprehensive list of arguments for that item generated from the argument booklets and discussion transcripts.

The cover page of the booklets instructed the raters to read the item, read over all the arguments, reread the item, then proceed to weight each argument using the 10 point weighting scale devised by Vinokur and Burnstein (in press). After evaluating all arguments for the first time, the rater was then to repeat the same process with the next three items. The mean of the 41 ratings for an argument was used as the P value for that argument in the model. For the sake of convenience all arguments supporting the risky alternative were assigned a positive value while all arguments supporting the cautious alternative were assigned a negative value.

Reliability. To test the reliability of the argument identifications two estimates of the shift index (s) were computed for each group interaction: one from the argument identifications of each of the two observers. Reliability was then tested by correlating the indices derived from the two observers. To avoid inflating the correlations with between item variation, correlations were computed for each item and were then averaged using Fisher's Z -transformation. Mean correlations of .60 ($p < .001$) and .55 ($p < .001$) resulted for the discussion and argument exchange conditions, respectively.

A simpler alternative to the mathematical model may be defined by isolating one element of the postulated informational influence process: the extent to which shared arguments favor one alternative over the other. Estimates of the proportion of shared arguments which were risky were derived from the argument identifications of the two independent observers for the two conditions in which arguments were shared (i.e., argument exchange and discussion). This resulted in mean within item interobserver correlations of .71 ($p < .001$) and .86 ($p < .001$) for the discussion and argument exchange conditions, respectively. The two estimates were then averaged to obtain a single estimate of the proportion of risky arguments for each group interaction.

Prediction of shift. The predictive success of the informational influence model can be examined at two levels. On a molar level we can examine the degree to which the mean shift index (s) for an item is predictive of mean observed shift for that item. This was done by computing analyses of variance on the shift index (s) and proportion of risky arguments just as were computed previously on the actual shift scores. Only the two conditions on which arguments were shared (discussion and argument ex-

change) were included in these analyses. For the shift index, we find a strong main effect for item type [$F(1,18) = 549.76, p < .001$] as was the case in an analysis comparing shift scores for the two conditions [$F(1,18) = 24.49, p < .001$]. The difference in the magnitude of the F ratios indicates that the shift index made more differentiation between risky and cautious items than did the observed shift scores. However, while the analysis of shift scores showed a strong interaction between condition and item type [$F(1,18) = 12.22, p < .005$] the analysis of the shift index did not [$F(1,18) = 1.64$]. This reflects the fact that only non-significant shifts occurred in the argument exchange condition while the shift index predicted shifts comparable to those in the discussion condition. This is paralleled by the fact that for the discussion condition a significant correlation was found between mean shift index and mean shift for each item ($r = .95, p < .05, n = 4$ items) while the corresponding correlation in the argument exchange condition was nonsignificant ($r = .73, ns$).

The analysis performed on the proportion of risky arguments revealed a significant main effect for item type [$F(1,18) = 177.24, p < .001$] and for the condition by item type interaction [$F(1,18) = 7.19, p < .05$]. This interaction occurred because arguments shared through discussion were more polar than those which were written in the argument exchange condition. On the risky items, 81% of the spoken arguments (in the discussion condition) and 69% of the written arguments (in the argument exchange condition) favored the risky action. On the cautious items only 29% of the spoken and 35% of the written arguments favored the risk. More will be said later regarding this interesting finding.

Moving now to a more molecular level we can ask how well the shift index (s) and the proportion of risky arguments actually estimate the outcomes of specific group discussions.

Looking first at the shift index (s) we find that across all group interactions within a condition (s) correlates with shift .59 ($p < .01$) in the discussion condition and .26 (ns) in the argument exchange condition. As it is possible that these correlations are inflated by between-item variance, within-item correlations were computed for each item within a condition and then averaged for each condition using Fisher's Z -transformation. This procedure resulted in average correlations of $-.17$ (ns) and $.20$ (ns) for the discussion and argument exchange conditions, respectively.

Using the proportion of risky arguments as a predictor of shift resulted in correlations over all group interactions of .62 ($p < .01$) and .35 ($p < .05$) for the discussion and argument exchange conditions, respectively. Average within-item correlations were .08 (ns) and .30 ($p < .05$), respectively. Thus it is evident that the significance of correlations calculated over all group interactions results mostly from the between-item variation.

Initial Variability, Convergence, and Shift

Evidence exists that greater shift is obtained when there is diversity among initial responses to an item than when there is homogeneity (Burns, 1967; Ellis, Spencer, & Oldfield-Box, 1969; Willems & Clark, 1971). This has been interpreted as support for the idea that extreme responders exert disproportionate influence upon less extreme responders. It has also been interpreted as support for a social comparison explanation of group shift, no shift being expected when the subject in a homogeneous group discovers that no one is riskier than himself (Willems & Clark, 1971).

There also exists ample evidence indicating that group members converge as well as shift following discussion (e.g., Teger & Pruitt, 1967) and there is an indication that amount of convergence may predict amount of shift (McCauley, 1970). Since these are correlated variables (as indicated in Table 2) it is of interest to inquire whether the heterogeneity-shift or convergence-shift relationship is more fundamental. Table 2 presents correlations among heterogeneity (variance among a group's pretreatment scores), convergence (variance reduction from pre- to posttreatment), and group shift. The same analyses were also conducted using mean absolute deviation scores instead of variance scores, but will not be reported separately since similar results were obtained.

Table 2 indicates that in the discussion condition initial variability was a strong predictor of shift. On risky items heterogeneous groups evidenced more risky shift than homogeneous groups and on cautious items more shift to caution. However, group convergence was an even stronger predictor of shift and its predictive strength was largely retained even when

TABLE 2
CORRELATIONS OF HETEROGENEITY AND CONVERGENCE WITH SHIFT SCORES

Condition	Risky items ^a	Cautious items ^a
Discussion condition		
Group initial variance (1)	.75	-.73
Variance reduction (2)	.93	-.83
r_{12}	.83	.92
$r_{Y1.2}$	-.16	.20
$r_{Y2.1}$.84	-.59
Argument exchange condition		
Group initial variance (1)	-.05	.10
Variance reduction (2)	-.02	.19
r_{12}	-.08	-.11
$r_{Y1.2}$	-.08	.12
$r_{Y2.1}$	-.02	.09

^a Based on $N = 20$ (10 groups per condition \times 2 items).

initial variability was partialled out. On the other hand, initial variability no longer predicted group shift when convergence was partialled out. This suggests that the convergence-shift relationship is more fundamental than the heterogeneity-shift relationship which is obtained because initial variance tends to predict amount of convergence. The fact that these relationships are not obtained in the argument exchange condition where little treatment effect was observed indicates that the discussion condition correlations are related to the treatment and are not artifactual results.

DISCUSSION

The present study reveals only limited support for an informational influence explanation of group-induced response shifts. At a molar level, the informational resources available on an item seem to correspond closely with the mean shift observed on that item. This finding was also observed in a study by Vinokur and Burnstein (in press) conducted at about the same time.

However, at a more molecular level, the shift index (s) failed to successfully predict variation between groups within particular items. These results may have been due to methodological problems with our procedures or it may be that the information weighing assumptions on which the model is based are oversimplified or in error.

Possible methodological problems include the difficulty in identifying an exhaustive list of mutually exclusive arguments, the fact that the parameter values for weighting arguments were normative (not determined by the subject himself), and the questionable validity of our assumption that if a subject had not written an argument he was unaware of it. This latter assumption is probably invalid—some unoriginal arguments were written down by only a few subjects (probably because they were obvious from reading the item) and yet were given heavy weight by the raters.

Other data from the experiment suggest, however, that the problems with the model may have been theoretical as well as methodological. The model makes no allowance for the possibility that not only are new cognitions learned through group exchange but also that existing cognitions might be strengthened. An elementary informational index, based simply on the direction of shared arguments matched all the predictions of the model, suggesting that hearing or expressing reinforcing arguments may be as important as the quality of new information which emerges. More importantly, the experimental evidence that passive argument exchange did not affect subjects' responding suggests that the information weighting assumptions may be an inaccurate description of the causal mechanisms producing the observed group-induced shift.

These present results may be compared with data indicating that ob-

servicing discussions without participating elicits some response shift, although observers tend to shift less than participants (cf. Cartwright, 1971). In one of these studies (St. Jean, 1970), observers who passively read transcripts of discussion shifted significantly, although the magnitude of shift was only about 40% of that obtained in the interactive discussion condition. One difference between reading discussion transcripts and reading individual arguments is the logically sequenced flow of information in the transcripts. Indeed, a recent study by St. Jean and Percival (1973) indicates no effect of exposure to individual arguments. Since there is evidence that the exchange of arguments in an interactive context is sufficient to produce group shift, even without social comparison of responses (Burnstein, Vinokur, & Trope, 1973; Myers, Wong, & Murdoch, 1971; St. Jean, 1970; Vinokur, 1971) and since there now is also evidence that passive exposure to arguments seems to produce reduced shift, if any, there is need to refine the informational influence hypothesis to incorporate both sets of findings.

A suggestion as to how this might be done comes from theory and research on the role of cognitive learning and rehearsal in attitude change. McGuire (1972) points out that attention to and comprehension of arguments (cognitive learning) must be followed by conditions which also produce yielding in order for attitude change to be evidenced. Awareness of information is not a sufficient condition for attitude change. Consistent with McGuire's analysis, Greenwald (1968) observed that cognitive learning in a passive context was not sufficient to produce attitude change. Cognitive rehearsal of self-generated cognitive responses was also necessary for attitude change to occur.

The finding of the present study that active discussion produced more response change than passive reading of arguments may be seen as a parallel to Greenwald's observations and to the classic findings of Lewin (1958) regarding the superiority of group discussion to lecture. Other recent experiments may also be seen as supporting the conjecture that active cognitive rehearsal is an important component of group shift. Silverthorne (1971) manipulated the direction of discussion-produced shift by manipulating the direction of the arguments rehearsed (discussed) and Knowles (1972) obtained risky shift in a familiarization treatment after engaging subjects in rehearsal of risky arguments.

While data from the present experiment are not definitive regarding the role of cognitive rehearsal in producing yielding in group discussion situations, the data obtained are consistent with the cognitive rehearsal concept. A simple count of the direction of arguments was as good predictor of shift as the elaborate model. The same may be seen to be the case in the study by Vinokur and Burnstein (in press).

Another relevant finding is that in the discussion condition (where shift occurred) the direction of rehearsed arguments was more polar than in the argument exchange condition (where little shift occurred). This finding that discussed arguments more decisively favor the dominant alternative than arguments developed for a written brief (which also generally favor the dominant direction but in less decisive fashion) is confirmed by scrutiny of data from several other recent studies (Ebbesen & Bowers, in press, and by comparing Myers & Bishop, 1971 and Silverthorne, 1973, with Myers & Bach, in press; Stokes, 1970; and Vinokur & Burnstein, in press). There are at least two possible reasons for this phenomenon. Perhaps a normative process motivates people to express arguments which support the group value (cf. Janis', 1972, discussion of "groupthink"). For example, the group may reward others for talking in support of the group's preference. Or perhaps when preparing the written brief people attempt to be impartial, but when discussing they seek consistency in their presentation by verbalizing only arguments which express their ideal.

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