

INTEGRATION THEORY AND INOCULATION THEORY AS EXPLANATIONS OF THE "PAPER TIGER" EFFECT*¹

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SUMMARY

This experiment compared a weighted-average model from information integration theory with McGuire's inoculation theory as explanations of the "paper tiger" effect. *Ss* were 24 male and 24 female American college students. Procedure and design were similar to that used by McGuire, and his messages were used verbatim. Each *S* indicated his attitude on each of four health issues and also made direct estimates of the weight and scale value of each piece of information upon his attitude. An apparent paper tiger effect was observed for some issues, but the opposite effect was observed for other issues. The predictions of the averaging model were quite good in six of eight cases. The two discrepancies seemed to reflect an underestimation of the importance of attacking message. Overall, the results were interpreted as supportive of the informational interpretation. No need was found for the motivational concepts of belief threat and refutational practice used in inoculation theory.

A. INTRODUCTION

1. *Information Integration Theory*

The basic principle in the theory of attitudes proposed by Anderson (3) is the principle of information integration. Attitudes are considered to result from a processing of incoming information, and from the integration of this new information with the previously developed attitude. This general view has received an exact mathematical formulation in terms of the averaging hypothesis: attitudes are considered to develop and change as weighted averages of stimulus information.

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An extensive body of empirical evidence underlies this theory. Key support comes from the parallelism prediction which states that data from a factorial design should, under conditions of equal weighting, plot as a family of parallel lines. This parallelism prediction has been verified in a series of experiments on attitudes toward U.S. Presidents (5, 7, 22), and it has also been supported in numerous experiments on person perception (2, 4, 6, 8, 10). In addition, critical qualitative tests have nearly always supported the averaging hypothesis and ruled out the alternative summation hypothesis adopted by Fishbein (12) and others.

The purpose of the present paper is to compare information integration theory with McGuire's (19) inoculation theory. McGuire's theory makes considerable use of various motivational concepts. However, the evidence for these motivational concepts is tenuous, and most of the facts can be explained in simpler information processing terms.

2. *Inoculation Theory*

McGuire's theory of inoculation is primarily concerned with the problem of resistance to persuasion. According to the theory, ability to resist persuasion is determined by the person's skill at refuting arguments against his beliefs. This skill is assumed to depend on two factors: motivation and practice.

To test this theory, McGuire selected "cultural truisms" (e.g., "It's a good idea to brush your teeth after every meal if at all possible"). For each truism, he developed two types of defense messages, the Supportive Defense, and the Refutational Defense. The Supportive Defense contained only positive reassuring information supporting belief in the truism. The Refutational Defense mentioned arguments against the truism and then extensively refuted those arguments.

McGuire argued that the Supportive Defense should leave the belief extremely vulnerable to attack. Since truisms are rarely threatened, the person lacks motivation to defend them. Lacking motivation, he fails to get practice at refuting arguments against the belief. The Supportive Defense fails to arouse any threat, and hence fails to provide any practice. Therefore, it should produce little or no resistance to persuasion.

In contrast, the Refutational Defense should produce considerable resistance because the mention of arguments against the truism should be threatening. That threat should motivate the *S* to practice the subsequent refutational arguments.

An impressive series of experiments by McGuire obtained considerable

support for various predictions from this theoretical system. However, this support is all indirect. The theory rests on very specific assumptions about causal mechanisms for which the evidence is extremely circumstantial, as has been pointed out by Tannenbaum (23), and by Kiesler, Collins, and Miller (16, p. 141). It is quite possible, therefore, that some other theory might do as well or better.

In fact, most of the results obtained by McGuire can be explained more simply in terms of information integration. The present report concentrates upon one specific result: namely, the "paper tiger" effect.

3. *The "Paper Tiger" Effect*

McGuire found that the Supportive Defense increased the *S*'s belief in the truism, whereas the Refutational Defense left the belief unchanged. This effect of the Supportive Defense was labeled "strengthening." The label seemed appropriate, since an increase in the extremity of an attitude usually reflects an increase in its strength. However, when a message attacking the truism was given, it was found that the Supportive Defense had conferred much less resistance than the Refutational Defense. The supposedly stronger attitude induced by the Supportive Defense was in fact more vulnerable to attack. McGuire labeled this paradoxical pattern the "paper tiger" effect, and interpreted it in terms of the motivation-practice framework noted above (19, pp. 207-208).

The seeming paradox of the paper tiger effect vanishes when viewed from the perspective of information integration theory. To describe an attitude, integration theory uses two parameters: a scale value, s ; and a weight, w . The scale value represents location along the attitude dimension. The weight represents the importance or strength of the attitude (that is, its resistance to change). Typically, these two parameters are correlated, but this is not always true, since a moderate opinion may be held quite firmly. The paradoxical character of the paper tiger effect comes from the implicit assumption that extremity of scale value is a direct index of resistance to change.

The informational interpretation of the paper tiger effect depends on the parameters of the defense messages. It is assumed that the scale value of the Refutational Defense is approximately equal to that of the initial opinion, whereas the scale value of the Supportive Defense is more extreme. This assumption seems reasonable in view of McGuire's description of his messages. The Supportive Defense contained only positive arguments, whereas the Refutational Defense contained both positive and nega-

tive information. Thus, the average value of the arguments would be greater in the Supportive Defense, and it would be expected to have a more extreme scale value. On this basis, the scale value of the attitude itself should become more extreme after the Supportive Defense, but should remain about the same after the Refutational Defense. This simple difference in scale value could account for the "strengthening" effect obtained by McGuire.

It is also assumed that the Refutational Defense has greater weight than the Supportive Defense. This assumption also seems reasonable in view of McGuire's description of his messages; indeed there is more than one informational mechanism that could produce this result. Perhaps the simplest possibility is that the Refutational Defense, since it also includes negative arguments, effectively contains more information than the Supportive Defense. It is also possible, however, that the opening statements of the Refutational Defense serve as an attentional cue which, without producing any threat, does produce greater attention to the subsequent arguments. Such attentional factors are known to be quite important (6, p. 68f). Theoretically, the weight parameter of the defense message adds to the weight of the initial attitude. Under either interpretation, therefore, the weight parameter of the attitude would be greater following the Refutational Defense and so would be more resistant to change.

B. METHOD

1. *Subjects*

Ss were 24 male and 24 female volunteers from introductory psychology at the University of California, San Diego. This *S* population was comparable to that used by McGuire in his work on inoculation theory. They received course credit for their participation; and were run in groups, usually four at a time, though sometimes fewer, in a session lasting about 50 minutes. All *Ss* in a group received the same sequence of stimulus materials.

2. *Procedure*

The experimental procedure was quite similar to that used by McGuire (19) in his work on inoculation theory. Each *S* served in four message conditions, one for each of the four health-related cultural truisms. Each condition included a Supportive Defense or a Refutational Defense, with or without a subsequent Attack. A preliminary measurement was taken of the

initial attitudes on all four issues. In each condition, the *S* read a message, or messages, and indicated his new attitude. He also rated the importance of each message and of his initial opinion as determinants of his new attitude. After all four conditions had been completed, the *S* then reread all of the messages and rated the scale value of each communication.

3. *Messages*

The Supportive Defense, Refutational Defense, and Attack messages developed by McGuire (9, 17, 18)² were used verbatim. Each message was about 600 words in length, divided into three paragraphs. According to McGuire, the Supportive Defense is intended to be nonthreatening and consists of positive arguments in favor of the truism. In contrast, the Refutational Defense is intended to be threatening, beginning with several arguments attacking a particular truism, and then refuting those arguments.

Since two alternative forms of each message were available, one Supportive and one Refutational Defense were chosen randomly for each health issue. The Attack messages were then chosen so that the arguments in each Attack were different from those in the corresponding Refutational Defense.

4. *Stimulus Presentation*

Each *S* received two booklets, one of messages, and one of questionnaires. The message booklet had two parts. The first part contained the four message conditions. The second part, used for collecting ratings of scale value, repeated the same messages in the same order.

The questionnaire booklet had four parts. The first part was McGuire's opinionnaire, which included four items for each issue, which the *Ss* marked on a scale with 15 steps from Definitely False to Definitely True. The initial attitude was taken as the mean rating of the four corresponding items.

The second part of the questionnaire booklet contained an attitude

² The messages used in McGuire (17), ADI No. 6629, are slightly different from those used in Anderson and McGuire (9) and McGuire (18), ADI No. 7058. The messages on all of the issues except penicillin are exactly the same; the attacking messages for the penicillin issue, however, are considerably longer in Anderson and McGuire (9) and McGuire (18) than in McGuire (17). The longer messages were used in this study. Both the messages and McGuire's opinionnaire are on deposit with the American Documentation Institute, c/o Microfiche Publications, 440 Park Avenue South, New York, New York 10016; pay in advance \$5.00 for photocopy; \$1.50 for microfiche. Postage outside the U.S. and Canada is \$2.00 for a photocopy or \$.50 for a fiche.

questionnaire and an importance rating scale for each message condition. After reading the message(s) in a given condition, the *S* rerated the four items used in the initial pretest of the particular attitude. He then rated the importance or weight of both his initial opinion and each message, as determinants of his new attitude on the given issue. Each importance rating was made by marking a 10-cm line running from Not Important to Very Important. One such line was provided for the initial opinion, and for each message in the condition. This procedure was followed for each of the issues in turn.

The third part of the questionnaire booklet repeated the four attitude items for each message. The *S* reread the messages in the second part of the message booklet, and then rerated the items to give his estimate of the scale value of each of the messages, *per se*. Before going through this procedure, the *S* was instructed to judge each message separately on how favorable or unfavorable that message was toward the issue, and that his personal belief on the issue was not relevant to this judgment.

Finally, the fourth part of the questionnaire booklet repeated the attitude questionnaire used in the first part, with *Ss* instructed to rate their pre-experimental attitudes. This measure was obtained to assess possible shift in self-perception of belief following attack. Since these ratings were virtually identical to those in the pretest, they will not be considered here.

5. *Issue Replication*

To achieve balance in the design, a 4×4 greco-latin square was employed to balance the four health issues across the four message conditions. The four rows of this square constituted the four issue replications, each a different sequence of the four message conditions. Thus, each *S* judged each of the issues, in a different message condition. Over a subgroup of four *Ss*, each issue occurred once with each message condition. Further, each issue and each message condition occurred equally often at each serial position within the square.

6. *Testing the Integration Model*

Most previous tests of the averaging model have relied on the parallelism prediction, but parallelism depends on the assumptions of equal weighting and independence, neither of which was expected to be satisfied here. Specifically, it was expected that different messages would have different natural weights, and that the effective weight of any one message might depend on which other message it was paired with. Accordingly, the

present test of the averaging model was based on the use of direct subjective estimates of the weight and scale value of each single message.

The subjective estimates of the weight parameter were obtained *in situ* in order to allow for possible interaction among the messages. In contrast, the subjective estimates of the scale values were obtained separately at the end of the experiment in order to avoid contamination by generalized halo effects (2, 8).

The justification for using direct subjective estimates of the parameters comes from previous work on integration theory. There is extensive evidence, at least in person perception (4), that scale values are effectively constant from one combination to another. The work on attitudes toward U.S. Presidents (5, 7, 22) shows that even fairly complex messages can be represented by a single scale value. Both lines of work also show that *Ss* can make valid evaluative judgments on an interval scale. Some work (10) also suggested that *Ss* can judge weight on a ratio scale, although this aspect of procedure was somewhat uncertain. As will be seen, the present results provide some moderate support for this latter aspect.

C. RESULTS

1. *Averaging Model Analysis*

When the *S* receives a single communication, his resultant attitude is theoretically the average of his initial opinion and the scale value of the message. For the present defense conditions, therefore, the final attitude would be

$$R = (w_o s_o + w_d s_d)/(w_o + w_d), \quad [1]$$

where w_o and s_o are the weight and scale value of the initial attitude, w_d and s_d are the weight and scale value of the defense message.

The question is whether or not the *S*'s final attitude is predictable from his separate estimates of the weights and scale values. For this test, the scale value of the initial opinion was taken directly from the first part of the questionnaire booklet. The scale values of the messages were taken from the third part of the booklet. Finally, the weight estimates for both the initial opinion and the messages were taken from the second part of the booklet. The weight estimates were normalized to add to unity by dividing each weight by the sum of the weights, as required by the averaging model. This prediction method was applied to the data for each *S* and the overall means are shown in Table 1.

TABLE 1
PREDICTED AND OBTAINED ATTITUDES

Attack condition	Issue replication	Defense type	Initial attitude + Defense + Attack =	Predicted	Observed	Difference
Defense only	1 & 2	Supp	.52(12.48) + .48(13.86)	13.14	13.07	.07
		Ref	.52(10.35) + .48(13.57)	11.90	12.50	-.60
	3 & 4	Supp	.53(9.71) + .47(13.59)	11.53	11.44	.09
Ref		.58(11.88) + .42(13.53)	12.57	12.35	.22	
Defense and attack	1 & 2	Supp	.36(10.05) + .27(13.42) + .37(3.27)	8.45	6.83	1.62
		Ref	.44(11.69) + .37(13.20) + .19(5.08)	10.99	10.97	.02
	3 & 4	Supp	.39(11.37) + .35(12.75) + .26(5.76)	10.39	10.87	-.48
		Ref	.34(9.52) + .28(12.93) + .38(3.43)	8.16	6.87	1.29

Note: The numbers within parentheses are estimated scale values, and the preceding numbers outside the parentheses are the corresponding weights of the message or opinion listed in each column. See text.

To illustrate the procedure, consider the top row of Table 1. In this condition, the mean scale value of the initial attitude was 12.48 and the estimated mean scale value of the defense message was 13.86. Their respective normalized, or relative, weights were estimated as .52 and .48 so that the predicted attitude equals 13.14. This predicted attitude differs from the observed value by only .07 on the 15-step rating scale.

Predictions for the four defense-only conditions are quite good. To test goodness-of-fit, each S was given a score equal to the signed difference between his predicted and actual attitude for each condition. The overall mean of these difference scores was only .05 which did not approach significance. Further, none of the four listed mean differences in Table 1 was significantly different from zero.

Two points of incidental interest appear in the data. First, the weight of the initial attitude is only a little larger than $1/2$. As a consequence, the final attitude lies about midway between the initial attitude and the scale value of the defense message. Second, the estimated scale values of the defense messages are all nearly equal so that differences in final attitude reflect corresponding differences in initial attitude toward the various issues.

While the averaging model did quite well in the defense-only conditions, a different pattern of results emerged in the defense-plus-attack conditions. In these conditions, there are two messages so the prediction equation must be written,

$$R = (w_o s_o + w_d s_d + w_a s_a)/(w_o + w_d + w_a), \quad [2]$$

where w_a and s_a are the weight and scale value of the attack, and the other terms have the same meaning as in Equation 1.

Predictions were made with the use of Equation 2 in the same way as Equation 1 above, and the results are listed in the lower half of Table 1. The differences in the last column show that the predictions were quite good in two cases, but that there were substantial discrepancies in two other cases. The statistical analysis confirmed the visual inspection, yielding F ratios of 25.79, .24, 1.44, and 8.05, each on $1/23$ df , for the four respective mean differences in Table 1. The two larger F s are significant at the .01 level, while the two smaller F s do not approach significance. Both discrepant cases show the same pattern, with the actual attitude being more extreme than the predicted attitude. Closer study of Table 1 suggests

that the *Ss* underestimated the influence of the attack message on their final opinion.

2. *Nonreplication of the Paper Tiger Effect*

Replication of the paper tiger effect ran into difficulty because of differences among the messages and issues. The effect can be seen in the left panel of Figure 1 which plots the data for Issue Replications 1 and 2. When only a defense message is given, the attitude produced by the Supportive Defense is higher than that produced by the Refutational Defense. This agrees with the "strengthening" effect reported by McGuire.

A marked change is produced by the attack. The attitude induced by the

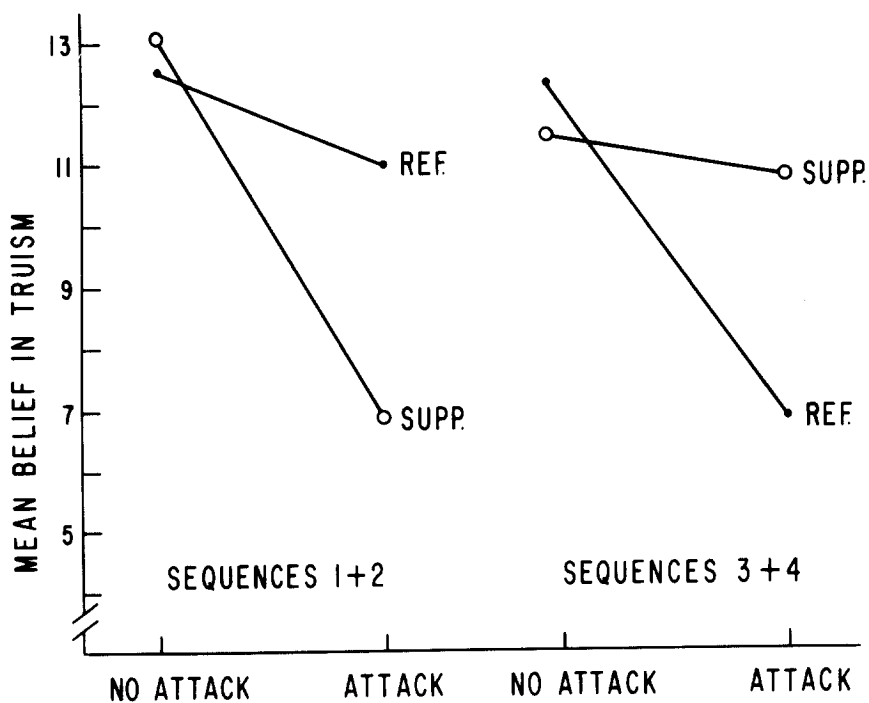


FIGURE 1
MEAN BELIEF IN TRUISM AS A FUNCTION OF MESSAGE CONDITION
Abbreviations by the curves stand for Refutational and Supportive Defenses, respectively.

Refutational Defense changes little, whereas the attitude induced by the Supportive Defense changes greatly, producing a strong crossover interaction. This pattern, in which the Supportive Defense produces a more extreme attitude, but one that is more vulnerable to attack, is precisely the "paper tiger" effect reported by McGuire.

Unfortunately, although the same pattern appears in the right panel of Figure 1, the role of the defense messages is exactly opposite. For Issue Replications 3 and 4, the Refutational Defense produced both a more extreme and a more vulnerable attitude. The pattern is still that of the paper tiger effect, to be sure, but the role of the defenses is reversed. This anomalous finding is quite reliable, since the three-way interaction between Defense, Attack, and Issue Replication was highly significant ($F = 20.93$, $df = 3/44$, $p < .001$). Thus, a theoretical interpretation in terms of the relative inoculating power of Supportive and Refutational Defenses is no longer possible.

Since McGuire presents his results averaged over issue replications, a proper comparison requires that the same be done here. When this is done, however, there is virtually no difference between the Supportive and Refutational Defenses, either in the defense-only or in the defense-plus-attack conditions. Thus, McGuire's paper tiger effect failed to be replicated.

In this connection, it should be noted that the weight estimates of Table 1 follow the reasoning of Section A.3 above only for Issue Replications 1 and 2. In this case, the weight parameter of the Refutational Defense is greater than for the Supportive Defense; and correspondingly, the weight of the attack is greater following the Supportive Defense than following the Refutational Defense. These messages had been used in the pilot work which had appeared to support the information-theoretical interpretation of the paper tiger effect. However, Issue Replications 3 and 4 gave exactly opposite results, in Figure 1 as already noted, and also in the weight parameters of Table 1.

Of themselves, the large issue and message differences do not present any theoretical difficulty to the integration model. Indeed, the model predictions were about as accurate for Issue Replications 1 and 2 as for 3 and 4. Tests of inoculation theory, however, would seem to be largely dependent on assessing and standardizing the messages in terms of informational content.

D. DISCUSSION

1. *Inoculation Theory*

The present results provide no support for inoculation theory. Both panels of Figure 1 show the marked crossover pattern of the paper tiger effect, but these crossovers merely represent issue differences. Averaged over issues, there is virtually no difference between the Supportive Defense and the Refutational Defense. Although this failure of the paper tiger effect to replicate could result from procedural differences, the present procedure followed that used by McGuire fairly closely.

Regardless of the reason, the failure of the paper tiger effect to be replicated brings up the disturbing realization that there is no independent assessment of the messages that have been used in inoculation theory. They have not been standardized in terms of their informational content, and there is no direct evidence for their presumed difference in threatening power. Indeed, it may be doubted that American college students would feel at all threatened by the prospect of reading about some disadvantages of annual medical checkups. Without such threat, however, inoculation theory does not apply.

A similar point has been made by Tannenbaum (23) and by Kiesler, Collins, and Miller (16, p. 141). These writers emphasize that the evidence for the basic motivational concepts of inoculation theory is almost entirely circumstantial and indirect. That the Refutational Defense is threatening and that this threat causes the Ss to practice the arguments are merely assumptions for which direct evidence is lacking. At present, therefore, the terms Supportive and Refutational are little more than names, and the need for standardization of the messages is clear from the strong issue interaction of Figure 1.

McGuire's inoculation papers represent a program of research that is remarkable in ingenuity, variety, and concentration. However, most of the results can be interpreted in simpler information processing terms without the need for the special processes assumed in inoculation theory. As McGuire himself (20, p. 272) has observed, the attitude area is replete with theoretical systems that have had reasonable predictive success, but whose assumed causal processes have not been verified. This same observation may also apply to inoculation theory.

2. *Congruity Theory*

Tannenbaum (23) has discussed the problem of resistance to persuasion from the standpoint of congruity theory. His emphasis on source effects,

largely ignored in inoculation theory, is especially important. Moreover, he has attempted to delineate the specific mechanisms underlying the inoculative effects reported by McGuire. But despite the value of Tannenbaum's contributions, the validity of congruity principle itself is subject to serious question (21; 24, p. 59). Tannenbaum (23) presents two experiments that he claims to be incompatible with an information processing approach. In fact, information integration theory seems to handle these data even better than congruity theory (3, p. 188).

3. *Summation Theory*

A continuing controversy in attitude theory has focussed on the question of whether people add or average stimulus information. The present results support the averaging hypothesis and infirm the summation model used by Fishbein (12) and others. The same conclusion follows from the dissertation research of K. J. Kaplan (13, 14), one of Fishbein's students, who used a design similar in certain respects to that used here.

Kaplan's *Ss* rated overall likeableness of a Mr. X who was described by two installments of personality adjectives. Two ratings of each single adjective were obtained: of its likeableness, which corresponds to its scale value, s ; and of the probability that Mr. X actually had the trait, which corresponds to its weight, w . These ratings were used to predict overall likeableness and yielded correlations around .70, at least as large as in previous work on summation theory.

However, the correlation coefficient is not a proper test of goodness of fit; high correlations can readily be obtained even from seriously incorrect models (3, p. 192*f*; 11). In fact, as Kaplan apparently recognized, his data (Table 5, bottom) did reveal a serious discrepancy from the summation model. When the second installment of adjectives is near neutral in value, the summation model predicts near zero change in attitude. But the data showed that the added neutral information actually reduced the extremity of both the positive and negative attitudes. That is precisely what is predicted by averaging theory. Indeed, this particular comparison is just another instance of the numerous critical tests that have been made between the summation and averaging formulations (3, p. 192-193; 6, p. 14).

4. *Information Integration Theory*

At the empirical level, the present results have given reasonable support for the integration theory analysis of the cultural truisms studied in inoculation theory. Although two of the eight predictions from the averaging model fell short, even they make qualitative sense. Provisionally, at least,

it seems fair to think that the information-theoretical approach that has been developed in previous work on attitudes (1, 3, 5, 6, 7, 22) also applies to the kinds of issues studied in inoculation theory.

This conclusion has special methodological interest. In the inoculation studies, as in much of attitude theory, the usual methods of functional measurement do not apply directly because the assumption of parameter independence is not expected to hold. It is necessary, therefore, to rely on separate judgments of the weight and/or scale value of each component within context as was done here. The basic idea of functional measurement is still present, since the validation rests on the integration function, but the parameter estimation scheme itself rests on additional assumptions. Although there are obviously many ways in which this approach could fail, the present results provide some hope that it may have some degree of success. To the extent that it does, it provides a simple direct assessment of each message within the conceptual representation of the basic theory. In particular, the effective weight parameters can be estimated with allowance for possible message interactions, such as inconsistency or redundancy.

At the conceptual level, the basic idea of information integration theory is that attitudes grow and change by the continual incorporation of new information. Further, this integration of information is considered to obey a general cognitive algebra (3, 6). Thus, the general principle of information integration takes on specific, testable form.

Two other approaches to attitudes—namely, summation theory and congruity theory—also rely on the use of mathematical models. These models, however, have not been very successful. The summation model cannot account for the averaging-*versus*-adding data noted above. The congruity model cannot account for the set-size effect (3, p. 188). In contrast, the averaging model from integration theory provides a connected account of a substantial body of fairly complex results.

Inoculation theory itself strictly applies only to “cultural truisms,” widely accepted beliefs that are almost never attacked (19, p. 200-201). Once these beliefs come under attack, they cease to be truisms and inoculation theory may no longer apply. From the present view, cultural truisms constitute only a small class of attitudes. They should not require special conceptual analysis. Thus, integration theory has largely avoided the use of motivational concepts, such as have been central to the inoculation studies, because it seems reasonable to try to account for the data in simpler

informational terms. Even when motivation concepts are necessary, it may still be possible to handle these as informational concepts (15).

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