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STRUCTURING EXPERIENCES FOR INTERNAL OR EXTERNAL
ATTRIBUTION OF CONTROL OVER REINFORCEMENT: THE
INTERACTION OF REINFORCEMENT CONTINGENCY AND
SITUATIONAL CONSTRAINT

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STRUCTURING EXPERIENCES FOR INTERNAL OR EXTERNAL ATTRIBUTION
OF CONTROL OVER REINFORCEMENT: THE INTERACTION OF
REINFORCEMENT CONTINGENCY AND SITUATIONAL CONSTRAINT

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I. INTRODUCTION

In a given situation, a person may feel personally in control of, or responsible for, any reinforcements he or she receives, or the cause of reinforcement may be seen as lying outside personal control, perhaps in a more powerful person, in chance, or destiny. These perceptions of the source of reinforcement received in a particular situation are called internal or external attributions of control over reinforcement. Situational variables, as well as characteristics of the person, influence the location of the attribution on the internal-external continuum. In this paper, two aspects of experience which determine the attribution of control over reinforcement in specific situations are suggested: reinforcement contingency, and constraint. (Constraint is defined as the lack of resources to engage all the behavior-reinforcement sequences which a person associates with the situation.) An experiment designed to examine the effect of varying contingency and constraint, on attribution of reinforcement control to internal or external sources, is described, and the results reported.

Julian Rotter proposed in 1954 that situational attributions of control are partly determined by an individual's generalized expectancy for internal or external control of reinforcements; and that individuals may be characterized by their position on a dimension of internal to external generalized expectancy. Such a generalized expectancy, hereinafter referred to as locus of control (Rotter's term), would operate to determine attribution of control in a given situation to
the extent that the cause of the reinforcement was ambiguous. Rotter's model of the ontology of locus of control considers locus of control the product of a series of experiences in which control is predominantly attributed either to internal, or external, causes. The design of the experiment referred to above permitted an examination of the relationship between model of the ontology of locus of control considers locus of control the product of a series of experiences in which control is predominantly attributed either to internal, or external, causes. The design of the experiment referred to above permitted an examination of the relationship between attributions and locus of control.

The organization of the paper is as follows: first, a discussion of the constructs attribution of control (Section II) and locus of control (Section III), followed by a model of the process by which an individual acquires his internal or external orientation (Section IV). Section V addresses the situational determinants of reinforcement control attribution; Section VI, the definition and elaboration of concepts used in this study; the research hypotheses are stated and the experiment is described in Section VII. The results of the experiment are reported in Section VIII. A discussion (Section IX) is followed by a summary and conclusion in Section X.
II. ATTRIBUTION OF CONTROL

Over the past twenty years, a considerable volume of theory and research has addressed the meaning, antecedents, and consequences of attributions of control. Elucidation of the concepts involved, and comparison of research, are hampered by the proliferation of vocabularies which seem tantalizing similar in referents, but frustratingly distinct or imprecise in definition. Compare, for example, the concept(s) of 'volition' (Brehm and Cohen, 1959), used to those similar constructs which have been relatively precisely defined by other authors.

The importance of attributing control internally or externally has been demonstrated in a number of different areas. Perhaps Seligman's 'earned helplessness' experiments are among the best known: Seligman, in a series of experiments (summarized in Seligman, Maier & Solomon, 1969) demonstrated that dogs subjected to unavoidable shock show extreme resistance to learning avoidance behavior in subsequent experiences with contingent shock. Seligman also showed that dogs can be 'inoculated' (by prior experience with avoidable shock) so that this resistance to learning does not follow exposure to unavoidable shock. Similar results have been reported with rats (Mower & Viek, 1948; Richter, 1959). These results have been widely interpreted as evidence of the deleterious effects of lack of control (Lefcourt, 1976; Mower, 1950; Wortman & Brehm, 1975) and extrapolated to human cognitive processes. Less well known, perhaps, are subsequent experiments, for instance Langer's work with humans. Langer and her colleagues were able to reduce stress
(measured by self-report, ratings by nurses, and the amount of medication requested post-surgery) in surgical patients, by providing brief training in cognitive control theory and techniques (Langer, Irving & Wolfer, 1975). Langer and Rodin (1976) manipulated perceptions of control over the environment among residents of a geriatric institution by varying the verbal messages given to the elderly by an administrator, and showed remarkable changes in ratings (by 'blind' personnel) of alertness, activity, and satisfaction. The relevance of attributions to learning has not been explicitly investigated, but educationists writing about alternative schools often seem to describe open, or free schools as giving children more control over the learning process, and to assert that when children perceive themselves as controlling their academic life, they are more motivated to achieve, happier, and more likely to transfer classroom learning to extracurricular areas (Kozol, 1967; Silberman, 1971; Stone, 1974; Wright & Ducette, 1976). Ude and Vogler (1975), studying perceived correlation, asked adult subjects to rate the control they felt they had over sequences of flashing lights, which were actually contingent on a button-pushing response. Subjects who perceived that their responses controlled the sequence learned to predict the sequence faster than unaware subjects. Dweck (1975) demonstrated the effectiveness of teaching internal attributions for success and failure on children's subsequent persistence after failure. While internal attributions are not, of course, appropriate in all situations, it would seem that in many situations, unrealistic external attributions are likely to be made, to the detriment of the individual. A knowledge of the conditions under which attributions will be internal or external would permit the
restructuring of certain experiences, for instance in educational or medical settings, to make more salient the appropriate, facilitative attribution.
III. LOCUS OF CONTROL

The construct of locus of control originated in response to experimental evidence that subjects aware of the contingency of reinforcement on their behavior responded differently than subjects who did not perceive a consistent relationship between their behavior and reinforcement (Rotter, 1966). Phares (1957) hypothesized that differing histories of reinforcement would produce individual differences in tendency to perceive reinforcements as due to internal or external causes. He developed the first scale for measuring such a tendency, and it was by refining this scale that Rotter constructed his widely accepted I-E Scale which places subjects on a continuum from external to internal locus of control. Externally controlled people are those who believe the reinforcements in their lives depend on chance, fate, or the actions of powerful others; internals tend to perceive their reinforcement schedules as responsive to their own efforts, or to relatively permanent personality characteristics, according to Rotter (1966).

Locus of control as a personality variable has proved to be an immensely popular and predictive variable in recent research. Reviewers (Joe, 1971; Lefcourt, 1972; Prociuk and Lussier, 1975) cite literally hundreds of studies involving locus of control. Variables associated with internality are generally indicators of positive adjustment while the variables associated with externality are often maladaptive (Sherman, 1973). Consistent with this generalization are findings linking locus of
control with mental health (Abramowitz, 1969; Tiffany, 1967) suicide proneness (Williams and Nickels, 1969), obesity (Snow & Held, 1973), and delinquency (Tuft & Dana, 1973) among other relationships. Internally oriented people tend to seek out task relevant information more often and utilize it better than those with external orientations (Davis & Phares, 1967; Seeman & Evans, 1962). In studies of resistance to con­formity, external subjects tend to conform more than internals in response to persuasion or social pressure (Crown & Liverant, 1963; Sherman, 1973). The relationship between locus of control and learning as measured by school achievement is complicated by various interacting variables but Coleman (1969) found it was the best predictor of school achievement among disadvantaged children, with the more internal children having higher achievement scores. Increasing age, and higher SES, are each consistently associated with greater internality (Battle & Rotter, 1963). Thus a large body of research attests to the usefulness and appeal of the locus of control construct.

The I-E scale developed by Rotter to measure locus of control orientation has been used in most of the investigations to date (Prociuk and Lussier, 1975), and is associated with the most substantial body of research. Nevertheless, in the decade since Rotter published the I-E scale, many other measures have appeared in the literature, and a few have shown respectable psychometric properties and predictive validity in their use so far. These alternative measures seem to have been most frequently inspired by rejection of the unidimensionality of the Rotter scale. Rotter himself identified only one major factor in the I-E scale (1966). However other factor analyses have identified varying
numbers of factors (Gurin, Gurin, Lao, & Beattie, 1969; Mirels, 1970).
Several researchers have objected on theoretical grounds to a uni-
dimensional locus of control construct, as well. Levenson (1972)
developed a scale based on her belief that a tendency to perceive
reinforcements as under the control of powerful others should have
different effects on behavior than a belief in chance or fate control.
H. L. Mirels (1970) hypothesized two areas within which expectations
operate independently: personal events, and political events. He
obtained by factor analysis two subscales of the I-E scale, which he
suggested measure locus of control in the personal and political areas.
Collins (1974) suggested that two separate dimensions are confounded in
the I-E scale: a dimension of predictability, and a dimension of
situational (unstable) versus dispositional (stable) attributions. Rotter
(1975) discussed the issue of dimensionality in a theoretical paper and
concluded that factor analyses or new multi-factor measures may be use-
ful for predicting specific behaviors for which they have greater
predictive validity than total I-E score.

Another motivation for new scales has been a desire for increased
simplicity in administration, or for suitability for different popula-
tions (Crandall, Katkovsky, & Crandall, 1965; Nowicki & Strickland,
1973). The Nowicki-Strickland (N-S) scale, developed as a scale suitable
for children, has some advantages over the I-E scale. In its construc-
tion, items were written to describe reinforcements related to several
motivational areas such as affiliation, achievement, and dependency.
Item analysis concentrated on inter-judge agreement on direction of
scoring and on discrimination between levels of academic achievement.
(with IQ controlled), and age levels. As compared to Rotter's I-E scale, the N-S scale requires lower reading ability (fifth grade level), does not sample macro-level (political or social) expectancy, and has shown insignificant correlation with a measure of social desirability (Children's Social Desirability, Crandall et al., 1965). Further, the format (a yes/no response to each question) avoids some of the problems of Rotter's forced-choice alternatives, which have been criticized on several grounds (lack of bipolarity, unequal variability, etc.) (Collins, 1974). An adult version of the N-S scale is also available.

Correlations between the Rotter and N-S scales are significant but not high ($r = .49 - .61$) (Nowicki & Strickland, 1973). The I-E dominates the literature as the classic measure of general locus of control expectancy; however, in specific research situations, consideration of alternate scales or of relevant factors of the I-E scale seems advisable. For the present study, Mirel's division of the I-E scale into subscales measuring personal versus political 'focus' of control is particularly appropriate, since the proposed research does not address perceptions of political or social control. The N-S scale is also employed due to its lower social desirability bias, its concentration on personal versus macro-level content, and also to further investigation of the relationship between the two scales.
IV. DEVELOPMENT OF LOCUS OF CONTROL

Most frequently, locus of control orientation is viewed as the product of a history of experience in reinforcement situations. By the principles of generalization, we would expect that if control of reinforcement in one situation is attributed to internal (or external) sources, then in a new situation with similar stimulus cues, there would be an expectancy for similar sources of reinforcement; i.e., the expected attribution would generalize to the new situation to the extent that the stimulus cues are similar. Julian Rotter, referring not specifically to locus of control expectancy but to any type of expectancy (e.g., expected probability of reinforcement), writes "Expectancies in each situation are determined not only by specific experiences in that situation but also, to some varying extent, by experiences in other situations that are viewed as similar." (1975, p. 57). If an individual has attributed control to internal sources repeatedly, in a wide variety of situations, a relatively consistent generalized expectancy for internal control in new situations will result; that is, the individual's locus of control will be internal. If, on the other hand, past experiences are predominantly characterized by a perception of lack of personal control over reinforcement, locus of control orientation will be more external.

There are other theoretically reasonable and interesting explanations of an individual's locus of control: modelling, or a history of reinforcement for verbalizing a certain orientation, for instance. These alternatives have received less attention. Probably a complete
explanation of locus of control development would require inclusion of all these alternatives, but the present study is restricted to consideration of the influence of histories of experienced attributions on locus of control.

If it is developed as a product of past experiences, presumably locus of control changes throughout life in response to new experiences. Furthermore as Lao (1973) found in a study of retrospective reports of life experiences, more recent experiences dominate less recent ones in influencing control orientation.

Several attempts have been made to change locus of control scores by providing specific experiences of internal or external control, many reporting some degree of success. Reimanis (1971) reports success in increasing internality of ten first and third graders compared with ten controls by encouraging teachers to adopt and make explicit individual reinforcement contingencies in the classroom as well as to verbally point out consistent contingencies already present. Several problems restrict the usefulness of Reimanis' study; the extremely small number of subjects limits confidence in the findings; no measurement was made of actual changes in teacher behavior, or of the children's actual attributions in the classroom; and the teachers were specifically instructed to pay extra attention to the experimental children, making plausible a substantial Hawthorne effect. McArthur (1970), with a flair for serendipity, measured locus of control scores of Yale students immediately following the publication of military draft priorities established by lottery. He found that students who thus by good luck escaped the draft were more external than those whose draft priority was
high (McArthur assumed that all the men had previously had a high
expectation of being drafted before the lottery so that the assignment
of a high priority did not alter their expectations and hence did not
affect their locus of control); and more external than a similar
'control' group of students measured a year earlier. While suggestive,
this research is not conclusive: for example, the untested post hoc
explanation for the lack of change by the 'bad luck' group, and the
possible non-equivalence of the 'controls', are objectionable. Eitzen
(1974) reports locus of control change scores for male juvenile
delinquents in a small 'family-type' institution. The institution employed
a contingent reward economy linking task completion to privileges and
desired objects. The shift towards internality from pre-test at ad-
mission to post-test at discharge was significant. The lengths of stay
are not reported, however, so that some of this shift could be related
to maturation. Modelling and reinforcement for 'internal' verbaliza-
tions by the 'parents' in the institution may also have contributed to
the change in locus of control scores. Again, comparison with a non-
equivalent 'control' group tested only once is cited as supporting the
reality of the shift, but such evidence is not entirely convincing.
Johnson and Meyer (1974) note a marginally significant shift toward
externality by seven subjects who were not able to increase their alpha
brain pattern activity in biofeedback training. Presumably these sub-
jects attributed control of their brain waves externally following this
failure, while by a process similar to that assumed by McArthur (op. cit.)
those who were successful suffered no change from their initial, internal
attribution of control and hence exhibited no shift on the locus of
control measure. The small number of subjects involved, and more importantly the lack of random assignment to conditions, detract from the reliability of this result. It should be noted, however, that even apart from weaknesses in design, these reports of changes in locus of control scores do not adequately address the model presented above, of a history of experiences of specific attributions of control over reinforcement. In none of these situations was attribution explicitly measured—it is assumed to be consistent with the experiences as interpreted by the researcher: the attribution literature is studded with examples of the remarkable discrepancies between such reasonable interpretations and the attributions actually reported (see, e.g., Wortman, 1976).
If locus of control expectancies are the product of a series of experiences of consistently attributed control, we need to analyze the aspects of an experience likely to produce internal or external attributions.

The most obvious place to start is with the locus of control theorists. Classically, the basis in experience for an internal versus external attribution is the contingency of the reinforcement on the subject's behavior. Rotter's definition, for instance, is as follows:

When a reinforcement is perceived by the subject as following some action of his own but not being entirely contingent upon his action, then, in our culture, it is typically perceived as the result of luck, chance, fate, as under the control of powerful others, or as unpredictable because of the great complexity of the forces surrounding him. When the event is interpreted in this way by an individual, we have labeled this a belief in external control. If the person perceives that the event is contingent upon his own behavior or his own relatively stable characteristics, we have termed this a belief in internal control. (1966, p. 1)

However, as R. A. Clark points out, "Clearly Rotter designed his Internal-External Locus of Control Scale to differentiate people according to the amount of personal control they feel their behavior exerts over corresponding reinforcements [perceived reinforcement contingency]. But attempts of other researchers to use the scale to predict differences in behavior suggest a separate, significant question. Does the I-E Scale differentiate people according to the degree of control they feel they have over the behavior itself [perceived control of behavior]?") (1976, p. 154) This 'separate,
significant' aspect of experience is what many people understand as the heart of locus of control. Hamid and Flay, introducing a study of values modification, state "The locus of control dimension, from internal to external . . . is a measure of the degree to which people feel that their behavior is determined by their own choosing or by external forces beyond their control." (1973, p. 143). Aviram and Milgram emphasize the same aspect: "Locus of control refers to the extent to which an individual perceives his behavior to be under his own control versus determined by fate or the behavior of other people." (1977, p. 27).

Part of the reason for this dual interpretation of locus of control lies in the tendency to omit 'over reinforcement' after 'control'. In a situation characterized by random reinforcement, for example, one could experience control over one's behavior, but obviously one would be very unlikely to attribute reinforcement to internal sources. In spite of this disclaimer, however, there still exists a logical claim for including 'control over behavior' as part of the meaning of 'control over reinforcement'. Consider the following example: a child is called in from recess to class. She looks back at the play equipment, picturing the pleasure to be gained by returning to it. The reinforcement 'play' is contingent upon the child's behavior (whether she proceeds to the classroom or returns to the playground). But the behavior 'return to playground' is not under her control, that is, she cannot choose this behavior (it is constrained by lack of power). This behavior is controlled by the teacher by virtue of the authority vested in the role 'teacher'. Therefore the reinforcement 'play' is not under the child's control; i.e., the source of this reinforcement is external to the
child. This example clarifies a crucial relationship between the two meanings of locus of control brought out by Clark. If reinforcement in a situation is to be attributed to an internal cause, not only must reinforcements be contingent upon different subject behaviors, but the subject must also have control over the behavior-reinforcement sequences so defined. Further, as Hamid and Flay's definition above implies, control over one's own behavior is essentially freedom of choice among behaviors. Freedom of choice among potential behaviors is constrained when the actor lacks the resources (e.g., time, strength, transportation) necessary to perform some of the behaviors. To the extent that various behaviors and hence their associated reinforcements are unavailable to a person (i.e., his behavior-reinforcement field is constrained), control over behavior will be attributed to external sources. The woman who can afford every item on the menu has more control over what she eats than a poorer woman; a person with many food allergies has less control over the pleasure he gets from eating than a healthy person.

Thus, the two types of definition of locus of control (reinforcement contingency, and control of behavior) lead to two corresponding characteristics of experience (contingency, and constraint of behavior-reinforcement sequences) which together determine the attribution of control over reinforcement to internal or external sources.

To date, research into the situational antecedents of locus of control has focused on either one or the other of the two characteristics. The studies described above, by Reimanis (1971), Eitzen (1974), and Johnson and Meyer (1974), focused on contingency. So do the skill versus chance experiments (James and Rotter, 1958; Phares, 1957; Rotter,
1966) which account for a large part of the literature on locus of control.

The link between constraint and locus of control is more speculative. Frequently, the consistent and substantial relationship between race (black vs. white) or SES and locus of control is attributed to the degree of early constraint of economic or social reinforcements (Jessor, Graves, Hanson & Jessor, 1968; Lefcourt, 1976; Stephen & Delys, 1973). Studies of parental influence on locus of control generally report that internals' parents are more nurturant and accepting (or are so perceived by their children), while the parents of externals are more dominant and authoritarian or overprotective, a distinction which seems clearly related to constraint of alternative behaviors (Chance, 1965; Davis and Phares, 1969; Katkovsky, Crandall, and Good, 1967). Although contingency and constraint have separately been recognized as important antecedents of locus of control, no explicit research into their interaction has been published.

A second theoretical area which addresses the question of situational antecedents of control attribution is attribution theory. Attribution theory attempts to establish principles according to which an observer will assign responsibility, or particular dispositions (personality traits) to an actor, or not. One variable often assumed to be critical to such assignments is the observer's perception of the actor's control over the event observed (Kelley, 1973). If a mature observer perceives an event (for example, an automobile accident) as outside the actor's control, he will not attribute responsibility for the event to the actor, nor will he normally infer the presence of corresponding
characteristics (e.g., carelessness) in the actor. Thus attribution theorists have necessarily been concerned with internal or external attributions of control over events, where an event consists of an act and its consequences. Where the consequences of the act have affective significance for the actor (as is typically the case) they may be identified as reinforcements and the issue at stake may be looked at as determinants of the assignment to internal or external sources, of control over reinforcement. Attribution theorists present an analysis of the attribution process consistent with that derived above from locus of control theory. Fritz Heider, perhaps the originator of attribution theory, in analyzing the concept 'can' (as in "p can cause x"), is essentially dealing with internal (can) or external (cannot) attributions of the cause of an event. Heider divides 'can' into an 'environmental' and a 'personal' part. The environmental part of 'can' corresponds closely to degree of contingency, with luck or opportunity opposed to consistency in the occurrence of x when p tries to cause x. The personal part of 'can' Heider calls 'power'. Power is the interaction of individual characteristics with situational requirements for producing x: i.e., whether p is constrained in acting on the environment to produce x (Heider, 1958). Thus Heider's analysis of 'can' not only involves concepts similar to contingency and constraint but identifies them as the two determinants of attribution. Jones and Davis (1965) in their discussion of attribution of intention, conclude that "knowledge [of the consequences of an action, i.e., reinforcement contingency] and ability [to produce the action-reinforcement sequence] are preconditions for . . . enabling the perceiver to decide whether an
effect or consequence of an action was accidental [due to external causes]" (p. 221). Kelley states, "To the degree the effect of his selected action is different from those of other actions he might have taken, the observer has evidence of the actor's willful intervention as a causal agent, exercising choice to cause a special effect" (1967, p. 211). This sentence refers both to contingency (actions with different effects) and to lack of constraint (choice among "other actions he might have taken").

Attribution research provides evidence for the influence of both perceived contingency, and lack of constraint, on attributions. Degree of contingency has been manipulated in research inspired by Heider's five posited developmental levels of attribution. Reassuringly, adult subjects assign greater responsibility to an actor when the actor's behavior caused the event than when the actor was not instrumental in its occurrence (Shaw & Sulzer, 1969). More attention has been paid to the variable 'constraint'. Steiner (1970) summarizes a number of studies in which subjects attributed dispositions to speakers in proportion to the lack of constraints (assigned direction of speech, audience approval) perceived to influence them. Similarly constraint affects our reactions to unpleasant behaviors. When an actor's freedom appears to be restricted by his lack of resources, his disagreeable behaviors may be pardoned. But when such constraints are not perceptible, similar behaviors evoke hostile reactions (Steiner, 1970, p. 213). Several investigators have found that disliked behaviors perceived as due to physical handicaps, low intelligence, or ignorance evoke less hostility than the same behaviors perceived as 'deliberate'
(i.e., unconstrained) (Burnstein & Worchel, 1962; Cohen, 1955; Pastore, 1952; Rothaus & Worchel, 1960). It is likely that these differential attributions of responsibility reflect similar attributions of control over consequences.

Thus, attribution theory and locus of control theory may be interpreted as consistent in suggesting that reinforcement contingency, and constraint, are variables critical to the ascription of control over reinforcement to internal or external causes.

It is now appropriate to reconsider the relationship between attribution of control, and locus of control. Developmentally, locus of control is logically an expectancy generalized from consistent experiences of either internal or external attribution of control. However, many researchers have argued that locus of control also influences attribution of control. Insofar as a situation provides ambiguous cues to the source of reinforcement control, one's initial expectancy would determine the attribution of reinforcement control. A person characterized as internal on the locus of control trait will enter an unfamiliar situation expecting to control any reinforcement he may receive. If reinforcement occurs, and its cause is unclear, he will attribute control over the reinforcement to his own effort, will, intent, etc. consistent with his internal expectations. Similarly in an ambiguous situation an external person will attribute control to external sources. As Rotter put it, "... the relative importance of generalized expectancy goes up as the situation is novel or ambiguous and goes down as the individual's experience in that situation increases." (1975, p. 57).

There is little research bearing directly on this point. Ude and Vogler
(1969) report an experiment in which subjects attempted to anticipate patterns of flashing lights; internals tended to perceive contingency of the patterns on their responses more than externals, who tended to see the patterns as random. Phares and Wilson, measuring the influence of several variables on attribution of responsibility, found a main effect for I-E score, with internals attributing more responsibility than externals, and also an I-E X Ambiguity X Severity of outcome interaction: for 'severe' outcome in ambiguous circumstances, internals attributed more responsibility than did externals. This (hypothesized) effect did not occur in the unambiguous scenarios or those with mild consequences. The authors surmise that "when an outcome becomes severe, this serves to engage the internals' generalized expectancy to a greater extent." (1972, p. 403) Similarly, in a study of reactions to failure under distracting (unambiguous) and non-distracting (ambiguous) noise conditions, Phares and his colleagues found that only in the non-distractive condition did internals and externals differ in their attributions of the cause of their failures (Phares, Wilson, & Klyver, 1971).

The relationship between locus of control and attribution of control is probably circular. Each experienced attribution is associated with the stimulus cues of the situation in which it arose, and influences expected attribution in similar situations. In this way, to a limited extent, an experienced attribution affects the orientation of expected attribution in general, which is locus of control. Conversely, locus of control as a generalized expectancy probably affects specific attributions in situations where cues are inadequate for the ascription of source of reinforcement to internal or external causes. Because of this
circularity, locus of control logically belongs among both dependent and independent variables in attribution research.
At this point three concepts which have been introduced above can be defined and analyzed. First I propose an explicit definition of attribution of control over reinforcement:

Given a person in a situation characterized by a variety of perceived potential reinforcements, control attribution is the subjective probability (that is, the person's estimate of probability) that she can acquire any reinforcement she chooses by engaging in some appropriate behavior. A high probability is an internal attribution, a low probability is an external attribution.

At this point a distinction needs to be drawn between control attribution and probability of success. The latter (referred to by Rotter as need potential (1954) and by Steiner as outcome freedom (1970)) is the probability that one will receive the reinforcement one chooses, irrespective of one's behavior. For example, a child who has lost his father's prized flashlight foresees at least two possible reinforcements: let's say anger and punishment, or anger and no punishment. He attributes control over these reinforcements internally to the extent that he believes he can behave in such a way (by telling his mother first, waiting til after dinner, etc.) that he will not be punished. (Note the presence of contingency--his actions affect the outcome--and freedom--these actions are available to him.) His probability of success, however depends, as well, on other factors outside his control, such as his
father's mood, anticipated need for the flashlight, and tendency to punish. Thus if the father is seen as non-punitive, the child's probability of success (no punishment) may be high, while control will be attributed externally by the child. Control attribution to internal sources implies active manipulation of reinforcements by behavior. In some cases, of course, where probability of success depends entirely on the person's behavior (or is so perceived by the person), the two probabilities will be identical.

We are now ready to examine, in detail, the concepts implied in the above definition of control attribution.

First, the definition implies the contingency of reinforcement on behavior. Reinforcement contingency is classically defined as the degree to which different behaviors by an organism result in different reinforcements. However, when dealing with cognitive phenomena like 'attribution of control over reinforcement', it becomes necessary to consider the internal cognitive representation of the behavior-reinforcement relationship. Reinforcement contingency is to be regarded as the association of particular behaviors with particular reinforcements, by the individual: the degree to which the individual expects, or predicts, specific different consequences for different behaviors.

For the purposes of the proposed research, objective contingency will be defined as the degree of concomitant variation between behavior and reinforcement, and 'contingency' will refer to a subject's own rating of association between specific behaviors and specific reinforcements.

The concept 'constraint', unlike contingency, does not have a generally accepted objective definition, and requires a longer and more
critical analysis. It should be noted that the analysis presented here is not intended as a lexicographical, or even naive-psychological, one. The intent here is to define a concept which is referred to in this paper as constraint; this concept is logically essential to the analysis of attribution of control presented here, and the term 'constraint' has been chosen for it because of an intuitive overlap of meaning between word and concept.

Historically, constraint is a descendant of the concept of 'free will'. The traditional philosophical controversy over the actual existence of free will is not relevant to the present argument, which concerns the bases for the psychological experience of freedom, or as Lefcourt has it, "the illusion" of freedom (1976). Free will has been most frequently defined negatively, as the absence of constraint. The English philosopher Hobbes wrote "Liberty, or Freedome, signifieth (properly) the absence of Opposition; (by Opposition, I mean externall Impediments of motion;)") (quoted in Bay, 1965). More recently, Gilbert Ryle asserted in a discussion of free will that a judgment as to whether an act is 'voluntary' or 'involuntary' involves assessing the ability of the agent to act otherwise and establishing "that there were no agencies at work preventing him from" acting otherwise (Ryle, 1949, p. 71). Ability may be regarded as lack of constraints arising from interaction between task and actor characteristics, such as intelligence too low for a certain puzzle, or height too great for a small tunnel (cf. Heider, 1958). Thus Ryle's characterization of 'voluntary' refers to the absence of task-specific and situation-specific constraints. Following this tradition, Webster defines freedom as "exemption from necessity in choice or action."
Among psychologists, the issue of constraint versus freedom has often been addressed under the rubric of perceived choice among behaviors: "If the individual . . . did have a clear and explicit choice to behave differently, and, in addition, had justification [anticipated a contingent response] . . . then the locus of causality shifts from an external to an internal point of reference." (Zimbardo, 1969, pp. 14-15) Compare, also, Brehm and Cohen's discussion of 'volition' as perception of free choice (1962), and DeCharm's statement "If he chose to act freely, he will locate the cause for the behavior within himself . . ." (DeCharms, 1968, p. 337). The word 'choice' is unfortunate because it conceals an ambiguity which has produced much confusion in theory and research in this area. The confusion is between two different perceptions which may be aroused in a situation involving behavioral alternatives: the 'amount' of choice (the number of alternative behaviors perceived) and the degree of freedom to choose one or another alternative (lack of constraint). Consider a hungry person offered a delicious meal: she surely considers her decision to eat as freely taken, that is she attributes her behavior internally, to her own intention, desire, or will, but at the same time she will not feel she has 'much' choice, since her hunger prevents her seriously considering the alternative of not eating; no other alternative is equally attractive. If we alter the situation by offering a menu of possible meals, her perception of free choice is unchanged, and her perception of amount of choice increases. However, if the similarly attractive alternatives are apparent, but constrained, as when a hungry man sees a menu but can only afford the cheapest meal, both freedom and amount of
perceived choice are diminished. This double use of the word choice has led some psychologists astray, as when Harvey and Harris (1975) in a study of the determinants of perceived amount of choice (i.e., similarity of options) justify their research partially on the grounds of its relevance to freedom of choice ("the psychological experience of freedom of choice"). Steiner, in his analysis of perceived freedom (1970) first defines decision freedom as the belief that the perceiver "rather than other people, fate, or the press of circumstances, selects the outcomes he will seek and the means he will employ in seeking them" (p. 189); thus far decision freedom sounds like freedom of choice. However Steiner later explains that decision freedom is limited to the extent that the consequences of different behaviors have different "payoff value" for the individual: decision freedom is maximized when all possible behaviors have the same expected value for the individual (p. 195). Steiner argues this position, I think, because of a confusion between actual and perceived freedom. For instance, what is the 'freedom status' of a man held up at gunpoint, or, in Steiner's example (taken from Dewey), "free to walk, when the only walk he can take leads over a precipice" (p. 189)? Objectively, freedom of choice exists: one is 'free' to choose to be shot, or to walk over the cliff. But subjectively, (and perceived freedom is the focus here) the actor can be presumed to feel that these behaviors are unavailable. In Steiner's analysis, the presumed lack of decision freedom in this kind of case is handled by the extremely different payoffs of the alternate behaviors. Rather than introducing the payoff dimension, which seems absurd in less exceptional circumstances (does one feel more free to choose among menu items which
all are equally desirable than when one prefers some to others?) it seems reasonable to conclude that subjective and objective 'freedom' should not be expected to correspond. (Indeed, Steiner himself states "The focus of this chapter is on perceived freedom rather than on actual 'exemption from necessity'" (p. 188).) Steiner, in calculating decision freedom from payoffs, strays from freedom of choice to amount of choice. Similarly Brehm and Cohen's concept of 'volition' seems to shift back and forth between these two concepts (Brehm & Cohn, 1962). To avoid this ambiguity, and to remain consistent with philosophical use of the terms freedom, free will, voluntarism, etc., the phrase constraint is used hereafter; its opposite is 'freedom of choice', not 'amount of choice'.

The most obvious clarification necessary for the objective definition of constraint is, its field of operation: what is constrained. For the purposes of analyzing attribution of control over reinforcement, we are restricting our attention to situations characterized by the existence of alternative behaviors, and by reinforcements contingent on those behaviors. (As pointed out above, where reinforcement is not contingent, there is no possibility of controlling it.) Constraint restricts the availability of some behavior-reinforcement sequences. Obviously, human behavior is always literally constrained. We can never step over buildings, become invisible, reproduce the past. But we do not usually experience these universal limitations as constraint. Under some circumstances we may feel very free, in choosing a college major, for example, or deciding how to spend a weekend morning. But in either case, we can also feel constrained if some of the options we associate with the situation are unavailable—we do not have the talent
for a major in art, or engineering; our teenager has taken the family car. The issue apparently is the constraint of behavior-reinforcement sequences which we expect; that is, which we consciously associate with the situation. The school child associates play and its pleasure with the schoolyard, because he's been there before, and played and enjoyed it. A chemistry student expects his combining materials in a certain way to give the desired result because his lab instructor told him it would. A youngster learning to drive a car expects the torque he exerts on the steering wheel to turn the car because he turned his tricycle and bicycle that way. Prior experience, instructions, or generalization from other situations can cause behavior-reinforcement sequences to be associated with a situation. The universe of these associated behavior reinforcement sequences constitutes the field of operation of constraint.

Obviously, there are many reasons why various behavior-reinforcement sequences are unavailable; lack of money prevents one from traveling more frequently, low intelligence restricts the possibility of 'aceing' the GRE's, the teacher forbids returning to the playground, a door can't be unlocked without the key—the instances are uncountable. They are all characterized by a lack of resources to engage a behavior-reinforcement sequences. Typical resources in short supply are money, talent, physical requirements like the key for the lock, power, or time. The insufficiency of resources is specific to a particular behavior-reinforcement sequence in a situation; one may not have enough money for a movie, but have plenty for a day at the beach; in the evening one may feel constrained, but not in the morning. Constraint, then, is the
lack of resources operating on the field of behavior-reinforcement sequences associated with the situation to reduce the number of alternatives available.

Having defined the concepts involved in perceptions of source of control of reinforcement, and discussed their inter-relationships, we can now turn to an experiment designed to examine these relationships. The purpose of the experiment was to manipulate reinforcement contingency, and constraint, and determine the effect of these variables on the attribution of control over reinforcement to internal or external sources. The following effects were hypothesized:

H1: Contingent reinforcement in conjunction with low constraint will provoke a more internal attribution of control over reinforcement than will either contingent reinforcement in conjunction with high constraint, or non-contingent reinforcement.

H2: The source to which control over reinforcement has been attributed in the experimental setting, will be generalized to produce an expectancy for similar attribution in a similar setting.

H3: Groups of subjects which have attributed control internally will score more internal on a locus of control measure than groups which have attributed control externally.
VII. METHODS

Overview

Using a completely balanced repeated measures design, 96 subjects (Group 1) received four different treatments, corresponding to the four cells of a 2 x 2 (contingency x constraint) treatment design. In each treatment, subjects, run individually, confronted a display of beads of different colors, stated which one they wanted, and received a bead (not necessarily the one they chose—the process by which the experimenter decided which bead to give differed from treatment to treatment). Twelve choices constituted one treatment. During the intervals separating the treatments, subjects completed the instruments described below. Sixteen subjects constituted a 'constraint control' group (Group 2). They received only two treatments (contingent and non-contingent reinforcement).

Subjects

The subjects were 112 students at the University of Hawaii Manoa Campus, who volunteered to participate in return for a very small bonus influence on their grades in undergraduate educational psychology and psychology classes. Two-thirds of the sample were women. Subjects' ages ranged from 18 to 45 with two-thirds of the subjects between 19 and 22 years old, and 8% older than 30. The prominent ethnicities were Japanese (52%), Caucasian (21%), and Chinese (9%). In general, the Caucasians tended to be older than other groups. Subjects were obtained in two separate samplings. The first sample, of 96 subjects, constituted
the main experimental group, Group 1. The second sample, of size 16, constituted the constraint control group, Group 2.

Sex of Subjects

A brief discussion of gender and attribution is necessary to justify the inclusion of both sexes in the subject pool. The literature on locus of control indicates that gender has not been a significant factor in experiments manipulating locus of control (Battle & Rotter, 1963; Lessing, 1969; Rotter, 1966) except notably in the study of achievement.

The literature on attribution theory suggests that sex of observer and actor account for significant variance in attribution of causality when the outcome is characterized as success or failure, and the act is associated with higher probabilities of success for males than for females (for a review of relevant research see Deaux and Farris, 1977). Attribution of responsibility is also affected by sex of actor and observer, probably due to the same success-failure process noted above, and partly to differing cultural norms for responsibility. The experimental task described below (selecting a bead and getting a bead) is simple and novel enough that differential norms for success (getting the bead requested) were not expected to arise. The instructions to the subjects avoided any mention of success or failure, and there was no suggestion of responsibility--in fact, it seems extremely unlikely that 'responsibility' would be a concept associated with this task. Therefore, both for ease of subject selection and for generalizability of results, both sexes were included in this study.
Instruments

1. Adult Nowicki-Strickland Internal-External Scale (ANSIE). This scale gives a measure of generalized locus of control expectancy (Duke & Nowicki, 1973). Its items are free of macropolitical or social content. It has been validated on college-age samples. The reliability on such samples has been assessed with tests six to seven weeks apart ($r = .65$, $N = 48$; $r = .83$, $N = 70$) and over a one year period ($r = .56$, $N = 854$). The correlation with the IE scale is reported as between .48 and .68. The correlation with gender was non-significant over a series of thirteen studies summarized by the authors (Duke and Nowicki, 1972).

2. Rotter's IE scale (Rotter, 1954).

3. The Multiple Affect Adjective Check List (MAACL): a list of adjectives among which the subject is instructed to choose those which describe him/her "today." A subset of these adjectives is scored to provide a depression measure, referred to in this paper as the MAACL score (Zuckerman & Lubin, 1965).

4. Perception measures: These consist of Likert type items, constructed for this research, which require the subject to answer a question by placing a mark on a scale. The first three items measure the effectiveness of the experimental manipulations. The latter two items measure experienced and expected (in a scheduled similar experiment) attribution of control. The items are as follows:

   Q1A. To what extent does the color to the bead you get depend on the color you say?
Q1B. After you say what color you choose for a trial, to what extent can you predict what color you will get?

Q2. At each trial, you choose a color to say. When you are choosing, to what extent are you limited, or restricted, as to what colors you can say?

Q3. On any one trial, to what extent do you personally control what color of bead you get? (Complete control means you can any color you want; no control means you have no influence over what color you get)

Q4. Now we are going to do another experiment with the beads and boxes. To what extent do you think you will probably control what color of bead you get in this next game?

These questions were printed on separate slips of paper and the order of questions 1 to 3 was randomized for each subject and presentation. Q4 followed the last question.
5. Objective measure of control attribution (OMAC). This dichotomously scored measure, constructed for this research, assigns subjects (Ss) to internal or external attribution depending on the pattern of their responses to three questions. The OMAC is presented as a continuation of the experimental procedure, in which the experimenter will continue to prepare and participate in trials exactly as before, but the subject will attempt to collect a specified set of beads. The subject reads descriptions of three different variations on the experimental procedure as described below. Each variation requires S to obtain a specific set of colors of beads. S then estimates the number of trials he will need to complete the set. The estimates comprise the measurement; actual trials are not run.

Variant 1. S is to choose a set of three colors and write the colors on paper—the experimenter turns her back while S writes and places the paper face down under an opaque paperweight. The experimenter (E) thus is ignorant of which colors S chose.

Variant 2. E picks a set of three colors. She records these colors on paper and gives the paper to S. E and S both know the colors.

Variant 3. E picks a set of three colors, writes it down, and places the paper face down under the paperweight while S turns away. S does not know which colors he must obtain. He is told the number of beads necessary is three.

Rationale for the OMAC Measure

As defined above, internal attribution is a high subjective probability that a person may choose one of a set of reinforcements and
obtain it through his own behavior. If S attributes control over the reinforcements internally, then he will be confident that he can readily obtain the reinforcements he chooses. Thus the number of trials estimated for each of variants 1 and 2 will be three. However, in variant 3, if he controls the colors he gets but he doesn't know which colors to choose, his estimate should be higher.

On the other hand, if S attributes control externally in the first part of the experiment, he could conceivably show several different patterns of estimates, but not the pattern (3-3-higher) of an internally attributing subject. For instance, if S attributes reinforcement to chance, then his estimates for all three variants should be equal. If S attributes control to the experimenter, or some other powerful and purposeful source, there are three possibilities:

1) the experimenter (or other source) is benevolent (will try to help S get the right beads). In this case, S's estimates should be high on variant 1, where only he knows the right colors, and low on variants 2 and 3.

2) the experimenter (or other source) is malevolent (will try to prevent S from getting the 'right' beads). In this case S's estimates should be higher on variants 2 and 3 than on 1. In the first variation, the controlling agent is powerless to affect the number of trials because he doesn't know the 'right' colors; in variants 2 and 3 the agent actively preventing S's success will prolong the number of trials.

3) a disinterested agent--here chance is largely operative and the estimates for 1, 2, and 3 should not differ much.

Even if S assumes an omniscient agent who somehow knows the colors S chooses in variant 1, this agent would then be assumed to act
consistently over all three variants and the three estimates should not differ.

In general, when S does not control the colors he gets, then knowledge of the desired colors should not increase the likelihood of getting one of the right colors on any trial, i.e., knowledge should not decrease the number of trials necessary to collect the specified set.

Thus subjects will be dichotomously classified as attributing internally or externally on the basis of their pattern of responses to the three variants. If n, m, o are the estimates for variants 1, 2, 3 respectively, the pattern (n, m, o) is scored internal if n = 3 or 4, m = 3 or 4, and o > max (n, m) + 2; otherwise it is scored external.

Apparatus
1. Boxes: a rectangular piece of cardboard (41 cm. x 11 cm.) visually divided by six vertical lines drawn with a dark blue marking pen into seven 'boxes'. At the top of each box is drawn a numeral (1 to 7), by which S and E can refer to a particular box. The cardboard boxes are placed on a table within reach of the subject and the experimenter, but not at the edge of the table—that is, there is space on the table between the people and the boxes for the lists (see below).

2. Beads: 5/8" wooden beads, hexagonal and flat-sided, were painted in six bright colors. The beads, 14 of each color, were placed in a translucent bowl on the table in front of the experimenter.

Experimenters

Two experimenters were used to add validity and generalizability to the results. One was the researcher herself. It was felt that the
use of subject-completed questionnaires to record responses, and the standardization of instructions, provided minimal opportunity for communication of expectations. The second experimenter, also a female Caucasian University of Hawaii student, was strikingly similar in physical appearance to the first. Both experimenters read identical instructions to the subjects, and tape recordings of both obtained in a pilot study failed to reveal any remarkable differences. Subsequent analysis of the data collected indicated no significant experimenter effects.

Procedure

Each subject received a demonstration of the apparatus, including the fact that S would request E for a particular color of bead at each trial, that only E could remove beads from boxes, and that only colors represented in the boxes could be requested.  

Ss were run individually. Each subject in Group 1 was assigned randomly to an ordering of the four treatments, with the provision that the 4! (24) possible orders, and sex within order, were balanced. Similarly subjects in Group 2 were assigned to order of two treatments (contingent and non-contingent reinforcement). As each treatment began, S sat in front of a table with the boxes and lists (see below) in front of S on the table. E sat next to S. At each trial E placed a bead in each box except one (one box was always empty—otherwise subjects in non-contingent treatments might consider their reinforcement contingent simply because they would always get some bead, even if not the one they wanted). E then signalled the beginning of a trial, and S told E which
color he chose. E gave a bead to S: the process by which E determined which bead to give differed from treatment to treatment.

After each treatment, S completed first the OMAC and the perception measures. After the first treatment S also completed the locus of control instruments (in order balanced over subjects), i.e., ANSIE and IE scales. After the second treatment, S completed a demographic questionnaire. After the third treatment, S completed the MAACL form. (Subjects in Group 2 completed the demographic survey after the first treatment. The IE, ANSIE, and MAACL forms were not completed by these subjects.) The time taken to complete the entire set of forms was longer after the first treatment than after the others, partly because the OMAC and perception measures were new and required careful reading the first time, and partly because the locus of control scales are long compared to the demographic and MAACL forms. The time between the first and second treatments was frequently 30-45 minutes, while between subsequent treatments the interval often had to be prolonged by the experimenter to 12-15 minutes (the minimum interval).

Contingency Manipulation

In the two treatments which involved contingent reinforcement, E gave S a bead of the chosen color at each trial. In the two treatments which involved non-contingent reinforcement, E consulted a list of box numbers and gave S the bead from the box indicated by the list for each trial in sequence. This list of box numbers by trials is referred to hereafter as LOPN and looks like this:
The order of box numbers on the list was constructed to "look" random after actual randomization produced lists which, in a pilot study, were not perceived as random. This list was placed on the table between E and S, and S had an unobstructed view of it. The list was partially covered by a cardboard sheet which E ostentatiously moved down the page to the correct trial number as soon as S had stated a color. E read aloud "Trial n.... Box m" before giving S the bead from box m. Thus S's choice of color had no effect on which color he received.

This trivially obvious form of non-contingency was inspired by the demonstrated tendency for subjects to perceive any reinforcement as contingent, no matter how many negative instances they experience (Jenkins & Ware, 1965; Wortman, 1976); the precise format was chosen after several pilot studies employing variations of the above procedure.

Constraint Manipulation

In the two treatments which involved low restraint, E placed a different colored bead in each compartment except one—all the colors

<table>
<thead>
<tr>
<th>Trial #</th>
<th>Bead from box #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
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</tbody>
</table>
which S could see in the bowl were available in the boxes at each trial. In the two high constraint treatments, E consulted a list (LCLR) before loading the boxes. LCLR gives for each trial the two colors to be loaded into the boxes. This list of colors by trials looks like this:

<table>
<thead>
<tr>
<th>Trial #</th>
<th>Use colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>green, red</td>
</tr>
<tr>
<td>2</td>
<td>yellow, white</td>
</tr>
<tr>
<td>3</td>
<td>orange, red</td>
</tr>
</tbody>
</table>

E loads the prescribed colors of beads into the boxes. S has an unobstructed view of this list, which is on the table in front of S. The list is partially covered by a sheet of cardboard which E ostentatiously moves down the page to the correct trial number as soon as a new trial begins.

**Constraint Control Group**

In order to examine the operation of constraint, and particularly the validity of the distinction above between 'freedom of choice' and 'amount of choice', an attempt was made to manipulate the set of behavior-reinforcement sequences associated with the situation. In the experimental group (Group 1), six different colors of beads were used as described above. In the constraint control group, only two colors were used. This treatment was intended to limit the number of colors...
perceived by the subject as belonging to the situation. Thus subjects in Group 2, while experiencing objectively the same 'amount' of choice as subjects in the high constraint treatments of Group 1 (i.e., they could choose between only 2 colors) were expected to experience less constraint, and hence more control, since every color (reinforcement) associated with the situation would be available to them. The colors used for the constraint control group were red and white.

The four treatments and their procedures were as follows:

<table>
<thead>
<tr>
<th></th>
<th>contingent</th>
<th>non-contingent</th>
</tr>
</thead>
<tbody>
<tr>
<td>high constraint</td>
<td>T1</td>
<td>T2</td>
</tr>
<tr>
<td>low constraint</td>
<td>T3</td>
<td>T4</td>
</tr>
</tbody>
</table>

T1: contingent reinforcement, high constraint

Procedure: E consults list LCLR of trial # by colors and fills the boxes accordingly.
E signals S to state which color he wants.
S states a color.
E gives a bead of that color to S from the boxes.
A new trial begins. Twelve trials are given.

T2: non-contingent reinforcement, high constraint

Procedure: E consults list LCLR of trial # by colors and fills the boxes accordingly.
E signals S to state which color he wants.
E consults list LOPN of trial # by box # and gives the bead from that box to S.
A new trial begins. Twelve trials are given.
T3: contingent reinforcement, low constraint

Procedure: E loads the boxes with six colors of beads (all the colors in the bowl).
E signals S to state which color he wants.
S states a color.
E gives a bead of that color to S from the boxes.
A new trial begins. Twelve trials are given.

T4: non-contingent reinforcement, low constraint

Procedure: E loads the boxes with six colors of beads.
E signals S to state which color he wants.
S states a color.
E consults list LOPN of trial # by box # and gives the bead from the indicated box to S.
A new trial begins. Twelve trials are given.

After each treatment, subjects complete the OMAC and other dependent variable and descriptive measures as described above. After the fourth treatment, they are thanked and dismissed.
VIII. RESULTS

Effectiveness of Manipulations

Subjects' perceptions of contingency were measured by two questions:

Q1A. To what extent does the color of the bead you get depend on the color you say?

Q1B. After you say what color you choose for a trial, to what extent can you predict what color you will get?

Two questions were used because the perception of contingency as discussed above logically requires not only the knowledge that response and reinforcement are linked (Q1A) but also knowledge of the rules of linkage (Q1B); and conversely, predictability per se (Q1B) does not imply contingency unless the response is seen as 'causing' the reinforcement (Q1A).

Responses to the two questions were first analyzed separately. The effect of the contingency manipulation on responses to Q1A and Q1B was highly significant, \( F(1,95) = 488.91, \ p < .00001 \), and \( F(1,95) = 765.57, \ p < .00001 \), respectively. The manipulation accounted for 61% of the variance in responses to Q1A and 63% of the variance of Q1B. After contingent reinforcement, the mean response to Q1A was 94.1, \( \text{SD} = 18.6 \); the mean response to Q1B was 94.3, \( \text{SD} = 18.1 \). After non-contingent reinforcement, the mean response to Q1A was 28.2, \( \text{SD} = 32.1 \); the mean response to Q1B was 30.9, \( \text{SD} = 29.2 \). Possible effects of sex, experimenter, order of treatment, and order of question, were examined and found to be non-significant. Responses indicated that subjects perceived higher levels of contingency in the high constraint treatment (M = 66, SD = 37.7 for Q1A, and M = 68.8, SD = 33.1 for Q1B) than in the low
constraint treatment (M = 56.2, SD = 45.7 for Q1A, and M = 56.3, SD = 45 for Q1B), F (1,95) = 26.56, p < .00001 for Q1A and F (1,95) = 39.38, p < .00001 for Q1B; this trend was accentuated in non-contingent treatments (see Table 1), resulting in a significant interaction between contingency and constraint manipulations, F (1,95) = 33.24, p < .00001 (Q1A) and F (1,95) = 98.93, p < .00001 (Q1B), (see Figure 1). The effects of constraint and interaction were much smaller than those of contingency, R² < .1 in all cases.

Since a high correlation between Q1A and Q1B (r = .85, p < .0001) indicated the two questions were indeed measuring the same 'thing' (contingency), the two questions were combined into an index of perceived contingency, and the analyses of this index again indicated that the manipulation was successful, F (1,95) = 329.7, p < .00001, R² = .44; and the interaction between contingency and constraint was also significant, as was the main effect of constraint, F (1,95) = 42.8, p < .00001, R² = .04, and F (1,95) = 25.7, p < .0001, R² = .03, respectively.

To assess the effect of the constraint manipulation, responses to Q2: To what extent were you restricted, or limited, as to what colors you could say? were analyzed. The manipulation accounted for approximately 20% of the variance in responses, F (1,95) = 100.69, p < .00001. The mean response to Q2 after high constraint was 51.4, SD = 32.3; after low constraint, the mean response was 19.2, SD = 32.1. Neither sex, experimenter, question order, or treatment order affected the responses. There was however a significant effect from the contingency manipulation: non-contingent reinforcement provoked slightly greater perceived constraint (M = 39.7, SD = 36.7) than contingent reinforcement (M = 30.9, SD = 34.8), F (1,95) = 11.46, p < .001, R² = .02).
Table 1. Effectiveness of Contingency Manipulation: Part 1

Output from BMDP2V: Analysis of variance with repeated measures.

Codes: Cngy (Contingency status) Free (Constraint status)
       1,...contingent reinforcement    1,...low constraint
       2,...non-contingent reinforcement 2,...high constraint
       QIA,...response to QIA after treatment

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
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Count 96 96

Standard Deviations for 1st Dependent Variable

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Analysis of Variance for 1st Dependent Variable--Q1A | Q1A3 | Q1A2 | Q1A4

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Table 1 (continued) Effectiveness of Contingency Manipulation: Part 2

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### Cell Means for 1st dependent variable - Q1B

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Figure 1. Effect of interaction between manipulated contingency and constraint on Q1A and Q1B
Validity of Perceived Control Measures

Evidence of concurrent validity of the perceived control rating scale Q3: To what extent do you personally control what color of bead you get? is provided by the substantial correlation with the objective measure of attributed control (OMAC) - \( r = .56, n = 384, p < .0001 \).

Validity of the distinction between 'amount of choice' and 'freedom of choice': The difference between responses of Group 1 subjects to the high constraint, contingent reinforcement treatment, and Group 2 subjects in the corresponding treatment with limited reinforcement variety (two colors of beads, instead of six, in the bowl) was not significant. A (one-tailed) \( t \) test of difference between means indicated the effect of group on OMAC and Q3 scores approached, but did not reach, the level of significance selected as critical for this research (.01): \( t (15) = 2.3, p < .05 \). The effect of Group membership on Q2 (perceived constraint) was non-significant.

Tests of Hypotheses

H1. Contingent reinforcement in conjunction with low constraint will provoke a more internal attribution of control than will either contingent reinforcement in conjunction with high constraint, or non-contingent reinforcement.

An analysis of variance (using the BMDP2V program at the University of Hawaii Computer Center) indicated that the interaction of contingency and constraint had a highly significant effect on Q3 and OMAC, \( R^2 = .06, F (1,95) = 69.81, p < .00001 \), and \( R^2 = .1, F (1,95) = 99.35, p < .00001 \), respectively (see Figure 2). An \( F \) test of the a priori comparison of
Figure 2. The effect of the interaction of contingency and constraint on perceived control (Q3 and OMAC).
treatment 3 with treatments 1, 2, and 4 was significant at the .001 level. Thus the hypothesis was supported by the data.

There was no effect due to sex or experimenter.

Neither ANSIE nor IE locus of control measure accounted for significant variance in perceived control.

The assessment of order effects in a completely balanced repeated measures design is not straightforward. Each score on the dependent measure represents two variables: treatment, and order. Thus while main effects of each variable are easily obtained by separate analyses of variance, it is impossible to obtain the treatment-order interaction, which, in an experiment like this, is a highly plausible source of variance. While a regression analysis enables the coding of the two variables and their interaction corresponding to the single dependent variable score, the regression analysis of repeated measures entails a separate independent variable vector for each subject; for the present design, this would require the use of 95 separate vectors—clearly not a feasible computational procedure.

There was no significant main effect of order of treatment on either dependent variable (Q3 or OMAC). To examine the possibility of interaction between order and treatment, three different procedures were used.

First, each treatment was considered separately: an analysis of variance assessed the main effect of order within each treatment. If there were a significant interaction between treatment and order, the results of these four analyses of variance would differ. Comparison of the four analyses indicates a significant difference: for treatment 1
(contingent reinforcement, high constraint) only, the effect of order on Q3 was significant though inconsistent: perceived control was highest when this treatment was given third, lowest when first. For the other three treatments, the main effect of order was non-significant.

Second, an attempt was made to analyze the treatment-order interaction by categorizing each subject based on which of the 4! different orderings of the four treatments the subjects received. An analysis of variance was performed with category membership as a between-subjects variable and treatments within subjects. The interaction was not significant, but since each of the 24 categories had only four members, the lack of significance is hardly surprising.

The third method by which treatment-order interaction was examined was regression analysis. As indicated above, individual differences in response (within-subject variance) could not be included in the regression model due to the unwieldiness of the repeated measures model for the 96 subjects. Thus each subject provided four scores which were treated as four independent observations. There was no interaction effect on OMAC scores. Perceived control ratings (Q3) however revealed a significant interaction between contingency and order, $R^2 = .015$, $F(1,383) = 14.69$, $p < .0001$ (see Figure 3). Examination of the scores revealed that on the first treatment received, responses to Q3 tended to be central, that is, subjects in both contingent and non-contingent treatments rated their personal control closer to 50%. In subsequent treatments, the effects on Q3 of both contingency and non-contingency were much stronger with scores diverging toward the extremes.
Figure 3. The effect of the interaction between order and contingency on Q3 (perceived control).
H2: The source to which control over reinforcement has been attributed in the experimental setting, will be generalized to produce an expectancy for similar attributions in a similar setting.

Expectancy for control in a similar setting was measured by Q4:

Now we are going to do another experiment with the beads and boxes. To what extent do you think you will probably control what color of bead you get in this next game? The overall correlation of attributed and expected control was $r = .5$, $N = 383$, $p < .0001$, when attributed control was measured by the perception measure Q3. The correlation between OMAC and expected control was $r = -.3$, $N = 383$, $p < .0001$. It was anticipated that the correlation would be highest for the first treatment given, and subsequent correlations would be depressed both by subjects' memories of previous attributions, and by their having experienced different attributions. The correlation between Q3 and Q4 for the first treatment was $r = .58$, $N = 96$, $p < .0001$, while the correlation for subsequent treatments was $r = .5$, $N = 287$, $p < .0001$, consistent with expectations.

Thus hypothesis 2 was supported by the data.

R3: Groups which have attributed control internally will score more internal on a locus of control measure than groups which have attributed control externally.

R3 was evaluated by comparing locus of control scores of those subjects who received an 'external' treatment (treatments 1, 2, 4) first, with those of subjects who received treatment 3 first. (The locus of control measures were administered after the first treatment.) Regression analysis failed to reveal any significant effect of experimental
treatment, perceived control rating (Q3), or OMAC score, on either locus of control scale, or on the Mirel Factor of the IE scale. The hypothesis was rejected.

A few incidental results which may be of interest to researchers in the area of locus of control:

1) Order of administration did not significantly affect scores on either scale.

2) Variables significantly correlated with locus of control were age (with IE, $r = .36, p < .0004$) and MAACL depression score (with ANSIE, $r = .27, p < .009$).

3) The correlation between the two scales was $r = .51, p < .0001$; the correlation between ANSIE and Mirel Factor of the IE scale was $r = .38, p < .0001$, indicating that the ANSIE scale does not correspond more closely to this 'personal life area' factor than to the IE scale as a whole, contrary to expectation.

4) Neither sex nor ethnicity was correlated with locus of control.
IX. DISCUSSION

Theoretical treatments suggest that attribution of control over reinforcement is determined both by relatively enduring characteristics of the attributor, and by characteristics of the specific situation. The construct 'locus of control' represents the personality variables which determine attribution. Among the situational determinants, reinforcement contingency, and constraint, were chosen for investigation because of their consistent and logical role in attribution theory and research.

The experiment described above addressed the roles of reinforcement contingency, constraint, and locus of control in relation to attributions of control over reinforcement.

The experimental manipulation of reinforcement contingency was highly effective. However, questions assessing the subjects' perception of contingency indicated that subjects perceived higher levels of contingency in the high constraint treatment than in the low constraint treatment; this trend was accentuated in non-contingent treatments (see Table 1), resulting in a significant interaction between contingency and constraint manipulations. The effects of constraint and interaction were much smaller than those of contingency. Probably this illogical bias in responses reflects the higher probability of receiving the color chosen when choosing between two rather than six colors, and is consistent with research on the influence of 'success' on perceptions of contingency (Jenkins & Ward, 1965).
The success of the contingency manipulation is noteworthy. Several experiments which were designed to provoke subject discrimination between contingent and non-contingent conditions have failed, in that subjects perceived all conditions as contingent or made inaccurate discriminations (Jenkins & Ward, 1965; Langer, 1975; Ward & Jenkins, 1965; Wortman, 1975). Since the technique used in the present experiment was extremely successful in enabling subjects to accurately assess degree of contingency, the same or some similar technique could be useful in future research where such discriminations are desirable.

The manipulation of constraint was also successful in affecting perceived constraint. There was however a significant effect from the contingency manipulation: non-contingent reinforcement provoked greater perceived constraint than contingent reinforcement. The effect was not large, and probably reflects a halo phenomenon: interestingly, the bias for a halo effect had to overcome response set—a low contingency response was physically similar to a high constraint response due to the wording of the questions. In any event, the theory of control developed above makes no predictions about the effect of constraint when reinforcement is non-contingent—the variable constraint is defined only for contingent reinforcement situation.

The substantial correlation of the objective (OMAC) and perception (Q3) measures of control attribution provides encouraging evidence of the validity of these measures. This correlation is almost certainly attenuated by the low variance of the bi-valued OMAC, especially in treatment 2 (non-contingent reinforcement, high constraint). In treatment 2, the correlation between Q3 and OMAC failed to reach significance; the variance of OMAC was only .10 while that of Q3 was 29.6.
Research by Jenkins and Ward (1965), among others (see Wortman & Brehm, 1975, for further references and discussion), has indicated that judgments of perceived control are substantially affected by rate of success, or percentage of reinforced trials. The present data tend to confirm the effect of success on perceived control, although much more weakly than Jenkins and Ward's results. In the non-contingent treatments, subjects stated a color and received an arbitrary pre-determined color. Many subjects seemed to interpret the experience as a challenge (though not necessarily a test) to predict which color they would get. For these subjects, 'guessing right' was clearly a 'success'. For all subjects, receiving (even though by chance) the color they had asked for was probably interpreted to some extent as positive reinforcement. Some subjects obviously received more of such positively reinforced (or 'success') trials, than others. The number of such trials was surreptitiously recorded for each subject by the experimenter after treatments 2 and 4, while the subject completed the questionnaires. A positive correlation between number of 'successes' and Q3 and OMAC scores was anticipated, but not obtained. However, when correlations were obtained separately for each treatment, the correlation between number of 'successes' and Q3 in treatment 2 was significant ($r = .3$, $N = 96$, $p < .014$). In treatment 4 the correlation was non-significant. These results suggest a floor for the effect of the number of successes on perceived control. In treatment 4, where subjects chose among six colors at each trial, the mean number of 'successes' was 1.67; in treatment 2, where subjects chose one of two colors, and thus had a 50% chance of receiving the color they chose, the mean number of
'successes' was 5.3 (out of 12 trials). It seems reasonable that subjects weren't impressed by the small numbers of successes in treatment 4, but in treatment 2 the larger absolute amount of success was enough to provide them with pseudo-information about control. The non-significant correlation between rate of 'success' and OMAC in treatment 2 is again probably due to the extremely small variance of the latter.

The experimental design did not provide a critical separation of freedom of choice (lack of constraint) from the amount of choice. As discussed above, these two concepts are logically distinct. The results described above do not support this distinction. However, subjects frequently referred to the possibility of responding to Q2 in terms of all possible colors, as opposed to just the colors in the bowl, so it is probable that the use of some colors as reinforcements inevitably evokes association of other colors, so that, for Group 2, the associated set of behavior-reinforcement sequences was no smaller than the set associated with the situation by Group 1. Probably a more novel group of reinforcements could overcome this problem. For instance, if the individual reinforcements were items with no obvious common grouping quality, the subjects might be less likely to associate extra reinforcements with the situation by some principle of similarity to the available reinforcements, as some subjects in this experiment apparently referred mentally to the set of all possible colors, rather than just the set of presented colors, in assessing constraint.

The results strongly support the hypothesized effect of the interaction of contingency and constraint on the direction of reinforcement control attribution.
Obviously, however, a large part of the variation in attributions of control was not due to the interaction of contingency with constraint. What other variables were influencing attributions?

The analysis of variance indicated that manipulated contingency and constraint each contributed to the variance independently, as well as by their interaction (see Table 2). The main effect of contingency on Q3 and OMAC was considerably stronger than that of constraint (see Table 3).

According to the theory developed above, if subjects had found the cues to the source of reinforcement in the experimental situation ambiguous, they would have made attributions consistent with their generalized locus of control expectancy. This did not occur: neither locus of control measure accounted for significant variance in perceived control.

The assessment of treatment-order interaction by two methods indicates that this interaction is one of the factors contributing to variance in attributions of control. Separate analyses of the four treatments reveal that, for treatment 1 (contingent reinforcement, high constraint) only, the effect of order on Q3 was significant though inconsistent: perceived control was highest when this treatment was given third, lowest when first. I am at a loss to explain this effect: perhaps it merely reflects the danger of data-snooping—the testing of numerous non-hypothesized effects will occasionally result in significance as indicated by the α level selected. Comparing the patterns of mean Q3 scores for the four possible orders between treatments suggests that non-contingent reinforcement (treatments 2 and 4) did not depress
Table 2. Effect of Contingency, Constraint, and Interaction on Attribution

Output from BMDP2V: Analysis of variance with repeated measures.

Codes: C....Contingency  F....Constraint  CF....Interaction
Q3n.....response to Q3 after treatment  n
OMACn.....score on OMAC after treatment  n

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Analysis of Variance for 1st Dependent Variable—OMAC1

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** p < .00001

Q3 scores as much when it occurred first as when it occurred later (Figure 4), presumably reflecting the relativity of perceived contingency.

When regression analysis was performed on all the attributed control scores, ignoring the repeated measures aspect of the design, there was no interaction effect on OMAC scores. Perceived control ratings (Q3) however revealed a significant interaction between contingency and order. Examination of the scores revealed that on the first treatment received, responses to Q3 tended to be central, that is, subjects in both contingent and non-contingent treatments rated their personal control closer to 50%. In subsequent treatments, the effects on Q3 of both contingency and non-contingency were much stronger with scores diverging toward the extremes. This pattern is certainly reasonable considering that felt control is, like most perceptions, relative. On the first treatment, the novelty of the task presumably left subjects without a standard against which to evaluate control. On subsequent treatments, the
Figure 4. Effect of Order x Treatment Interaction on Q3 (Attribution).
differing manipulations provoked different perceptions of control which could be compared to former ones. However, if the novelty of the task prevented 'accurate' perceptions of control as determined by contingency, why would not an order x constraint, or an order x contingency x constraint, interaction appear as well? An answer may lie in the relative strengths of contingency, compared to constraint and contingency x constraint interaction, as determinants of Q3. Recall that the proportion of variance of Q3 responses accounted for by contingency was .5, that accounted for by constraint was non-significant, and the proportion accounted for by the interaction of contingency with constraint was .06. Noting that the effect in question here (contingency-order interaction) was quite weak, I assume that the effect of order on contingency x constraint interaction might exist as well, but not strongly enough to achieve significance. Examination of direction of differences between mean Q3 scores for the four contingency x constraint treatments clearly reveals this damping of the effect of any treatment given first, as opposed to later (see Figure 4).

The assessment of treatment--order interaction by two methods indicates that the effect of any treatment on perceived control is least when that treatment is given first; the difference between contingent and non-contingent reinforcement occurring first is primarily responsible for this diminution.

The main effects of contingency and constraint, and the interaction of contingency with treatment order, account for some of the non-hypothesized variance in attributions of control. The number of 'success' trials in treatment 2 accounts for some additional variance. Identification
of other factors must be purely speculative. Plausible sources of attributions abound: for example, the psychological demands of the experimental situation might evoke external attributions, since the experimenter is clearly in charge of the situation as a whole, and in addition appears as having relatively high status compared to the subject (Thibaut and Riecken, 1955); Wortman (1976) reports that subjects attributed control more externally when an experimenter physically handled the reinforcement tokens, as happened in the present experiment, that when they themselves handle the tokens; both experimenters are highly internally oriented and may have inadvertently modelled internal attributions in casual remarks while admitting the subject and directing the seating arrangements, etc. These and other factors probably affect different people to varying extents, and may have contributed to the variance in attributions of control.

The source to which control over reinforcement was attributed in the experimental situation was generalized to produce an expectancy for similar attributions in a similar setting, as hypothesized. This limited result lends credibility to the operation of established principles of generalization on attributions, and hence to the theory of locus of control expectancy as the product of a history of experienced attributions. Regression analysis failed to reveal any significant effect of experimental treatment, perceived control rating (Q3), or OMAC score, on either locus of control scale, or on the Mirel Factor of the IE scale. A plausible explanation for the negative findings is that the experience was too brief and/or too discontinuous with normal life experiences to affect general locus of control expectancy; that is, the conditions for
broad generalization were not provided. A second possible reason for the rejection of the hypothesis is that this type of experience was not sufficiently important to the subjects: the level of personal involvement and cognitive centrality was probably very low. Thus change in cognitive processes was unlikely to occur (cf. Brehm & Cohen, 1962; or Kelly, 1955; or Wortman, 1975). A third possible explanation for the negative results lies in the measurement properties of the locus of control scales. Perhaps due to its prominence, the IE scale has been the focus of a great deal of critical attention (Collins, 1974; Levenson, 1972; Weiner & Kukla, 1970). The criteria for item selection for the ANSIE scale were very limited, and seem unlikely to lead to a broadly valid measure of expectancy for source of control. Most distressingly, review of the experimental literature reveals an enormous preponderance of negative results where attempts were made to change locus of control scores: the popular scales are quite likely not valid measures of the intuitive construct they are often presumed to reflect. Such a lack of construct validity is implied by the inconsistent inter-scale correlations and intra-scale reliabilities (Lefcourt, 1976; Prociuk & Lussier, 1975).

The short history of attribution theory and research has already indicated the broad relevance and practical importance of reinforcement control attribution. Since by the paradigm presented here, the direction of attribution of control over reinforcement can be successfully manipulated, future research could profitably examine the effects of direction of manipulated attribution on specific variables such as learning, persistence, motivation, transfer, and satisfaction. It is expected
that there exist limits as to the malleability of attributions in real-life settings, and these limits and their consequences also need to be explored.

In many institutional settings, knowledge of the situational antecedents of attribution may be an extremely important tool for increasing the effectiveness of the services provided.
X. SUMMARY AND CONCLUSION

The attribution of control over reinforcement to either internal or external sources in a specific situation is a complex function of personal and situational variables. Rotter's social learning theory treats the personal variables as products of the individual's reinforcement history, acting upon attributions through a generalized expectancy for internal or external reinforcement control. The situational variables have been the subject of considerable theory and research; but no unified model of the various situational influences on attribution has emerged. Two of these influences, reinforcement contingency, and constraint, were selected for investigation for two reasons: theories of attribution and locus of control consistently identify contingency and constraint as antecedants of attribution; and the interaction of contingent reinforcement with low constraint provides a logically necessary and sufficient condition for internal attribution.

An experiment designed to test the hypothesis that reinforcement contingency, and constraint, interact to provoke internal or external attributions of control over reinforcement, was performed. The results strongly supported the hypothesis. It was further hypothesized that attributions would be generalized to specific expectations for control in similar situations, and would influence locus of control scores. Generalization to a similar situation was confirmed, but generalized expectancy (locus of control) scores showed no effect due to treatment or attribution.
The technique used to manipulate contingency and constraint was highly successful in making the appropriate perceptions salient; thus experiences structured for perception of contingent reinforcement, and low constraint, were demonstrated to provoke internal attributions of control over reinforcement. Experiences arranged so that reinforcement was perceived to be non-contingent, or so that the availability of behavior-reinforcement sequences associated with the situation was restricted (high constraint) provoked external attributions of control.

Possible extensions of this research, and the viability of practical applications of this model of control attribution, were suggested. The experimental procedures provide a promising starting point for such future endeavors.
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