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17. The program is a cooperative project carried out under the direction of M. Ewing, R. Gerard, and B. Heezen of the geophysics group and W. Broecker, E. Olson, and J. L. Kulp of the geochemistry group. The results reported in Table 2 as well as the air samples reported in Table 1 were collected from aboard the Columbia University research vessel *Vema* as part of this program. Preliminary results have been reported at the Endicott Nuclear Geophysics Conference [W. S. Broecker, M. Ewing, R. Gerard, B. C. Heezen, J. L. Kulp, *Natl. Acad. Sci.–Natl. Research Council Publ. No. 572* (1958), p. 118].
18. This research was carried out at the Lamont Geological Observatory of Columbia University. Financial support for the oceanic sampling and analyses program was provided by the Atomic Energy Commission [grant AT (30-1) 1808] and by the International Geophysical Year Organization (grant Y/9.11/134). The terrestrial samples were measured in connection with a program supported by the National Science Foundation (grant N.S.F. G 4191). We appreciate the help and encouragement provided by J. L. Kulp and the extremely valuable review and criticism of the manuscript by E. A. Olson.
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Emotion in Prejudice

Physiological tests support the thesis that prejudicial attitudes are attended by relatively strong emotion.

Joseph B. Cooper

Attitudes are viewed psychologically as learned sets, preparations for action toward particular stimulus objects. Although some attitudes are referred to as prejudicial, the specific characteristics which social psychologists agree upon as essential criteria for judging whether or not an attitude is prejudical are not fully understood.

One of the characteristics most investigators agree upon as an essential criterion for designating an attitude as prejudicial is level of emotionality. In fact some psychologists (*1*) have gone so far as to define prejudice as ". . . an emotional attitude." Gordon Allport (*2*) has stated this thesis operationally in the following way: "We tend to become emotional when a prejudice is threatened with contradiction."

Grounds for the thesis that prejudicial attitudes are supported by emotion are not especially convincing when viewed empirically. It may be that the thesis is acceptable to many psychologists partly because there seems to be no contradictory evidence. What supporting evidence there is has come principally from two sources. First, when a person verbally expresses a strong negative or positive attitude toward some human group, or defends such an attitude in the face of contradiction, he commonly displays behavior which is interpreted by others as emotional. Second, emotionally charged words and phrases used in attitude scales are often selected by subjects as descriptive of their attitudes toward certain human groups (*3*). "Attitude scale" refers to any paper-and-pencil device to which subjects individually respond either by placing a given stimulus group (for example, ethnic or national) at some position on a preference continuum, or by checking a statement which is descriptive of the individual subject's feeling toward a given stimulus group.

If it is true that prejudicial attitudes are supported by emotion, it should be possible to detect the presence of emotion by physiological means as well as by attitude scale content analysis and overt behavior observation. Attitude scale "content analysis" is a procedure whereby statements which are descriptive of many possible feelings toward stimulus groups are categorized according to psychological meaning, that is, such meaning categories as emotional strength, type of emotion, cognitive state, and so forth. By "overt behavior observation" is meant observing humans react, and recording their reactions in accordance with certain categories; for example, emotional and nonemotional responses are tabulated. To our knowledge, physiological measurement has not been used to test the thesis that prejudicial attitudes which are subjected to verbal contradiction are supported by relatively high levels of emotionality (*4*).

It is known that emotion involves widespread physiological changes which have the effect of mobilizing the body to meet emergency. The galvanic skin response is regarded as a reasonably valid index of such physiological changes. When this response indicates a decrease in skin resistance, the inference is drawn that physiological mobilization has increased. Upon the basis of such an increase in physiological mobilization, the further inference is drawn that the level of emotion has increased. For a given subject, galvanic skin responses will provide an ordinal index of emotional level. That is, one measurement may be said to be greatest, another next greatest, and so on to that which is least. However, the response affords no information with respect to the cognitive direction an emotion may take. That is to say, the skin response does not distinguish scorn from fear, rage from joy.

This article (*5*) describes three exploratory studies, each designed to test the validity of the thesis that prejudicial attitudes are supported by relatively high levels of emotionality.

Responses to Verbal Contradiction of Positive and Negative Attitudes

In the first study (*6*) college students were asked to rate and rank 20 alphabetically listed ethnic and national groups in terms of preference. Subjects rated each group independently by checking one of six graded preference categories: "like intensely" to "dislike intensely." They ranked the groups by designating the group liked best, next best, and so on, to the group liked least. The groups were: Argentines, Austrians, Canadians, Chinese, English, French, Germans, Greeks, Indians (India), Irish, Italians, Japanese, Jews, Mexicans, Negroes, Filipinos, Poles, Russians, Swedes, Turks. Interest did not reside in the particular named groups, but rather in each subject's negative and positive attitude-indicating responses to groups as groups.

Of 126 subjects, 26 confirmed the validity of their highest and lowest rankings

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(positions 1 and 20) by also rating those groups high and low, respectively. It was assumed that extreme rankings which were confirmed by extreme ratings identified prejudicial attitudes. Twenty of these 26 subjects were subsequently available for individual laboratory sessions.

The equipment used to measure galvanic skin responses was a Stoelting psychogalvanoscope. With this equipment, resistance changes were indicated by a dial needle which reflected "units of resistance." Deflection magnitudes could not be directly compared from subject to subject since subjects balanced in at different response (resistance) levels. However, for a given subject in a given session, magnitudes of needle deflections could be directly compared. Thus, for a given subject, it was possible to obtain both ordinal and interval values of several possible emotion-evoking stimuli. That is, for a given subject, not only could his galvanic skin response magnitudes be ordered to ranks, but they could be assigned quantitative values which permitted their conversion to ratios. Because needle excursions varied not only in space covered but also in duration, the responses were estimated as the product of needle deflection multiplied by time. This was the procedure followed in this study. During the presentation of a stimulus by the experimenter the equipment operator observed two things, needle deflection and time. If and when the needle passed the fifth calibration mark (the pin was at 35 maximum) he started his stop watch. He stopped his watch when the needle came to the fifth calibration mark on its return.

Four brief evaluation statements were composed for use in the individual experimental sessions. Each was designed so that the name of any group could be inserted into it. Two of the statements could be used to place any inserted group name in a derogatory light, and the other two to place any inserted group name in a complimentary light. For a given subject, the name of his most liked group was inserted into one of the derogatory statements, and the name of his most disliked group was inserted into one of the complimentary statements. The names of the groups that the subject ranked in positions 10 and 11 were inserted into the two remaining statements—one derogatory and one complimentary. The order of presentation of the statements and the insertion of ranked (as confirmed by ratings) group names was randomized from subject to subject. The equipment operator had no way of knowing either the content or strength of the subject's scaled attitude toward any group.

One of the derogatory statements was: "People can be divided into two groups: the good and the bad. Close to the bottom of the list are the ———. They certainly can be said to have caused more trouble for humanity than they are worth." One of the complimentary statements was: "The world over, no single group of people has done as much for us, for our civilization, as the ———. The world will undoubtedly come to recognize them as honest, wise and completely unselfish." The other statements were similar to these.

After a subject had been balanced in, a trial statement which incorporated the name of the group the subject had ranked in position 9 was read. Following this the four critical statements were read.

Since galvanic skin response raw scores could not be directly compared from subject to subject, each subject's laboratory session was treated as an independent experiment. That is, intrasubject rather than intersubject comparisons were made. Thus, 20 separate experiments were conducted. The problem was reduced to determining in how many experiments the critical stimuli evoked relatively greater responses than did the neutral stimuli. The data were analyzed in two ways.

In the first analysis, each subject's skin responses to the names of the groups he had ranked in positions 10 and 11 were averaged. It was then determined by simple inspection whether or not responses evoked by critical stimuli (those relating to most liked and most disliked groups) were larger or smaller than the mean of the responses to the noncritical stimuli. These data are shown in Table 1, "First Study." It will be noted that for 14 of the subjects, skin responses were greater to derogatory statements containing the names of liked groups than to statements containing the names of groups toward which they had expressed a relative attitude of neutrality. The binomial test indicated a probability of .059. This provided minimal evidence for the thesis that positive (that is, favorable) prejudicial attitudes are supported by relatively great emotionality. However, for 19 of the 20 subjects, galvanic skin responses were greater to complimentary statements containing the names of disliked groups than to those containing the names of neutrals. In this instance $p < .001$. Thus, substantial support for the thesis that negative (that is, unfavorable) prejudicial attitudes are

Table 1. Galvanic skin responses, in resistance units, to verbal stimuli. Stimuli under "No. 1" consisted of derogatory statements about the group most liked by the subject. Stimuli under "No. 20" consisted of complimentary statements about the group most disliked by the subject. Greater refinement in measurement in the second study accounts for the decimals. The subjects in the first study were not the same as those in the second.

	First study			Second study	
Subject	Mean of Nos. 10 and 11	No. 1	No. 20	Mean of Nos. 10 and 11	No. 20
1	170	8	247	11.30	47.14
2	83	120	88	10.75	16.45
3	593	1400	700	59.60	69.30
4	317	1575	360	8.95	1.20
5	5	600	550	77.92	206.10
6	952	992	2100	11.60	46.00
7	169	70	84	29.29	28.30
8	187	420	525	18.00	39.20
9	30	25	48	6.76	24.64
10	96	20	325	18.32	25.79
11	29	160	91	6.69	18.60
12	145	88	150	32.24	72.90
13	49	105	310	5.20	8.29
14	42	70	60	29.30	23.30
15	346	364	350	10.12	36.72
16	161	308	432	10.25	27.35
17	15	35	208	23.74	41.13
18	421	520	594	24.81	60.62
19	42	12	200	57.68	113.51
20	49	208	180	18.97	150.50
21				5.17	23.70
22				14.16	22.95
23				44.79	53.61

supported by relatively great emotionality was provided by this result.

The second analysis was purely descriptive. Ratios for each subject's skin responses were computed for the following: neutral attitude response (rank position 10) to neutral attitude response (rank position 11), positive attitude response to mean neutral attitude response, and negative attitude response to mean neutral attitude response. When these three distributions of ratios (Table 2, "First study," and Fig. 1) were compared, one significant observation emerged. The ratios of neutral to neutral stimulus-evoked responses clustered around unity; the variability was relatively slight. For both the negative attitude and positive attitude stimulus-evoked responses to neutral stimulus-evoked responses, the ratio variability was clearly much greater. This lends support to the contention that the group name stimulus was principally responsible for response magnitude, rather than the evaluation statement itself.

Responses to Verbal Contradictions of Negative Attitudes—Partial Replication

The second study (7) was designed as a partial replication of the first. In view of the fact that in the first study only one of 20 subjects failed to respond to a negative attitude stimulus with greater emotionality than to the mean of neutral stimuli, it was apparent that further study of this relationship was warranted. Thus, the second study dealt only with negative prejudicial attitudes.

The same rating and ranking scales that were used in the first study were administered to 176 college students. Of these, 31 gave extremely low ratings to the groups they ranked lowest. Twenty-three of these subjects were subsequently available for skin response sessions.

A self-recording galvanic skin response unit of a Keeler polygraph was used in place of the dial-indicator Stoelting psychogalvanoscope. This polygraph is equipped with a kymograph which carries chart paper at a uniform rate beneath a recording pen. Skin response magnitude may be calculated by measuring the area under the curve between two given points.

Four 18-word complimentary statements were so constructed that the name of a selected group could be inserted as the second word. One of the statements was: "The ——— have demonstrated to the rest of the world that their excellence is justly and honestly earned."

Subjects were individually escorted into the laboratory room by the experimenter. Rapport was established by introducing the subject to the equipment operator, and briefly describing the equipment and the manifest purpose of the experiment. After the subject was comfortably seated in a specially designed chair, directions were read by the experimenter. The directions included a statement instructing the subject to refrain from overtly verbalizing about any of the statements. Subjects were urged to "concentrate on the statement, imagining how you feel about it or how you would respond." This control was introduced with the intention of reducing the possibility that part of the measured affectivity might be a function of preparing, responding, and listening to one's own speech in a social setting. The subject was seated facing the experimenter, slightly to the right of the equipment and operator. His position was such that he could see both the equipment and the operator but could not observe the pen tracings.

The equipment operator then attached palmar electrodes. While the experimenter read the directions, the equipment operator began balancing the subject into the bridge circuit. After balancing in had been accomplished, the operator nodded to the experimenter, who, after a pause of about 10 seconds, began reading the first statement. The first statement was the same for each subject and contained the name of the group the subject had placed in rank preference position 9. This was for the purpose of validating the skin response base line which had been established for the subject. Into the three remaining state-

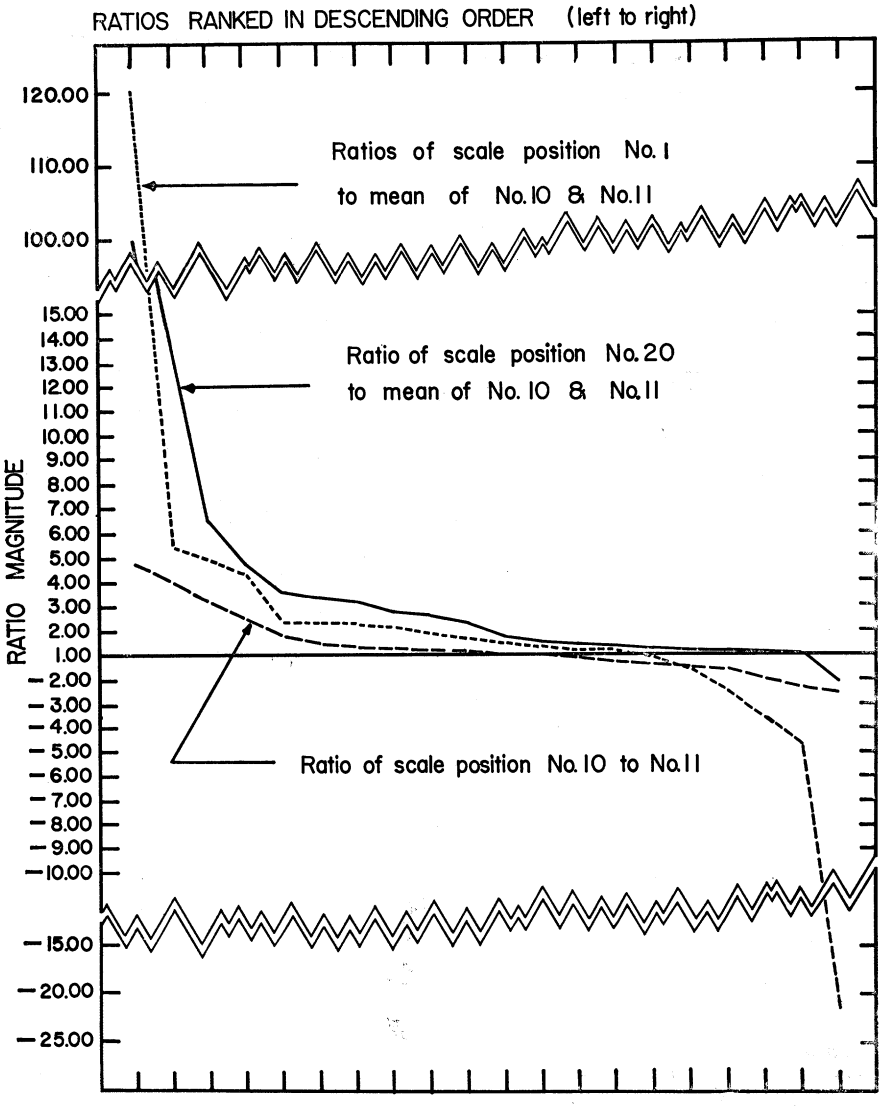

Fig. 1. Ratio distributions from the first study. Ratios of scale positions No. 10 to 11 are relatively restricted, approximately the same number falling above and below unity.

ments were inserted the names of the groups the subject had ranked at positions 10, 11, and 20. The orders of presentations of both the group names and the statements were randomized from subject to subject.

The same data analyses were made in this study as in the first. Each subject's galvanic skin responses to his rank position 10 and 11 stimuli were averaged. This mean magnitude was then compared with the magnitude of his response to the statement containing the name of his 20th rank position. These data are shown in Table 1, "Second study." In 20 of the 23 cases, responses were greater to statements containing the subject's most disliked groups. The binomial test indicated $p < .001$. Thus, this finding confirmed its counterpart in the first study.

Ratios for each subject's galvanic skin responses were computed as follows: response for the statement containing the group name of rank position 20 (disliked) to the mean response for preference positions 10 and 11 (neutrals), and the response for rank position 10 to the response for rank position 11. When these ratios were rank distributed (Table 2, "Second study," and Fig. 2) the same pattern that was found in the first study appeared. The ratios of negative to neutral stimulus-evoked responses were widely distributed, whereas those of neutral to neutral were relatively restricted. This tends to confirm the results of the first study, which led to the inference that the group name stimulus is an independent variable of importance in determining skin response magnitude.

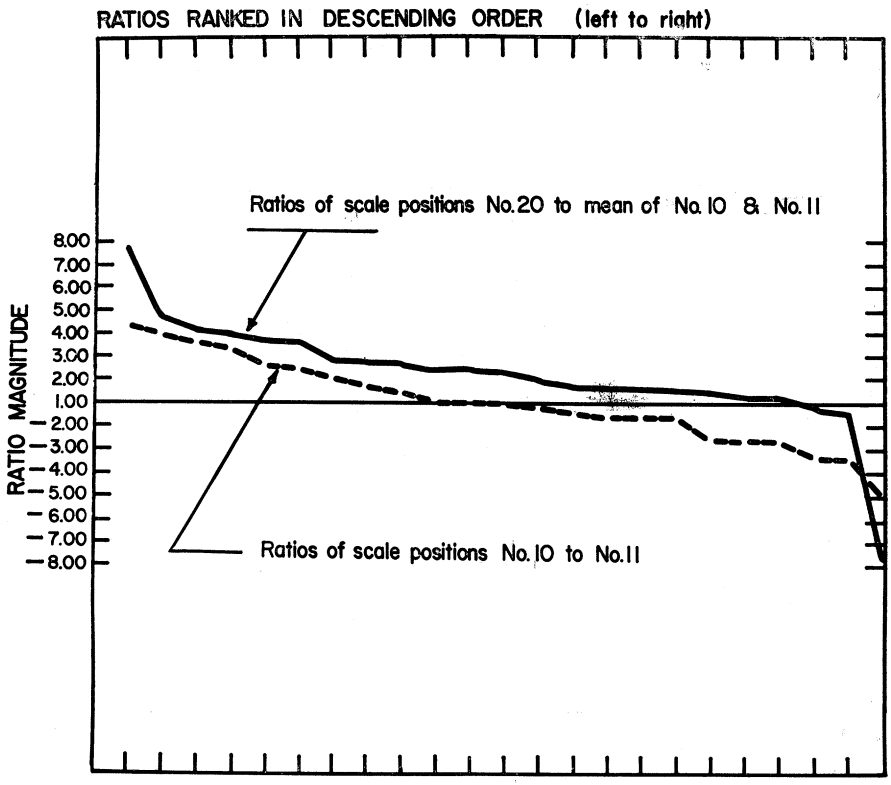

Fig. 2. Ratio distributions from the second study. Ratios of scale positions No. 10 to 11, as in the first study, are relatively restricted and quite evenly balanced above and below unity.

Attitudes Predicted from Skin Response Measurements—Reverse Design

In the third study (*8*) the basic design of the first and second studies was reversed. Subjects were first measured for galvanic skin responses to complimentary statements in reference to nine ethnic and national groups. At a later time these subjects were administered an attitude scale containing the names of the same groups. From skin response records, predictions were made with reference to subjects' scale-measured attitudes. The basic prediction was: an excessive galvanic skin response to a complimentary statement concerning a group identifies that group as the object of a negative prejudicial attitude. In this study, subjects were not first screened and selected upon the basis of attitude scale results. Nothing was known of a

Table 2. Galvanic skin response ratios, arranged in order of magnitude. Neutral-to-neutral ratios are the ratios of responses to groups ranked No. 10 to responses to groups ranked No. 11. Critical-to-neutral ratios are of two kinds: positive-to-neutral and negative-to-neutral. Positive-to-neutral ratios are the ratios of responses to derogatory statements about groups ranked No. 1 to the mean of the responses to groups No. 10 and No. 11. Negative-to-neutral ratios are the ratios of responses to complimentary statements about groups ranked No. 20 to the mean of the responses to groups No. 10 and No. 11.

First study			Second study	
Neutral to neutral	Positive to neutral	Negative to neutral	Neutral to neutral	Negative to neutral
4.8	120.0	110.0	4.4	7.9
4.0	5.5	13.9	4.0	4.7
3.1	5.0	6.3	3.6	4.2
2.5	4.2	4.8	3.3	4.0
1.7	2.4	3.7	2.6	3.7
1.4	2.3	3.4	2.4	3.6
1.3	2.2	3.1	2.1	2.8
1.2	2.1	2.8	1.7	2.7
1.1	1.9	2.6	1.4	2.6
1.1	1.7	2.2	1.0	2.4
1.0	1.4	1.6	1.0	2.3
1.0	1.2	1.4	1.0	2.2
−1.1	1.1	1.4	−1.2	2.0
−1.1	1.1	1.4	−1.4	1.7
−1.3	−1.2	1.2	−1.7	1.6
−1.6	−1.6	1.1	−1.7	1.6
−1.7	−2.4	1.1	−1.7	1.5
−2.0	−3.5	1.1	−2.5	1.4
−2.4	−4.8	1.1	−2.5	1.2
−2.5	−21.2	−2.1	−2.5	1.2
			−3.3	−1.1
			−3.3	−1.2
			−5.0	−7.4

subject's attitudes prior to his coming to the laboratory.

Seventy-two college student subjects were individually measured for galvanic skin response. Nineteen did not respond sufficiently for scoring, leaving a total N of 53. Approximately 1 week after the skin response measurements had been completed, these 53 subjects were administered a paired comparison attitude scale containing the names of the groups which had been used as stimulus objects in the skin response sessions. The paired comparison scale was so devised that the name of each stimulus object (in this case, a group) was paired once with every other. A subject's preference for each stimulus object could thus be assigned a score by counting the number of times the stimulus object was selected in preference to its paired opposite.

The Keeler polygraph was again used. Individual galvanic skin response sessions differed from those of the second study in four minor ways. First, the number of complimentary statements was increased from three to nine. Second, group names were reduced from 20 to 9 and scaled by paired comparison. Third, statements were not randomized, and only three of the group names were positionally rotated from subject to subject. Fourth, the experimenter not only read the statements but operated the equipment as well.

The order of presentation of the nine statements was the same for each subject. Final balancing in was achieved by reading a preliminary statement which referred to the Irish. The names of three groups (Japanese, Jews, and Mexicans), minorities in the population from which the sample was drawn, were successively rotated from subject to subject into the statements which had positions 3, 5, and 7. It was suspected that one or another of these groups would later be scale-identified by some of the subjects as objects of strong negative attitudes. The rotation of these names was intended as a safeguard against possible positional effects.

The paired comparison attitude scale contained the following group names: Austrians, Canadians, English, Germans, Irish, Japanese, Jews, Mexicans, Poles, and Swedes. These names were randomly paired so that each appeared once with every other. Each subject circled the name of the group he preferred in each pair. The highest possible score for any group was 9 and the lowest was 0. The median test-retest Spearman rank correlation coefficient was .96.

Table 3. Galvanic skin response (GSR) and paired-comparison (P-C) ranks for stimulus groups. GSR rank 1 indicates least response by sample. P-C rank 1 indicates best liked by sample.

Stimulus group	GSR rank	P-C rank
Swedes	1	2
Canadians	2	1
Austrians	3	5
English	4	4
Poles	5	7
Germans	6	3
Japanese	7	6
Jews	8	9
Mexicans	9	8

Again, the hypothesis to be tested was: relatively strong prejudicial attitudes are supported by relatively high levels of emotion. According to the hypothesis, group name stimuli which elicit the greatest amounts of emotionality should identify those groups as objects of relatively strong prejudicial attitudes as confirmed by attitude scaling. Four analyses of the data were made.

The first analysis was restricted to data elicited by the three positionally rotated group names: Japanese, Jews, and Mexicans. By inference from the hypothesis, it was predicted that a subject whose galvanic skin response to one of these groups was above his mean galvanic skin response would rank that group below the median. The accuracy of the prediction was tested by the chi square test for two independent samples (*9*). For Japanese, Jews and Mexicans, the chi squares were, respectively, 8.54, 6.73, and 9.43. In each case $p < .005$. For most subjects, then, a relatively great skin response identified a group as relatively low on the paired comparison scale.

The second analysis dealt with data elicited by all nine group name stimuli. It was predicted that in most instances the group name stimulus which elicited the greatest skin response would be ranked below the paired comparison scale median. As it turned out, the group name stimulus which elicited the greatest skin response was ranked below the paired comparison rank median by 43 of the 53 subjects. The binomial test result was: $Z = -4.41$, $p < .001$.

The third analysis was the same as the second except for one modification. Instead of the single greatest galvanic skin response, the two greatest were identified and the same prediction was made with respect to both being ranked below the paired comparison median. Of the 53 subjects, 41 ranked both below the paired comparison scale median. The binomial test was again applied: $Z = -3.85$, $p < .001$.

The fourth analysis was directed to the relationship between the sample's attitude consensus toward the nine groups and the magnitude of galvanic skin responses which the group names elicited. The nine stimulus groups were ranked according to both skin response magnitude and paired comparison position. As predicted by inference from hypothesis, a positive relationship was found. The rank orders of these two variables are shown in Table 3. The Spearman rank coefficient was .82, $p < .01$ (*10*).

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