THE LEARNING OF BALANCED AND UNBALANCED
SOCIAL STRUCTURES

by

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Technical Report No. 27
March 15, 1964

Prepared under Contract NONR-1224(34)
(NR 170-309)
for
OFFICE OF NAVAL RESEARCH

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It has recently been shown that people attribute the mathematical properties of transitivity and symmetry to certain forms of social structures (De Soto, 1960; De Soto & Kuethe, 1958, 1959). These findings were obtained, among others, in an experiment in which the Ss' task was the learning of a set of relationships among a group of hypothetical people (De Soto, 1960). Several structures of relationships, such as shown in Fig. 1, were learned by the Ss, using a method similar to the paired associates paradigm. The circles in Fig. 1 represent hypothetical individuals--Bill, Jim, Ray, and Stan--while the lines connecting them represent relationships such as influence, attraction, or confidence. Thus, for instance, a solid arrow going from one circle (Bill) to another (Jim) may mean that Bill likes Jim, while a broken arrow from Ray to Stan that Ray dislikes Stan. In other conditions these same lines meant "influences" and "doesn't influence", or "confides in" and "doesn't confide in".

The Ss' task was to learn all the twelve pairwise relationships of the given structure to a criterion of two consecutive correct repetitions. The items of this list consisted of the two names as the stimulus terms and of the relationship ("likes", "doesn't influence", or "confides in") as the response terms. As in paired associates learning, the Ss anticipated the response terms upon the presentation of the stimulus terms. De Soto's major finding was that the
Fig. 1. Examples of structures employed by De Soto (1950).
learning of a given structure depends on the type of the relationship involved. Thus, for instance, the asymmetric and the symmetric structures in Fig. 1 were learned on the average in 16.2 and 9.1 trials respectively when the relation was "confides in", in 14.7 and 10.9 when it was "likes", and in 8.9 and 12.9 when it was "influences".

Since these experiments were published other evidence had been obtained to show that cognitive representations of social relationships are rather stable and pervasive. Kuethe (1962a; 1962b; 1964) labeled these cognitive tendencies "social schemata", proposing that they are ways of organizing social stimuli, learned during the person's social experience. In some of his experiments, (Kuethe, 1962a; 1962; Kuethe & Weingartner, 1964) evidence was found for a rather pervasive schemata about "males" and "females". When Ss were given one male felt figure, one female felt figure, and two felt rectangles to place on a felt field in any manner they wished, the majority put the two rectangles on the outside of the human figures, and placed the man figure on the right of the woman, side by side. Diagnosed overt homosexuals, however, tended to separate the male and female figures, placing the rectangles between them.

Heider's concept of balance (Heider, 1946) can be readily thought of in terms of "social schemata". If there exists a pervasive tendency to think of social groupings
in terms of balance this tendency should manifest itself when Ss are asked to learn an hypothetical set of relationships which form balanced and unbalanced structures. The theories of balance (Cartwright & Harary, 1956; Heider, 1946; Newcomb, 1953), congruity (Osgood & Tannenbaum, 1955), and dissonance (Festinger, 1957), which deal with the problem of relational consistencies, all assume that balance, congruity, and consonance are the "normal", "expected", and "desired" states of affairs, while imbalance, incongruity, and dissonance are the "unexpected" and the "undesired" states, producing strain and discomfort. To some extent these assumptions have been confirmed, although there is little evidence bearing directly on them (Brehm & Cohen, 1962; Burdick & Barnes, 1958; Jordan, 1953; Morissette, 1958; Rosenberg & Abelson, 1960; Zajonc, 1960). However, if these assumptions are correct it should be easier for Ss to learn a balanced structure than an unbalanced one. The purpose of the present experiment is to examine this question, using the technique developed by De Soto (1960).

Method

Subjects

The Ss were twelve volunteers recruited from among male undergraduates at The University of Michigan. They were paid $1.50 for the participation in the experiment.¹

¹We wish to thank Mr. James J. Taylor for his assistance in carrying out this experiment.
Balanced and unbalanced structures

Six structures, three balanced and three unbalanced, were employed. Each structure involved two hypothetical men (e.g., Bill and Bob) and an issue (INTEGRATION or NEWSWEEK). These structures are shown in Fig. 2. As in De Soto's (1960) experiment each arrow constituted an item in the paired associates list, the six structures generating 18 items. It will be noted that among the 18 items nine require a positive response ("likes" or "approves of") and nine require a negative response ("dislikes" or "disapproves of"). It will also be noted that the names of the individuals forming a structure begin with the same letters. One group of Ss learned the six structures with INTEGRATION as the issue and another with NEWSWEEK as the issue.

Procedure

The items were typed on 3 x 5 in. cards, with the stimulus terms (the two names, or the name with the issue) on one side, and with a plus or a minus sign on the other. The plus or minus sign was explained to the Ss as meaning "likes" or "dislikes" in the case of two persons, and "approves of" or "disapproves of" in the case of a person and an issue. The Ss' task was to anticipate these signs upon the presentation of the stimulus terms. To counterbalance for possible idiosyncratic associations between
FIG. 2. Balanced and unbalanced structures used in the paired-associates learning task. Names and structures were counterbalanced.
names and issues, each pair of names was used with a different structure for different Ss in a latin-square design.

The object of the experiment was explained to the Ss as dealing with learning. The items were shown in a standard 2-2 sec. routine, with a 5 sec. interval between the items, and a sec. interval between the repetitions of the list. Ten trials were given to all Ss, each having a different random order of the 18 items, the same for all Ss. In none of these orders did the three items of a given structure appear in adjacent positions.

RESULTS

The effects of balance

Fig. 3 shows the learning curves for the two groups of Ss, expressed in terms of average number of errors on each trial. Each point in these curves is based on 54 observations (9 relations and 6 Ss). Since there are nine relationships to be learned among the balanced structures and nine among the unbalanced ones, the Ss can make a maximum of nine errors on a given trial. The Ss do seem to begin the task with a chance level of errors. The learning task is rather difficult, since only one S learned the list to the criterion of two consecutive repetitions of the list.
FIG. 3. Average number of errors in the learning of balanced and balanced structures.
It is quite clear from Fig. 3 that for the INTEGRATION group the balanced structures were on the whole easier to learn than the unbalanced ones. However, the opposite tendency is observed for the NEWSWEEK group. Besides a significance overall practice effect \( (F/8, 1707 = 22.40; p < .001) \), the analysis of variance on the results also shown in Fig. 3 disclosed a significant interaction between ISSUE and TYPE OF STRUCTURE \( (F/1, 1707 = 17.30; p < .001) \). Analyses of variance performed for the two groups separately showed significant differences between the number of errors on balanced and unbalanced items for the INTEGRATION group \( (F/1, 907 = 7.33; p < .01) \) and for the NEWSWEEK group \( (F/1, 907 = 4.45; p < .05) \). But, as was noted above, the directions of these differences were opposite.

The effects of positivity

Two different issues were utilized in this experiment to determine if the effects of balance on the learning of social structure are the same when the "importance" of one element of the structure is varied. Intuitively, one may think that interpersonal relationships do not break up because of a disagreement over the merits of NEWSWEEK. They might be strained because of disagreements over INTEGRATION, however. One might expect, therefore, that if balance effects obtain at all, they should obtain primarily for the INTEGRATION group. The results of the present experiment show that balance
effects do obtain for the INTEGRATION group, and that they run in the expected direction. But they also show that there are apparently balance effects for the NEWSWEEK group as well, albeit in the opposite direction. We shall attempt to account for this result.

It can be seen from Fig. 2 that the three balanced structures contain only three positive relationships, while the unbalanced ones contain six. If Ss learn positive and negative items at different rates, and moreover, if the rate of learning of positive and negative relationships depends on the issue, then the interaction between ISSUE and TYPE OF STRUCTURE might indeed be obtained. A separate analysis of variance was therefore computed which controls for the effects of positivity independently of balance. Since practice effects did not enter into any of the interactions in the previous analysis of variance, the results were collapsed over all trials. Four scores were computed for each S: errors per item on (a) positive items which belonged to balanced structures, (b) negative items which came from balanced structures, (c) positive items which came from unbalanced structures, and (d) negative items which came from unbalanced structures. The means of these error scores are shown in Table 1 and the analysis of variance in Table 2. Since there are nine repetitions the S can make a maximum of nine errors on a given item. It is
### Table 1

**Average Errors per Item**

<table>
<thead>
<tr>
<th></th>
<th>Integration</th>
<th></th>
<th>Newsweek</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+</td>
<td>-</td>
<td>Both</td>
<td>+</td>
<td>-</td>
<td>Both</td>
</tr>
<tr>
<td>Balanced</td>
<td>1.72</td>
<td>1.92</td>
<td>1.82</td>
<td>3.00</td>
<td>3.36</td>
<td>3.18</td>
</tr>
<tr>
<td>Unbalanced</td>
<td>2.03</td>
<td>4.17</td>
<td>3.10</td>
<td>2.08</td>
<td>3.94</td>
<td>3.01</td>
</tr>
<tr>
<td>Both</td>
<td>1.88</td>
<td>3.04</td>
<td>2.46</td>
<td>2.54</td>
<td>3.65</td>
<td>3.10</td>
</tr>
</tbody>
</table>

### Table 2

**Summary of Analysis of Variance for Data in Table 1**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue (I)</td>
<td>1</td>
<td>4.88</td>
<td>2.53</td>
</tr>
<tr>
<td>Error (b)</td>
<td>10</td>
<td>1.93</td>
<td></td>
</tr>
<tr>
<td>Balance (B)</td>
<td>1</td>
<td>3.69</td>
<td>3.35</td>
</tr>
<tr>
<td>Positivity (P)</td>
<td>1</td>
<td>15.56</td>
<td>14.15***</td>
</tr>
<tr>
<td>I x B</td>
<td>1</td>
<td>6.28</td>
<td>5.71*</td>
</tr>
<tr>
<td>I x P</td>
<td>1</td>
<td>.01</td>
<td>&lt;1.00</td>
</tr>
<tr>
<td>B x P</td>
<td>1</td>
<td>8.90</td>
<td>8.09**</td>
</tr>
<tr>
<td>I x B x P</td>
<td>1</td>
<td>.15</td>
<td>&lt;1.00</td>
</tr>
<tr>
<td>Error (w)</td>
<td>30</td>
<td>1.10</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
** p < .01.
*** p < .001.
clear from the tables that there are indeed strong differences due to positivity. The main effect of positivity shows an F(1,30) of 14.15, significant at the .001 level, with 2.21 errors per positive item and 3.34 errors per negative item. It is also clear that the difference in learning positive and negative items is constant over the two issues. The ISSUE x POSITIVITY interaction was not significant. But it is also clear that, when positivity effects are controlled, balance effects obtain only for the INTEGRATION group, and we find therefore significant ISSUE x BALANCE and POSITIVITY x BALANCE interactions. Separate analyses of variance on the same scores for each group showed significant effects of positivity for both groups (F(1,207) = 4.83 for INTEGRATION and 7.98 for NEWSWEEK, both significant at the .05 level). The effects of balance, however, were found to be significant only for the INTEGRATION group (F(1, 207) = 5.79, p < .05).

The learning of specific items

Fig. 4 shows the average number of errors for each of the 18 relationships. Besides the overall patterns of balance and positivity effects which we observed above, the finding which emerges quite clearly is that the major source of errors lies in the negative relationships which are embedded in the unbalanced structures. In comparison to the
FIG. 4. Average number of errors in the learning of individual relationships.
two other relationships within the same unbalanced structures, the errors made on the negative relationship are almost twice as frequent for the NEWSWEEK group and more than twice as frequent for the INTEGRATION group (see Table 1). This may lead us to expect that the difficulty here arises because the negative relationship in the unbalanced structure is the odd one, and we should therefore find a relatively greater number of errors on the positive relationships in the balanced structures. This, however, is not the case. Negative and positive relationships in the balanced structures are learned with equal ease, a finding evident from the results shown in Table 1.

Discussion

The above experiment has shown that the technique developed by De Soto (1960) can be profitably used for the learning of social structures which differ in terms of balance. The data tended to disclose the operation of balance as a social schema, comparable in its effects to transitivity and symmetry found by De Soto.

Two findings emerged from the experiment. First, an unbalanced structure was found more difficult to learn than a balanced one but only when the issue was an important one. Second, negative relationships were found to be more difficult to learn than positive ones. This finding was
independent of whether these relationships existed between two people or between a person and an issue.

The examination of the learning of the components of the structures has clarified to some extent the nature of the differences in the learning of balanced and unbalanced structures. It showed that the differences in the learning of balanced and unbalanced structures are not equally distributed over all the components of these structures, but that there exists a relationship which is particularly difficult to learn -- the negative item in the unbalanced structures. The Ss tend to attribute a positive quality to this relationship, thus "balancing" this unbalanced structure. The learning differences due to balance, however, cannot be explained on the basis of this item alone. As a matter of fact there is reason to believe that the process of learning involved here takes the entire structure into account, rather than being a direct consequence of the learning of individual items. Table 3 shows for each type of structure given the Ss to be learned the type of structure which emerged as a consequence of their responses. We are not concerned here with the accuracy of these responses, but simply with whether the three responses given to the three items of a given triad form a balanced or an unbalanced structure. It is clear that for the INTEGRATION group there is a strong tendency to
Table 3

Percentage of Balanced and Unbalanced Structures Constructed as a Function of Structures Given

<table>
<thead>
<tr>
<th></th>
<th>INTEGRATION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure given</td>
<td>Balanced</td>
<td>Unbalanced</td>
</tr>
<tr>
<td>Structure</td>
<td>Balanced</td>
<td>71.6</td>
</tr>
<tr>
<td></td>
<td>Unbalanced</td>
<td>41.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>NEWSWEEK</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure given</td>
<td>Balanced</td>
<td>Unbalanced</td>
</tr>
<tr>
<td>Structure</td>
<td>Balanced</td>
<td>51.2</td>
</tr>
<tr>
<td></td>
<td>Unbalanced</td>
<td>50.6</td>
</tr>
</tbody>
</table>

produce balanced structures. No such tendency obtains for the NEWSWEEK group. Together with the finding that the effects of positivity of lines on learning were the same for both issues -- that is, the relatively greater difficulty of learning of negative lines was found for both groups -- the results in Table 3 strongly suggest that in the case of the INTEGRATION group the three components of each structure were learned as a whole.

The theories of balance, congruity, and dissonance all assume that the "importance" or "relevance" of the elements of the structure plays an important role in the consequences of these states. There is presumably less
strain when an unbalanced structure (or an incongruous or dissonant state) centers around an insignificant element than when it involves one of importance to the other elements of the structure. But this parameter has not been quantified, nor has it been meaningfully integrated into these theories. The importance of the issue, for example, was clearly a significant factor in obtaining learning differences between balanced and unbalanced structures in the present study. Yet the theoretical formulations of balance do not specify precisely how this parameter should be treated. Perhaps the person's commitment to the issue may be expressed in terms of Heider's unit (U) relations (Heider, 1946). A positive U-relation, for instance, could be assumed to exist between each of the pair members and the issue, when the latter was important to them, such as was the case with the INTEGRATION group. For the same reasons we would then assign no U-relations to the NEWSWEEK group. But adding two positive relations does not change the degree of balance of the structures used in the present experiment according to Heider's definition of balance. A need for the specification of the parameters of balance is clearly indicated -- a need already noted by Morrissette (1958).
References


