THE FORMALIZATION OF BALANCE THEORY AS AN EXPLANATION OF ONE-STEP DEPENDENCE

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PHILIP S. HART

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ABSTRACT

THE FORMALIZATION OF BALANCE THEORY AS AN EXPLANATION OF ONE-STEP DEPENDENCE

By

Philip S. Hart

Through the technique of formalization, or the process of making explicit the logical structure of a set of assertions, the author is attempting to account for the 'lack of fit' between theory and empirical results in the Camilleri-Berger model of rational decision-making. The theory predicted that a trial-by-trial independence process would be generated. However, the data revealed a one-step dependent trials process which as an underlying dynamic is not accounted for in the original theoretical formulation.

The concept of balance as postulated by Fritz Heider and later formalized by Dorwin Cartwright and Alvin Zander is the methodological tool employed as a possible means of accounting for the one-step dependence process. A central conceptual and methodological derivative of balance theory which is utilized is that of the degrees

of balance in a system of relations. This concept is expanded to provide a system of ordering predictions. Predictions are made within and between systems, and such an ordering provides further explanation for the dependence process.

It is pointed out that the ad-hoc nature of the original theory did not approach with sufficient clarity the dynamism of the verifying device, i.e., the experimental design. This inability aids in accounting for the discrepancy between the theory and results. The author proposes that a dual level of analysis is necessary if the original theory is actually valid and/or malleable. These levels are; (a) the conceptualization and measurement of intra-individual balance, and (b) the conceptualization and measurement of intra-systemic balance. It is proposed that with a thorough grounding of these two levels of balance the generation and understanding of an independent trials process would result.

The formalization of balance theory as outlined here thus serves both an explanatory and heuristic function. It is explanatory insofar as an accounting is provided for a dependence process-in-action. The formalization is heuristic insofar as its function as a generative technique for further theory and model-building. Such a model has been explored by the author in another paper, and the model under consideration is a modification of Bernard P. Cohen's model of conforming behavior, but is deemed a 'balance model'.

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By

Philip S. Hart

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CHAPTER I

HISTORICAL

Introduction

Social psychological research literature has been the scene of a number of research designs incorporating the concepts of subjective value[1] and utility, either as central topics of investigation or as components of a larger problem. Through utilizing the concept of utility and an attempt to measure[2] it, there has been the attendant concern with subjective probabilities. For once one is able to measure the utility attached to performance (or non-performance) of a particular action-choice, then the subjective probability of making such a choice can also hopefully be measured. This concern with the measurement of utility and subjective probabilities is a vital one in statistical decision-theory. And Sidney Siegel in "Level of aspiration and decision making"[3] states that a "behavioral model of decision-making should contain not only subjective probability but also utility whose main concepts are level of aspiration and reinforcement of effects."

One such decision-making model to which my concern will be directed here is incorporated into a research study carried out by Santo F. Camilleri and Joseph Berger, "Decision-making and social influence: A model and an experimental test."[4] A key point in the model and the experimental design constructed to test it, is the Actor's subjective structure. For the authors make the point that if this subjective structure is known then Actor's choices should be predictable. Camilleri and Berger attach utilities to three sources of potential feedback to Actor and these utilities are fundamental in the decision situation. These utilities are used in the construction of models of choice behavior in the attempt to predict the probability of particular responses in experimental conditions.

There occurred a breakdown between the theory and the data in this research study. The original formulation predicted that over a sequence of trials in the experimental situation that an independence[5] process would ensue. However the data mirrored more of a dependence process in action. Thus my concern here will be with developing viable means to view and interpret the data gathered in relation to 'testing' the Camilleri-Berger decision-making model.

A Markov[6] process seems to be in effect in which P_{n+1} depends upon P_n only and not on the earlier values of the function p (where P_{n+1} = df the probability of a particular choice on trial n+1). This Markov property of the model defines the phenomenon such that "the subject's performance in trial n+1, although dependent on his level of behavior in the preceding trial (as measured by P_n), is independent of the past record of performance leading to trial n."[7]

Thomas L. Conner in his M.A. thesis (Stanford University, October, 1963) "First order dependence and Self-other expectation theory" also made note of the dependence process spoken of and he tried to demonstrate that "the very structure of the experimental situation is such that one could never have an independent trials process."[8] And in the attempt to explain why dependence rather than independence prevails, Conner utilized particular of the notions of Fritz Heider's[9] balance theory as formalized by Dorwin Cartwright and Frank Harary.[10] This attempt to account for theoretical and empirical divergence Conner attacked by revising the original theory. In his revision, Connor considered the two experimental states "where the individual holds high expectations for self and low expectations for other [+-], and where the individual holds low expectations for self and high expectations for other [-+]." (Page 19)

This revision attempts to lay the dependent relations as found in the lap of (a) states of imbalance leading to tension which foster alterations in performance in the attempt to restore balance in the microsystem, i.e., if a particular choice leads to imbalance, then the probability of that choice on the next trial will be lessened. By viewing the situation in such a light, dependence is necessarily an assumption because the choice situation is a function of the preceding trial. That is, an explanation based upon the notion of balance makes dependence a given as well as an a postereori finding. The second point which Conner felt fostered dependence was (b) the structure of the situation. And he goes on to state in relation to these two points that "the crucial question focuses upon accounting for the dependence in terms of imbalance produced by the structure of the choice situation itself and not by fixed conditions of the situation. Only if one could in some sense remove the tension would it be possible for independence to exist." (Page 19) I would concur somewhat with Conner on these two reasons why independence exists. And in concurring with Conner on imbalance-produced tension and the structure of the situation as producing dependence, I will attempt to view these in a somewhat different light and also to build further on these ideas.

The Original Experimental Design

The original experimental procedure was introduced by Berger and J. Laurie Snell in "A stochastic theory of Self-other expectations"[11] in which the purpose was to "explicate a stochastic theory describing the relation between specific and defined 'self' and 'other' expectations and the pattern of disagreement resolutions in a two-man group."[12]

This description of the design used by Camilleri and Berger is taken from "Decision-making and Social Influence: A model and an Experimental test" with certain modifications and deletions. In the Berger experimental situation, a pair of subjects is asked to make binary choices in two steps. The subjects are shown a series of slides presenting two alternatives. They are given the instruction to make a provisional, independent decision between the alternatives (the initial choice); then, after being told what the other has decided, each is to take this information into account as he sees fit in making a final decision on the trial. A subject's final choices are not communicated to his partner. The subjects are led to believe that the final decisions are being evaluated as 'correct' or 'incorrect' and that such evaluations constitute their performance score in the task situation. These evaluations, however, are not communicated by the experimenter to the subjects during the series of trials.

The exchange of information about initial decisions involves a deception, for the communicated initial choices are not necessarily the actual choices made but follow a schedule determined by the experimenter according to whether or not he desires to have disagreement created between the two subjects. This involves experimental manipulation by which the machination used is controlled by the experimenter such that feedback can be arranged to mirror continuous (or whatever schedule is desired) disagreement over a series of twenty slides on the initial choices. Whether a subject makes a final choice which is inconsistent with his provisional choice (an 'other' response), or one that is consistent with his initial choice (a 'self' response) on any trial of the process is regarded as an indication of whether he accepts influence or not.

The task is an ambiguous one in that the slides used are in the form of a larger rectangle composed of smaller black and white rectangles each of which color comprises fifty per cent of the total area. In the artificial "Spatial Judgment Ability Test" the subjects are told that there is a right and a wrong answer, i.e., in some rectangles there is more black than white, and they are to act on this information in making a choice (choosing <u>either</u> black or white). The subjects make their choices under various structural conditions. They are first induced in the manipulation phase to believe that each of them has a certain amount (not necessarily the same) of the ability (Spatial Judgment) needed to make the choices presented. Each subject is also cognizant of the amount of ability possessed by his partner. These beliefs constitute the 'expectation state' of a subject. And since each subject is induced to believe that he has either superior or below average ability, four expectation states are distinguished: high ability for self and low ability for other is denoted by [+-]; high self and high other by [++]; low self and low other by [--]; and low self and high other by [-+].

The task conditions are so defined that the subjects are working as a team. They are told that performance scores, based on their final decisions, are being calculated for the team as a unit. Further, subjects may differ in their control over the team score. There are situations of (i) no control (ii) full control, and (iii) equal control. The situation of interest here is that of equal control where the final choices of the two subjects are weighted equally in determining the team's performance. In this case, the subjects are 'equals' in their decision-making rights. The data to be viewed in this paper will be that of the equal-control situations.

The specific experiments to which the Camilleri-Berger decision-making model was applied were carried out on university undergraduates who were paid volunteers. The pair of subjects in an experiment were of the same sex and usually previously unaquainted with each other.

In all cases the subjects were randomly assigned to one of the four expectation states and to one of the three control conditions (full, equal or no control).

The equal control experiments were carried out both at Michigan State University and at Stanford University. In this paper I will only be looking at the equal-control data gathered in the Stanford experiments. There was a difference in the number of trials run at each locale. At Michigan State there were a series of twenty, continuous disagreeing trials, while at Stanford subjects were asked to make initial and final choices on twenty-five trials. On twenty-three of these trials, each subject found himself in disagreement with his partner on his provisional choice. This difference between the number of trials run should not effect the data itself (i.e., give rise to differences between the Stanford and MSU data), but rather should only indicate some differences in the suspicion rates between Stanford and MSU subjects.

The Problem Under Investigation

My concern will be with the attempt to lend a more functional interpretation to the existence of the dependence process. In doing so, I will be building upon conceptions introduced by Heider, Cartwright and Harary, and by Conner. That is there will be the effort to explicate more fully why trial-by-trial (or one-step) dependence does exist in the experimental data and to posit some sort of functional relationship between variables affecting such a process. And with such a function as a base of inquiry, I will attempt to postulate a "quasi-program" outlining a procedure for ordering predictions on a trial-by-trial basis. In constructing such a function, I will be incorporating into the imbalance-produced tension interpretation a key tenet contained in the formalization of balance theory. Reference here is directed to the idea of the degree of balance (denoted as b(G) within a system modeled after Heider's p-o-x paradigm.

Such a conception will lend to the interpretation more of a quantitative character than that afforded by Conner. This will not be quantification just for the sake of quantification, but a concerted effort to construct a measure that will enable me to order predictions. As suggested, such a function will be one measurable at the ordinal level and the philosophical mode of analysis will be that of explication. This method of analysis will involve making more precise the idea of tension (such precision entering in under the guise of a function constructed between tension and degrees of balance) in the universe of discourse. In Conner's usage, tension is an informal context. It is (i) incomplete and (ii) inconsistent, thus there is an inability to apply the term. This necessitates transference to a more formal context in which an explication is defined which is more precise. The concern here will be with some sort of quantitative confirmation, or a measure of some degree of support for the one-step dependence as accounted for by the mode of analysis I will attempt.

CHAPTER II

A MOVE TOWARD EXPLANATION

It has been noted by Conner that in the high-low and low-high expectation patterns, given continuous disagreements, the individual never changes his expectations for self or other. Under the assumption of independence, the process as outlined by Camilleri and Berger thus becomes a Bernoulli independent trials process,[13] where $P(S \rightarrow S) = p(O \rightarrow S)$; [P(S)-probability of a Self response; P(O)-probability of an Other response] in which P(S) response is a constant probability p, independent of previous trials. That is, "the probabilities of success (self response) and failure (other response) remain the same throughout the trials."[14] All of this seems theoretically sound, the only drawback is the data. It does not indicate independence in action, rather one-step dependence is observed.

Independence takes the form,

$$\begin{array}{cc} & \quad n+1 \\ & \begin{array}{cc} S & O \end{array} \\ n & \begin{array}{c} S \\ O \end{array} \left(\begin{array}{c|c} a & 1-a \\ \hline a & 1-a \end{array} \right) \end{array}$$

where $P(S) = P(S/S) = P(S/O) = a$.

This is a stochastic matrix which mirrors the probabilities associated with making a particular choice on trial n+1, given a particular choice on trial n, e.g., P(S/S) symbolizes the probability of making a self-response on trial n+1 given a self-response on trial n. A stochastic matrix thus mirrors conditional probabilities. At this point I will utilize the formalization of balance theory in the attempt to explain the dependent relations found. This will first involve a look at the balance diagrams used by Conner (as derived from Cartwright and Harary) and then a discussion of the diagrams which I will use. A step-by-step mirroring of each stage of the decision process will be presented with an interpretation of the components of the system. Once the difference is noted, I will go into an exposition as to why my balance diagrams (and attendant interpretation) are more suitable for analysis.

Conner's balance diagrams contain, at most, five elements or entities, these are;

p = self (the reference individual in the system),

p' = self as he views himself as an object,

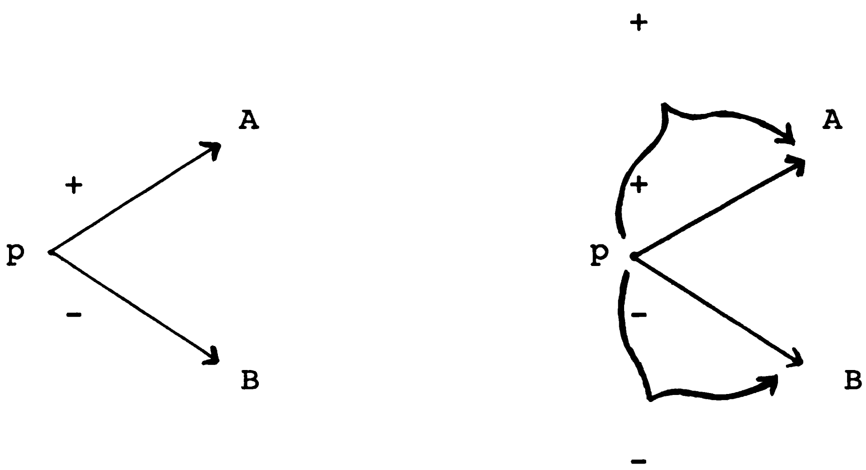
o = other,

A,B = choice alternatives A and B, respectively of the series of mutually exclusive binary choices.

As in Heider's theory of balance, two relationships may obtain between elements, (a) sentiments and (b) unit relationships. In the diagrams used by Conner, a directed line will represent a sentiment relationship (in this case a specific evaluation of a choice alternative or of a person) and a directed brace will represent a unit relationship (in this case, selection or rejection of a choice alternative). Thus,

$p \rightarrow p'$	p evaluates himself
$p \rightarrow o$	p evaluates others
$p \rightarrow A$	p evaluates A
$p \curvearrowright A$	p selects or rejects A
$o \rightarrow A$	p perceives that o evaluates A
$o \curvearrowright A$	p perceives that o selected or rejects A
$p' \curvearrowright A$	p sees himself as having selected or rejected A
$p' \rightarrow A$	p sees himself as having evaluated A.

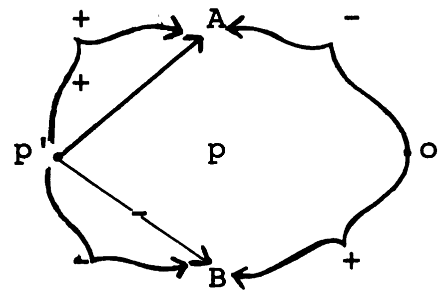
A particular diagram will be referred to as a choice structure and <u>balance</u> in such a structure will be defined as Cartwright and Harary define it in their formalization, i.e., all cycles must be counted and all cycles must be positive. It will further be assumed that on any step of the decision sequence, <u>only</u> those relationships can occur which maintain balance in the total structure for that point in time. Once p has made his initial choice he exchanges information with o and discovered that o's preliminary choice differs from his own . . . this will be called by Conner as <u>act-of-disagreement</u>.



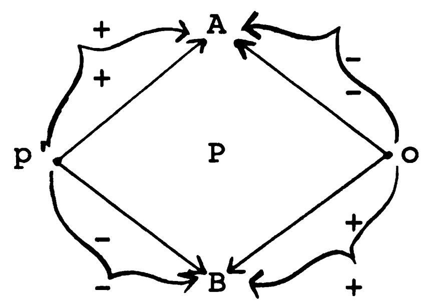
p positively evaluates alternative A and negatively evaluates alternative B

p selectes the alternative he positively evaluates and rejects and one he negatively evaluates

Figure 1.--Balance diagram of p selecting the alternative which he positively evaluates.



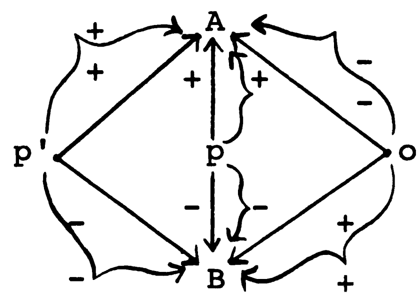
p receives the information that o has selected alternative B and rejected A . . . he sees himself as having selected A and rejected B



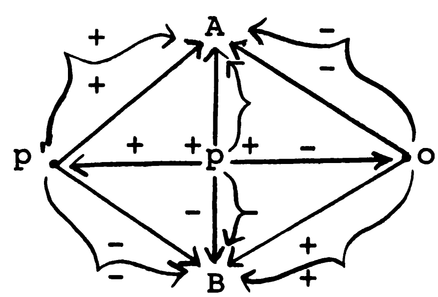
p associates the disagreement on choices with different evaluations of alternatives by himself and o

Figure 2.--Balance diagram of p inferring o's evaluation of alternatives.

Conner at this point notes that it is sufficient to state that p will always assign unit evaluations of persons or alternatives in a manner which maintains balance in his choice structure.

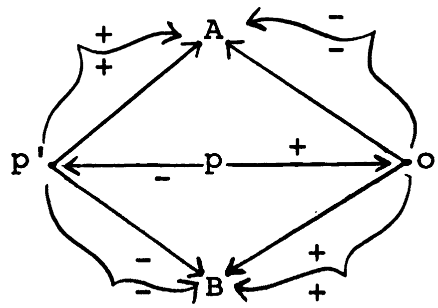


p positively evaluates and selects the same alternative he selected initially (and hence negatively evaluates and rejects the other alternative)

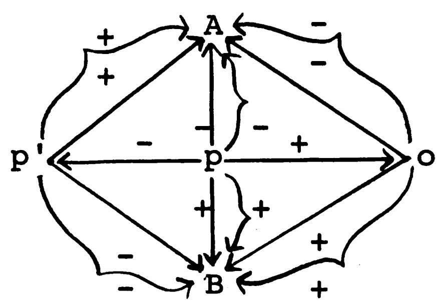


p, as a consequence of his evaluations of the alternatives, positively evaluates o, which balances the total structure

Figure 3.--Balance diagram of p assigning unit evaluations of persons after evaluating the alternatives.



p first assigns unit evaluations of persons by deciding he is wrong and o is right



As a consequence of his unit evaluations of persons, p positively evaluates and selects o's initial choice (he negatively evaluates and rejects his own initial choice)

Figure 4.--Balance diagram of p evaluating the alternatives after designing unit evaluations of persons.

In such a setup, the consequences of p's unit evaluations of persons, on any stage, is that the possibility then exists which did not exist previously for him to 'assign' states of C* (which denotes a change, the same as an Other response). Moreover, when p does 'assign' states of C the positively evaluated state of C will always be assigned to the person who was given the positive unit evaluation and the negatively evaluated to the person who is negatively evaluated. Stability is not problematical if p believes himself to be more competent than o and makes an S-response, or believes himself to be less competent and makes a C-response. This situation arises because p's unit evaluations of persons in the above-mentioned cases are consistent with his assignment of states of C. If, however, p believes himself more competent and makes a C-response, or believes himself less competent and makes an S-response, his unit evaluations of persons are inconsistent with his assignment of states of C. P thus less frequently makes responses which lead to inconsistent evaluations. And stability is primarily a function of a change in the way p interprets the unit evaluations of persons.

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*Assigning states of C occurs after each unit evaluation. A state of C is the same as an O-response. These states are assigned consistent with the maintenance of balance in the total structure.

With this brief synopsis of the formalization used by Conner concluded, I will next turn my attention to the balance diagrams as I used them which point up certain modifications and differences in interpretation. As in the original formalization, this system is composed of five elements, these being;

p' = p's perception of himself (analogous to an external self-evaluation),

p = the reference actor in the system, self,

o = other,

A,B = choice alternatives of the series of mutually exclusive binary choices.

This formalization will be composed of sentiments, unit relationships and a third component which can be termed 'meta-sentiments' in that this is a relationship positing p's view of himself as evaluating a particular alternative. And this relationship shall be designated by a broken or dashed line. A difference in interpretation between the two systems can be noted among one of the components, i.e., my interpretation of p'. Thus we have

$p' \longrightarrow p$ p's evaluation of himself, e.g., p's perception of himself is one of a particular level

$p \longrightarrow o$ p evaluates other

$p \longrightarrow A$	p makes a particular <u>initial</u> choice (either selecting or rejecting A)
$o \longrightarrow A$	p perceives o as making a particular <u>initial</u> <u>choice</u> (a choice always the opposite of p's choice)
$p \rightsquigarrow A$	p selects or rejects A on the final choice
$o \rightsquigarrow A$	p perceives (implicitly) that o selects or rejects A on the final choice, though the experimental design does not call for final choice feedback
$p' \dashrightarrow A,B$	p's views of himself evaluating A(B)

Differences thus do arise between interpretations of the two systems. In the [-+] and [+-] conditions, expections remain constant throughout the series of trials. However in the [++] and [--] conditions does expectation change with continuous disagreement? And does this change in expectation states follow any consistent pattern as in the [+-] and [-+] conditions? I would posit that any changes in expectations would vary across individuals and it would be difficult to isolate aggregate patterns. Even upon considering subjects who are team-oriented, it would be difficult to assess a consistent aggregate pattern of a resultant change in expectation state over the series of trials. What this is saying in relation to the balance diagram presented is that once manipulation is induced then the relationships between p' and p, and p and o are constant.

Thus we have,

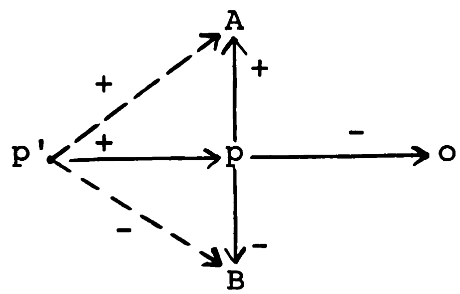


Figure 5.--(1) Based upon the manipulation induced in Phase I, p perceives himself ($p' \xrightarrow{+} p$) as having high ability and perceives o ($p \xrightarrow{-} o$) as having low ability (this expectation remains constant over the series of trials) and (2) p evaluates A and B, and selects A on his <u>initial choice</u>, (3) p views himself as positively evaluating A and negatively evaluating B.

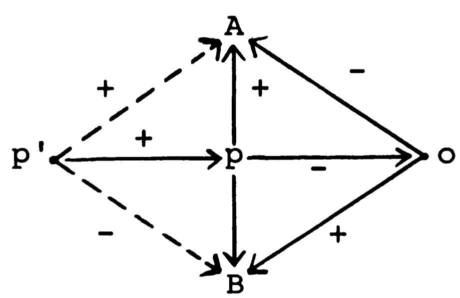


Figure 6.--(1) p receives information that o has positively evaluated and selected B (rejected A) on his <u>initial choice</u>. (2) An act of disagreement is created.

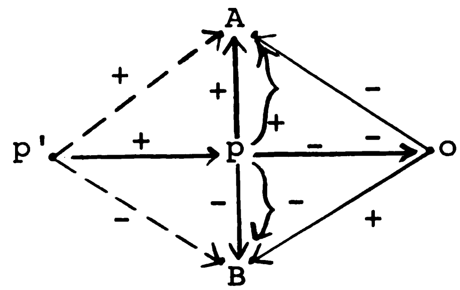


Figure 7.--(1) Given this act of disagreement outlined in Figure 6, a decision-making situation is thus created. (2) p reacts by selecting alternative A (rejecting B) on the <u>final choice</u>. (3) The system remains stable.

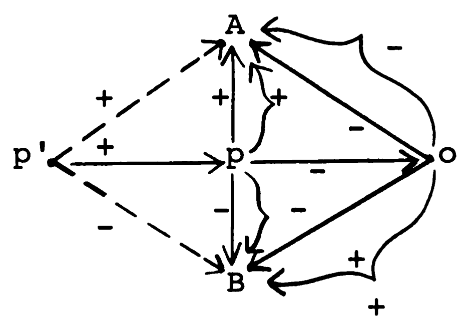
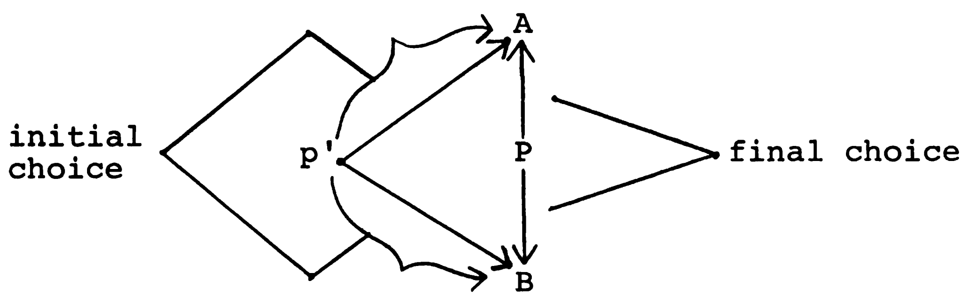


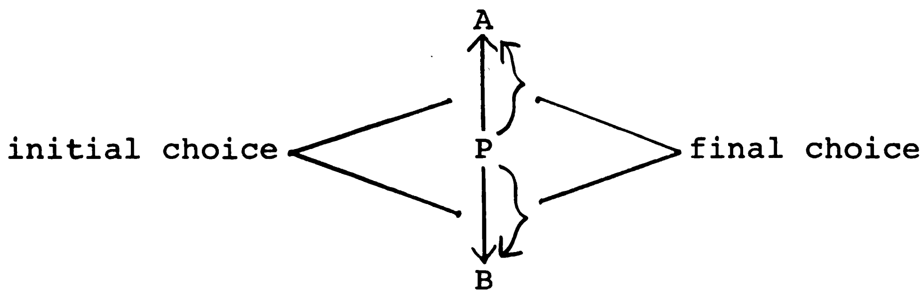
Figure 8.--(1) p implicitly perceived o as selecting B (rejecting A) on his <u>final choice</u>. (2) p thus perceives o as maintaining systemic stability also.

Thus Figure 8 is the complete system once the final choices are made by both p and o. In this system p does not actually perceive o's final choice. O's final choice is not communicated to p. However p's implicit perception of o's final choice revolves around the concept of systemic stability within o's system. P perceives o's quest for stability as being no different from his (p's) quest. This whole matter becomes more complex as we enter the arena of intra-individual and intra-systemic balance. Perhaps this is not a <u>true</u> model of reality, but it allows for analysis and resultant measurement which is a valid <u>approximation</u> of reality. At best these balance diagrams can only serve as approximations. And all attempts should be made to have such a measure approach with as great a degree of accuracy as possible, the actual situation. These diagrams serve to reflect the general phenomenon of concern, and attempts to define the system more precisely will only take us into the realm of individual psychology.

My system is thus (i) more condensed in that the choice structures are contained within the same sub-cycle. In the original system the initial/final choice structure is such,



whereas in my system,

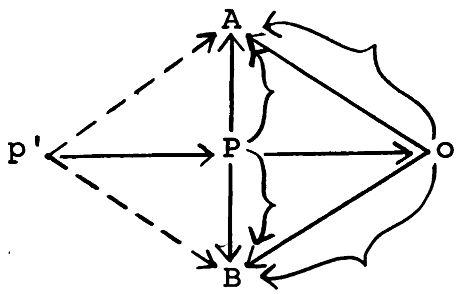


Also (ii) my system contains the final choice of o, which is a convenient device for more elaborate systemic interpretation, (iii) I have a different interpretation of p', and (iv) there is a constant relation between p', p and o which is a function of the manipulation induced in Phase I. Thus there are constant valences between particular components in the system, and one is not lost in the process of assigning variable states which may be more subjective and arbitrary than is demanded.

The latter diagrams constructed are thus more malleable in that there are fewer subjective variable relationships to consider, and they serve as a closer approximation to the actual state of nature. This enables one to isolate those relationships that do vary and to account for this variance which comes about with the help of a concept which mirrors the magnitude of balance in the total system. Here I am referring to the degrees of balance, b(G), which will be utilized in conjunction with the informal context (as it is now used) of tension to make ordering predictions.

Use of the Diagrams

With the four experimental conditions, [++], [+-], [-+] and [--], diagrams have been constructed and b(G) has been computed. And in such a system as this one,



there are seventy sub-cycles which go into computing b(G), where

$$b(G) = \frac{+c(G)}{c(G)}$$

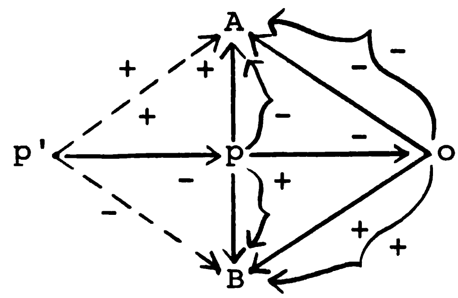
b(G) - degrees of balance,

where $0 \leq b(G) \leq 1$,

+c(G) - the number of positive cycles,

c(G) - total number of cycles.

An example of such a computation will be illustrated here in relation to the [+-] O-response situation,



the number of cycles are counted and we find,

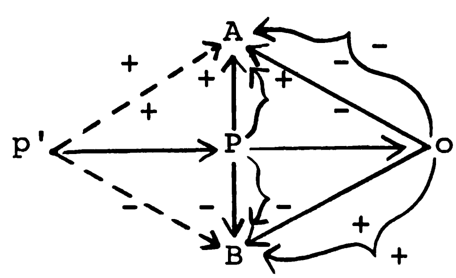
Cycle	Number of +	Number of -
2-cycles	2	2
3-cycles	6	6
4-cycles	20	10
5-cycles	12	12
Total	40	30

thus b(G) = 40/70 = .57.

These diagrams and the computation of b(G) will be explicitly used for ordering the cells in the stochastic matrix. And inherent in such a predictive scheme will be the notion of 'tension' as it will become more refined briefly, i.e., it will take on a more formal context as the mode of analysis requires.

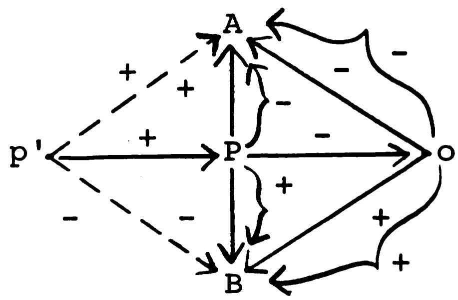
Next I will turn to an analysis of the individual systems beginning with,

(A) [+-]



the situation in which p makes an S response. In this situation, b(G) = 1.00 (where 1.00 = perfect balance), in that the system is locally balanced at p, i.e., every semi-cycle containing p is balanced. Thus, in the [+-] situation where p makes an S response, the system is balanced, i.e., there is very little tension. The fact that the system is perfectly balanced does not mean that p will not be prone to make an O response, although he will not do this too frequently. In doing this, he is attempting to keep the entire system in balance (under the assumption that he cannot be correct all of the time), whereas a string of S responses preserves intra-individual balance. This situation of balance is thus rewarding to p, an O response is punishing.

Where p makes an O response, we have,



in which b(G) = .57 and the system is imbalanced. This imbalance produces tension and p can alleviate this tension by making an S response on the next trial. Thus we have, S response: b(G) = 1.00

O response: b(G) = .57

$P(S \longrightarrow S)$, b(G) constant

$P(S \longrightarrow O)$, b(G) decrease

$P(O \longrightarrow S)$, b(G) increase

$P(O \longrightarrow O)$, b(G) constant

therefore a directional hypothesis based upon b(G) would be that,

$$P(O \longrightarrow S) > P(S \longrightarrow S) > P(S \longrightarrow O) > P(O \longrightarrow O).$$

In words this would mean that the probability of an S response on trial n+1 given an O response on trial n is greater than the probability of an S response on trial n+1 given an S response on trial n. These are conditional probabilities and they are a function of the balance in the system. Of course the subjects do not know the magnitude of balance in a system, they are only cognizant of the tension. And this tension arises due to the imbalance, i.e., the more balance, the less tension and the resultant pressure to change on the next trial is lessened.

Based upon these assumptions of balance then, a Markov process seems to be in effect where,

$$P(S_{n+1}/S_1, S_2, \ldots, S_n) = P(S_{n+1}/S_n)$$

thus the transition matrix in this instance would become,

$$
\begin{array}{cc} & n+1 \\ & \begin{array}{cc} S & O \end{array} \\ \begin{array}{c} S \\ O \end{array} & \left(\begin{array}{c|c} a & 1-a \\ \hline b & 1-b \end{array}\right) \end{array}
$$

where

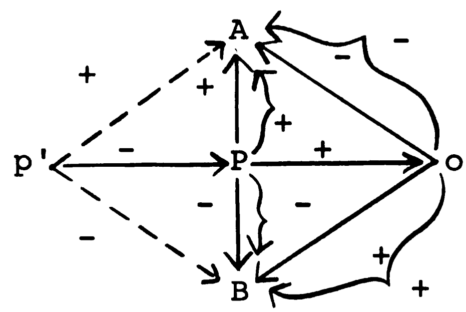
$P(S/S) = a$
$P(S/O) = b$
$P(O/S) = 1-a$, and
$P(O/O) = 1-b$

which is a stochastic matrix depicting one-step dependence.

Based upon the concept of degrees of balance, in the [+-] situation the magnitude of the balance in the system was determined. The magnitude was implicitly related to tension, i.e., the greater the degree of balance (the closer the system approached perfect balance) the less tension is there in the system and thus there is less pressure to alter one's choice on the next trial. One-step dependence is thus handled in relation to the degree of balance, and this magnitude serves as a key in attempting to understand and explain the divergence from independence in the original experimental data.

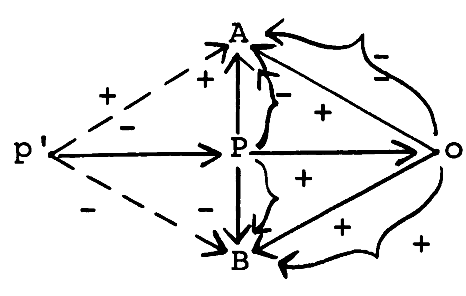
This interpretation of imbalance-produced tension is not in direct accord with Heider's theoretical propositions. For he states in one of his propositions that: (Tension states) "If a change is not possible, the state of imbalance will produce tension." The assumption in our system is that on <u>any one</u> trial the system may be imbalanced and this produces tension. This tension is carried over to the next trial, and the subject has the opportunity before him to restore balance (reduce the tension) depending upon the choice he makes (whether an S response or an O response). <u>So in essence the individual controls the system</u>.

(B) Much that was said regarding the previous situation can be repeated here, however we are more interested in the differences that result in this [-+] situation.



In this system, b(G) = .49. The system is imbalanced and this makes for tension on this trial. In other words, p by making an S response creates tension in the system and the intensity of this tension will have a bearing on his performance on the next trial.

Thus we have,



the situation where p makes O response. Here b(G) = .57 and the system is a little more in balance than with an S response. But the system is still imbalanced. There is a little less tension and p will be prone to make variable responses. The near equality of b(G) in both situations dictates that this situation will approach an independence process more so than the other three conditions. And in that b(G) in the two above systems are very similar, it would appear that the amount of tension in each would be similar. The subjects would not be capable of discerning such a negligible difference, thus it seems as if there should be an equal probability of S or O responses. However, from the observer's viewpoint (one which knows the exact magnitude of b(G) there would be a difference, slight though it may be. And this difference is some increment, Δ, which is a function of b(G), e.g.,

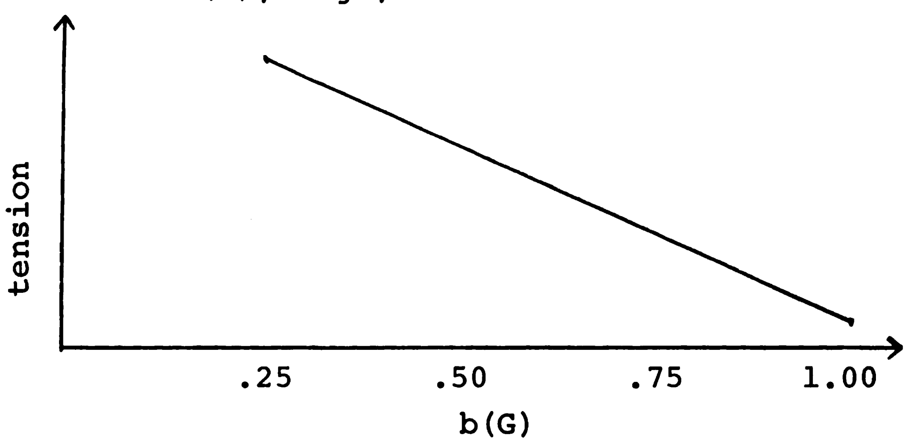
$$P(S/O) - P(S/S) = \Delta$$

where Δ is defined by b(G) in the S response system and in the O response system.

According to the "quasi-program" laid out in relation to ordering predictions, in the [-+] case $P(S \longrightarrow S) > P(O \longrightarrow S)$ and $P(S \longrightarrow O) > P(O \longrightarrow O)$, but the mathematics of matrices makes this an impossibility.

Thus it is to other sources that prediction in this case must be made, and I will go into this briefly.

The degree of balance, b(G), can thus be viewed as an indicator of the tension in the system, i.e., the greater is b(G) then the less tension is there in the system. Seemingly an inverse linear relationship can be posited between these two variables and I will concern myself with whether or not tension is in actuality a function of b(G), e.g.,

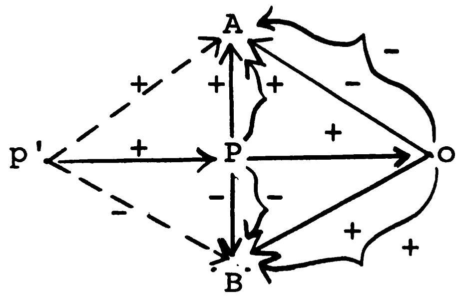


The attribution of values (beyond merely qualitative ones) to the dependent variable of tension presents a problem. For beyond being cognizant of the magnitude of b(G) in any one system, the quantitative aspect of tension cannot be discerned. Thus the function as it exists is a "loose" one in the sense that the independent variable is quantitative, while the dependent one is qualitative, e.g., a high amount of tension, etc. The function thus becomes defined upon observing the choice structure, i.e., the P(S) response on trial n+1 given an

O response or S response on trial n. That is, the variable of tension can enter the quantitative realm a postereori based upon assumptions made previous to verification. And in that such a function seemingly exists, for <u>each</u> value of b(G) there is a unique "value" attributed to the tension variable.

From here I will turn to,

(C) [++]

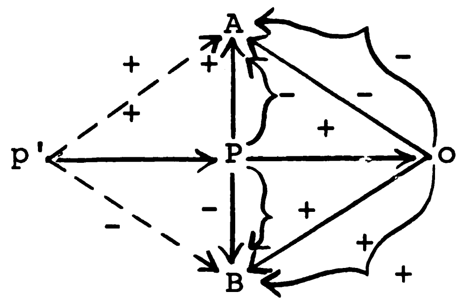


This is the system in which both p and o have high ability and p makes an S response. In this system, calculations indicate that b(G) = .71. Tension is thus in the system, but its force is not as great as in the [-+] situation and its force is less than in the [+-] situation. Thus it would be expected that P(S) follows this ordering

$$[+-] > [++] > [-+] ,$$

i.e., more S response in [+-], fewer in [++] and fewer still in [-+].

Upon looking at the system in which p makes an O response, we have



and calculations reveal that b(G) = .49. This system is thus in greater imbalance than is the previous one and this would lead one to expect that there would be more pressure to change on the following trial.

Thus we have,

S response: b(G) = .71

O response: b(G) = .49

and a directional hypothesis based upon b(G) would be that,

$$P(O \longrightarrow S) > P(S \longrightarrow S) > P(S \longrightarrow O) > P(O \longrightarrow O) .$$

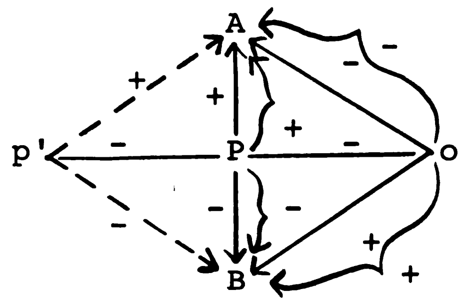
As stated previously, the subjects do not know the magnitude of b(G). They are only aware of the fact that tension is in the system and based upon the intensity of the tension, pressure ensues to alter one's choice on the next trial. Based upon b(G), the P(O) response can also be ordered between systems, such that

[+-] = [-+] > [++]

and these orderings would lead us to believe that predictions can be made between systems as to the probability of particular choices.

The final system to be considered is

(D) [--]



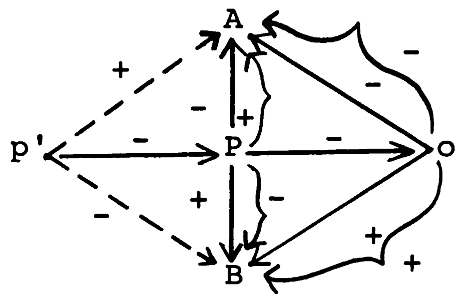
where p and o have low ability and in this situation, p makes an S response. As before, b(C) is computed and it is found to be equal to .66. By including this system in the between-system ordering procedure based upon b(G), we have (ordering according to the degree of balance),

[+-] > [++] > [--] > [-+]

which predicts that the probability of S responses follows the above ordering. In other words, there will be a greater number of S response in the [+-] situation than in the [++] situation, symbolically,

(S) response [+-] > SR[++] > SR[--] > SR[-+] .

Now it is necessary, as before, to turn to the situation where p makes an O response.



here b(G) = .53. Thus there is more tension in this system in that it is less balanced than is the S response case. We would therefore expect that p would be under more pressure to change his response on the following trial given an O response on trial n than he would if an S response were on trial n. Symbolically, we have,

S response: b(G) = .66

O response: b(G) = .53.

And it would be hypothesized that,

$$P(O \longrightarrow S) > P(S \longrightarrow S) > P(S \longrightarrow O) > P(O \longrightarrow O) .$$

Here I will also view the between-system ordering predictions based upon b(G). And they indicate that

$$OR_{[+-]} = OR_{[+-]} > OR_{[--]} > OR_{[++]}$$

It can thus be seen that my postulation hinges upon tension as being a function of b(G) in that b(G) indicates the degrees of balance in a system. And a state of imbalance produces tension which can and often is relieved on the following trial by the selection of a particular alternative. As noted before, the individual controls the system insofar as he has it within his power to ease the tension within the system, i.e., by making a choice which puts the system into a more balanced state. However, there is an asymptotic level of balance capable of being attained within each system as defined by b(G). And the individual is powerless to go beyond this limit, other than withdrawing from the situation entirely.

Thus particular propositions can be stated in relation to b(G) and tension as they provide an inverse functional relationship in the explanation of choice-structures in the balance diagrams.

Proposition I: An actor will tend to move to a state that is more balanced.

Proposition II: An actor will be more likely to move to a state that is more balanced, than from one state to another that has the same magnitude of balance.

Proposition III: An actor will not tend to move to an imbalanced state from a balanced one.

The exceptions to this latter proposition which do arise will be discussed in more detail later in relation to the topic of intra-systemic and intra-individual balance.

<u>Proposition IV</u>: An actor will be more likely to move between equal states of balance than from a balanced state to an imbalanced one.

This proposition states that an individual will be more likely to make a choice on the following trial which preserves the balance in the system, rather than making a choice on trial n+1 which will lessen the degree of balance in the system.

Given the stochastic matrix which indicates conditional probabilities,

$$\begin{array}{ccc} & & n+1 \\ & & \begin{array}{cc} S & O \end{array} \\ n & \begin{array}{c} S \\ O \end{array} & \left(\begin{array}{c|c} a & 1-a \\ \hline b & 1-b \end{array}\right) \begin{array}{c} 1.00 \\ 1.00 \end{array} \end{array}$$

then mathematically if $b \geqslant a$, then $1-a \geqslant 1-b$. That is <u>either</u> both of the top entries (a and 1-a) or both of the bottom entries (b or 1-b) cannot exceed <u>both</u> of the other entries, e.g., a situation where $b > a$ and $1-b > 1-a$ would be mathematically impossible in accordance with the mathematics of this stochastic matrix.

By viewing the matrices for each condition we can get a representation of what the function defined between b(G) and tension indicates in mathematical terms.

Thus we have,

[+-]

$$
\begin{array}{cc} & n+1 \\ & \begin{array}{cc} S & O \end{array} \\ n \begin{array}{c} S \\ O \end{array} & \left(\begin{array}{c|c} a & 1-a \\ \hline b & 1-b \end{array}\right) \end{array}
$$

where b > 1-a, and 1-a > 1-b, and b should be the largest entry in the matrix.

[-+]

$$
\begin{array}{cc} & n+1 \\ & \begin{array}{cc} S & O \end{array} \\ n \begin{array}{c} S \\ O \end{array} & \left(\begin{array}{c|c} a & 1-a \\ \hline b & 1-b \end{array}\right) \end{array}
$$

where b > a, and 1-a > 1-b. This ordering prediction violates the propositions as stated. But the internal inconsistency of the matrix is a function of the near equality of b(G) in both choice situations and an interpretation of this structure as being a reflection of intra-systemic balance at its height. For as the between system predictions pointed out, the P(S) response in the [-+] condition would be less than the P(S) response in the other three situations. This is a result of the manipulation induced which imposes more of an intre-systemic balance proclivity to Actor in the [-+] condition, and this means that entry 1-a will be the largest one in the matrix. And if we have a situation where 1-a > 1-b, then b must be greater than a. This situation is a hybrid in the sense that it does not follow from the propositions, but rather is a function of a team-orientation on the part of p (Actor), between system ordering predictions and mathematical induction.

[++]

$$\begin{array}{cc} & n+1 \\ & \begin{array}{cc} S & O \end{array} \\ n & \begin{array}{c} S \\ O \end{array} \left(\begin{array}{c|c} a & 1-a \\ \hline b & 1-b \end{array}\right) \end{array}$$

where b > a, and 1-a > 1-b and b should be the largest entry.

[--]

$$\begin{array}{cc} & n+1 \\ & \begin{array}{cc} S & O \end{array} \\ n & \begin{array}{c} S \\ O \end{array} \left(\begin{array}{c|c} a & 1-a \\ \hline b & 1-b \end{array}\right) \end{array}$$

where b > a, and 1-a > 1-b.

This attempt to utilize the formalization of balance theory to account for one-step dependence thus gives rise to a number of assumptions to be stated in more precise terms. And at this point I will state these assumptions in a more formal manner.

Assumption I: The dependent trials process is a function of the tension inherent in the structure of the situation.

Assumption II: Given imbalance in the system, there is the opportunity to restore balance on the following trial, i.e., a one-step dependence trials process.

Assumption III: Tension is a function (an inverse linear one) of the degree of balance, and given the notion of transitivity we have that the dependent trials process is a function of the degree of balance.

From these more all-inclusive assumptions we now move to assumptions involving specific response situations. Thus,

Assumption IV: In the [+-] situation, $P(S/O) > P(S/S)$ and $P(O/O) > P(O/S)$

which is contrary to the original assumption of independence where,

$$P(S/O) = P(S) \text{ and } P(S/S) = P(S)$$

because if independence is assumed, our formulation says that $P(S) > P(S)$, which is contradictory.

Assumption V: In the [-+] situation, $P(S/O) > P(S/S)$ and $P(O/O) > P(O/S)$.

Assumption VI: In the [++] situation, $P(S/O) > P(S/S)$ and $P(O/O) > P(S/S)$.

Assumption VII: In the [--] situation, $P(S/O) > P(S/S)$ and $P(O/O) > P(O/S)$.

Thus in <u>all</u> of the conditions we have the situation hypothesized that P(S/O) > P(S/S) and P(O/S) > P(O/O).

<u>Assumption VIII</u>: Balance is a reward and imbalance is a cost.

These assumptions based primarily upon systemic balance provide a possible explanation for the one-step dependence. They also indicate the relative magnitudes which a particular dyad of responses will assumed relative to another distinct dyad, e.g., P(S/O) > P(S/S) in the [++] situation. <u>These predictions are thus situationally specific</u>. By looking at the equal control data from the Stanford studies we have,

[+-]

$$
\begin{array}{cc} & n+1 \\ & \begin{array}{cc} S & O \end{array} \\ n \begin{array}{c} S \\ O \end{array} & \left(\begin{array}{c|c} .76 & .24 \\ \hline .84 & .16 \end{array}\right) \end{array}
$$

where b > a > 1-a > 1-b, which holds with predictions (Assumption IV).

Turning now to,

[-+]

$$
\begin{array}{cc} & n+1 \\ & \begin{array}{cc} S & O \end{array} \\ n \begin{array}{c} S \\ O \end{array} & \left(\begin{array}{c|c} .39 & .61 \\ \hline .50 & .50 \end{array}\right) \end{array}
$$

where 1-a > b + 1-b > a, which holds with predictions (Assumption V). The salience of preserving systemic balance (i.e., p is cognizant of o's higher ability and an O response is "rewarding" to p) would outweigh the desire to maintain ones' integrity (an S response viewed as a cost). As noted, there is not perfect balance in the system where p makes an O response, for b(G) = .57 and this divergence from perfection in the system could effect p's response to tension.

[++]

$$
\begin{array}{cc} & n+1 \\ & \begin{array}{cc} S & O \end{array} \\ n \begin{array}{c} S \\ O \end{array} & \left(\begin{array}{c|c} .63 & .37 \\ \hline .76 & .24 \end{array}\right) \end{array}
$$

where b > a > 1-a > 1-b, which holds with predictions (Assumption VI).

One-step dependence is thus seen to be in existence in the above three conditions, but the formalization of balance theory as a predictive device is not stringent throughout in that a 're-interpretation' or hybrid situation had to be posited in order to account for the matrix ordering in the [-+] situation.

Before delving into a consideration of a possible explanation, I will turn finally to the

[--]

$$
\begin{array}{cc} & n+1 \\ & \begin{array}{cc} S & O \end{array} \\ n \begin{array}{c} S \\ O \end{array} & \left(\begin{array}{c|c} .63 & .37 \\ \hline .71 & .29 \end{array}\right) \end{array}
$$

where b > a > 1-a > 1-b. This situation is also consistent with the predictions (Assumption VII).

Thus the ordering predictions are met upon looking at the Stanford equal control data. Now let us take a retrospective view of the original theory and the language of the theory. What we come across is Homans' conception of cost and reward, which he uses rather ambiguously despite attempts otherwise through a quasi-equation, i.e., profit = reward - cost. By incorporating these "concepts" into my explanation, it is seen by Assumption VIII that the notion of balance is a cost. But at what level or to what meaning of balance is reference being made? Granted, tension leads to imbalance within the system, but there are two systems at work. Perhaps there needs to be a stricter definition of balance in relation to p and to the system in its entirety.

CHAPTER III

BALANCE/IMBALANCE: SYSTEMS AT WORK

Within the realm of social psychology the concern is with the interrelated efforts of an individual upon an aggregate (with all the attendant structurings), i.e., how a person x effects and is effected by a group Y (attributing syntality to the group). Experimental social psychology makes the focus even sharper and this is what Erving Goffman refers to as 'focused gatherings' and what Hans Zetterberg refers to as artificial situations. In these situations, variables to be studied are isolated with utmost care and there is the attempt to eliminate extraneous variables of no particular interest. What seems to have arisen in the Camilleri-Berger laboratory experiment which the theory did not take account of was the two levels of systems within which cost/reward are defined. In looking at the notion of balance, I feel that it is essential to consider (a) intra-systemic balance, and (b) intra-individual balance. Is there a threshold beyond which an individual sacrifices his integrity in order to work for group harmony (in terms used here, harmony = balance). For it is seen that in all systems <u>except</u> the [-+] that b(G) in the S response systems is greater.

TABLE 1

+-	S response: O response:	b(G) = 1.00 b(G) = .57	.43
++	S response: O response:	b(G) = .71 b(G) = .49	.22
--	S response: O response:	b(G) = .66 b(G) = .53	.13
-+	S response: O response:	b(G) = .49 b(G) = .57	-.08

What this says is that the degree of balance is greater with an S response in all systems, except the [-+] one and even here the difference is not that large. Thus individual integrity seems to be a key concern. Seemingly there is more balance in a system given an S response, indicating a great reluctance to make an O response (in that there is more tension). And even in a situation where it would be expected that individual x would tend to make more O response([-+]) the difference in tension in the system is not great. Even perceptibly so, the [-+] O response situation has less tension and in making this choice the individual has moved to considerations of intra-systemic balance, i.e., his interest is in preserving balance in the system at the expense of 'balance within himself.' The other systems indicate Actor preserving intra-individual balance, and in these cases we would expect a greater number of S responses. At this point I am not referring to conditional probabilities, but rather S responses over a sequence of trials.

This is important in the sense that the [-+] case is the only one 'contrary' to the propositions. Thus this seems to be the system where intra-systemic balance is more a concern because p perceives himself as having low ability and o as having high ability. Therefore he succumbs to the idea of his 'wrongness,' and thus works for the group, i.e., he is more team-oriented than what is seemingly the case in the other situations, despite experimental instructions.

As was stated earlier, it was assumed that balance is rewarding to actor and imbalance is punishing (i.e., tension-producing). The nature of the data indicates that perhaps this is not true, or else the multitude of ramifications indigenous to costs and rewards are not fully understood. This seems to imply that the notion of a cost in relation to the system needs to be defined more specifically, as does the notion of reward. For in some instances it seems as if what we view as a cost (e.g., an O response in the [+-] situation) may in actuality be viewed as a reward by the actor (he believes he cannot be correct all of the time, so he makes an O response in order to preserve intra-systemic balance). Thus it is that the notions of intra-systemic and intra-individual balance are operative on each trial and we can possibly infer from overt acts the particular type of systemic balance that the individual was attempting to attain or preserve. Attaching probabilities to being in one or the other 'balance-predispositions' would be a function of b(G) in relation to each alternative (the system as defined by the choice of a particular mutually exclusive alternative), the preceding decision and a cost/reward matrix defined by some subjective means. This model of behavior would involve assumptions similar to Cohen's* conformity model in that one would be able to derive probabilities by observing which state an actor was in. This paradigm would be more inclusive in that it would incorporate the cost/reward notions as varying within and between experimental situations. Here the main concern has been with balance at these two levels and asymptotic points beyond which particular states will not be sacrificed.

One-step dependence is thus a reality in the data and here I attempted to account for this dependence using the formalization of balance theory and the use of a key

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*Bernard P. Cohen, Conflict and Conformity: A Probability Model and Its Applications. Cambridge, Mass.

idea from this theory, that of the degrees of balance b(G). The dependence was explained, but in so doing we were swept into another realm of concern which transcended my original intentions, i.e., the idea of intra-individual and intra-systemic balance. But this realm must be considered, for it may serve as a key to unlock the mystery behind the entire theory.

CHAPTER IV

CONCLUSION

The work done here was an attempt to account for the dependence process generated by the Camilleri-Berger experimental design. Perhaps a change in this design would lead to the generation of data more in accordance with the original model and theory. However, the concern in this paper was with explaining why a dependence process did result. Crucial to this explanation is the formalization of balance theory and one of its key components, that of the degree of balance within a system.

Thomas L. Conner in his M.A. thesis raised a crucial issue when he stated that the structure of the (experimental) situation itself precludes an independence process. For inherent to this structure is the concept of tension. Tension was posited in my work as a function of the degree of balance. And this inverse linear function served to order predictions both within and between systems.

It was found that through the utilization of such a function, the ordering predictions did hold. The only discrepant situation was that of the low-high condition.

The ordering predictions as made in this condition moved beyond the functional interpretation into the realm of intra-systemic and intra-individual balance. This involved a transcendance which stamps the dependence process as a reality while at the same time it calls for a further analysis of the meaning of balance. Such an analysis must delve more deeply into the idea of a cost-reward system as a function of intra-systemic and intra-individual balance. Such a function would have to consider every conceivable individual as well as systemic 'pre-disposition.' For it will only be through a thorough grounding of the intra-individual and intra-systemic levels that a design can be constructed which will indeed be an independence process. The inability to make this necessary distinction between the two levels of balance further confused the original theoretical verification.

Further implications of such an effort could possibly involve research studies in the area of 'socio-existential' concerns. What I am alluding to here is the existential idea on the part of an individual of his own unique worth. This embodies an 'I am my worth' concern which moves beyond the 'looking-glass self' and 'we-ness' ideas spoken of by George H. Mead and C. H. Cooley. This 'I-ness' is revealed through the between-system ordering predictions. It was seen that in every condition except the low-high there were more S-responses.

There was more of an intra-individual emphasis. This was despite experimental instructions which set up a team situation. What this is saying is that every condition except the low-high approached the high-low condition in which the self was more worth preserving than was the group. Individual integrity was seemingly the principal concern, and it would not be sacrificed at the expense of intra-systemic balance. In a sense then, the actors 'existentialized' themselves to the point where a series of continuous disagreements could not convince them of their 'wrongness.'

Such an individual response cannot allow for an independence process and this is where the within system ordering predictions come in. The heuristic value of this intra-individual emphasis is abundant. Contemporary America is the scene of traditional group-stripping in which there is at least the overt pronouncement of 'doing my own thing.' This implies a discarding of the conception of a larger level of conformity and the construction and preservation of intra-individual balance is becoming a more potent force. Heuristic implications exist not only in the social psychological[17] realms of conformity, identity and decision-making studies but also in the area of mental health. Such an interest enters in the realm of mental health insofar as personality decomposition is concerned. This involves studies of breakdowns say in combat situations and everyday tension-producing situations. Generally it is found that loyalty to a group[18] is the last defensive layer surrendered prior to a total breakdown. Such traditional intra-systemic loyalty is overtly declining, yet is the incident of mental breakdown increasing?

Questions such as these can perhaps be explored and answered. I see these ideas of intra-individual and intra-systemic balance as having far-reaching heuristic value in contemporary society. What is needed is a refinement of these ideas to the point that they are malleable concepts. The inability to account for and thus define and refine these ideas rendered the Camilleri-Berger model and theory invalid in relation to the experimental design.

NOTES

1. A mention of a few of such studies would include, Harold Berman, "Probability, Statistical Decision Theory and Accounting," Accounting Review, 1962. v. 37, pp. 400-405; N. T. Feather, "Success Probability and Choice Behavior," Journal of Experimental Psychology, 1959. v. 58, pp. 257-266; William S. Vickrey, "Utility, Strategy and Social Decision Rules," Quarterly Journal of Economics, 1960. v. 74, pp. 507-735; R. T. Feather, "Subjective Probability and Decision under uncertainty," Psychological Review, 1959. v. 66, pp. 150-164; Ernest W. Adams and Robert F. Fagot, "A model of Riskless Choice," Behavioral Science, 1959. v. 4, pp. 1-10; Ward Edwards, "Utility, Subjective Probability, Journal of Conflict Resolution, 1962. v. 6, pp. 42-51; Sidney Siegel, "Level of Aspiration and Decision making," Psychological Review, 1957, v. 64, pp. 253-262. Subjective probability arises when a decision-maker is ignorant of the statistical frequencies of events in a particular situation, yet he still tends to behave as though he has assigned numerical probabilities to the events.

2. Adams, Ernest W. and R. F. Fagot in "A model of Riskless Choice," Behavioral Science, 1959, v. 4, pp. 1-10. Their model provides a method of measuring 'subjective value' or 'utility' which under some conditions leads to an ordered metric scale and under still more restrictive conditions to an interval scale of utility (a cardinal utility function).

3. Siegel, Sidney, "Level of Aspiration and Decision Making," Psych. Review, 1957, v. 64, pp. 253-262.

4. Santo F. Camilleri and Joseph Berger, "Decision-making and Social Influence: A Model and an Experimental Test," Sociometry, 1967, v. 30(1), pp. 365-578.

5. Two trials (of the same or different experiments) are independent if the outcome of one does not effect the outcome of the other. Symbolically, then, two events in the same probability space are independent if and only if $P(AB) = P(A)P(B)$. An

independence process is thus one that yields a series of independent trials.

6. A finite Markov chain is a stochastic process which moves through a finite number of states, and for which the probability of entering a particular state depends only on the last state occupied. Frcm John G. Kemeny and J. Laurie Snell, Finite Markov Chains.

7. Samuel Goldberg. Introduction to Difference Equations. p. 104.

8. Thomas L. Conner, "First Order Dependence and Self-other Expectation Theory." Masters thesis, Stanford University, Oct. 1963.

9. Fritz Heider, "Attitudes and Cognitive Organization," Journal of Psychology, v. 21, pp. 107-293.

10. Dorwin Cartwright and Frank Harary, "Structural Balance: A Generalization of Heider's Theory," Psych. Review, v. 63 (Sept. 1956), pp. 277-293.

11. Joseph Berger and J. Laurie Snell, "A Stochastic Theory of Self-other Expectations," Technical Report, under the auspices of the National Science Foundation Grant c-13314, Dept. of Sociology, Stanford, Calif., Feb. 1961.

12. Joseph Berger, et al., Types of Formalization, p. 116.

13. An experiment which has only two possible outcomes is called a Bernoulli trial. In an n independent Bernoulli trials process, the word 'repeated' is meant to indicate that the probabilities of success and failure remain the same throughout the trials. The natural generalization of the notion of independent Bernoulli trials is the notion of Markov dependent Bernoulli trials. For further exposition, see Emanuel Parzen, Modern Probability Theory and Its Application, Chapter 3.

14. Ibid., Parzen, p. 100. (The parentheses are my own).

15. A matrix is defined as stochastic if the sum of the entries in any row is equal to one. A matrix is defined as doubly stochastic if in addition the sum of the entries in any column is equal to one.

16. Given two events, A and B, by the conditional probability of the event B, given the event A, denoted by P(B/A), we mean intuitively the probability that B will occur, under the assumption that A has occurred. In other words, P(B/A) represents our reevaluation of the probability of B in the light of the information that A has occurred. For further exposition see Parzen, Chapter 2.

17. See Jan Hojda, "Ambivalence and Social Relations," Sociological Focus, winter 1968, vol. 2(2). pp. 21-26; Erving Goffman, "Alienation from Interaction," Human Relations, 10(1957), pp. 47-59; Robert K. Merton and Elinor Barber, "Sociological Ambivalence," in Sociological Theory, Values, and Sociocultural Change. New York: The Free Press of Glencoe, 1963, pp. 91-120.

18. For example, see; Maj. R. Sobel, "Anxiety-depressive Reactions After Prolonged Combat experience--the old sergeant syndrome." Bull. U.S. Army Fed. Dept., Combat Psychiat. Suppl., Nov. 1949, pp. 137-146. Sobel found in studying the eventual breakdowns of the army personnel who had been most resistant to personality decomposition that such individuals seemed to have been protected by five 'defensive layers.' These were surrendered progressively in the face of too severe stress and threat. Distant ideals like 'democracy' and 'the four freedoms' went first. Loyalty to the group was the last to be given up. Pride in self was the second-to-last thing given up.

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