THE 3-POINT SPAN GROUP DECISION-MAKING METHOD IN SORORITIES

by

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May 22, 1968
Date

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ABSTRACT

A new decision-making method, 3-point SPAN, was developed. This method is similar to 100-point SPAN, in that votes may be given to either options or representatives, but is less time consuming and expensive. The method was tested on twelve groups of sorority members. Their task involved choosing correct answers to the Parasol Assembly Problem. In ten of the twelve groups, 3-point SPAN outperformed a direct "one man, one vote" system. The difference between the two systems was found to be significant at the 5 per cent level. It was also hypothesized that 3-point SPAN would be preferred by the subjects for making these types of decisions. This hypothesis was confirmed. However, subjects did not prefer 3-point SPAN for making decisions which involved policy changes or the election of officers in an organization.

INTRODUCTION

Much research in social psychology has focused on the behavior of individual group members in decision-making. Until recently, however, little attention has been directed toward maximizing individual and group gains through innovations in the method of decision-making. The "one man, one vote" plurality-rule method has been a tradition in our society. This method of arriving at group decisions has not been subjected to close scientific scrutiny because it has been accepted as an integral part of our democratic system. W. J. MacKinnon (1966b) has developed a new group-decision making method which is just as democratic as the plurality-rule method and may be more effective (Willis, 1966; Hitchcock, 1967). The method is named SPAN (Successive Proportionate Additive Numeration). Each member of a group receives 100 points which he may divide among options and representatives (other group members to whom he gives points). Restrictions are confined to (1) a rule that the individual give at least one point to answers, or (2) a rule that he give at least one point to answers and at least one point to members. A computer program has been developed by Mary MacKinnon (1967) for analyzing the data. After many cycles of computation all but a small fraction of the total points end up distributed to options.

In a time when more and more decisions are being made by experts, many people feel that the average individual will gradually lose all decision-making power. This is a dilemma. We are in need of better decisions, and, for this, experts are essential in many cases. On the other hand, if the average individual no longer plays any part in decision-making, democracy is certainly in a precarious position. The SPAN technique was designed to overcome this dilemma. Each member has an equal number of points to distribute. If every member of the group is alert to the abilities of other members, there should result from the computation an upgrading of the quality of decisions. Members of low knowledge or ability would distribute points to members of average ability, who would distribute points to members of above average ability, who would distribute points to members of superior ability. W. J. MacKinnon (1966a) outlines how this might occur in a hypothetical university psychology department.

The evidence that this upgrading process does, in fact, occur is accumulating. Willis (1966) compared SPAN with two direct methods of voting. The Mined Road Problem, which has several possible solutions of varied quality, was used. A weighted average was determined for each method. SPAN had a significantly higher weighted average than the two direct methods. Hitchcock (1967) compared SPAN with a direct method using groups of fraternity officers and the Mined Road Problem.

Again SPAN outperformed the direct method. Other significant findings of these two studies were that participants on the average allocated approximately half of their points to members; that 60 per cent of the subjects "achieved higher weighted averages by their indirect allocations than by their direct ones"(Willis, Hitchcock, and MacKinnon); that more subjects preferred SPAN than the direct methods.

The method used in the present study is a 3-point variation of the original 100-point SPAN. A need existed for a technique modeled after 100-point SPAN which could save time and money in the day to day decision-making activity of small groups; 3-point SPAN fills this need. The results can be calculated in ten minutes for groups of ten persons or less. The technique is quite economical, requiring only pencil and paper; no computer is necessary.

In 3-point SPAN each member of the group receives three points which he may divide in one of ten ways among answers (options) and representatives. (See Appendix A for a copy of the instructions.) A person may give all of his points to either representatives or answers. He is not required to give some proportion of his points to answers or representatives, as is the case with 100-point SPAN. As with 100-point SPAN, all the points which are sent to representatives eventually end up at options.

The 3-point SPAN or the "3-point voting system," as it is referred to in this study, is compared with the conventional "one man, one vote" system. The conventional system is referred to as the "1-point system." Each subject is asked to vote first using the 3-point system and then the 1-point system. (Refer to Appendices C and D for copies of the voting sheets.)

A problem was sought which would be comparable to the Mined Road Problem but less time-consuming and applicable to women as well as men. The Parasol Assembly Problem, intensively studied by Maier (1952), was found to be a good substitute. (See Appendix B for a copy of this problem.) Maier lists twenty-nine possible solutions which fall into seven different categories. The solutions are listed in the order of quality with the best solution referred to as the "elegant" or "inventive" solution (Maier, 1952, p. 317). Ten of these solutions included in four of the categories were ultimately selected for use in this study. A group of eighteen students in an introductory psychology class were asked to rank twenty-one of the solutions as their first, second, and third choices. Ten of the most popular solutions were then selected. Each of the four categories and the solutions included in them were then given weights, according to their quality as derived from Maier (1952). The weights used were -1, 0, +1, and +2. Those solutions in category IV were given weights of -1 because they violate the stated conditions of

the problem. Those in category III were given 0 weight because they do not necessarily either help or hurt the situation presented in the problem. The solutions in category II are ones which will improve the stated conditions and were given weights of +1. The solution in category I is the best solution and therefore was given a weight of +2. (See Appendix E for solutions and weights.) The order of the solutions on the voting sheet was decided systematically so as to preclude any unintentional bias on the part of the subjects.

Previous studies using 100-point SPAN (Willis, 1966; Hitchcock, 1967) found that a majority of subjects preferred to use SPAN over direct methods in making the kind of decisions entailed in the Mined Road Problem. An important question yet to be asked is: do subjects prefer SPAN for making other types of decisions? Voting decisions in a social organization involving the acceptance of policy changes or the election of officers may not be viewed in the same light with regard to SPAN.

The two major hypotheses of this study are that 3-point SPAN will outperform the 1-point or direct voting system and that subjects will prefer 3-point SPAN for making decisions like those included in the experiment. The subjects' preferences for 3-point SPAN on other types of decisions will also be tested, but no specific hypothesis was made on this question. The 5 per cent level of significance for two-tailed tests

was adopted. All probabilities reported in this paper are two-tailed or refer to two-directional tests.

METHOD

Materials

All participants received copies of Instructions, Parasol Assembly Problem, Voting Sheet for Parasol Assembly Problem, Horse Trading Problem and Voting Sheet, and Questionnaire. The Questionnaire had two forms; half of the subjects received Form A and half received Form B.

Subjects

Subjects were members of four sororities at The University of Arizona. Three groups, ranging in size from 5 to 7 members were taken from each sorority. The total number of girls used was 70. The breakdown of these subjects into groups and the status of each girl in the sorority is shown in Appendix G.

One of the advantages of using women subjects from sororities was that both the Willis (1966) and Hitchcock (1967) studies had used men, and Hitchcock had used fraternities. Until now no indication of how women would perform using SPAN had been given. Also, women did slightly better than men on the Parasol Assembly Problem in four pilot groups composed of volunteer subjects in discussion sections of an

introductory psychology course and one graduate class in social psychology.

An attempt was made to have each group composed of sorority officers who had worked together as a group. However, the study was completely voluntary, and it became necessary to substitute some rank and file sorority members for officers. This should not have affected the study because the entire sorority can be taken as an established group with all members participating in the making of many decisions.

Procedure

The experiment was conducted in the four sorority houses. In each sorority all three groups were run at the same time. The girls were first separated into groups and seated in a circle or semi-circle. They were thanked by the experimenter for having volunteered to participate in the experiment. At this time they were also cautioned against discussing the problems and were told to do their work independently. Then the instructions were passed out. (The experimenter was assisted in three of the sororities by an undergraduate honors student who was familiar with 3-point SPAN.) The subjects were instructed to read through the material thoroughly. They were assured that any questions they might have would be answered after they had done this.

Prior to the presentation of the Parasol Assembly Problem the subjects were given a short warm-up problem. The problem used for this purpose was the Horse Trading Problem (Burke, 1965). This problem contained five possible solutions. Subjects voted using the 3-point system and the 1-point system just as they would do with the Parasol Problem. The Horse Trading Problem was used solely as a warm-up to familiarize subjects with the 3-point voting system. In the experiment no attempt was made to compare the two systems on this problem.

The Horse Trading Problem was passed out after all subjects had read the instructions. They were told to write their name at the top of the voting sheet containing this problem. Then they were requested to write in the last names of all the members of their group (including their own last name) in the blanks under the heading Representatives. The subjects were not informed that the Horse Trading Problem was a practice problem. (See Appendix D for a copy of this problem.)

After all the members of the group had voted using both the 3-point system and the 1-point system, the second problem was distributed, each member receiving a copy of the Parasol Assembly Problem and a copy of the Voting Sheet for the Parasol Assembly Problem. They were told to read the problem and vote using both systems, just as they had done with the Horse Trading Problem. Subjects were allowed as much time as they needed to read the problem and make their allocations.

When all members of a group had finished the second problem, a Questionnaire was passed out. Half of the subjects received Form A and half received Form B. (For copies of the Questionnaire see Appendix F.) The time for the entire experiment was about twenty minutes.

Only the processing and counting of the points in 3-point SPAN requires special mention. Appendix H presents a sample counting sheet. The order of the individuals and answers to which the received points of a representative go is determined by the receivers own choice of an order. This order is followed repetitively, e.g., the fourth point of all the points a representative receives during all cycles of counting will go to the first of his three choices. The sequence in which the various voting sheets are processed partly determines which answer eventually receives a particular indirect vote, but it has no effect upon the number of points any answer receives from the group as a whole.

RESULTS

The relative effectiveness of the two systems was compared directly by a non-parametric sign test. Ten groups performed better using the 3-point system and two groups performed better using the 1-point system. The difference between the two systems is significant at the .05 probability level ($p = .039$). In order to check the hypothesis further, another non-parametric test was run which took into account the magnitude of the difference between the systems for each group. The difference again was significant ($p = .02$). The results of these tests are summarized in Table 1.

A preliminary experiment was run on six pilot study groups. Four of these groups performed better using the 3-point system, one group performed better using the 1-point system, and one group did equally well with the two systems. This data lends further support to the conclusion that the 3-point system outperforms the 1-point system on the Parasol Assembly Problem.

Table 2 shows the average scores for each experimental group on the 3-point system and on the 1-point system. It is possible to determine from this table how much better or worse the "average member" of each group did using the 3-point system.

TABLE 1

SUMMARY TABLE OF TESTS OF SIGNIFICANCE
FOR THE EXPERIMENTAL GROUP

Sign test for correlated samples	N = 12	p = .039
Wilcoxon rank test for correlated samples	N = 12	p = .020

TABLE 2

AVERAGE SCORES OF GROUPS ON EACH SYSTEM
(POSSIBLE RANGE: -1 to +2)

Group	N	1-point	3-point
A1*	6	.33	0
A2	7	.43	.71
A3	7	.14	.76
B1	5	.40	.53
B2	5	1.20	1.33
B3	5	.20	.33
C1	5	.40	1.07
C2	5	.20	.47
C3	5	-.20	-.07
D1	5	.20	.53
D2	5	.60	.53
D3	5	.40	.80

* Represents sorority A, group 1

In order to compare this study more closely with the earlier studies by Willis (1966) and Hitchcock (1967), it was necessary to separate all the votes into those that were allocated directly to answers and those that were allocated indirectly to answers through representatives. When this is done it is possible to achieve a direct and indirect weighted average for both individuals and groups.

The indirect average of an individual using 3-point SPAN was found by assigning to each point he gave to another member the average score achieved by that member with all the points that were allocated to him on the ballots of the group members. The sum of these averages achieved by the individual's representatives was, of course, divided by the number of points the individual gave to representatives, and the result was the individual's indirect average.

If a person's direct weighted average is higher than his indirect weighted average, then the points he allocated via the direct route could be said to be "more effectively allocated" or "more effective." Conversely, if a person's indirect weighted average is lower than his direct weighted average, then the points he allocated indirectly may be said to be "less effectively allocated" or "less effective" (Willis, Hitchcock, and MacKinnon). This distinction may also be extended to groups.

The following results have been taken from the data in Appendix G:

1. The 65 participants allocated 35.4 per cent of their 195 votes to other members. However, among the 34 subjects who divided their points among answers and members, exactly 50 per cent of the votes went to members. The per cent of indirectly allocated points in the Willis (1966) study was 49.0 and the Hitchcock (1967) study was 50.7.

2. Again among the 34 subjects who allocated votes both directly and indirectly, discounting four ties, 63 per cent achieved a higher weighted average through their indirect allocations. This figure compares with 60.7 per cent for Willis and 60 per cent for Hitchcock. Optimal allocation in this study would have resulted in 63 per cent of the votes going to members.

3. These 34 subjects, again discounting the four ties, allocated 55.6 per cent of their votes more effectively (chance expectations would result in a 50-50 split). In the Willis study 48.1 per cent were allocated more effectively, and in the Hitchcock study the figure was 54.0 per cent.

4. The same 34 subjects, discounting ties, allocated 64.4 per cent of the indirect votes more effectively and only 42.2 per cent of the direct votes more effectively (in the direction of the higher weighted average). In the Willis study the comparative figures were 58.7 per cent

and 37.2 per cent, and in the Hitchcock study they were 63.8 per cent and 43.9 per cent.

5. In eight of the twelve groups the indirect weighted average was higher than the direct weighted average, and in two of the remaining groups they were tied.

A Questionnaire was administered to determine the comparative preferences for the 3-point system and the 1-point system. The results are stated in Table 3. It can be seen that the difference between Form A and Form B on each question is small; therefore, the results have been combined for the final analysis. The 3-point system is preferred by a wide margin on question 1 ($p < .001$). The 1-point system is preferred by wide margins on questions 2 and 3 ($p = .006$ and $p < .001$). A binomial sign test was used to test these probabilities.

TABLE 3

SUMMARY OF QUESTIONNAIRE DATA FOR THE
1-POINT SYSTEM AND THE 3-POINT SYSTEM

		Form A	Form B	Total
Question 1	1 - point	4	7	11
	3 - point	31	28	59
Question 2	1 - point	23	24	47
	3 - point	12	11	23
Question 3	1 - point	27	24	51
	3 - point	8	11	19

DISCUSSION

The hypothesis that 3-point SPAN would outperform the conventional "one man, one vote" method was confirmed in this experiment. In combination with the results obtained by Willis (1966) and Hitchcock (1967), the evidence is convincing that methods from the SPAN family will outperform direct methods. SPAN methods have now been tested on two problems and on segregated groups of both sexes. Future research will undoubtedly test SPAN methods on established groups integrated as to sex.

When 3-point SPAN was analyzed into direct and indirect allocations of members, the results obtained were strikingly similar to those obtained by Willis (1966) and Hitchcock (1967). This experiment differed from the others in the type of SPAN used, in the problem used, and in the sex of subjects used. The fact that the results are so similar lends support to the idea that 3-point SPAN is indeed a simplified form (or short form) of 100-point SPAN.

It was hypothesized that subjects would prefer to use the 3-point system in making decisions on problems like the Parasol Assembly Problem of this experiment. This hypothesis was strongly supported. Subjects were also asked which of the two methods they would prefer to use in voting on policy proposals and electing officers in an organization.

On both of these last questions the 1-point system was favored by a wide margin.

The question of why subjects do not prefer 3-point SPAN in these areas is one which needs to be explored. It may be that in the election of officers people are strongly prejudiced in favor of traditional methods. On the other hand, it may be that given a chance to use 3-point SPAN for this purpose and presented with concrete evidence of its superiority, they would easily accept it. The subjects in this experiment had a very brief encounter with 3-point SPAN and were given no reason to believe that it would be successful in the election of good officers.

Future research is needed in which SPAN methods are used by a group over a period of time for many types of decisions. In such an experiment a true test of a group's preference for SPAN can be achieved. Such an experiment would also provide important feedback to group members after each use of SPAN. Members would learn to evaluate other members more realistically by tracing the route of votes they had allocated to these members. Some members would learn to send more votes via the direct route; others would learn to send more votes via the indirect route. Such an experiment is necessary in order to test what the maximum benefits of SPAN could be.

APPENDIX A

INSTRUCTIONS

This is an experiment comparing the effectiveness of two voting systems. You will be given two successive timed problems, and you will make decisions regarding solutions to these problems. After you have read each problem, you will be asked to vote for the solution(s) to express your judgment of their correctness or excellence. On the voting sheet are listed the possible answers. You are to vote twice, each time using a different voting system. These systems are referred to as the 1-point system and the 3-point system.

You are probably most familiar with the 1-point system. With this system you have 1 point (or vote) and you give it to the answer which you feel is best.

The 3-point system is different in essentially two ways. First, you have 3 points instead of 1. Second, you may give your points to answers, members, or both. When you give a point to another member he is referred to as a representative. If you are in doubt about the correct answer, there are two cases in which you might wish to give some points to representatives.

1. You feel another member of the group may have had more experience dealing with this type of problem, or for some reason you

simply feel he is better qualified than yourself to choose the right solution.

2. You feel that another member is in a better position than yourself to judge which members of the group would be better able to select the right answer.

Under this system you may divide your 3 points in any one of ten ways, which fall into three categories.

1. You may give all 3 points to representative(s).
   A. You may give 3 points to one representative.
   B. You may give 2 points to one representative and 1 point to another representative.
   C. You may give 1 point to each of three representatives.
2. You may give some points to representative(s) and some to answer(s).
   A. You may give 2 points to one representative and 1 point to one answer.
   B. You may give 1 point to each of two representatives and 1 point to one answer.
   C. You may give 1 point to one representative and 1 point to each of two answers.
   D. You may give 1 point to one representative and 2 points to one answer.

3. You may give all 3 points to answer(s).

   A. You may give 1 point to each of three answers.

   B. You may give 2 points to one answer and 1 point to another answer.

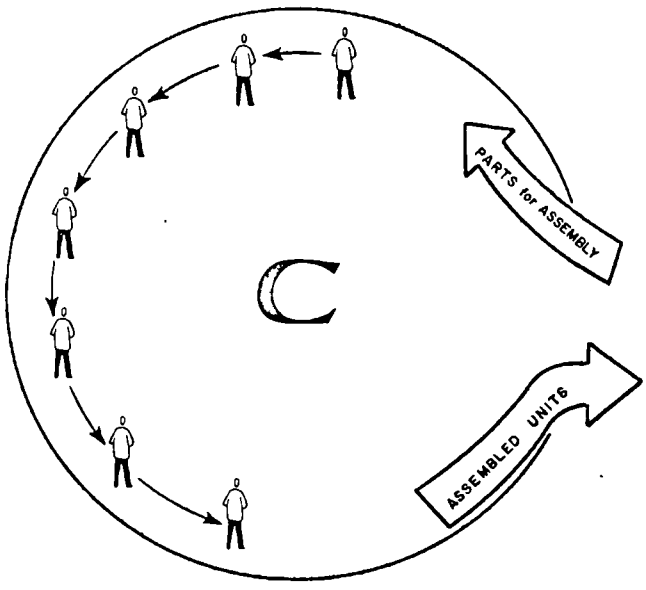
   C. You may give 3 points to one answer.

Any points that you receive from other voters will be distributed according to your own pattern of voting and the patterns of any voters who receive any of your points. All your points will be distributed to answers directly or indirectly depending on your choice(s). Each voter receives the same instructions.

Vote with the aim that the group voting process will give more votes to the best answer than to any other.

APPENDIX B

PARASOL ASSEMBLY PROBLEM



Visualize a subassembly situation in which 7 men work in a circle and assemble part of a car (carburetor or instrument panel, for example). The basic unit enters the circle at one point, and each person adds his pieces and pushes the unit to the next worker, who adds his elements. When the unit leaves the circle, it is a completed unit. This work arrangement is diagrammed in the figure above.

The assembly work is simple and requires a minimum of training for each step. The aptitude requirement is primarily good finger dexterity. The materials for each assembly position are located in bins which

are kept supplied by material handlers. Thus each worker has his essential material at his elbow. The job has been analyzed by time-and-motion experts so that the positions are of equal difficulty.

Suppose there are 4 such parasol subassembly stations, each one supervised by a foreman. In this problem we are concerned with one of these stations, which we shall call station C. Station C has been producing significantly fewer units than the other three stations. The total factory production is dependent upon receiving the required number of assembled units from these four stations. The production from station C is so slow that the factory production as a whole has had to slow down. The work piles up at the position of Joe Brown. The unit must pass through him (position 3), and he always has several units piled up waiting for him. Foremen on non-production jobs are not willing to accept Joe as a transfer. Joe is a man of 60 with 30 years of service in the company. Emphasis on improving production has brought his deficiencies to light. In talking to the members of station C about the slow production, the foreman became aware that several members of the group were dissatisfied with the slow pace and complained of not having enough work to keep them busy. Also, at least one member of the group complained of the monotony of doing the same task over and over.

APPENDIX C

VOTING SHEET FOR PARASOL ASSEMBLY PROBLEM

First use the 3-point system and then use the 1-point system. This sheet contains a list of possible answers to the assembly problem and a list of all possible representatives for your group. As you see, each answer is identified by a letter.

3-Point System

Answers

A. Get rid of Joe.

B. Put Joe in number 7 position.

C. Reorganize job so that some positions will have less work.

D. Rotate all the workers every so often in the same direction as the units are moving.

E. Promote Joe to foreman.

F. Have each man do full assembly.

G. Put faster workers next to slow ones so that they can help out.

H. Change Joe by training him and improving his attitude.

I. Rotate until each finds best position.

J. Have Joe periodically change places with a faster man.

	Order of Counting		
Representatives	1st column	2nd column	3rd column
Answers			
A			
B			
C			
D			
E			
F			
G			
H			
I			
J			

In the empty boxes above please mark three x's, one in each vertical (up-and-down) column. These x's will designate the representative(s) or answer(s) for which you wish these votes to be counted. You may write one, two or three x's in the same horizontal (left-to-right) row. The first vote you may receive from anyone else will go to the representative or answer corresponding to the row in which you write your x in the first column; the second vote you may receive from anyone

else will go to the representative or answer corresponding to the row in which you write your x in the second column, etc.

It is possible, though unlikely, that all of the points which you send to representatives will be sent back to you. In order to make a decision possible in such a case, please indicate the letter of the one answer to which you would like these points to go. _____

1-Point System

In the blank put the letter of the best answer. See the answers and letters above. _____

APPENDIX D

HORSE TRADING PROBLEM AND VOTING SHEET

A man bought a horse for $60 and sold it for $70; then he bought it back again for $80 and sold it for $90. How much money did he make in the horse business?

First use the 3-point system and then the 1-point system. This sheet contains a list of possible answers to the horse trading problem and a list of possible representatives for your group. As you can see, each answer is identified by a letter.

3-Point System

Answers

A. He lost $10.

B. He broke even.

C. He made $10.

D. He made $20.

E. He made $30.

	Order of Counting		
Representatives	1st column	2nd column	3rd column
Answers			
A			
B			
C			
D			
E			

In the empty boxes above please mark three x's, one in each vertical (up-and-down) column. These x's will designate the representative(s) or answer(s) for which you wish these votes to be counted. You may write one, two or three x's in the same horizontal (left-to right) row. The first vote you may receive from anyone else will go to the representative or answer corresponding to the row in which you write your x in the first column; the second vote you may receive from anyone else will go to the representative or answer corresponding to the row in which you write your x in the second column, etc.

It is possible, though unlikely, that all of the points which you send to representatives will be sent back to you. In order to make a decision possible in such a case, please indicate the letter of the one answer to which you would like these points to go. _____

1-Point System

In the blank put the letter of the best answer. See the answers and letters above. _____

APPENDIX E

SOLUTIONS AND THEIR WEIGHTS

Solutions	Weights
A	0
B	-1
C	+1
D	+2
E	0
F	-1
G	+1
H	0
I	-1
J	+1

APPENDIX F

QUESTIONNAIRE - FORM A

When you have finished voting, please answer the following questions:

1. Which of the two methods of voting do you think would be more likely to select better answers to problems like the assembly problem of this experiment?

   A. 1-point system

   B. 3-point system

2. In voting to pass or defeat a policy proposal in an organization, which of the two methods of voting would you prefer to use?

   A. 1-point system

   B. 3-point system

3. In voting to elect candidates for office in an organization, which of the two methods would you prefer to use?

   A. 1-point system

   B. 3-point system

QUESTIONNAIRE - FORM B

When you have finished voting, please answer the following questions:

1. Which of the two methods of voting do you think would be more likely to select better answers to problems like the assembly problem of this experiment?

A. 3-point system

B. 1-point system

2. In voting to pass or defeat a policy proposal in an organization, which of the two methods of voting would you prefer to use?

A. 3-point system

B. 1-point system

3. In voting to elect candidates for office in an organization, which of the two methods would you prefer to use?

A. 3-point system

B. 1-point system

APPENDIX G

SORORITY STATUS OF SUBJECTS

Sorority, Group and Member	Status
A1a	*I
A1b	I
A1c	I
A1d	I
A1e	I
A1f	I
A2a	I
A2b	I
A2c	I
A2d	I
A2e	I
A2f	I
A2g	**N-O
A3a	I
A3b	I
A3c	I
A3d	I

Sorority, Group and Member	Status
A3e	I
A3f	I
A3g	I
B1a	N-O
B1b	I
B1c	I
B1d	I
B1e	I
B2a	N-O
B2b	I
B2c	N-O
B2d	I
B2e	N-O
B3a	N-O
B3b	N-O
B3c	N-O
B3d	N-O
B3e	N-O
C1a	I
C1b	I

Sorority, Group and Member	Status
C1c	I
C1d	I
C1e	I
C2a	N-O
C2b	I
C2c	N-O
C2d	N-O
C2e	I
C3a	I
C3b	I
C3c	I
C3d	I
C3e	I
D1a	I
D1b	N-O
D1c	I
D1d	N-O
D1e	N-O
D2a	I
D2b	N-O
D2c	I

Sorority, Group and Member	Status
D2d	I
D2e	I
D3a	N-O
D3b	***P
D3c	P
D3d	N-O
D3e	P

* incumbent officer

** non-officer (active members, no pledges were used)

*** past officer

Note: One group of five had to be discarded and replaced because they violated the experimental conditions by discussing the problem. They were heard talking about the answers, and it was later found that they all had put down the same answer. Their Questionnaires, however, were used because the preference sheets became separated from the other data.

APPENDIX H

SAMPLE COUNTING SHEET

	Member V	Member W	Member X	Member Y	Member Z
Cycle 1	1^a	1^b 1^c		1^d 1^e	
Cycle 2	1^c			1^a	
Cycle 3		1^a		1^c	

	Member V	Member W	Member X	Member Y	Member Z
First Choice	Member Y	Answer J	Answer F	Answer I	Answer G
Second Choice	Member Y	Member V	Answer F	Answer I	Answer G
Third Choice	Member W	Answer G	Answer F	Member W	Answer G

Note: Together with the table of first, second, and third choices, the chart at the top of the page shows the destination of each indirect point. For example, on Cycle 1, Member W received two points, one of which went immediately to Answer J, and the other of which went ultimately to Answer I. The final destination of the 15 combined direct and indirect points is as follows: 3 for Answer F, 5 for Answer G, 5 for Answer I, and 2 for Answer J.

APPENDIX I

DATA SUMMARY

Group Member-ship	3-point system								1 pt. system	
	P_m	P_a	M_m	M_a	M_b	gM_m	gM_a	gM_b	x	gM_x
A1a	0	3(1,1,1)	0	.33	.33	-.20	.08	0	0	.33
A1b	1	2(1,1)	-.33	.50	.22	"	"	"	2	"
A1c	0	3(1,1,1)	0	0	0	"	"	"	0	"
A1d	2(1,1)	1	0	0	0	"	"	"	0	"
A1e	1	2(1,1)	-.33	-.50	-.44	"	"	"	0	"
A1f	1	2(2,0)	-.33	0	-.11	"	"	"	0	"
A2a	3(1,1,1)	0	.86	0	.86	.77	.62	.71	0	.43
A2b	0	3(1,1,1)	0	0	0	"	"	"	0	"
A2c	2(1,1)	1	1.62	0	1.08	"	"	"	0	"
A2d	1	2(1,1)	.50	1.00	.83	"	"	"	0	"
A2e	2(1,1)	1	.67	1.00	.78	"	"	"	1	"
A2f	3(1,1,1)	0	.33	0	.33	"	"	"	0	"
A2g	2(1,1)	1	.67	2.00	1.11	"	"	"	2	"
A3a	2(1,1)	1	1.08	0	.72	1.00	.44	.76	0	.14
A3b	2(1,1)	1	.50	0	.33	"	"	"	0	"
A3c	2(1,1)	1	1.25	0	.83	"	"	"	0	"
A3d	0	3(1,1,1)	0	0	0	"	"	"	0	"
A3e	3(2,1)	0	1.28	0	1.28	"	"	"	-1	"
A3f	1	2(2,0)	1.17	2.00	1.72	"	"	"	2	"
A3g	2(1,1)	1	.66	0	.44	"	"	"	0	"
B1a	2(1,1)	1	1.00	0	.67	1.00	.46	.53	0	.40
B1b	0	3(1,1,1)	0	.67	.67	"	"	"	1	"
B1c	0	3(1,1,1)	0	.33	.33	"	"	"	-1	"
B1d	0	3(2,1)	0	.33	.33	"	"	"	1	"
B1e	0	3(1,1,1)	0	.67	.67	"	"	"	1	"
B2a	1	2(2,0)	2.00	2.00	2.00	1.33	1.33	1.33	2	1.20
B2b	2(1,1)	1	1.00	0	.67	"	"	"	0	"
B2c	0	3(3,0)	0	2.00	2.00	"	"	"	2	"
B2d	0	3(3,0)	0	0	0	"	"	"	0	"
B2e	0	3(3,0)	0	2.00	2.00	"	"	"	2	"

Appendix I, Continued

B3a	0	3(3,0)	0	0	0	.33	.33	.33	0	.20
B3b	0	3(2,1)	0	.33	.33	"	"	"	1	"
B3c	0	3(1,1,1)	0	1.00	1.00	"	"	"	0	"
B3d	3(1,1,1)	0	.33	0	1.33	"	"	"	0	"
B3e	0	3(3,0)	0	0	0	"	"	"	0	"
C1a	2(1,1)	1	1.25	2.00	1.50	1.50	.57	1.07	2	.40
C1b	2(1,1)	1	1.58	0	1.06	"	"	"	0	"
C1c	2(1,1)	1	1.58	-1.00	.72	"	"	"	-1	"
C1d	2(1,1)	1	1.58	-1.00	.72	"	"	"	-1	"
C1e	0	3(1,1,1)	0	1.33	1.33	"	"	"	2	"
C2a	0	3(3,0)	0	1.00	1.00	1.33	.25	.47	1	.20
C2b	2(2,0)	1	1.33	-1.00	.55	"	"	"	-1	"
C2c	1	2(1,1)	1.33	-.50	.11	"	"	"	0	"
C2d	0	3(2,1)	0	-.67	-.67	"	"	"	-1	"
C2e	0	3(2,1)	0	1.33	1.33	"	"	"	2	"
C3a	0	3(3,0)	0	-1.00	-1.00	-.20	0	-.07	-1	-.20
C3b	1	2(1,1)	1.00	1.00	1.00	"	"	"	1	"
C3c	3(2,1)	0	-.67	0	-.67	"	"	"	-1	"
C3d	0	3(3,0)	0	1.00	1.00	"	"	"	1	"
C3e	1	2(2,0)	0	-1.00	-.67	"	"	"	-1	"
D1a	1	2(1,1)	-1.00	.50	0	.60	.50	.53	1	.20
D1b	2(1,1)	1	1.00	1.00	1.00	"	"	"	1	"
D1c	1	2(1,1)	.50	1.50	1.17	"	"	"	1	"
D1d	1	2(1,1)	1.50	.50	.83	"	"	"	-1	"
D1e	0	3(1,1,1)	0	-.33	-.33	"	"	"	-1	"
D2a	2(1,1)	1	.50	0	.33	.75	.45	.53	0	.60
D2b	1	2(1,1)	1.00	0	.33	"	"	"	1	"
D2c	0	3(1,1,1)	0	1.00	1.00	"	"	"	1	"
D2d	1	2(1,1)	1.00	.50	.67	"	"	"	0	"
D2e	0	3(1,1,1)	0	.33	.33	"	"	"	1	"
D3a	1	2(1,1)	.33	.50	.44	1.00	.67	.80	0	.40
D3b	1	2(1,1)	.33	.50	.44	"	"	"	0	"
D3c	3(2,1)	0	1.11	0	1.11	"	"	"	-1	"
D3d	1	2(1,1)	2.00	1.50	1.67	"	"	"	2	"
D3e	0	3(1,1,1)	0	.33	.33	"	"	"	1	"

Group Membership -- symbol designates sorority, group, and member, i.e., "A1a" means sorority "A", group "1", and member "a".

P_m -- points to members (indirect route)

P_a -- points to answers (direct route)

M_m -- mean value of points to members

M_a -- mean value of points to answers

M_b -- mean value of both points to members and points to answers

${}_gM_m$ -- group mean value of points to members

${}_gM_a$ -- group mean value of points to answers

${}_gM_b$ -- group mean value of both points to members and points to answers

x -- value of single direct allocation

${}_gM_x$ -- group mean value of all single direct allocations

REFERENCES

Burke, R. J. Sex differences in recognizing the correct answer to a problem. Psychological Reports, 1965, 17(2), 532-534.

Hitchcock, J. D. The SPAN group decision-making method in fraternities. Unpublished master's thesis, University of Arizona, 1967.

MacKinnon, Mary. A FORTRAN program for the SPAN technique of group decision-making. Unpublished master's thesis, University of Arizona, 1967.

MacKinnon, W. J. Development of the SPAN technique for making decisions in human groups. American Behavioral Scientist, 1966, 9(9), 9-13. (a)

MacKinnon, W. J. Elements of the SPAN technique for making group decisions. Journal of Social Psychology, 1966, 70, 149-164. (b)

Maier, N. R. F. Principles of Human Relations. New York: John Wiley, 1952.

Willis, J. E. A comparative study of different quantitative methods of obtaining group decisions by collecting and synthesizing individual decisions. Unpublished doctoral dissertation, University of Arizona, 1966.

Willis, J. E., Hitchcock, J. D., and MacKinnon, W. J. SPAN decision-making in established groups. Unpublished study, University of Arizona, Department of Psychology, 1968.