CAUSAL ATTRIBUTIONS FOR SUCCESS AND FAILURE IN RELATION TO EXPECTANCIES, SEQUENTIAL INFORMATION, LOCUS OF CONTROL AND STABILITY

A Thesis

Presented to

the Faculty of the Department of Psychology

University of Houston

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

By

Alice L. Bane

May, 1976

ACKNOWLEDGEMENTS

I would like to express my appreciation to my committee members, Dr. Richard I. Evans, Dr. H. G. Osburn and Dr. R. William Thomas, for their criticism and support. Incorporation of their suggestions in the thesis has improved its quality. Dr. Eric R. Brown, who served as Chairman, has been a valued source of encouragement and advice throughout the course of this research.

This work was carried out while I was supported as a pre-doctoral trainee by National Institute of Dental Research Training Grant Number TI DE 138, Dr. Richard I. Evans, Director.

CAUSAL ATTRIBUTIONS FOR SUCCESS

AND FAILURE IN RELATION TO EXPECTANCIES,

SEQUENTIAL INFORMATION, LOCUS OF CONTROL AND STABILITY

An Abstract of a Thesis

Presented to

the Faculty of the Department of Psychology

University of Houston

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

By

Alice L. Bane

May, 1976

ABSTRACT

Non-independent sub-samples of a group of 224 introductory psychology volunteer subjects provided data for each of 5 simulation experiments. Although each experiment employed a design peculiar to that experiment, the overall approach was to study subjects' use of information from different sources (context information, skill versus chance orientation, performers' causal attributions, sequences of success and failure outcomes) in determining the nature of underlying causal processes.

Experiment 1 pitted a "stable" causal factor (task difficulty or ability) against an "unstable" factor (luck or effort). Subjects read context paragraphs and printed sequences of success and failure outcomes which had been designed to suggest change in the process determining performers' outcomes. Subjects were required to indicate whether the "stable" or the "unstable" causal factor was more likely to have changed during the time period covered by the context paragraph and the success and failure sequence. Subjects' responses to four of the six items presented in Experiment 1 favored change in the "stable" factor, demonstrating that "stable" factors are viewed as changeable under the conditions suggested by these items.

A 2 X 2 X 2 X 2 orthogonal design was employed in Experiment 2 to assess the effects of performer's Motivation (motivated or unmotivated), Outcome (success or failure), Locus of Control of causal factor (internal or external) and Stability of causal factor (stable or unstable) upon expectancies for success for the performer's next attempt at a skill task. Subjects read paragraphs in which they were told that a fictitous motivated (unmotivated) performer had just succeeded (failed), and that he attributed his success (failure) to luck (effort, task difficulty, ability). Subjects were then asked to indicate their expectancies for the performer's success on the next trial by making a mark through a line, the end points of which were anchored at 0% and 100%. Expectancies were taken as indirect statements of subjects' perceptions of the nature of underlying causal processes. Subjects' responses indicate that successful or motivated performers are thought to be more likely to succeed on the next trial than are unsuccessful or unmotivated performers, that a repetition of a success is thought to be more likely than is a repetition of a failure, that a change in outcome is thought to be more likely when a current outcome is attributed to an unstable as opposed to a stable causal factor, and that effort is viewed as unstable when it is invoked as an explanation for a failure but stable when it is used to explain a success. The findings for Experiment 2 must be qualified by the possibility that the experimental manipulations also produced differential prior probabilities for success among the different conditions.

Experiment 3 required subjects to respond to printed sequences of success and failure outcomes by attributing cause for a designated outcome to luck, effort, task difficulty and ability. That subjects were sensitive to the arrangements of success and failure outcomes is demonstrated by the apparent systematic relationships found between sequence arrangements and attributions. Relatively high effort attributions occurred when there was consistency between the target outcome and the rest of the sequence, indicating that effort is treated as a more stable causal factor than is luck. Luck received high attributions only when the target outcome was inconsistent with the rest of the sequence.

Experiment 4 attempted to demonstrate that outcomes attributed to luck are weighted differently depending upon the skill or chance nature of the task in which the outcome occurs. Subjects read paragraphs stating that a performer in a dart throwing (skill condition) or a spinner (chance condition) game would win $1.00 for each time his dart or spinner landed on a designated area. A five trial sample of the performer's outcomes was presented (0 $1 $1 $1 0), along with the information that the performer attributed the 0 on his last trial to bad luck. It was predicted that expectancies for winnings on the next 10 trials would be greater for the skill condition, since the outcome attributed to luck should carry less weight in the skill as opposed to the chance condition. Although average dollar predictions were higher for the skill condition, the results also suggested that a response bias of .5 probability of success perhaps operated in the chance but not in the skill condition. Further research is needed to determine whether luck attributions are weighted differently in skill and chance situations.

The task for Experiment 5 required subjects to indicate whether printed sequences of success and failure outcomes were records of outcomes from skill or chance games. The prediction that "random" or stable probability sequences would be classified as chance derived while changing probability sequences would be classified as skill derived received support from the subjects' responses to the different sequences presented in a within-subjects design. Since stable probability sequences were thought to be chance derived, and since luck is the major causal factor in chance situations, luck is apparently perceived as a fairly stable causal factor in the chance situation, in contrast to its unstable nature in the skill situation.

The findings for the 5 experiments are discussed in relation to several theoretical perspectives. Points of agreement are noted with Heider's formulations (1958), Kelley's covariation principle (1973), the Bayesian approach to attribution of Ajzen and Fishbein (1975), and the use of judgmental heuristics as proposed by Tversky and Kahneman (1974). However, the results reported here conflict sharply with the classification model for causal factors in achievement situations proposed by Weiner, Frieze, Kukla, Reed, Rest and Rosenbaum (1971). The stability dimension of the model appears to be invalid, since factors classified as stable factors were treated as changeable in Experiment 1, and since effort, classified by the model as an unstable factor, was treated as a relatively stable factor in Experiments 2 and 3. Finally, the findings from Experiment 5 refute the criticism by Weiner, et al. that a confound of locus of control with stability is responsible for results reported in the locus of control literature.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D.)

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (CONT'D.)

LIST OF FIGURES (CONT'D.)

CHAPTER I

GENERAL INTRODUCTION

Heider (1958) suggests that common-sense has a great deal to contribute to the scientific study of interpersonal relations. He urges the study of common-sense psychology of interpersonal relations on the grounds that one's reactions to the social environment and one's interpretations and predictions of other people's actions are guided by a "naive psychology". Heider notes that common-sense psychology can be expected to contain certain truths, since it is advantageous to the individual to form accurate judgments of the causes of events that occur as the result of actions of people. Accurate attributions shape and maintain a reliable picture of the world, resulting in more accurate predictions of future performance.

Heider further notes that both the scientist and the naive person must infer the nature of underlying core-processes from the observable manifestations of such processes. Since a manifestation itself is ambiguous, hence unpredictable, people attempt to relate such a manifestation to its underlying causes or core-processes. Explanation in terms of invariant underlying causes of events allows meaning to be attached to observables, and the individual is then able to react to an underlying reality rather than to an ambiguous manifestation.

Heider goes on to present a "naive analysis of action", for which he suggests that the action outcome is felt to depend upon factors emanating from the person and factors emenating from the environment. The outcome, then, is a function of some combination of personal and environmental forces. He breaks the personal force down into a power factor consisting mainly of ability, and a motivational factor consisting of what the person is trying to do (his intention) and how hard he is trying to do it (exertion). He noted that "the personal constituents, namely power and trying, are related as a multiplicative combination, since the effective personal force is zero if either of them is zero (p. 83)."

Heider further differentiates between personal and environmental force on the basis of goal directedness: personal force is directed toward a goal, while environmental force is not. The power factor of the personal force and the environmental force are conceptually combined by Heider to form "can", a concept indicating that a particular action outcome is within the realm of possibility. One "can" overcome a given environmental obstacle if the power factor is sufficiently great relative to environmental force. Apparently the relationship between the power factor and the environmental force is such that "can" will be realized only when the power factor is greater than the environmental force. When this state exists, the motivational factor determines the actual outcome--a sufficient amount of trying will result in a total personal force that is great enough to overcome any opposing environmental force, while an insufficient amount of trying will result in a total personal force that is not great enough to overcome the opposing environmental force. It seems that the degree of trying determines the proportion of available personal power that will be utilized in a particular encounter with an environmental obstacle.

Heider notes that "can" generally, though not exclusively, refers to a relatively stable relationship between the person and the environment, allowing predictions for future outcomes. He does indicate, however, that temporary conditions are sometimes expressed as effecting "can" ("I can't do it right now because I am too tired"), but he claims that these temporary conditions are virtually always "explicitly indicated as disrupting the usual state of affairs between the powers of the person and the environmental situation (p. 84)."

With the notions of "can" and trying, the underlying causes of success or failure action outcomes can be better understood. Heider states:

> The action manifestations, together with other 'raw material' become the data that allow us, in a kind of factor analysis, to assess the role of the factors contributing to can. We assess when we attribute action outcome mainly to the person, mainly to the environment, or to a combination of both. Only then do we understand. Only then are we able to predict future action, for even when relatively momentary factors make an action possible, by circumscribing these factors, one acknowledges the existence of the more invariant and reliable personal and environmental conditions.
>
> But we not only diagnose the constituents of can from their manifestations; we are also led to expect certain manifestations when the constituents are given. Thus, if a task is easy, or if a person has good ability, then we expect the person to be able to engage successfully in the action. Or, if we know that p lacks the necessary powers to do something, such as ability or endurance, then we shall not expect him to do it. Moreover, if the action occurs, we may conclude that he did not do it (p. 99).

To summarize Heider's position, it appears that he sees the naive attributor attempting to predict future events by explaining past events in terms of relatively stable personal and environmental factors. He focuses primarily on personal power, trying, and environmental power. He acknowledges that more transient personal/factors (fatigue, mood) and environmental/factors (opportunity, luck) sometimes contribute to action manifestations, but implies that when these factors are involed by way of explanation, they are set apart so as to allow an assessment of the contributions of the more invariant factors. Heider seems to believe that trying is one of the relatively invariant factors, a point that will take on greater importance later in this thesis.

Social psychological research stimulated by Heider's formulation has come to be known as causal attribution, or simply attribution, research. Kelley (1973) recently summarized his own view of the area of causal attribution, a view that appears to have been accepted as one largely representative of current thought in the area. Kelley's causal attribution, like Heider's naive psychology, deals with the way people explain observed behavior. People attribute observed behavior to its perceived underlying causes, and attribution theory is concerned with the process by which such attributions are made.

Kelley lists three categories of possible causes for observed behavior: persons, entities, and times. First, given behavior might be attributed by an observer to the person who performed the behavior--characteristics of the person caused the behavior in question. Second, the behavior might be attributed to the entity (person, stimulus, task, object) to which the person's behavior was a response--characteristics of the entity caused the behavior. Third, the behavior might be attributed to the times category, indicating that some unusual combination of factors caused the behavior in question. For example, a usually friendly person (Person A) may exhibit hostile behavior toward a person (Entity B) who receives friendly responses from most other persons. In such a case, the behavior might be attributed to some unique set of circumstances present either between the two individuals or within the situation at the time of the encounter. It appears that person and entity attributions are attributions to relatively stable underlying causes, while times attributions tend to indicate more transient states. Heider's personal force, made up of power and trying, seems to fit into the person category, his environmental force fits into the entity category, and the more transient forces such as luck, opportunity, mood, and fatigue fit into the times category.

While Kelley's statement of attribution theory is applicable to causal attributions for human behavior in general, the narrower focus of the present thesis will be upon situations in which causal attributions are made for success and failure outcomes for which Kelley's theory has implications. In this case, the behavior to be explained, or the effect to be attributed to underlying causes is either a success or a failure. A person attribution in this case would be an inference that a success (failure) was caused by characteristics of the performer - e.g., high (low) ability. An entity attribution would be an inference that a success (failure) was caused by characteristics of the stimulus object - e.g., the attempted task was easy (hard). A times attribution would be an inference that particular circumstances present at the time resulted in the observed outcome--perhaps good (bad) luck was present.

Kelley presents an analysis of variance model of the attribution process. A basic proposition in the context of his model is the covariation principle: An effect is attributed to the one of its possible causes with which, over time, it covaries. In order to determine the degree of covariation between an effect and a possible cause, the attributor needs information concerning the degree of distinctiveness of the effect (Is this person successful on only this task?), the degree of consensus (Are other persons successful on this task?), and the degree of consistency of the effect (Is this person always successful on this task?). A success would be attributed to an easy task (entity attribution) if distinctiveness were high (the person succeeds on this task and fails on most others), if consensus were high (most other persons succeed on this task) and if consistency were high (this person always succeeds on this task). This pattern of information suggests that the effect (success) varies with the entity (task), indicating that something about the entity (it is an easy task) causes the effect. A person attribution for success would occur if the effect were not distinctive (the person succeeds on this and other tasks), if consensus were not present (other people fail on this task) and if consistency were high (this person succeeds almost every time he attempts this task). Low distinctiveness, low consensus, and high consistency indicate that the effect varies with the person, suggesting that something about the person caused the effect. Finally, a times or circumstances attribution for success would occur if the effect were distinctive (the person fails on most other tasks), if consensus were low (other people fail on this task), and if consistency were low (the person usually fails on this task). High distinctiveness, low consensus, and low consistency indicate that something about the particular circumstances at the time (luck was with him) caused the effect.

Kelley's covariation principle describes a basis by which Heider's naive psychologist may explain observable events in terms of underlying core-processes. An effect or observable event is thought to be caused by a particular underlying process if the occurrence of the event regularly coincides with the (inferred) operation of that underlying process. For example, success would be explainable by high ability if success occurred when high ability were present and if success did not occur in the absence of high ability. This example is an instance of a person attribution as outlined in the preceding paragraph: Success occurs when this person's ability is present, success does not occur when this person's ability is absent, and success occurs for other tasks when this person's ability is present. The covariation of the effect with an inferred underlying cause or process allows an explanation of that effect in terms of that underlying process.

A model of the attribution process in connection with achievement-related events has been presented in a paper by Weiner, Frieze, Kakla, Reed, Rest, and Rosenbaum (1971). The model postulates the use of four factors in the explanation of outcomes of an achievement-related event. The four elements to which subjects may attribute cause are ability, effort, task difficulty, and luck. Any or all of these factors may be perceived as the cause(s) of an outcome, and those factors perceived to be present may exist in varying strengths or degrees. Weiner, _et al_. describe the four causal elements of the model in terms of locus of control (either internal or external) and stability (stable or unstable). Ability and effort, which are qualities of the performer, are internal elements, while task difficulty and luck are external elements. Ability and task difficulty are described as stable elements, while effort and luck are unstable. The classification scheme for the perceived determinants of achievement behavior as presented by Weiner, _et al_. is reproduced in Figure 1.

LOCUS OF CONTROL

STABILITY		Internal	External
	Stable	Ability	Task Difficulty
	Unstable	Effort	Luck

Figure 1

Classification of determinantes of achievement behavior from Weiner, Frieze, Kukla, Reed, Rest and Rosenbaum, 1971.

A discrepancy will be noted between this author's interpretation that Heider would consider the trying component of the personal power factor to be relatively invariant and the classification of effort by Weiner, et al. as an unstable factor. It is necessary to consider the performer's motivation in order to determine whether effort should be considered a stable or an unstable factor. If the performer is highly motivated, one would expect effort to be high. Conversely, if the performer is not motivated, one would expect effort to be low. In either case, effort could be expected to remain at the same level for future encounters with the task. Variations in effort would occur only if some transient factor were to disrupt the usual state of affairs--the performer may be less motivated than usual on a particular occassion. It is not unreasonable to conclude that the classification of effort as an unstable factor by Weiner, et al. is somewhat misleading.

As noted earlier, Weiner, et al. also classify the four causal factors in an achievement task on the basis of locus of control. Ability and effort are classified as internal factors while task difficulty and luck are external factors. Weiner, et al. equate ability in the attribution literature with skill in the locus of control literature. They maintain that there has been a confound in the locus of control literature, since an internal stable factor (ability) has been compared to an external changeable factor (luck). It is important to note a basic difference in approach between the Weiner, et al. classification and the locus of control literature. Skill and chance in the locus of control framework refer to the different types of situations in which a person may obtain reinforcement. A skill situation is one in which a causal relationship exists between a person's behavior and the reinforcement or outcome. The person is rewarded for a certain outcome, and the occurrence of that outcome is, to some degree at least, determined by the person. That is, the occurrence of the reinforced outcome is internally controlled. In contrast, a chance or externally controlled situation is one in which the person can exert no influence over the outcome for which he is rewarded. For example, a person may collect $1.00 each time a tossed coin turns up heads, but the occurrence of the event "heads" is in no way influenced by that person--the event is externally controlled. Weiner, et al. restrict their analysis to achievement-related tasks, tasks which are categorized as internal or skill tasks in the locus of control literature. The four causal elements discussed by Weiner, et al. operate within the skill task framework. Outcomes in skill tasks may be influenced by internal or external factors, while outcomes in chance tasks include, by definition, only external factors. Ability and effort cannot operate in chance tasks, and luck appears to be the salient causal factor, although task difficulty in the form of probability of success may enter in.

The assumption that ability and luck in the attribution literature are equivalent to skill and chance, respectively, in the locus of control literature may not be justified. While the Weiner, et al. classification places ability (skill) in the stable category and luck (chance) in the unstable category, recent research reported in the locus of control literature suggests that subjects may regard skill tasks as involving more instability than chance tasks (Brown and Bane, 1975). Brown and Bane claim that "...one property of skill tasks is that they are typically associated with improvement, that is, a rising probability of success with repeated performance" (p. 183). Skills are thought to be changeable: Skills are acquired properties, and are necessarily low during early stages of acquisition. With effort and practice, skills can be increased over time. The common sense notion of "beginner's luck" can serve as an illustration: Any success produced by a beginner must be attributed to luck, since a beginner would be unlikely to possess the skill necessary to produce a success. This being the case, the successful beginner cannot expect to continue to enjoy success, since he has no real control over his outcomes. As he continues to perform the task his skill increases, and eventually he is able to produce successes through his (changed) ability. At this point he is no longer a beginner, and is no longer open to the charge that any successful outcome he may produce is due to luck.

While the probability of success within a skill task may be subject to change, the probability of "success" (or of a particular outcome) within the typical chance task used by researchers in the area of locus of control does not change. The probability of success for a subject performing a skill task may be low one day and high another, since the subject's skill may improve through practice, his level of effort may be greater one day than another, he may be more fatigued at one time than another, and so on. In contrast, the probability of some outcome on a particular chance task can be expected to be the same on any two occassions--if the probability of a head outcome for a coin tossing experiment is .50 during one session, it should remain .50 for a session on another occassion. If the probability of "success" within a chance task is stable, and if luck is the predominant cause of "success" within the chance task, luck in the chance task cannot be assumed to be equivalent to luck in the skill task.

The research to be reported here focuses upon the stability dimension of the Weiner, et al. classification scheme and upon the assumption of equality of luck in the chance and skill situations. Although the research was carried out as a single project, data concerning five distinct propositions were collected, and each set of data is reported separately under the headings of Experiments 1, 2, 3, 4, and 5, respectively. This format is not intended to obscure the fact that the five experiments were not independent: The same group of subjects provided information on all five propositions. Experiments 1, 2, and 3 are concerned with the stability dimension of the Weiner, et al. classification scheme, and Experiments 4 and 5 are concerned with subjects' perceptions of luck within both skill and chance situations.

CHAPTER II

GENERAL METHOD

Subjects

Subjects were drawn from introductory psychology classes at the University of Houston during the spring semester, 1975. Volunteers were awarded course credit in return for their participation. A total of 224 subjects, with approximately equal representation of males and females, participated in the present investigation.

Procedure

The investigation consisted of five different parts, hereafter referred to as Experiments 1, 2, 3, 4, and 5. Subjects participated in as few as two to as many as five of the experiments. Different numbers of subjects were required for the different experiments, so it was not necessary to gather data from all 224 subjects for all five experiments. Data for all 5 experiments were provided by 39 subjects, data for 4 experiments were provided by 88 subjects, data for 3 experiments were provided by 119 subjects, and data for 2 experiments were provided by 1 subject.

Stimulus materials for each experiment consisted of printed items which were read and responded to by subjects. Stimulus items for Experiments 2 and 4 were presented on single sheets of paper, while the items for Experiments 1, 3, and 5 were presented in small booklets in which one stimulus item appeared on each page. Materials for the different experiments were not combined--materials for any on experiment existed as an individual sheet or booklet.

The different sheets and booklets were presented to subjects in random order. Materials for each subject were placed in a manila folder, and the subject was instructed to go through the materials in the order in which the materials were presented. Following completion of all items received, subjects returned the materials to the manila folders, which were then collected by the experimenter.

Subjects were tested in groups. The largest group consisted of 39 subjects, and the smallest group consisted of 6 subjects. Except for one group of subjects who were tested in their own classroom, subjects reported to a designated lecture room at a given time. Subjects' names were taken upon their arrival in order to assign credit for participation, but names were not associated with responses. After all subjects had signed the experimental credit list and were seated at tables, the folders containing the stimulus materials were distributed. The folders and the materials within the folders had been arranged in random order prior to the testing occassion so that testing occassions were randomly distributed across conditions.

The experimenter was unaware of the conditions of the individual subjects.

After stimulus materials were distributed to all subjects, verbal instructions concerning the order of the materials were given. Instructions specific to each sheet or booklet were included on that sheet or booklet.

The experimenter remained in the testing room while subjects read the materials and made written responses to the simulated situations. All testing sessions were conducted by the same experimenter.

CHAPTER III

EXPERIMENT 1

Introduction

A number of studies of the attributional process in connection with achievement tasks offer support for the classifications along the stability dimension presented by Weiner, et al. (Frieze and Weiner, 1971; Weiner, Heckhausen, Meyer and Cook, 1972; McMahon, 1973). Frieze and Weiner found that when a current outcome is consistent with previous outcomes of the performer and of other persons on the same task, attributions to task difficulty and ability are high, implying that the cause of a stable series of outcomes (or the cause of a typical outcome) is attributed to stable causal factors.

Weiner, Heckhausen, Meyer and Cook report that when a failure is attributed to lack of effort or to bad luck, expectancies for success on the next trial are higher than when a failure is attributed to lack of ability or to task difficulty. The stability of the ability and task factors is thought to result in expectancies for future outcomes to resemble the current outcome, while the variability of luck and effort is thought to result in expectancies for future outcomes to differ from the current outcome.

McMahon found that greater similarity between a subject's expectation of success and his actual outcome results in greater weight being given to the stable factors (ability and task difficulty) in explaining the outcome. Relationships between attributions and expectancies for success on the next trial were similar for the McMahon and the Weiner, Heckhausen, Meyer and Cook studies.

The experimental evidence discussed above indicates that task difficulty and ability are often perceived to be stable factors as the Weiner, et al. classification scheme assumes. However, it is possible that the experimental procedures employed in the aforementioned studies were conducive to perceptions in line with the classification scheme. Subjects in the Frieze and Weiner study were asked to make attributions on the basis of information about the percentage of successes the performer had obtained on the current task and on similar tasks, and the percentage of successes by other persons on the same task. No further information was given. Thus, there was no basis for subjects in the Frieze and Weiner study to attribute an inconsistent outcome to ability or to task difficulty. If, as Kelley's covariation principle proposes, an effect is attributed to the one of its possible causes with which, over time, it covaries, subjects had ample reason for failing to attribute an atypical or inconsistent event to ability or to task difficulty. Since Frieze and Weiner gave their subjects no information to the contrary, subjects may well have assumed that the performer's encounter with the task took place over a relatively brief period of time, during which ability might not be expected to vary; therefore, it could not covary with atypical outcomes. Similarly, subjects in the Frieze and Weiner study were given information about a performer's outcomes on the same task, implying that the task remained constant. If subjects are told that the task difficulty is constant, it should not be surprising to find that they treat it as a constant factor.

Frieze and Weiner's data do indicate that when ability is allowed to vary, as it was when information concerning the current performance and the performance of other persons on the same task was considered, an inconsistent outcome is attributed to ability.

In a study of the effects of varying distributions of success and failure upon attributions of intelligence reported by Jones, Rock, Shaver, Goethals and Ward (1968), experimental procedures were designed to minimize the possibility of performers' "catching on" or learning during the presentation of a series of problems. Furthermore, subjects were asked to rate performers' intelligence, an ability which is usually believed to be relatively stable. The procedures employed by Jones, et al. were conducive to the perception of a stable rather than an unstable ability. The fact that certain procedures were necessary to insure that subjects would perceive the ability in question to be stable suggests that under other circumstances ability might be perceived to be unstable. One can imagine real life situations in which ability and task difficulty are assumbed to be changeable. Piano teachers, golf pros, college professors and any number of other types of teachers and instructors might have to find other means of earning a living if abilities were not thought to be subject to change. While a learning situation is thought to result in increased abilities, other situations, aging, for example, may be thought to result in decreased abilities. Even intelligence, a relatively stable ability, may be assumed to undergo long term changes with a child's development.

Task difficulty may often change in real life achievement situations. In competetive situations, a performer may encounter a more able opponent on different "trials" of the same task. Not only do ability and task difficulty change, but people are often called upon to make attributions in a situation in which these "stable" factors may have changed. A teacher may have to decide whether a student's improved performance is the result of an easier task or a higher level of skill.

Heider is not insensitive to the possibility of change in ability and task difficulty. He states "We focus upon the power component when a person's abilities are enhanced through teaching, training, and practice. We focus on the environmental component when we create favorable opportunities, remove environmental barriers, decrease task difficulty, and so on." (page 99).

The foregoing observations suggest that subjects in an experimental situation may be induced to treat "stable" factors as unstable and "unstable" factors as stable under certain conditions. Since evidence in the literature indicates that subjects are sensitive to the distribution of events in binary sequences (Jones, 1971), it may be possible to suggest that a factor has undergone a change by presenting sequences of success and failure in connection with context information. Sequence changes over time may indicate that a change has taken place. For example, if early parts of a sequence display a high proportion of failures and later parts display a high proportion of successes, it would not be unreasonable to infer that a change had occurred in at least one of the four causal factors. If the performer tried as hard as he could on each trial, and if the task had not changed, the difference in outcomes between early and late parts of the sequence would have to be attributed to a change in ability or to a change in luck. The classification presented by Weiner, et al. places ability in the stable category and luck in the unstable category, which leads to the conclusion that a change in luck would be a possible cause for a change in a sequence, while a change in ability would not. This approach would predict that the subjects' choices for the changed element would favor luck. However, unfavorable luck over several trials followed by favorable luck over several more trials is a most implausible sort of luck, while low ability followed by high ability as learning takes place is a familiar phenomenon. Therefore, for the situation described above, it is expected that subjects' choices for the changed element would favor ability.

Changes can also occur in an underlying process in the absence of observed changes in a sequence of outcomes. A sequence consisting entirely of successes could be presented with a cover story stating that although an individual's ability did not change, and he was not fatigued, it was necessary for him to increase his effort on each trial in order to maintain successful outcomes. Another factor had changed, and subjects would be required to choose between task difficulty and luck for their attributions. If task difficulty is stable, as suggested by Weiner, et al., it would not be perceived to be the changed element, and subjects would attribute change in the underlying process to a change in luck. However, it is implausible that luck would change in such a way as to require ever greater levels of effort. A change in task difficulty on each trial requiring greater effort to succeed is plausible, and is quite familiar to the high jumper who is expected to perform a more difficult task on each trial as the criterion height is raised.

Experiment 1 of the present investigation attempted to assess the effect of different sequences and different contexts upon attributions of the cause of change in an underlying process to the four causal factors of ability, effort, task difficulty, and luck. It was expected that subjects who were required to decide whether a change in a "stable" or and "unstable" factor was responsible for another change could be shown to attribute the change to the "stable" factor.

Method

A within-subjects design was used for Experiment 1. Each of six items was presented to each of 110 subjects; order of presentation of items was randomly determined for each subject. Items consisted of brief cover stories describing persons engaged in skill activities, a sequence of ten success and failure outcomes described as the record of the person's performance on the skill activity, and two alternative explanations of the performance record. The two alternative explanations were statements to the effect that a "stable" or an "unstable" factor had changed over the ten trials, and the subject was asked to choose which of the two statements he or she considered to be more likely. The two alternatives were counterbalanced for order, with approximately half the subjects receiving each order on each item.

The cover stories described either a particular skill activity (swimming, golf, playing chess) or an unspecified skill task (referred to as "a skill task"). All stimulus items used in Experiment 1 are included in Appendix A.

Sequences of success and failure outcomes were specific to particular cover stories. For example, seven successes followed by three failures was the record of a golfer's attempts to qualify for a particular tournament over a period of ten years, while a sequence of ten failures was the record of a person performing ten trials on a skill task in which harder versions of the task were presented on earlier trials and easier versions were presented on later trials.

Sequences were designed to be consistent with both the information given in the cover story and the demonstrational strategy to elicit subjects' judgments that a change in a "stable" factor had occurred. Two of the cover stories describing particular skill situations included a long-term time frame--the golfer's attempts occurred over a ten year period, and the swimmer's attempts took place during a ten day period. It was reasoned that a relatively long time period would be required in order for subjects to infer that performers' abilities had undergone a change, hence a long-term time frame was included in these two items. In an attempt to elicit judgments of a change in task difficulty, a player in a chess tournament was introduced. The tournament was structured in such a way that winners of one match would play winners of another match, and losers would play losers. Such an arrangement would allow judgments that the difficulty of the task had changed from trial to trial. The three other stimulus items dealt with unspecified skill tasks. Two of these items explicitly informed subjects that the difficulty of the task had changed from trial to trial, and using that information and the particular sequence paired with each paragraph, subjects were asked to decide whether effort or ability had changed. The final stimulus paragraph described a situation in which the identical task was used on each trial, while the outcome record showed improvement, and subjects were asked to decide whether luck or ability had changed. Since Experiment 1 was conceived as a demonstration of subjects' treatments of ability and task difficulty as unstable elements, no attempt was made to exhaust the possible combinations of context information and outcome sequences.

Results

Response frequencies and their associated probability levels as calculated using the normal approximation to the binomial distribution, two-tailed test, for each of the six stimulus items used in Experiment 1 are presented in Table 1. Responses to Items 1, 2, 3, and 4 favored the conclusion that the "stable" factor was subjectively more likely to have changed during the course of the ten reported trials than was the "unstable" factor, responses to Item 5 were at the chance level, and responses to Item 6 favored the conclusion that the "unstable" factor was more likely to have changed.

Discussion

Stimulus Item 1 elicited subjects' unanimous response favoring ability rather than luck as the factor more likely to have improved during the performer's ten attempts to swim across a pool within a certain length of time. The relatively long-term nature of the specified situation may have contributed to subjects' judgments: Subjects may find a change in ability to be plausible in a long-term situation, while the notion of such a change might be rejected in a short-term situation. In addition, swimming is a skill generally thought to improve with practice. Even those attempts on which the swimmer failed to reach the criterion

Table 1

Frequency of responses favoring stable and unstable factors.

COVER STORY AND SEQUENCES	N	STABLE FACTOR & FREQUENCY	UNSTABLE FACTOR & FREQUENCY	PROB. LESS THAN
1. Swimmer attempts swim across pool within certain time.		Ability	Luck	
F F F F S F S S S S	110	110	0	.001
2. Golfer attempts to qualify every year for ten years.		Ability	Effort	
S S S S S S S F F F	110	67	43	.05
3. Chess player in matches; winners play winners, losers play losers.		Task	Luck	
S S S S F S F S F F	110	94	16	.01
4. Unspecified skill task; identical task used on each trial.		Ability	Luck	
F F F F S F S S S S	109	102	7	.01
5. Unspecified skill task; earlier trials easy, later trials hard.		Ability	Effort	
S S S S S S S S S S	108	54	54	n.s.
6. Unspecified skill task; earlier trials hard, later trials easy.		Ability	Effort	
F F F F F F F F F F	110	21	89	.05

speed can be regarded as practice sessions resulting in some improvement in swimming ability. The same atmosphere of improvement through practice would probably obtain if the designated task were the playing of a musical arrangement from start to finish with no mistakes, and in this case the time required for subjects to infer that a change in ability had occurred might be even shorter, perhaps one-half hour or less. The important characteristics of Item 1 appear to be that the ability in question is one that is generally thought to improve with practice, and that the sequence presented allows an inference that the ability has indeed improved. It is even possible that subjects would have inferred an improvement in ability if the sequence presented had consisted entirely of one outcome or the other. Practice can lead to improvements in ability such that the performance approaches but fails to reach the criterion in the case of failure, or exceeds the criterion by greater margins in the case of success.

A difficulty with Item 1 is that locus of control is confounded with stability in the choices offered to subjects: An internal stable factor is pitted against an external unstable factor. Evidence from the literature (Jones and Nisbett, 1971) suggests that observers favor internal attributions when judging the performances of others, which could explain the responses favoring ability as the changed factor in Item 1. It would be possible to alter Item 1 so that ability could be pitted against effort rather than against luck. If the performer were described as highly motivated, subjects should infer that effort would be equally high on all trials and should still favor ability as the changed factor.

Stimulus Item 2, in which a golfer attempts to qualify for a particular tournament in each of ten years, and succeeds on earlier attempts while failing on later attempts elicited responses favoring ability rather than effort as the changed factor. For this item, a stable factor is pitted against an unstable factor within the internal division of the locus of control dimension, thereby avoiding the confound in Item 1. The effect of the unconfounded comparison is weaker, however. The sequence, in which earlier successes are followed by later failures, coupled with the information that the sequence spans a ten year period, allows subjects to infer that the golfer's ability has declined, perhaps because of aging. It seems unlikely that subjects would have made the same inference if the attempts had all occurred within a short time period. In that case, subjects might have reasoned that ability would not have declined in such a short period of time, and might have therefore concluded that the golfer had not put forth as much effort on later attempts as he had on earlier attempts.

Item 3 concerns a chess player who plays in a tournament in which the winner of one match plays the winner of another match while losers play losers. The chess player is successful during earlier matches, and suffers defeats on later matches. In this item, the stable and unstable factors were both drawn from the external division of the locus of control dimension. Even though luck may be generally thought to operate in games of this sort, and would probably be thought to effect outcomes differentially, subjects tended to conclude that task difficulty rather than luck had changed during the tournament, supporting the prediction that "stable" factors are viewed as changeable under certain conditions.

Item 4, in which the skill task is not specified and the sequence of outcomes suggests a change from failures to successes, elicited responses favoring ability (the stable factor) rather than luck (the unstable factor) as the changed factor. As in Item 1, locus of control is confounded with stability.

Item 5 is an unspecified skill task in which an easy version of the task is used for the first trial, a harder version is used for the second trial, and so on. A successful outcome occurs on every trial. Subjects apparently found the choice between effort and ability as possible changed factors to be a meaningless one; as responses were evenly divided between the two factors. It was not necessary for subjects to assume a change in either factor since the performer's ability and effort on any one trial could have been great enough to insure success on the hardest trial. Constant levels of effort and ability were entirely possible. One subject objected to the two choices presented, and wrote that a choice indicating no change had occurred in either factor would have been preferred to the two choices given.

Item 6 was included as the reverse of Item 5: Harder versions of the task on earlier trials gave way to easier versions on later trials, and a failure occurred on every trial. In this situation, subjects tended to believe that a decline in effort would occur over the ten trials, despite the fact that the reasoning suggested for the chance level of responding on Item 5 could also apply to Item 6. That is, subjects could have concluded that no change was necessary to explain the outcomes, and responses favoring either factor should have been at the chance level. However, chance level responses did not occur: Subjects tended to conclude that the performer's effort rather than his ability had declined over the ten trials. It seems likely that subjects considered the motivation of the performer. If he had failed on the first few trials on which the harder versions of the tasks were used, he might have become discouraged and stopped trying. Subjects could be fairly certain that continuing failure would reslut in a decline in effort, while the effects of continuing failure upon ability would be less obvious. Since subjects were asked to indicate which statement they considered to be more likely, they tended to choose the alternative reflecting the decline in effort, whether ability had declined or not. Also, the lack of information given about the specific nature of the task and about the time period over which the trials occurred could be expected to prevent judgments that a decline in ability had occurred in Item 6.

Conclusions

Responses to Items 1, 2, 3, and 4 demonstrate that ability and task difficulty, the "stable" causal factors, are sometimes perceived by subjects as changeable factors. Although stability and locus of control were confounded in the choices available for Items 1 and 4, responses to the unconfounded comparisons in Items 2 and 3 indicate that the "stable" factor is subjectively more likely to have changed than is the "unstable" factor under the context and sequence conditions employed for these items.

The two items for which subjects' choices did not favor the interpretation of a change in a "stable" factor, Items 5 and 6, consisted of unspecified skill tasks coupled with sequences containing only one kind of outcome. These results suggest that the presence of either context information concerning the nature of the task and the time period involved or sequence information suggesting a systematic change from one kind of outcome to the other, or both, may be necessary to elicit subjects' judgments that a change in a "stable" factor has occurred. Both the context and the observed sequence are sources of information about the underlying process. If these sources suggest or permit change in a stable factor, subjects are able to infer that such a change has occurred. Further research might be undertaken to determine whether identical context information coupled with different sequences elicit the same judgments, whether identical context information coupled with different sequences elicit similar judgments, and whether identical sequences coupled with different contexts elicit similar judgments.

The results from Experiment 1 demonstrate that ability and task difficulty are sometimes thought to be changeable causal factors, suggesting that their classification as stable factors by the Weiner, Frieze, Kukla, Reed, Rest, and Rosenbaum model may be invalid. Context and sequence information appear to have contributed to subjects' perceptions of change in stable factors in Experiment 1. In Experiment 3 of this thesis, the effects of different sequences upon causal attributions to the stable and unstable factors are considered. The notion that sequence structure contributes to subjects' perceptions of causal factors receives more support from the results of Experiment 3.

As noted above, the results from Experiment 1 suggest that the Weiner, et al. classification model may be invalid with respect to the "stable" factors. Experiment 2 of this thesis will extend the suggestion of invalidity to the unstable category as well.

CHAPTER IV

EXPERIMENT 2

Introduction

The classification of luck and effort as unstable factors by the Weiner, *et al*. scheme has received some support from recently reported experimental evidence. Frieze and Weiner found that when a current outcome is inconsistent with outcomes of other persons, attributions to effort and luck are high. However, the degree of consistency of the current outcome with the performer's own past outcomes and with his outcomes on similar tasks resulted in no significant main effect upon effort attributions, although significant main effects upon luck attributions were noted. Furthermore, data from the Frieze and Weiner study reported by Weiner, Frieze, Kukla, Reed, Rest, and Rosenbaum (1971) indicate that the degree of consistency of a current success outcome with past outcomes has virtually no effect upon effort attributions. These findings suggest that although subjects treat luck as an unstable factor, their perceptions of effort may depart from the Weiner, *et al*. classification scheme.

Weiner, Heckhausen, Meyer and Cook (1972) found that when failure was perceived to have been caused by bad luck or by lack of effort, subjects did not expect subsequent failure to as great an extent as when failure was ascribed to lack of ability or to a hard task. These findings are taken as indirect statements of the perceived stability or instability of the underlying causal factors. The relatively greater subjective expectancies for repetitions of failures attributed to ability or task difficulty suggest that these two factors are thought to be more stable than are effort and luck. These investigators assume that similar relationships will be found given success rather than failure outcomes. Their assumption may be justified for success attributed to luck, in which case subjects should not be so confident of future success as when success is attributed to ability or to an easy task. However, expectancies following effort attributions should not be expected to be similar to expectancies following luck attributions when the outcome is a success. If success is attributed to high effort, subjects should conclude that high effort will produce future successes, and, given motivation to succeed, subjects should expect to succeed on a subsequent trial. Expectancies following a success attributed to high effort should not differ so greatly from expectancies following a success attributed to ability or to an easy task as should expectancies following a success attributed to luck.

Results reported by McMahon (1973), while supporting the classification of luck as an unstable element, are unclear concerning the stability of effort in relation to success. The predicted positive relationship between both luck and effort attributions and expectancies for success on the next trial was found for failure: High luck or effort attributions for failure were associated with high expectancies for success on the next trial. However, the predicted negative correlations between attributions and expectancies for success on the next trial were found mainly in the case of luck. For effort attributions, some negative and some positive correlations were found.

Weiner, Heckhausen, Meyer and Cook found that expectancies following a failure attributed to lack of effort are similar to expectancies following a failure attributed to bad luck in an achievement situation in which subjects are motivated to succeed. In the absence of motivation, however, a failure attributed to lack of effort might be expected to result in expectancies which are lower than expectancies resulting from a failure which is attributed to bad luck. The effort of an unmotivated performer would be likely to remain low, resulting in further failures, while bad luck would not be expected to hold for future trials, and, in the absence of bad luck, success might occur.

Experiment 2 was an attempt to demonstrate that expectancies following effort attributions are not always similar to expectancies following luck attributions, and that, in fact, effort can be perceived as a relatively stable factor. An additional prediction was that the performer's motivation would have an effect upon expectancies following effort attributions: Motivated successful performers should be expected to repeat a success attributed to effort to a greater extent than should unmotivated successful performers, while unmotivated unsuccessful performers should be expected to repeat a failure attributed to effort to a greater extent than should motivated unsuccessful performers.

<u>Method</u>

A 2 X 2 X 2 X 2 factorial design was employed for Experiment 2. Outcomes (success and failure), Motivation (motivated and unmotivated), Locus of Control (internal and external) and Stability (stable and unstable) dimensions were varied systematically, resulting in 16 treatment conditions. Subjects were informed that a performer performed a task upon which he had sometimes succeeded and sometimes failed in the past. The performer was said to be very much concerned (not very much concerned) with success at the task. He had just completed a trial, and had succeeded (failed) on that trial. He attributed his success (failure) to effort (ability, luck, task difficulty). Subjects were then required to produce expectancies in the form of subjective probabilities for success on the next trial. Subjects indicated probabilities by making a pencil mark through a horizontal line 15 centimeters in length, the left end of which was labeled 0%, certainly will fail, and the right end of which was labeled 100%, certainly will succeed. A sample stimulus item for Experiment 2 may be found in Appendix B. The number of subjects in each cell was 14, for a total of 224 subjects.

Results

An analysis of variance was performed upon raw scores and again after transforming scores for the success outcome condition. The raw scores were subjective probabilities of success, in which a low probability indicated an expectancy for a failure on the next trial, and a high probability indicated an expectancy for success on the next trial. A second analysis using transformed scores was carried out to determine the degree to which subjects expected the outcome on the next trial to differ from the outcome on the trial just completed. For a failure on the trial just completed, the raw scores did indicate expectancies for the next trial to differ: A low subjective probability of success would indicate that the next trial was expected to be similar in outcome to the trial just completed, and a high subjective probability of success would indicate that the next trial was expected to differ in outcome from the trial just completed. In the case of a success, however, it was necessary to transform the score by subtracting the raw score from 1 to obtain a measure of the degree to which the next trial was expected to differ in outcome from the trial just completed. For example, if subjective probabilities for success following a success were high, it would indicate that the next trial was not expected to differ a great deal from the trial just completed, and the transformed score, 1 minus the subjective probability, would be low. If probabilities for success following a success were low, this would indicate that the next trial was expected to differ from the trial just completed, and 1 minus the subjective probability would be high.

Summaries of the Analyses of Variance performed upon the raw scores and upon the transformed scores are presented in Tables 2 and 3, respectively. Two significant main effects and two significant interactions were found by the analysis of the raw scores: Outcome ($F_{1,208} = 19.25$, $p < .01$); Motivation ($F_{1,208} = 13.84$, $p < .01$); Outcome X Stability ($F_{1,208} = 5.15$, $p < .05$); and Stability X Locus of Control ($F_{1,208} = 12.10$, $p < .01$). The analysis upon the transformed data resulted in significant main effects of Outcome ($F_{1,208} = 17.06$, $p < .01$) and of Stability

TABLE 2

Analysis of Variance Summary Table, Experiment II, Raw Scores

SOURCE	SUM SQUARES	df	MEAN SQUARE	F RATIO	PROB.
Outcome	.7921	1	.7921	19.25	.001
Motivation	.5693	1	.5693	13.84	.001
Stability	.0859	1	.0859	2.09	
Locus of Control	.0111	1	.0111	.27	
Outcome X Motivation	.0078	1	.0078	.19	
Outcome X Stability	.2121	1	.2121	5.15	.025
Outcome X Locus of Control	.0014	1	.0014	.03	
Motivation X Stability	.0120	1	.0120	.29	
Motivation X Locus of Control	.0246	1	.0246	.60	
Stability X Locus of Control	.4978	1	.4978	12.10	.001
Outcome X Motivation X Stability	.0654	1	.0654	1.59	
Outcome X Motivation X Locus of Control	.0005	1	.0005	.01	
Outcome X Stability X Locus of Control	.0021	1	.0021	.05	
Motivation X Stability X Locus of Control	.0677	1	.0677	1.65	
Outcome X Motivation X Stability X Locus of Control	.0025	1	.0025	.06	
Within cells	8.5586	208	.0411		
Total	10.9109	223			

TABLE 3

Analysis of Variance Summary Table, Experiment II, Transformed Scores

SOURCE	SUM SQUARES	df	MEAN SQUARE	F RATIO	PROB.
Outcome	.7019	1	.7019	17.06	.001
Motivation	.0078	1	.0078	.19	
Stability	.2121	1	.2121	5.15	.025
Locus of Control	.0014	1	.0014	.03	
Outcome X Motivation	.5693	1	.5693	13.84	.001
Outcome X Stability	.0859	1	.0859	2.09	
Outcome X Locus of Control	.0111	1	.0111	.27	
Motivation X Stability	.0654	1	.0654	1.59	
Motivation X Locus of Control	.0005	1	.0005	.01	
Stability X Locus of Control	.0021	1	.0021	.05	
Outcome X Motivation X Stability	.0120	1	.0120	.29	
Outcome X Motivation X Locus of Control	.0246	1	.0246	.60	
Outcome X Stability X Locus of Control	.4978	1	.4978	12.10	.001
Motivation X Stability X Locus of Control	.0025	1	.0025	.06	
Outcome X Motivation X Stability X Locus of Control	.0677	1	.0677	1.65	
Within cells	8.5586	208	.0411		
Total	10.8206	223			

($F_{1,208} = 5.15$, $p < .05$), and the following significant interactions: Outcome X Motivation ($F_{1,208} = 13.84$, $p < .01$) and Outcome X Stability X Locus of Control ($F_{1,208} = 12.10$, $p < .01$).

Discussion

Expectancies for Success. The significant main effect of Outcome found by the analysis upon the raw data reflects the higher average expectancies for success on the next trial following a success versus expectancies for success following a failure. The average subjective probability for a success following a success was .615, while the average subjective probability for a success following a failure was .496.

The main effect of Motivation indicates that subjects held higher expectancies for success for the motivated than for the unmotivated performer. The average subjective probability for a success on the next trial for a motivated performer was .606, while the average subjective probability for an unmotivated performer was .506.

Subjects' responses to the Outcome and the Motivation manipulations are unremarkable, and conform to intuitive expectations: Successful or motivated performers are considered to be more likely to succeed than unsuccessful or unmotivated performers.

The Outcome X Stability and the Stability X Locus of Control interactions found by the analysis upon the raw scores appear in the analysis upon the transformed scores as a main effect of Stability, and as an interaction of Outcome X Stability X Locus of Control, respectively. Since the transformed scores reflect the experimental interest in the degree to which the next outcome was expected to differ from the current outcome, discussion of the effects just mentioned will center upon the analysis of the transformed scores.

Expectancies for a Change in Outcome. The significant main effect of Outcome found by the analysis upon the transformed scores reflects a higher average subjective probability for a change in outcome following a failure (.496) than following a success (.385). Apparently, subjects expect the next outcome to differ from the current outcome to a greater extent when the current outcome is a failure. Put another way, subjects tend to expect repetition of a successful outcome more than they expect repetition of a failure.

The main effect of Stability is an indication of subjects' greater expectations for a change in outcome following an attribution to an unstable factor (average subjective probability = .471) as compared to their expectations for change in outcome following an attribution to a stable factor (average subjective probability = .410).

The Outcome X Motivation interaction is illustrated in Figure 2. For unmotivated performers, subjective expectancies for a change in outcome on the next trial are virtually identical for success and failure outcomes on the current trial, while for motivated performers a change in outcome on the next trial is considered by subjects to be more likely if the current outcome is a failure than if the current outcome is a success. The motivated successful performer is perceived to be more likely to repeat his success than is the unmotivated successful performer, and the motivated unsuccessful performer is less likely to repeat his failure than is the unmotivated unsuccessful performer.

The Outcome X Stability X Locus of Control interaction is of special interest, since it is a reflection of the degree to which effort (an internal, unstable factor) attributions result in expectancies similar to or different from attributions to the other factors following success or failure outcomes. The Outcome X Stability X Locus of Control interaction is illustrated graphically in Figure 3. Subjects seem to expect an outcome following a failure attributed to low effort to differ from the current outcome to a greater degree than would an outcome following a success attributed to high effort. This indicates that effort may be perceived to be a stable element in relation to attributions for successful outcomes, and an unstable element in

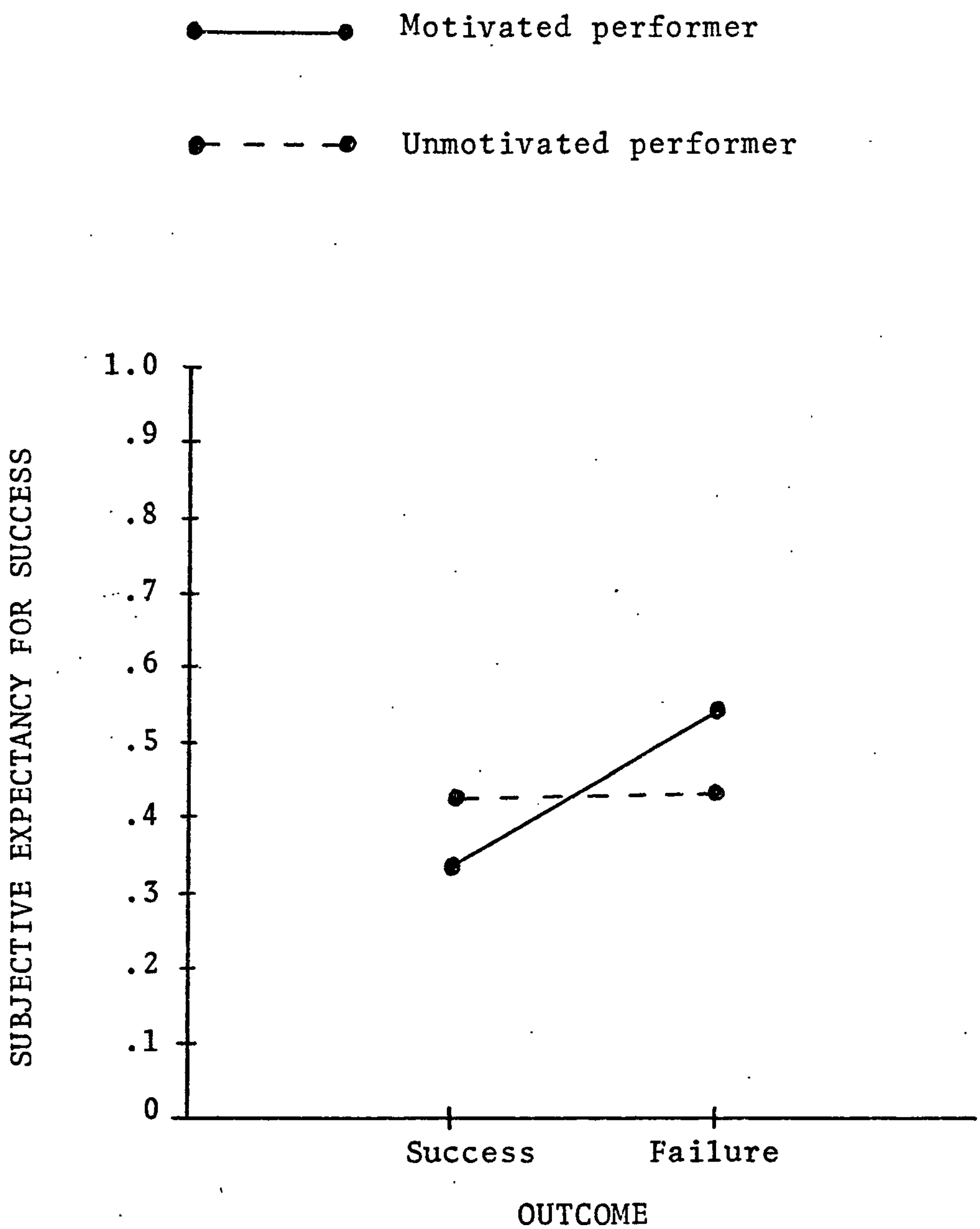

Figure 2

Subjective expectancy for success following success and failure outcomes for motivated and unmotivated performers.

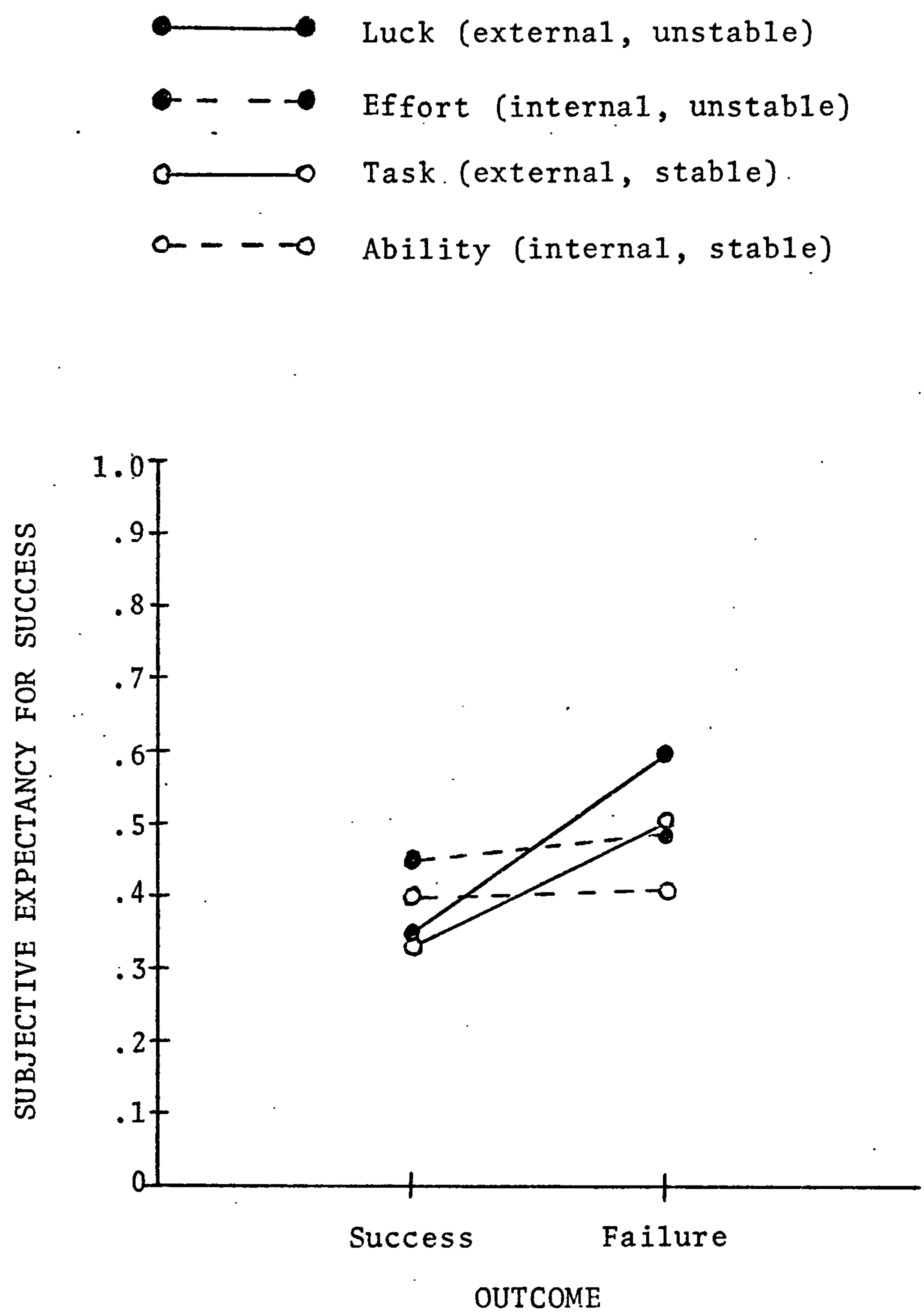

Figure 3

Subjective expectancy for success following success and failure outcomes attributed to luck, effort, task and ability.

relation to attributions for failures. The evidence indicating that effort is unstable in relation to attributions for failures conforms to the results obtained by Weiner, Heckhausen, Meyer, and Cook, who studied expectancies following only failures attributed to low effort. Their assumption that a similar relation holds for success attributed to high effort, i.e., that effort attributions will result in expectancies for future outcomes to differ from the current outcome, indicating that effort is seen as an unstable element in the cases of both success and failure, is apparently not justified. The evidence presented here indicates that effort is seen as a stable element in the case of success. Effort attributions for a success are shown in Figure 3 to result in expectancies for a change in outcome on the next trial that are very similar to expectancies for a change in outcome resulting from success attributed to task difficulty and ability, the stable elements.

The lack of a significant Outcome X Motivation X Locus of Control interaction indicates lack of support for the prediction that attributions to effort for motivated successful performers and for unmotivated unsuccessful performers would be more stable than attributions to luck for those same performers. Although the results obtained were in the expected direction for motivated performers, results were in the opposite direction for unmotivated performers. This unexpected result may be due to subjects' differential acceptance of performer's purported self-attributions for the current outcome in the different conditions. For example, an attribution to high effort as a cause for success by the motivated performer may present no problem for subjects, while an attribution to low effort as a cause for failure by the unmotivated performer may cast some doubts upon the performer's actual motivation. It may be the case that an unmotivated performer and a self-attribution to low effort represent contradictory pieces of information for subjects, who may then tend to discount the motivation information.

The results obtained in Experiment 2 must be qualified by a difficulty inherent in the design. Although the information given to subjects stated that the performer had sometimes succeeded and sometimes failed at the task, this information may have been interpreted differently in different conditions, resulting in different prior probabilities of success. The possibility of differential prior probabilities between conditions as a result of the experimental manipulations in attribution studies is discussed by Ajzen and Fishbein (1975).

In relation to the present experiment, subjects' prior probabilities might have been influenced by the stated attribution. For example, a success attributed to high ability might suggest to most subjects that successes had been common up to this point, while a failure attributed to low ability might suggest that successes had been rare. It is difficult to determine whether differential prior probabilities effected expectancies in the present experiment, since in most cases such prior probabilities would be expected to have an effect upon expectancies similar to the effect of the stated attribution. That is, if the stated attribution effected prior probabilities, success attributed to high ability should produce a high prior probability of success, which in turn should produce high expectancies for future success. However, the attribution itself should result in high expectancies.

The average expectancies for each task difficulty and ability attribution condition are in the direction that would be expected as a result of either the stated attribution or the prior probability (expectancies following a success greater than expectancies following a failure). Therefore, these results cannot be used to determine whether or not prior probabilities effected expectancies in these cases. The prior probability and the expectancy resulting from each effort attribution condition cannot be predicted, since there is some doubt as to the stability or instability of the effort factor. Therefore, the results for the effort conditions cannot be used either to determine whether differential prior probabilities effected expectancies. However, in the case of luck attributions, average expectancies did not seem to confirm the notion of differential prior probabilities. If subjects did assume different prior probabilities, the effect should be that expectancies for success following a success attributed to luck would be low, reflecting a low prior probability of success, while expectancies for success following a failure attributed to luck would be high, reflecting a high prior probability. Such an effect did not occur in the case of luck attributions, however. The average subjective expectancy following a success attributed to luck was .551, while the average subjective expectancy for success following a failure attributed to luck was .492. Although the difference between these means is small, the greater value occurred following a success rather than following a failure, suggesting that differential prior probabilities had little or no effect upon expectancies. The findings for the luck conditions can be explained by subjects' treatment of a luck attribution as one affording little or no information concerning the nature of the relationship between personal and environmental force. Since little information is available, the best prediction one can make for the probability of future success is one that is near the chance level. Average expectancies for both luck conditions are near the chance level although the average expectancy following a success attributed to luck does appear to reflect slightly the overal tendency for subjects to expect repetitions of success rather than failure outcomes.

Conclusions

The results obtained for Experiment 2 suggest that effort may be perceived as a stable causal factor when it is invoked to success. The possibility that the experimental manipulations produced different prior probabilities for the different conditions qualify this conclusion. However, differential prior probabilities appear to have had little or no effect upon expectancies following luck attributions, suggesting that such differential probabilities may not be an important factor.

The finding that effort, an "unstable" factor, may be perceived to be a stable factor coupled with the finding in Experiment 1 that "stable" factors are perceived to be changeable suggests that the Weiner, et al. classification model is invalid with respect to the stability dimension. In Experiment 3, findings concerning subjects' perceptions of the nature of underlying causal processes in relation to available sequence information further contradict the classifications along the stability dimension.

CHAPTER V

EXPERIMENT 3

Introduction

The design of Experiment 3 was guided by the same considerations mentioned in connection with Experiments 1 and 2, as well as by additional points discussed below.

In the Frieze and Weiner (1971) study, the attribution of an outcome to different causal elements was influenced by the nature of that outcome in terms of its consistency or inconsistency with percentage of success information about prior outcomes. For example, a success would be consistent with 80% successes on prior trials, and inconsistent with 20% successes. Frieze and Weiner concluded that consistency with prior outcomes increases attributions of causation of the current outcome to task difficulty and ability, while inconsistency increases attributions to luck and effort. However, their conclusion seems unjustified for effort attributions. As noted in the introduction to Experiment 2, data from the Frieze and Weiner study reported elsewhere (Weiner, Frieze, Kukla, Reed, Rest, and Rosenbaum, 1971) indicate that the degree of consistency of a current success outcome with past outcomes has virtually no effect upon effort attributions.

Frieze and Weiner summarized past outcomes in terms of percentage of success. No information was provided subjects about the distribution of success/failure outcomes over past trials. Such sequential information, if available, might be utilized by subjects. For example, a success following a sequence in which successes increase systematically might elicit one kind of attribution, while a success following a sequence in which the same percentage of successes are randomly distributed might elicit another kind of attribution. Further, a success on a particular trial might elicit different attributions depending upon the outcomes following that trial. Experiment 3 of this thesis attempts to determine what part the arrangement of successes and failures prior to and following a particular outcome plays in attributions of cause for that outcome. Experiment 3 represents an attempt to demonstrate that when arrangements of successes and failures differ between sequences for which overall percentages of success are identical, causal attributions for the final outcome will differ, and that for identical prior sequences, causal attributions for the target outcome will differ when subsequent outcomes differ.

Method

Stimulus materials for Experiment 3 consisted of horizontally printed sequences of success and failure outcomes, with outcomes symbolized by the letters "S" and "F", respectively. One sequence was printed on each page of an eight page booklet. One outcome in each sequence was underlined to designate that outcome as the target outcome. For each target outcome, subjects were required to indicate the degree to which each of the four causal factors luck, effort, task difficulty and ability had contributed to that outcome. Factors were consistent with outcomes: Good luck, high effort, easy task and high ability were possible causes for a success, while bad luck, low effort, hard task and low ability were possible causes for a failure. Subjects indicated the degree of causality attributed to each factor by circling one of the numbers 0, 1, 2, or 3 for that factor. A 0 indicated that the factor in question was not at all a cause of the outcome, and a 3 indicated that the factor was very much a cause. This method of attributing cause to each of the four factors was used by Frieze and Weiner. Instructions to subjects for Experiment 3 and a sample sequence with the possible causes for the target outcome in that sequence are presented in Appendix C.

Eight groups of stimulus sequences were prepared for Experiment 3. Four sequences were included in each of sequence Groups 1, 2, and 3, and two sequences were included in each of the other five groups of sequences. Target outcomes were embedded within sequences for Sequence Groups 1, 2, and 3, and targets were located at the end of the sequences for Sequence Groups 4, 5, 6, 7, and 8. All sequences used in Experiment 3 are presented by sequence groups in Appendix C.

Sequence Labels. Within Sequence Group 1, sequences are labeled 1 A-S, 1 A-F, 1 B-S and 1 B-F. The numeral 1 in each label refers to the sequence group, the letter A or B refers to the structure of the sequence, and the letter S or F refers to target outcome, either success or failure. All sequences labeled with the numeral 1 are found within Sequence Group 1. Within Sequence Group 1, the two sequences labeled with the letter A are alike in structure: All outcomes within the sequence are identical to the target outcome. Similarly, for the two sequences labeled with the letter B, all outcomes prior to the target outcome are identical to the target, and all outcomes following the target outcome are different from the target. The two A sequences are complementary, as are the two B sequences: To construct Sequence 1 A-F from Sequence 1 A-S, each success in 1 A-S was replaced by a failure, and each failure in 1 A-S was replaced by a success. Target outcomes were replaced as well. Complementary sequences were used within all sequence groups in Experiment 3. Four sequences were included in each of Sequence Groups 1, 2, and 3, and two sequences were included in each of Sequence Groups 4, 5, 6, 7, and 8. Since only one pair of complementary sequences was used in groups 4, 5, 6, 7, and 8, the A and B designations were not required. Labels are presented here to facilitate discussion; labels were not presented to subjects.

Embedded Target Sequences. Within Sequence Group 1, all target outcomes were preceded by five outcomes identical to the target outcome. For Sequences 1 A-S and 1 A-F, the three outcomes following the target outcome were also identical to the target, while for Sequences 1 B-S and 1 B-F the three outcomes following the target outcome were different from the target.

Within Sequence Group 2, the five outcomes preceeding the target outcome were different from the target. For two sequences the three outcomes following the target outcome were identical to it, and for two sequences the three outcomes following the target outcome were different from the target.

Within Sequence Group 3, the seven outcomes preceeding the target outcome consisted of five outcomes identical to the target and two outcomes different from the target. The two outcomes following the target outcome were either both identical or both different from the target.

Ending Target Sequences. In Sequence Groups 4, 5, 6, 7, and 8, the target outcome was the final outcome in the sequence. Target outcomes were preceeded by twelve prior outcomes, six of which were success outcomes and six of which were failure outcomes, resulting in target outcomes occurring at the end of a sequence in which overall probabilities of success and failure has been .50 - .50. Different arrangements of success and failure outcomes were used for sequences in the different ending target sequence groups. The actual arrangements of success and failure outcomes constructed for the sequences in Groups 4, 5, 6, 7, and 8 were guided by the results of research reported by Brown and Bane (1975) and by Kahneman and Tversky (1972). Brown and Bane found that subjects' expectancies for the occurrence of a particular outcome on the next trial of a chance controlled binary process were influenced by prior changes in outcome probabilities. Kahneman and Tversky note that subjects are sensitive to the arrangements of outcomes within sequences in judging whether a particular sample was likely to have been generated by a particular process. Kahneman and Tversky suggest that the representativeness of a sample, (the degree to which the sample is similar to the parent population in terms of overall probabilities of events and the degree to which the sample reflects the properties of the process by which it was generated) determines subjective likelihoods that the sample is in fact drawn from the population in question. These authors maintain that for subjects to accept a sample as resulting from a random process, the sample must reflect the proper relative proportions (.50 - .50 in the case of a coin tossing experiment) and the events must be arranged in such a way as to reflect the generating process (apparent systematic patterns would indicate that the sample was not generated by a random process). Sequences constructed for Sequence Groups 4, 5, 6, 7, and 8 were designed to reflect either "randomness" or "systematic" patterns.

For Sequence Group 4, a "random" arrangement of successes and failures was used. Success and failure outcomes were thoroughly mixed, and there was only one spot in the entire sequence where the same outcome was repeated in adjacent positions. Causal attributions were compared for the two complementary target outcomes within complementary sequences.

Sequence Group 5 also contained two complementary "random" sequences, differing from Group 4 sequences only in the arrangements of the two outcomes immediately preceeding the target outcome. The arrangement in Group 5 sequences resulted in a second repetition of outcome, and in a target outcome identical to the immediately preceeding outcome.

Outcomes for Group 6 sequences were arranged so that outcomes of one kind were more common early in the sequence and outcomes of the other kind were more common later in the sequence. This allowed the inference that a very gradual change from one type of outcome to the other occurred as the sequence progressed. The target outcome was of the type more common in the latter portion of the sequence. One sequence seems to change from mostly failure outcomes early in the sequence to mostly success outcomes later in the sequence, ending in a success target outcome, while the complementary sequence in Group 6 represents the opposite situation.

Group 7 sequences were also arranged to appear to change from one kind of outcome to the other, but the change was more pronounced than in Group 6 sequences. While runs in Group 6 sequences consisted of only two outcomes, so that the addition of the target outcome after the final run resulted in a total run length of three outcomes, runs in Group 7 consisted of three outcomes with a four outcome run when the target outcome was added. The first six outcomes in Group 6 sequences consisted of four outcomes of one kind and two of the other kind, and the arrangement of the next six outcomes was reversed. In Group 7 sequences the first six outcomes included five outcomes of one kind and only one of the other kind.

Outcomes in Group 8 sequences were arranged to reflect an abrupt change from one kind of outcome to the other. The first six outcomes of each sequence were of one kind, and the next six outcomes and the target outcome were of the other kind. In all sequences in Groups 4, 5, 6, 7, and 8, the target was preceeded by a sequence in which the overall probability of success was equal to the probability of failure. The different arrangements of outcomes employed for the different sequence groups resulted in different local probabilities between sequence groups.

To summarize the sequences used in Experiment 3, eight groups of sequences were constructed. Sequence Groups 1, 2, and 3 were each made up of four sequences in which target outcomes were embedded within the sequences. Sequence Groups 4, 5, 6, 7, and 8 were each made up of two sequences in which the target outcomes were located at the ends of the sequences. In Groups 4 and 5 outcomes were randomly arranged within sequences, in Groups 6 and 7 outcomes were arranged to suggest a gradual change from failure to success or vice versa, and in Group 8 outcomes were arranged to reflect an abrupt change.

As noted earlier, stimulus items for Experiment 3 consisted of printed sequences of success and failure outcomes. This simultaneous presentation of outcomes did not require subjects to rely upon remembered sequence aspects as would a method of presentation in which outcomes were presented one at a time. Simultaneous presentation provides a perfect record of the sequence, while the one at a time method would be subject to errors of recall. It was expected that obviating the need for temporal integration would facilitate detection of departures from "randomness". Also, real world evaluative information often has a simultaneous kind of format, e.g., academic transcripts.

Each subject was presented one sequence from each of the eight groups of sequences, resulting in a between-subjects design for any one sequence group. To control for order effects, assignment of a sequence from a group of sequences to any subject was randomly determined. This random method for assigning sequences to subjects made it impossible to use either a within-subjects or a between-subjects comparison between groups of sequences, precluding direct comparisons between sequence groups. Patterns of responses for the different sequence groups can be compared at a conceptual level, even though direct statistical comparisons were not made.

Results

The random method of assigning sequences to subjects resulted in different numbers of subjects responding to the different sequences. For Sequence Groups 1, 2, and 3, the least number of subjects in a sequence condition was 37, so the last subjects tested were removed from each of the other sequence conditions until all sequence conditions contained 37 subjects. For Sequence Groups 4, 5, 6, 7, and 8, the least number of subjects in a sequence condition was 84, and the last subjects tested were removed from each of the other sequence conditions until all sequence conditions contained 84 subjects.

Each of the four causal elements was classified by locus of control and stability according to the Weiner, et al. classification model. A three factor (Sequence, Locus of Control of Causal Element, and Stability of Causal Element) analysis of variance with repeated measures on two factors (Locus of Control and Stability) was performed. Responses to sequences were compared within groups of sequences--direct comparisons between sequence groups were not made, since neither a between-subjects nor a within-subjects design would be entirely appropriate for such an analysis, as noted earlier. For each of Sequence Groups 1, 2, and 3, four sequence conditions with 37 subjects in each condition were compared. For each of Sequence Groups 4, 5, 6, 7, and 8, two sequence conditions with 84 subjects in each condition were compared. The results of the eight analyses are presented in Tables 4, 5, 6, 7, 8, 9, 10, and 11. A summary of all significant main effects and interactions found by the analyses within each of the sequence groups is presented in Table 12.

Discussion

Subjects' Attributions Sensitive to Arrangements of Outcomes within Sequences. As Table 12 indicates, the eight

TABLE 4

Analysis of Variance Summary Table, Experiment III, Sequence Group 1

SOURCE	SUM SQUARES	df	MEAN SQUARE	F RATIO	PROB.
Between subjects	232.692	147			
Sequence	14.327	3	4.776	3.15	.05
Error	218.365	144	1.516		
Within Subjects	644.750	444			
Locus of Control	28.108	1	28.108	23.88	.001
Sequence X Locus of Control	2.642	3	.881	.75	
Error	169.500	144	1.177		
Stability	104.729	1	104.729	106.65	.001
Sequence X Stability	10.102	3	3.367	3.43	
Error	141.419	144	.982		
Locus of Control X Stability	93.287	1	93.287	141.99	.001
Sequence X Locus of Control X Stability	.409	3	.136	.21	
Error	94.554	144	.657		
Total	877.442	591			

TABLE 5

Analysis of Variance Summary Table, Experiment III, Sequence Group 2

SOURCE	SUM SQUARES	df	MEAN SQUARE	F RATIO	PROB.
Between subjects	185.438	147			
Sequence	11.979	3	3.993	3.31	.05
Error	173.459	144	1.205		
Within subjects	762.750	444			
Locus of Control	9.002	1	9.002	6.41	.001
Sequence X Locus of Control	80.085	3	26.695	19.01	.001
Error	202.163	144	1.404		
Stability	133.381	1	133.381	137.36	.001
Sequence X Stability	1.977	3	.659	.67	
Error	139.892	144	.971		
Locus of Control X Stability	10.541	1	10.541	9.23	.01
Sequence X Locus of Control X Stability	21.277	3	7.092	6.21	.001
Error	164.432	144	1.142		
Total	948.188	591			

TABLE 6

Analysis of Variance Summary Table, Experiment III, Sequence Group 3

SOURCE	SUM SQUARES	df	MEAN SQUARE	F RATIO	PROB.
Between subjects	162.858	147			
Sequence	9.439	3	3.146	2.95	.05
Error	153.419	144	1.065		
Within subjects	518.000	444			
Locus of Control	5.682	1	5.682	4.07	.05
Sequence X Locus of Control	25.413	3	8.471	6.07	.001
Error	200.905	144	1.395		
Stability	6.493	1	6.493	7.04	.01
Sequence X Stability	4.548	3	1.516	1.64	
Error	132.959	144	.923		
Locus of Control X Stability	16.224	1	16.224	20.01	.001
Sequence X Locus of Control X Stability	8.951	3	2.984	3.68	.05
Error	116.825	144	.811		
Total	680.858	591			

TABLE 7

Analysis of Variance Summary Table, Experiment III, Sequence Group 4

SOURCE	SUM SQUARES	df	MEAN SQUARE	F RATIO	PROB.
Between subjects	226.320	167			
Sequence	2.502	1	2.502	1.86	
Error	223.818	166	1.348		
Within subjects	546.250	504			
Locus of Control	3.871	1	3.871	2.78	
Sequence X Locus of Control	2.501	1	2.501	1.79	
Error	231.378	166	1.394		
Stability	3.013	1	3.013	3.72	
Sequence X Stability	12.323	1	12.323	15.21	.001
Error	134.414	166	.810		
Locus of Control X Stability	.001	1	.001	.01	
Sequence X Locus of Control X Stability	5.538	1	5.538	6.00	.05
Error	153.211	166	.923		
Total	772.570	671			

TABLE 8

Analysis of Variance Summary Table, Experiment III, Sequence Group 5

SOURCE	SUM SQUARES	df	MEAN SQUARE	F RATIO	.PROB.
Between subjects	166.994	167			
Sequence	11.524	1	11.524	12.30	.001
Error	155.470	166	.937		
Within subjects	533.000	504			
Locus of Control	.024	1	.024	.02	
Sequence X Locus of Control	.482	1	.482	.41	
Error	195.494	166	1.178		
Stability	2.381	1	2.381	2.55	
Sequence X Stability	16.720	1	16.720	17.92	.001
Error	154.899	166	.933		
Locus of Control X Stability	2.625	1	2.625	2.89	
Sequence X Locus of Control X Stability	9.524	1	9.524	10.48	.025
Error	150.851	166	.909		
Total	699.994	671			

TABLE 9

Analysis of Variance Summary Table, Experiment III, Sequence Group 6

SOURCE	SUM SQUARES	df	MEAN SQUARE	F RATIO	PROB.
Between subjects	175.320	167			
Sequence	.073	1	.073	.07	
Error	175.247	166	1.056		
Within subjects	572.750	504			
Locus of Control	39.537	1	39.537	33.53	.001
Sequence X Locus of Control	24.972	1	24.972	21.18	.001
Error	195.741	166	1.179		
Stability	2.502	1	2.502	2.76	
Sequence X Stability	4.180	1	4.180	4.61	.05
Error	150.568	166	.907		
Locus of Control X Stability	36.680	1	36.680	53.24	.001
Sequence X Locus of Control X Stability	4.209	1	4.209	6.109	.05
Error	114.361	166	.689		
Total	748.070	671			

TABLE 10

Analysis of Variance Summary Table, Experiment III, Sequence Group 7

SOURCE	SUM SQUARES	df	MEAN SQUARE	F RATIO	PROB.
Between subjects	152.320	167			
Sequence	.251	1	.251	.27	
Error	152.069	166	.916		
Within subjects	686.250	504			
Locus of Control	138.430	1	138.430	140.68	.001
Sequence X Locus of Control	19.002	1	19.002	19.31	.001
Error	163.318	166	.984		
Stability	1.252	1	1.252	1.27	
Sequence X Stability	7.930	1	7.930	8.05	.01
Error	163.568	166	.985		
Locus of Control X Stability	53.156	1	53.156	64.98	.001
Sequence X Locus of Control X Stability	3.870	1	3.870	4.73	.05
Error	135.724	166	.818		
Total	838.570	671			

TABLE 11

Analysis of Variance Summary Table, Experiment III, Sequence Group 8

SOURCE	SUM SQUARES	df	MEAN SQUARE	F RATIO	PROB.
Between subjects	195.286	167			
Sequence	13.149	1	13.149	11.99	.001
Error	182.137	166	1.097		
Within subjects	825.000	504			
Locus of Control	174.054	1	174.054	207.45	.001
Sequence X Locus of Control	32.595	1	32.595	38.85	.001
Error	139.351	166	.839		
Stability	16.721	1	16.721	14.24	.001
Sequence X Stability	5.356	1	5.356	4.56	.05
Error	194.923	166	1.174		
Locus of Control X Stability	103.713	1	103.713	112.85	.001
Sequence X Locus of Control X Stability	5.722	1	5.722	6.226	.05
Error	152.565	166	.919		
Total	1020.286	671			

Table 12

Significant F-ratios found by ANOVA performed upon each Sequence Group, Experiment 3.

Sequence Group	MAIN EFFECTS: Sequence	Locus of Control	Stability	Sequence X Locus of Control	INTERACTIONS: Sequence X Stability	Locus of Control X Stability	Sequence X Locus of Control X Stability
1	$p < .05$	$p < .001$	$p < .001$			$p < .001$	
2	$p < .05$	$p < .001$	$p < .001$	$p < .001$		$p < .01$	$p < .001$
3	$p < .05$	$p < .05$	$p < .01$	$p < .001$		$p < .001$	$p < .05$
4					$p < .001$		$p < .05$
5	$p < .001$				$p < .001$		$p < .025$
6		$p < .001$		$p < .001$	$p < .05$	$p < .001$	$p < .05$
7		$p < .001$		$p < .001$	$p < .01$	$p < .001$	$p < .05$
8	$p < .001$	$p < .001$	$p < .001$	$p < .001$	$p < .05$	$p < .001$	$p < .05$

separate analyses performed within Sequence Groups for Experiment 3 found numerous significant main effects and interactions. These findings are of interest, and will be discussed in some detail later. For the moment, however, the discussion will be focused upon the remarkable sensitivity to the arrangements of outcomes within sequences shown by subjects' causal attributions for target outcomes in the different sequences. Average attributions to each of the four causal factors for each of the Sequence Groups 1 through 8 are illustrated graphically in Figures 4 through 11, respectively. These graphic displays suggest that attribution patterns are systematically related to the arrangements of outcomes within sequences. Attribution patterns for target outcomes in Group 1 sequences, shown in Figure 4, appear to be related to the structure of the sequence in which the target outcome occurred. Although attributions are quite similar across the four sequences in Group 1, some difference based upon sequence structure appears to be present: Attributions for the sequences in which the target outcome is identical to both prior and subsequent outcomes (1 A-S and 1 A-F) are nearly alike, while attributions for the sequences in which the target outcome is identical to prior outcomes but different from subsequent outcomes (1 B-S and 1 B-F) are nearly alike.

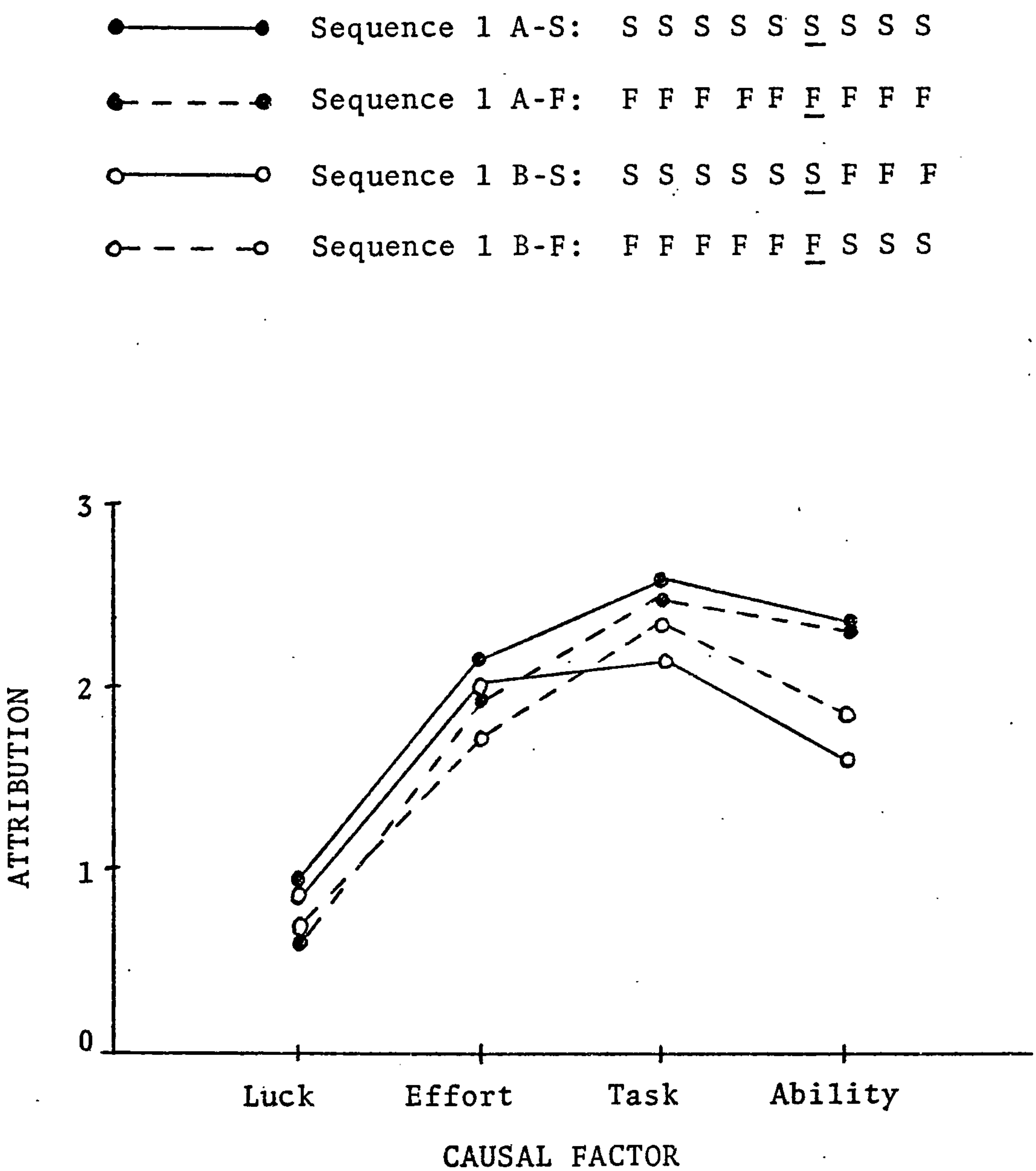

Figure 4

Average attributions to luck, effort, task, and ability for Sequence Group 1.

Moving to Sequence Group 2, illustrated in Figure 5, the apparent effect of sequence structure upon attribution patterns is more pronounced. In Group 2, all target outcomes are different from prior outcomes, and target outcomes are either identical to subsequent outcomes (Sequences 2 A-S and 2 A-F) or different from subsequent outcomes (Sequences 2 B-S and 2 B-F). Attributions for target outcomes in sequences 2 A-S and 2 A-F are similar to each other, as are those for 2 B-S and 2 B-F, while attributions for 2 A-S and 2 A-F are different from those for 2 B-S and 2 B-F. Furthermore, attributions for outcomes in Sequence Group 2 do not appear to resemble those in Sequence Group 1.

Attribution patterns for Sequence Group 3 are illustrated in Figure 6. Although attribution patterns for Group 3 sequences are less obviously dependent upon sequence structure, the patterns observed for these sequences are similar to patterns found in connection with certain similar ending target Sequences in Sequence Groups 4 and 6. Therefore, discussion of attribution patterns for Group 3 sequences will be postponed until Group 4 and Group 6 sequences are considered.

Turning to the ending target sequences found in Sequence Groups 4 through 8, reference to Figures 7 through 11, respectively, indicates that attributions are related to

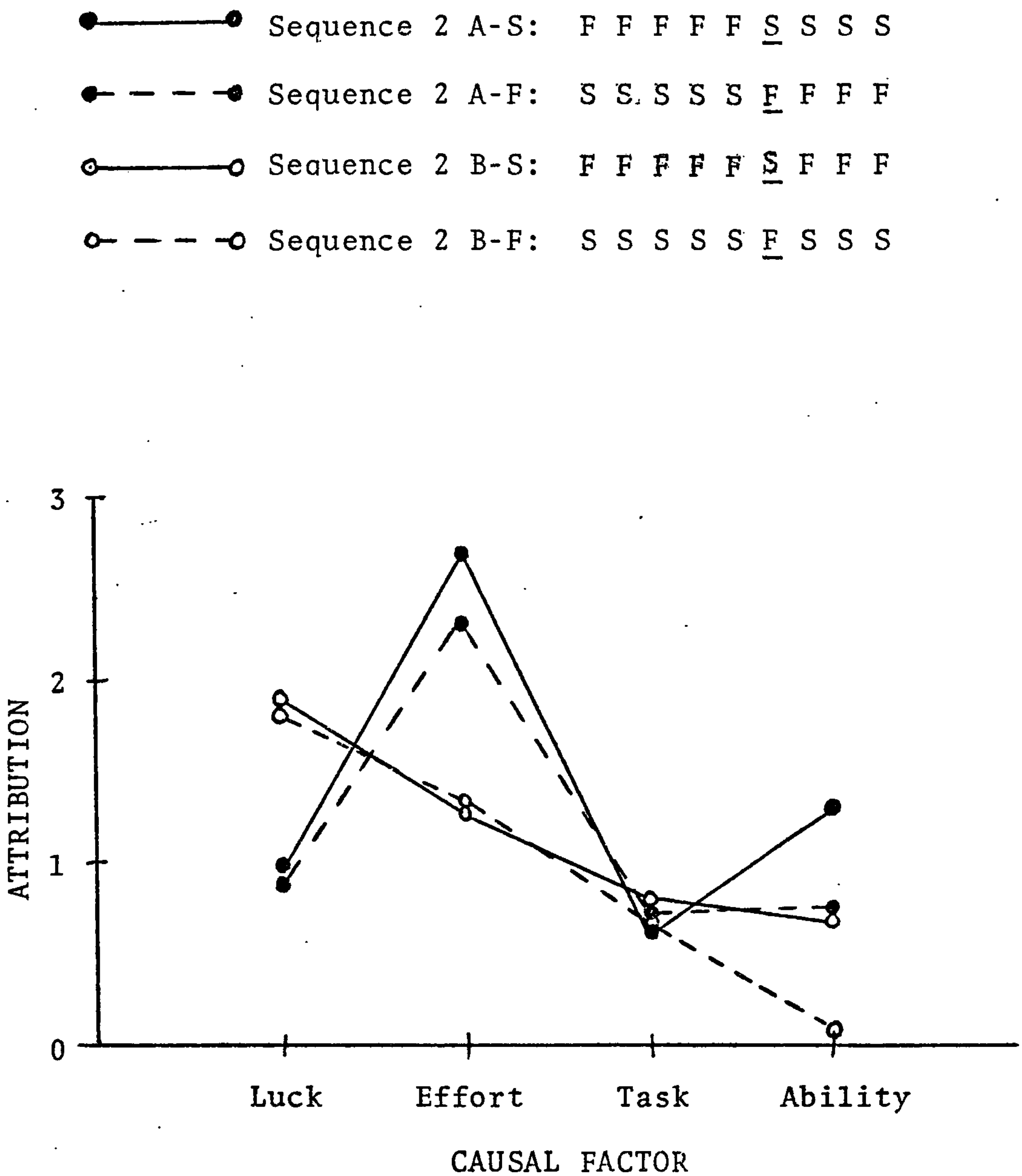

Figure 5

Average attributions to luck, effort, task, and ability for Sequence Group 2.

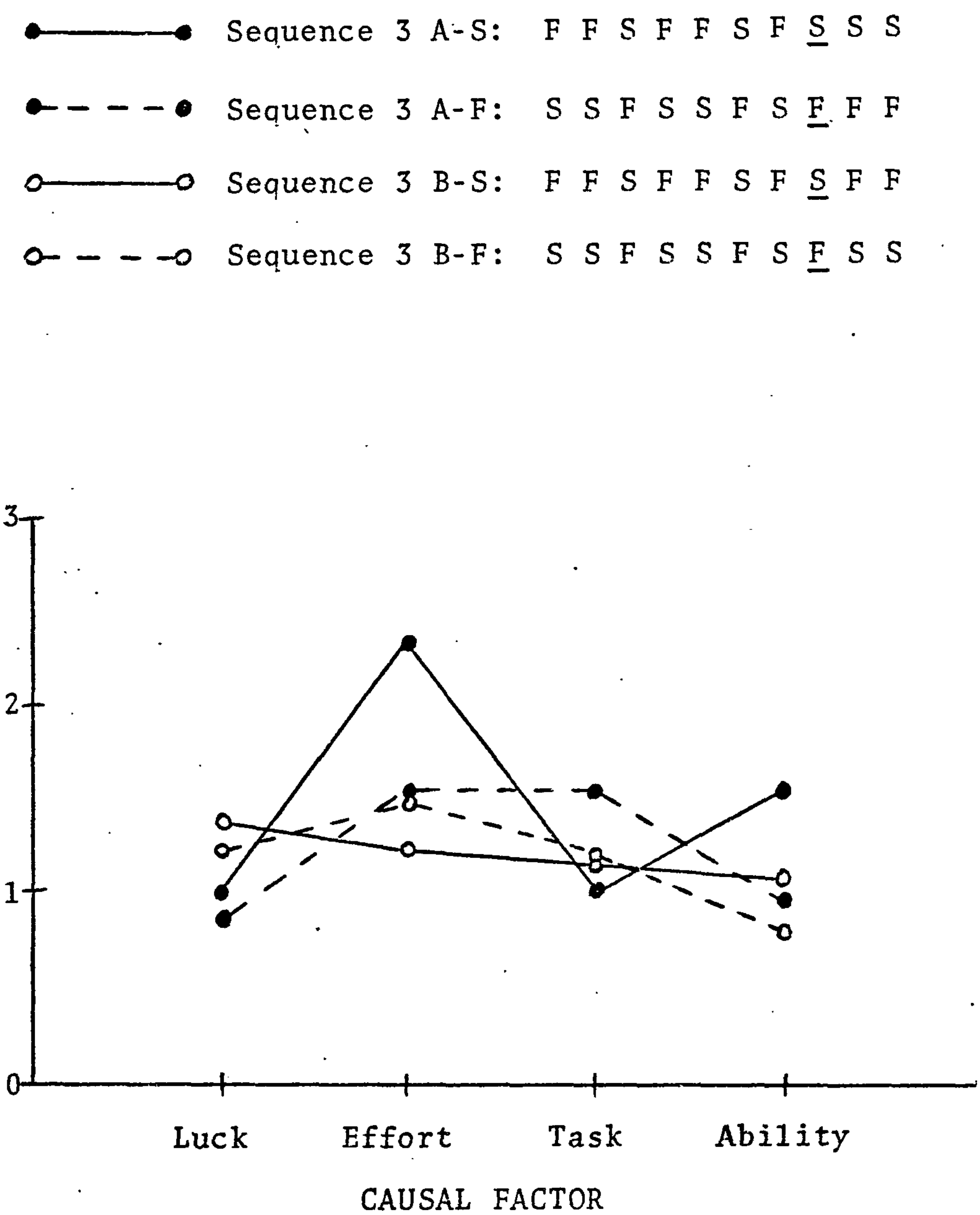

Figure 6

Average attributions to luck, effort, task, and ability for Sequence Group 3.

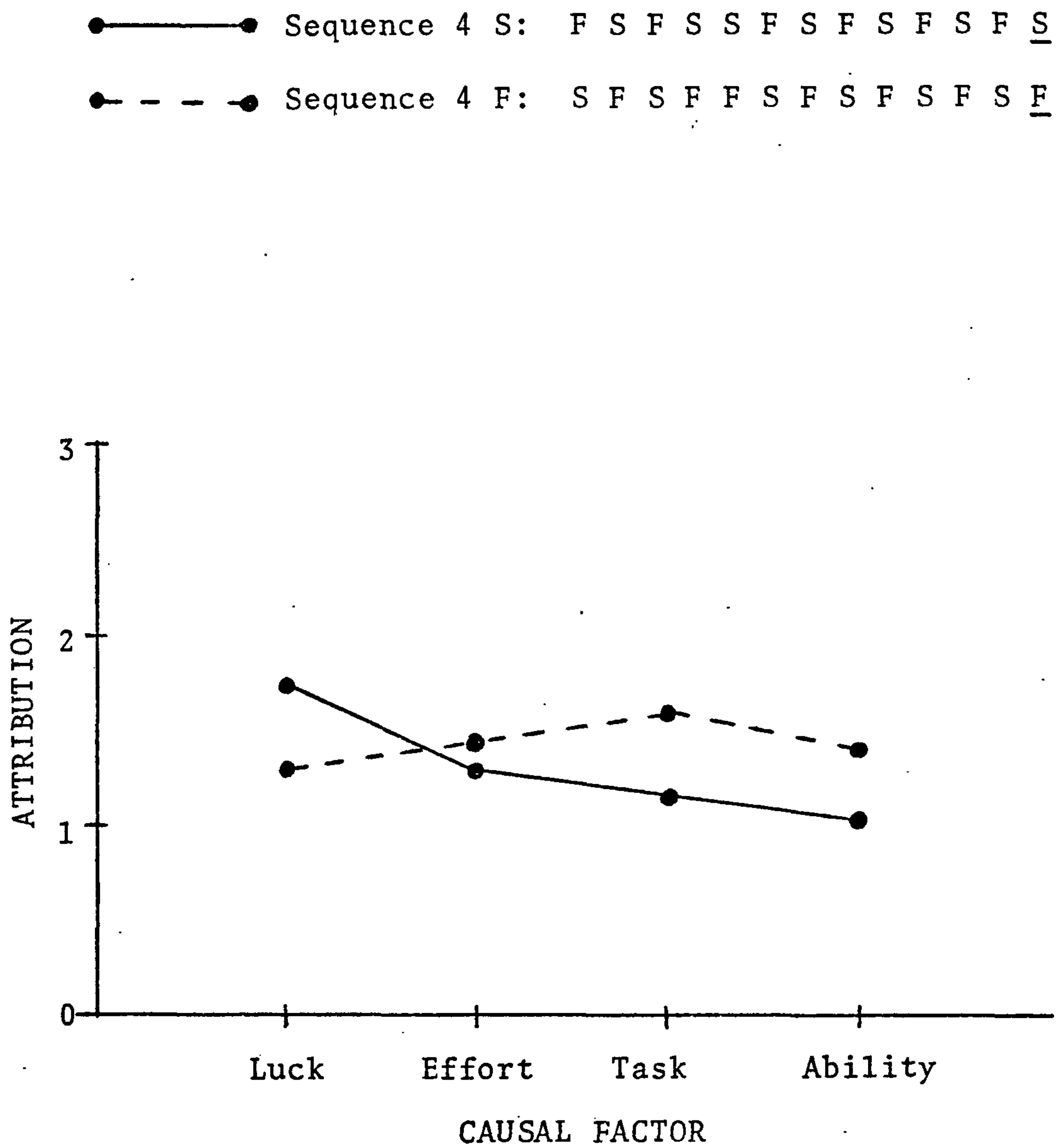

Figure 7

Average attributions to luck, effort, task, and ability for Sequence Group 4.

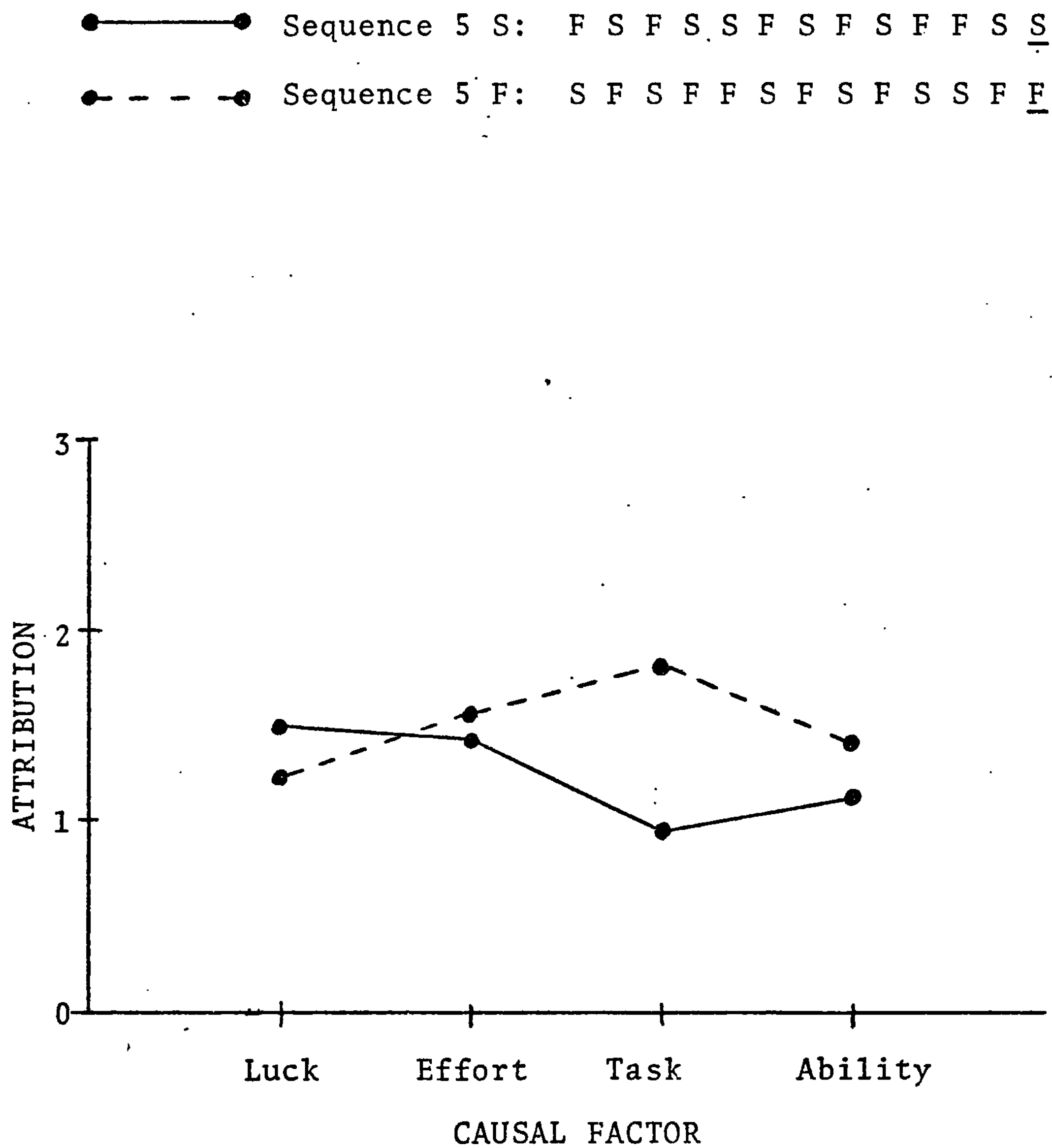

Figure 8

Average attributions to luck, effort, task, and ability for Sequence Group 5.

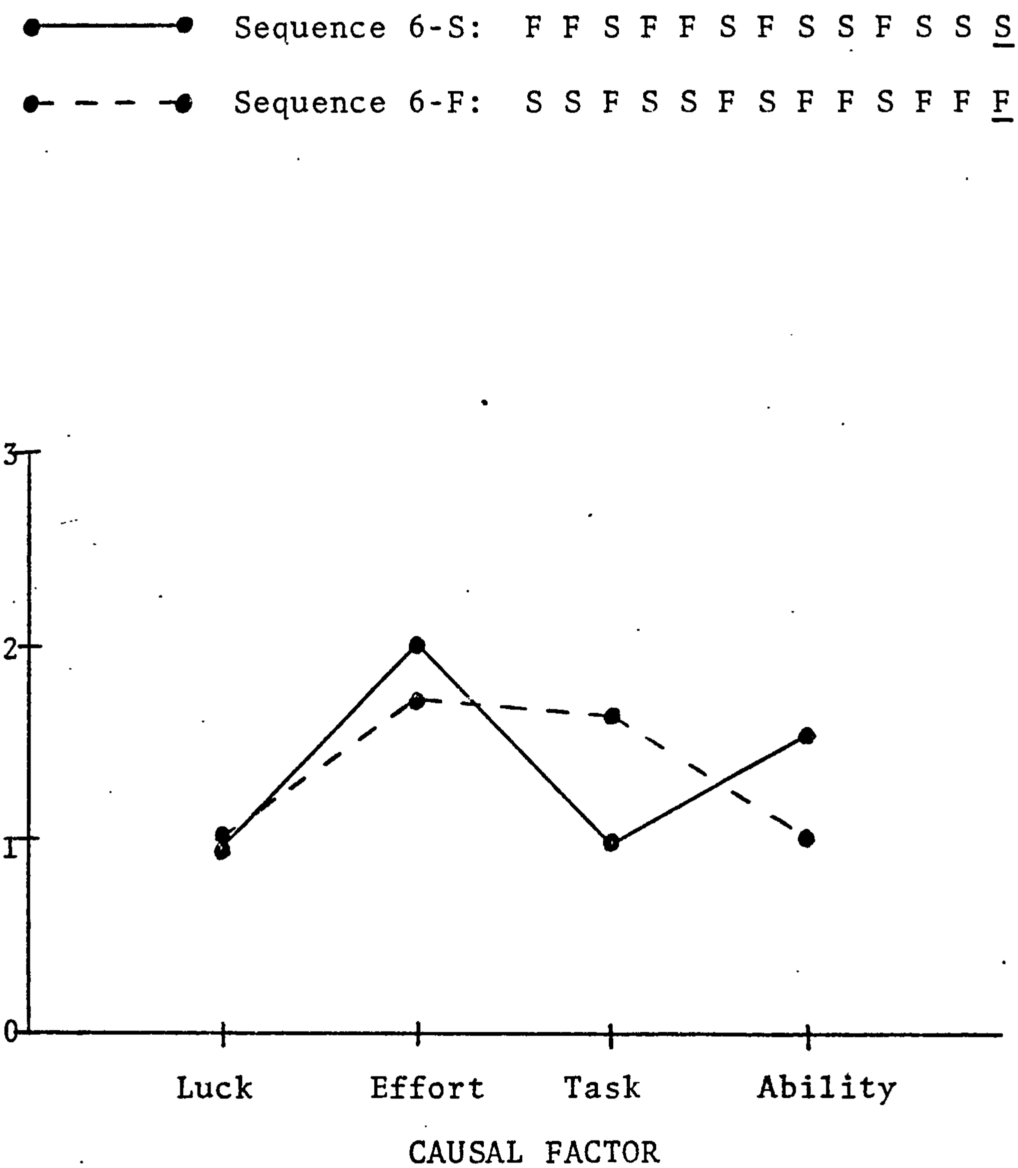

Figure 9

Average attributions to luck, effort, task, and ability for Sequence Group 6.

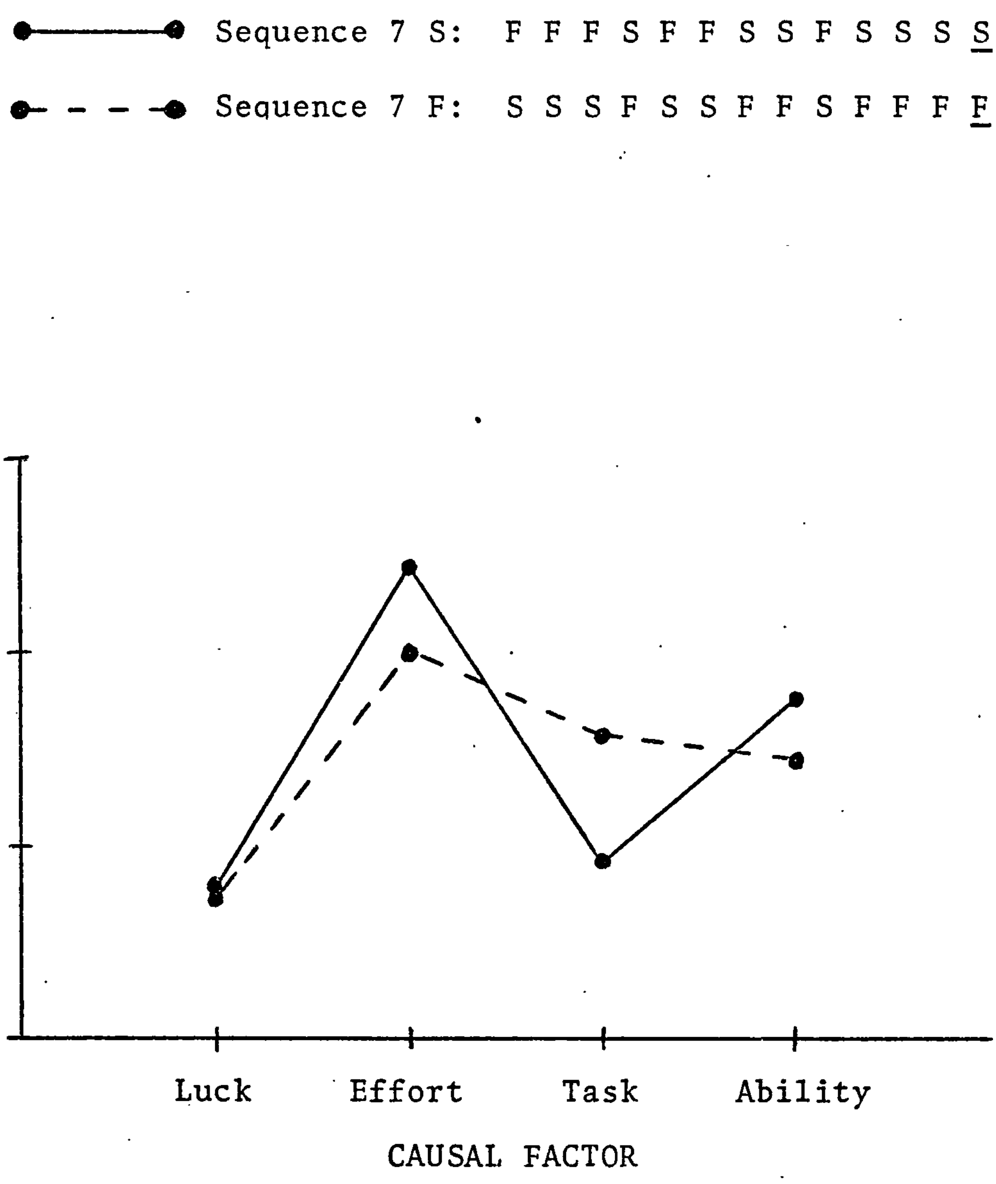

Figure 10

Average attributions to luck, effort, task, and ability for Sequence Group 7.

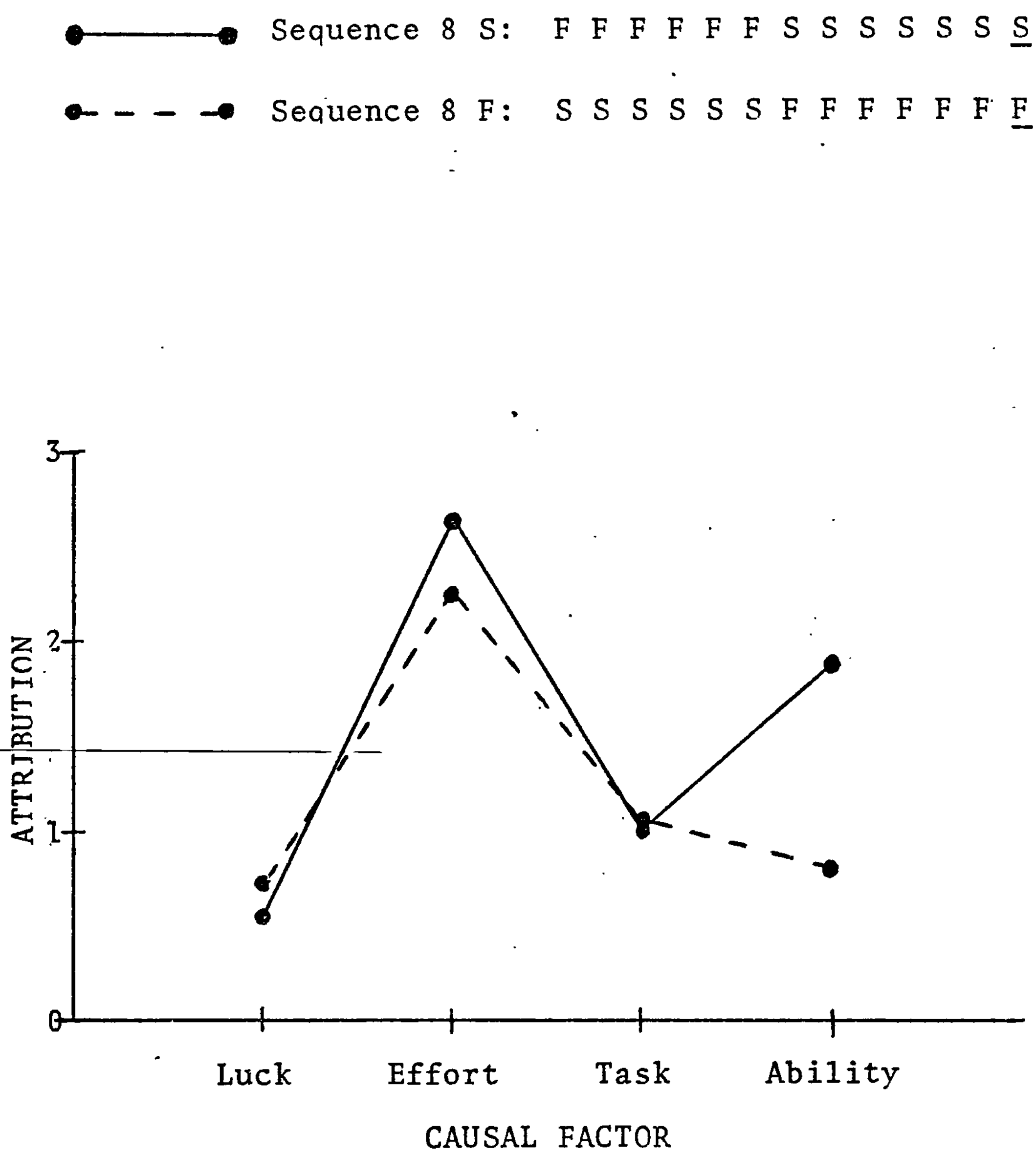

Figure 11

Average attributions to luck, effort, task, and ability for Sequence Group 8.

sequence structure. Although all target outcomes in Sequence Groups 4 through 8 are preceded by sequences in which the probability of success is equal to the probability of failure, attribution patterns are somewhat dissimilar for the five ending target sequence groups. Subjects apparently utilize pattern information when inferring cause for target outcomes. The "random" structure of sequences in Groups 4 and 5 affords little in the way of pattern information, and subjects' fairly low and relatively undifferentiated attributions shown in Figures 7 and 8, respectively, seem to reflect the relative lack of available information. Sequences 3 B-S and 3 B-F are similar in structure to Groups 4 and 5 sequences, and attribution patterns are similar as well (see Figures 6, 7, and 8). Likewise, Sequences 3 A-S and 3 A-F are similar in structure to Group 6 sequences, and Figures 6 and 9 suggest that similar attributions occurred here as well.

Moving to Sequence Groups 6, 7, and 8, illustrated in Figures 9, 10, and 11, respectively, increasing salience of patterns within sequences seems to result in greater weights being given to certain causal factors and greater differentiation between causal factors. Considering attribution patterns for Sequence Groups 4 through 8, patterns appear to become more pronounced as the pattern of change from one kind of outcome to the other within sequences becomes more pronounced (see Figures 7 through 11).

Even though direct statistical comparisons across sequence groups were not possible, the foregoing conceptual comparison of the observed patterns of attributions for the different sequence groups is intuitively compelling. The apparent systematic change in attribution patterns with changes in sequence structure noted in connection with the ending target sequences lends support to the notion that subjects' causal attributions are based in part upon sequence structure. Further support for that notion is derived from the distinctive attributions noted for the different embedded target sequences, and from the similarities in attributions noted for similarly structured embedded target and ending target sequences. This demonstration of subjects' sensitivity to sequence structures when attributing cause for target outcomes is the salient finding of Experiment 3. However, more light is shed upon the conditions under which subjects invoke internal or external and stable or unstable causal factors by a more detailed discussion of the findings within each of the eight sequence groups. Such a discussion of the findings for the different embedded target and ending target sequence groups is undertaken below.

Embedded Target Sequences. Response patterns for the four sequences in Group 1 are displayed graphically in Figures 4, 12, 13, and 14. Figure 4 depicts the average attributions to each factor. Uniformly low attributions occurred to luck as a cause, and relatively high attributions to effort, task difficulty and ability were found, with the highest average attribution being made to task difficulty.

Figure 12 illustrates the significant main effect found for the Locus of Control factor. Average attributions to internal elements were higher than were attributions to external elements.

The significant main effect of Stability is illustrated in Figure 6. Average attributions to stable elements were higher than were attributions to unstable elements.

Figures 4, 12, and 13 illustrate the significant Sequence effect found in Group 1. This effect apparently reflects a natural grouping, since attributions made for the target outcomes in Sequences 1 A-S and 1 A-F were similar, as were attributions for the target outcomes in Sequences 1 B-S and 1 B-F. All four sequences in Group 1 contain target outcomes preceeded by outcomes identical to the target, and two of these sequences (1 A-S and 1 A-F) contain subsequent outcomes which are also identical to the

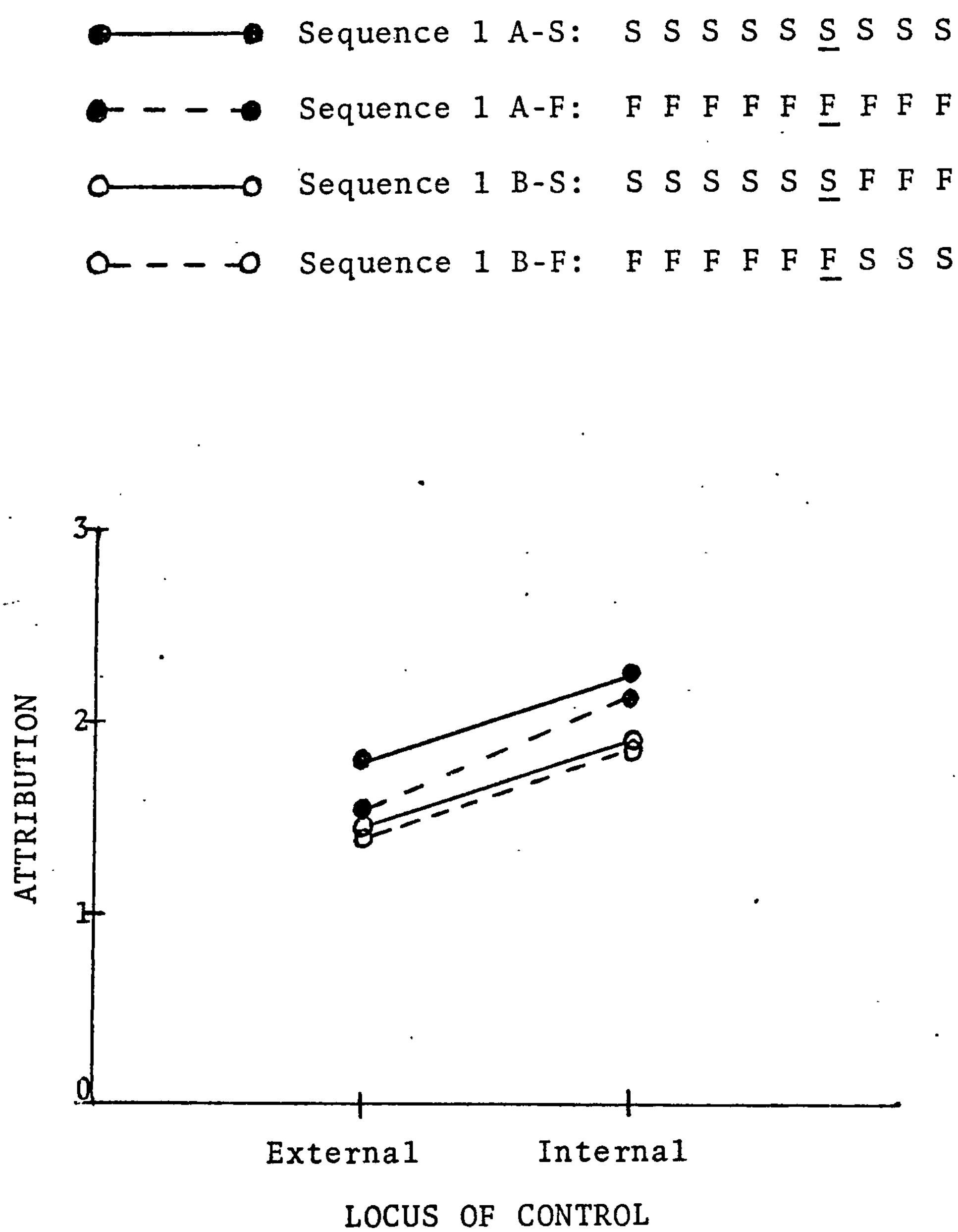

Figure 12

Average attributions to external and internal causal factors for Sequence Group 1.

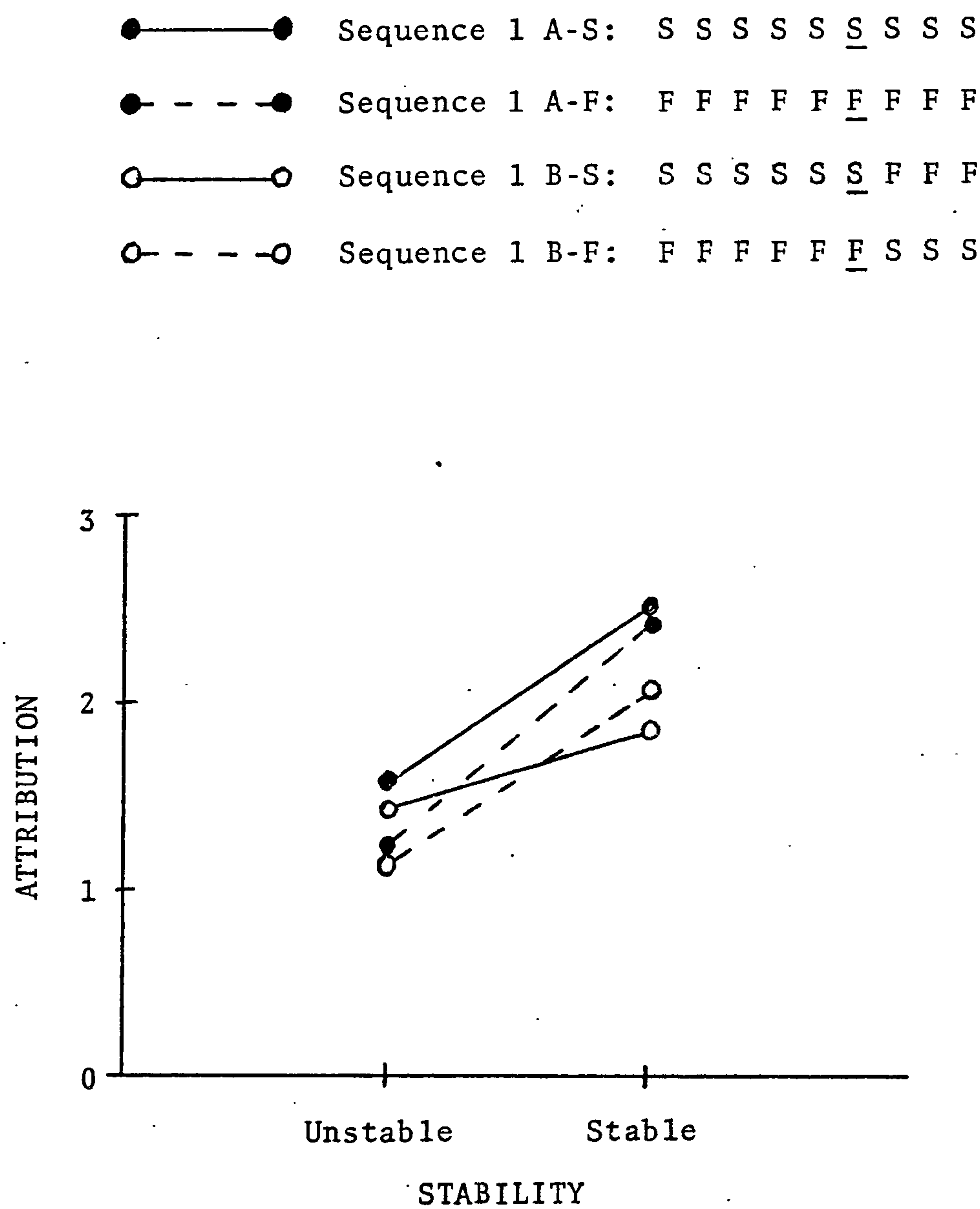

Figure 13

Average attributions to unstable and stable causal factors for Sequence Group 1.

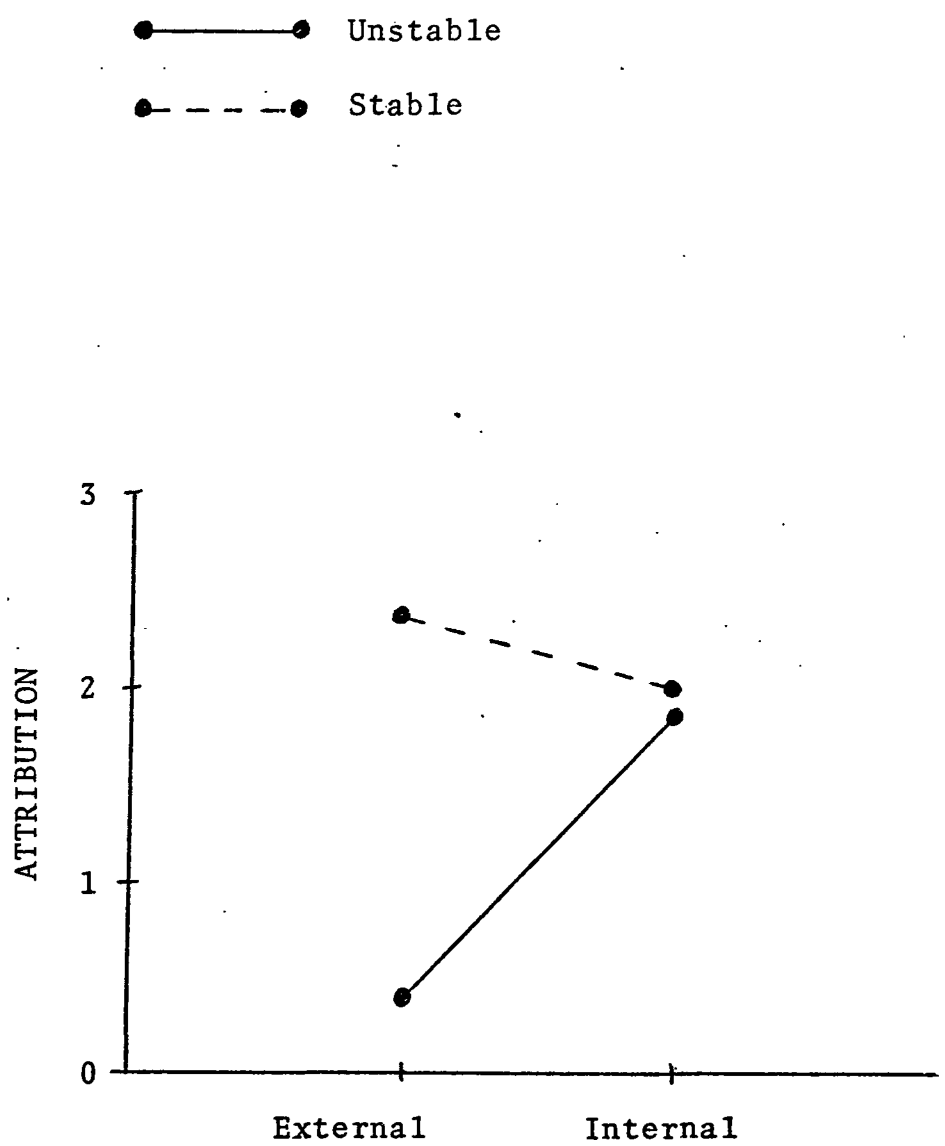

Figure 14

Average attributions to external and internal causal factors within unstable and stable categories for Sequence Group 1.

target, while the other two sequences (1 B-S and 1 B-F) contain subsequent outcomes which are different from the target outcome. Therefore, in two sequences the target outcome is consistent with the entire sequence, and in the other two sequences the target is consistent with prior outcomes but inconsistent with subsequent outcomes. On the basis of the consistency between the target outcome and prior outcomes, the attribution model would predict high attributions to the "stable" elements (task difficulty and ability), which is what did in fact occur. The model would further predict, again on the basis of consistency with prior outcomes, low attributions to "unstable" elements (luck and effort). Low attributions did occur in the case of luck, but attributions to effort were high, nearly identical to attributions to ability. Both stable elements received high attributions, while attributions to the unstable elements appear to depend upon the locus of control of the element, with the external unstable element (luck) receiving low attributions while the internal unstable element (effort) received higher attributions. The Locus of Control X Stability interaction was significant, and is illustrated in Figure 14.

Since subjects received information concerning outcomes subsequent to the target outcome as well as the information concerning prior outcomes, it might be expected that the high attributions to effort could be explained by inconsistency between the target outcome and subsequent outcomes. However, such an explanation is not tenable for the sequences under consideration, since attributions to effort were quite similar for all four sequences, including the two sequences in which the target outcome was consistent with the entire sequence. In fact, the highest average attribution to effort occurred for Sequence 1 A-S, in which there was no inconsistency between the target and subsequent outcomes, and the lowest effort attribution occurred for Sequence 1 B-F, in which such an inconsistency was present. It should be noted that the differences between the highest and the lowest effort attributions were not analyzed statistically, and are probably not significant. The author merely wishes to point out that not even the direction of the results would tend to support the hypothesis that the high attributions to effort were due to any inconsistency between the target outcome and subsequent outcomes.

It appears that, for the four sequences under consideration, effort is viewed as a stable rather than an unstable element. Effort was seen as an important cause of the target outcome, which was one of a stable series of outcomes for two sequences, and the last of a stable series prior to a change in outcome for the other two sequences. An unstable element would not be expected to be an important cause of such an outcome, and the low attributions to luck as a cause support this expectation. The fact that effort attributions resembled attributions to task difficulty and ability rather than attributions to luck supports the notion that effort is seen as a stable element in this instance. This notion of effort as a stable element will surface again during the discussion of responses to other groups of sequences.

Response patterns for the four sequences in Group 2 are displayed graphically in Figures 5, 15, 16, and 17. As with the Group 1 sequences, responses to Group 2 sequences resulted in significant main effects of Sequence, Locus of Control and Stability and a significant Locus of Control X Stability interaction. In addition, significant Sequence X Locus of Control and Sequence X Locus of Control X Stability interactions were found for the group 2 sequences.

A similar pattern across all four sequences in Group 2 was not found as Figures 5 and 15 illustrate. A natural grouping of sequences does appear to exist, however: Responses to Sequences 2 A-S and 2 A-F appear to be similar, as do responses to Sequences 2 B-S and 2 B-F. In the four sequences of Group 2, all target outcomes are different from prior outcomes, and in two sequences (2 A-S and 2 A-F)

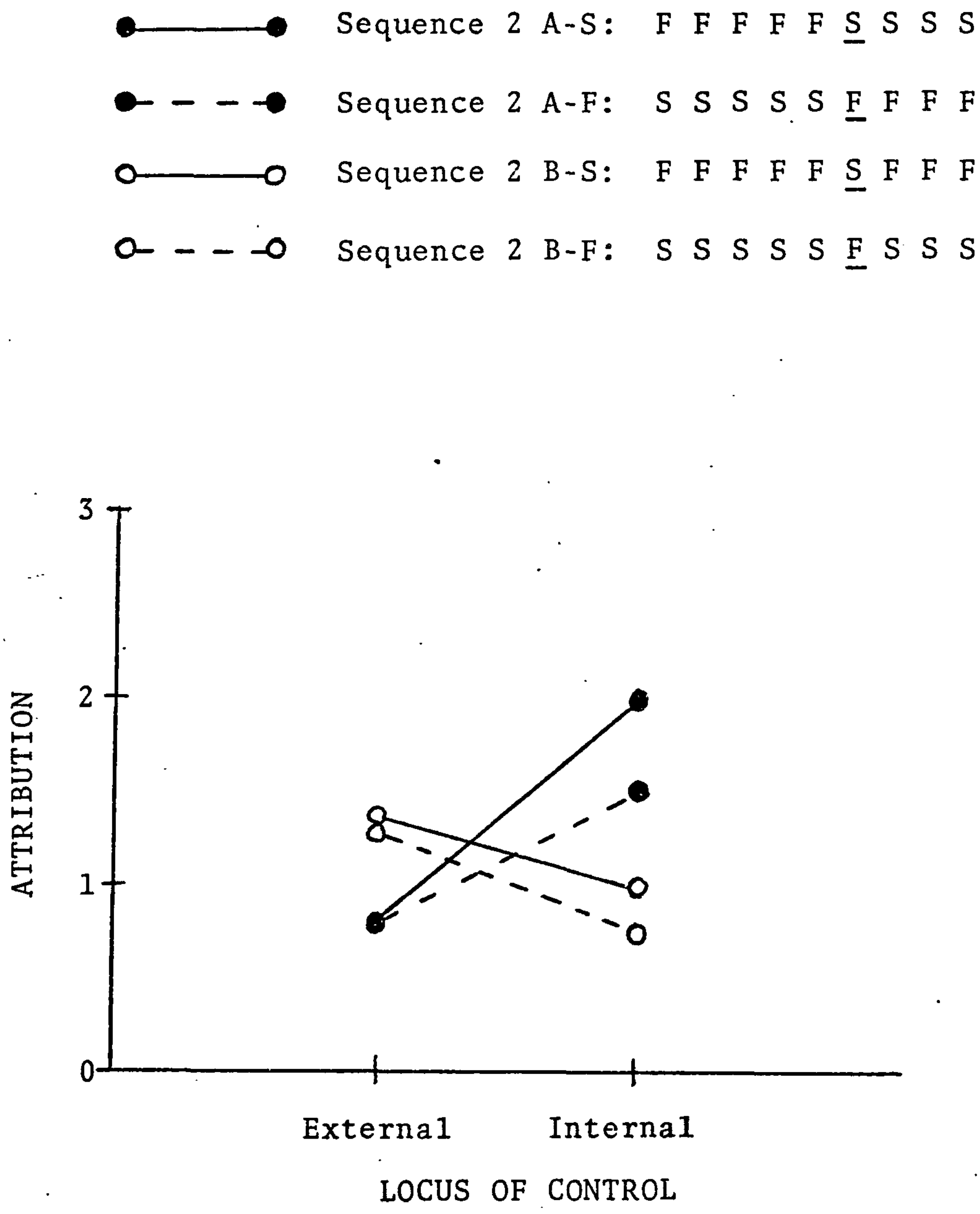

Figure 15

Average attributions to external and internal causal factors for Sequence Group 2.

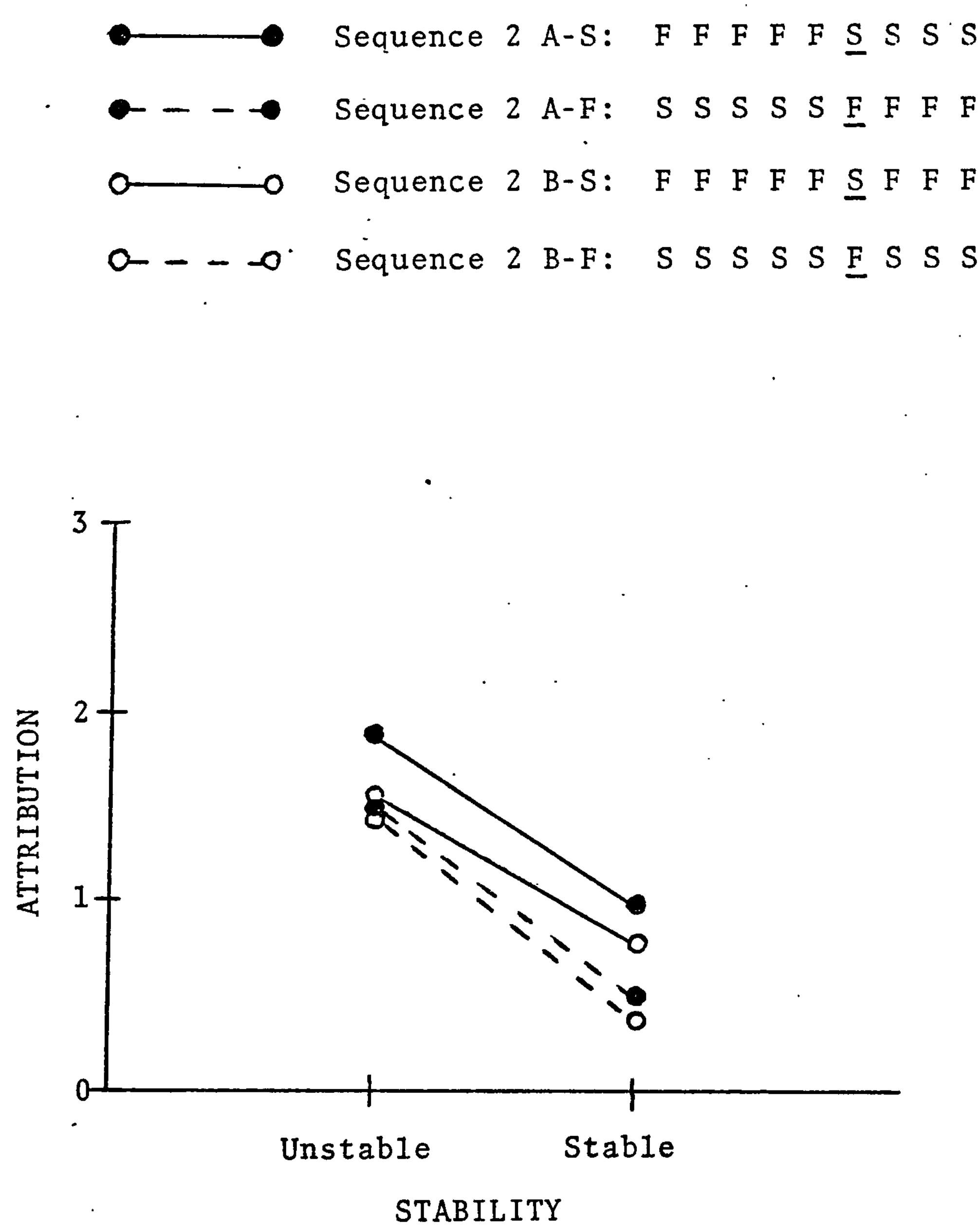

Figure 16

Average attributions to unstable and stable causal factors for Sequence Group 2.

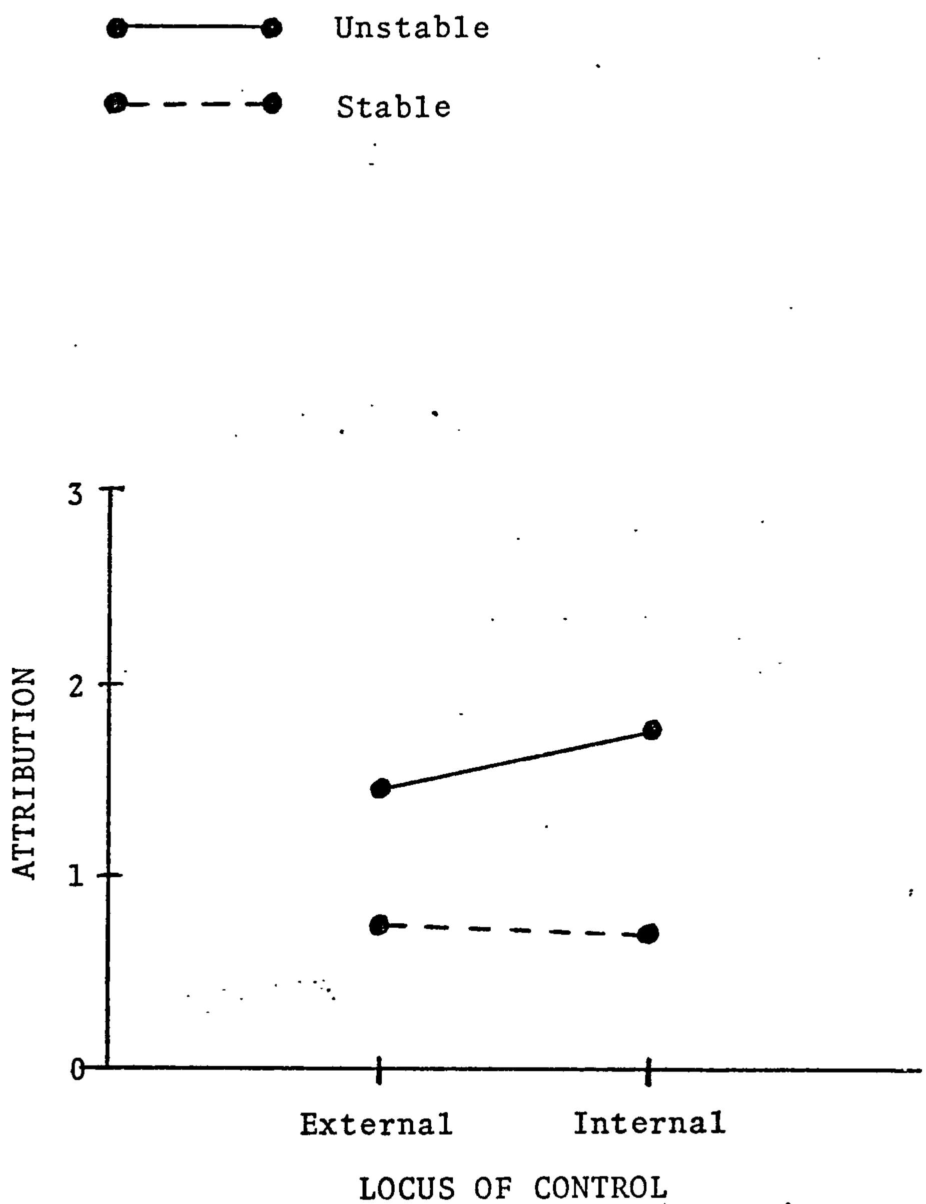

Figure 17

Average attributions to external and internal causal factors within unstable and stable categories for Sequence Group 2.

subsequent outcomes are identical to the target, while in the other two sequences (2 B-S and 2 B-F) subsequent outcomes are different from the target. Therefore, target outcomes are inconsistent with prior outcomes for all four sequences, and are consistent with subsequent outcomes for Sequences 2 A-S and 2 A-F, but are inconsistent with subsequent outcomes for Sequences 2 B-S and 2 B-F. It appears that subjects' responses are based in a systematic way upon the structure of the sequences.

The significant main effect of Locus of Control reflects the higher average attributions made to internal as opposed to external elements. Figure 15 illustrates average external and internal attributions made for each sequence. Higher internal attributions occurred for the two sequences in which the target outcome was consistent with subsequent outcomes (2 A-S and 2 A-F), while higher external attributions occurred for the two sequences in which the target was inconsistent with subsequent outcomes (2 B-S and 2 B-F). This Sequence X Locus of Control interaction is significant. When target outcomes are inconsistent with prior outcomes, subjects apparently are influenced by the consistency or inconsistency of subsequent outcomes in attributing cause to external or internal elements. When the target outcome represents an unusual event, a "fluke", external attributions are higher than internal attributions, but when the target outcome represents the first outcome of a new run, internal attributions are higher. Subjects apparently hold the performer responsible for a change in outcome when that change persists, but when the change in outcome is a fluke, they tend to attribute cause to external circumstances.

The significant main effect of Stability for Group 2 is illustrated in Figures 16 and 17. Attributions to unstable elements were higher than were attributions to stable elements, and the relationship appears to hold for all four sequences. Since some inconsistency between the target outcomes and other sequence outcomes was present for all sequences, this pattern of attributions was not unexpected. The Weiner, *et al*. attribution model would predict that unstable elements would receive higher attributions than would stable elements in the presence of inconsistency.

The significant Locus of Control X Stability interaction is illustrated in Figure 17. Average attributions to external and internal elements were virtually identical for the stable elements, while attributions to the internal element were higher for the unstable elements. Overall average attributions to task difficulty and ability were equally low, while attributions to luck and effort were higher, and attributions to effort were higher than those to luck. In the presence of inconsistency between the target outcome and prior outcomes, subjects apparently tend to attribute cause to unstable elements, with the internal unstable element (effort) receiving higher attributions than the external unstable element (luck).

It is necessary to refer again to Figure 5 in discussing the significant Sequence X Locus of Control X Stability interaction. This interaction suggests that the nature of the Locus of Control X Stability interaction just discussed differs between sequences. For Sequences 2 A-S and 2 A-F, attributions to the internal unstable element (effort) were higher than attributions to the external unstable element (luck), while for Sequences 2 B-S and 2 B-F the opposite occurred. When the target outcome was the first of a new run, effort was perceived as relatively more important as a cause than was luck, and when the target was a fluke, luck was perceived as relatively more important than effort. It appears that subjects may treat luck as a more unstable element than effort, since luck attributions were higher for extremely inconsistent target outcomes, while effort attributions were higher for outcomes representing some degree of consistency with other outcomes in the sequence. As noted previously in connection with the responses to Group 1 sequences, responses to Group 2 sequences suggest that effort is thought to be a somewhat stable element.

Group 3 sequences consisted of target outcomes preceded by seven outcomes, two of which were identical to the target outcome, and five of which were different from the target outcome, and followed by two outcomes, both of which were either identical to or different from the target outcome. For two sequences, (3 A-S and 3 A-F) the target outcome represented the beginning of a new run, and the target outcome and other outcomes like it made up 50% of the entire sequence. For the other two sequences (3 B-S And 3 B-F) the target outcome was not part of a run, and was one of three identical outcomes representing 30% of the entire sequence. The target outcome was atypical for these two sequences.

All significant main effects and interactions found for Group 2 sequences were found for Group 3 sequences as well. Response patterns for Group 3 sequences are illustrated in Figures 6, 18, 19, and 20.

Figure 6 suggests that the significant main effect of Sequence is a reflection of responses to Sequence 3 A-S. The toher three sequences seem to group together, but the pattern for 3 A-S appears to differ from the others.

The average internal and external attributions for the four sequences is illustrated in Figure 18. The main effect of Locus of Control is due entirely to Sequence 3 A-S, for which internal attributions were higher than external attributions. Average attributions for the other three sequences

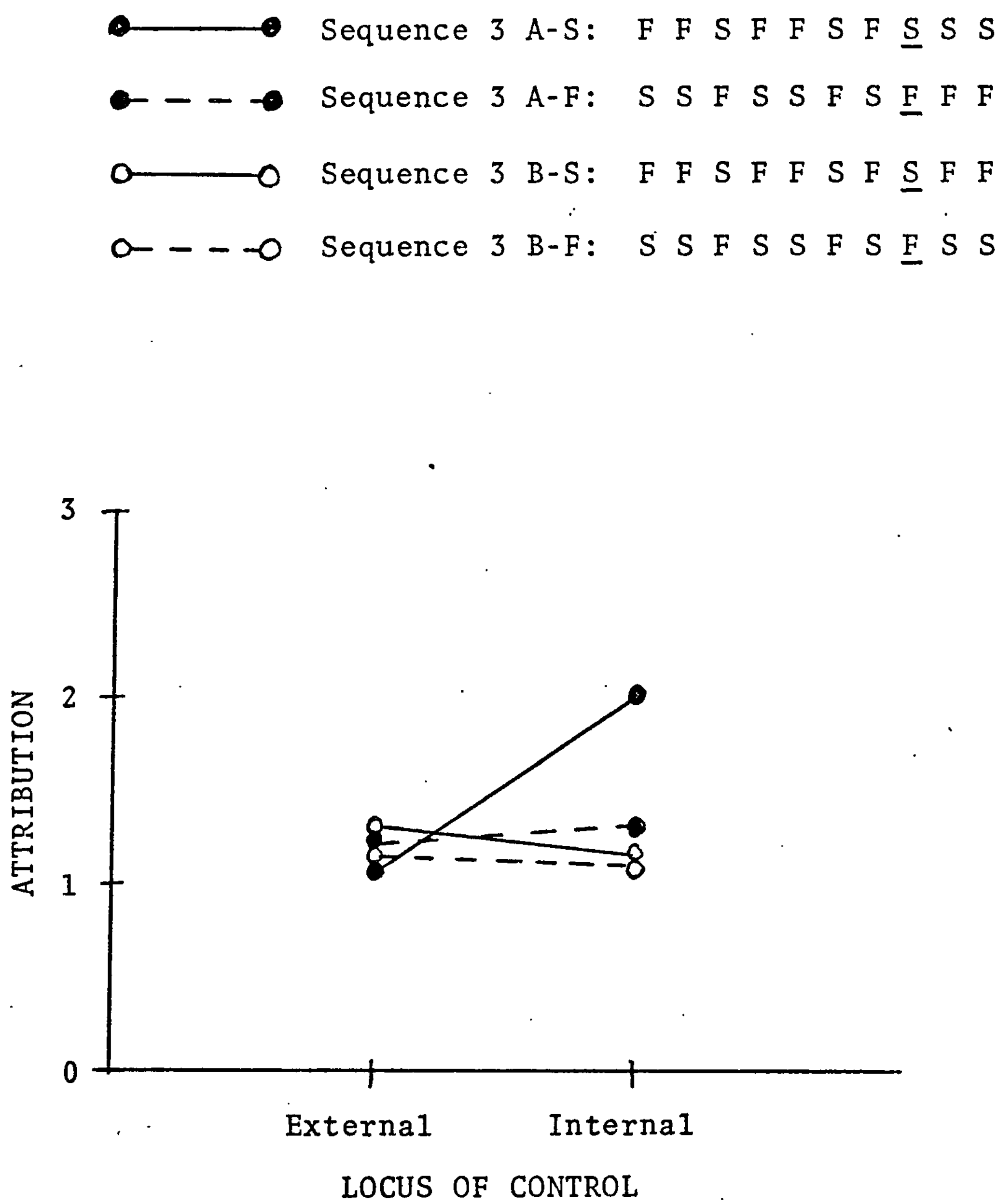

Figure 18

Average attributions to external and internal causal factors for Sequence Group 3.

Sequence 3 A-S: F F S F F S F S S S

Sequence 3 A-F: S S F S S F S F F F

Sequence 3 B-S: F F S F F S F S F F

Sequence 3 B-F: S S F S S F S F S S

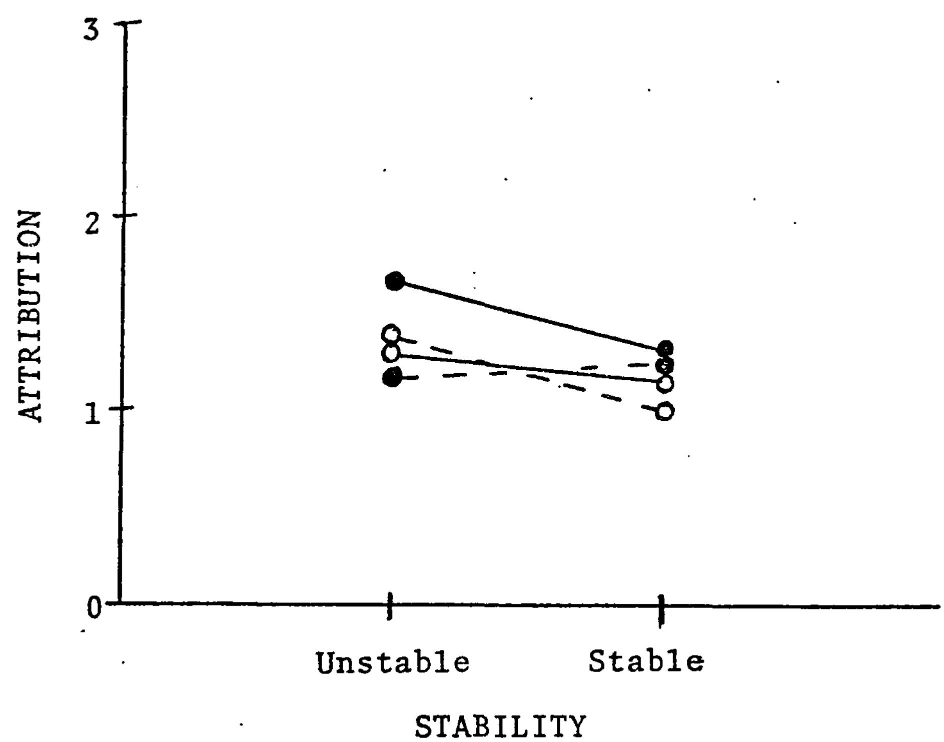

Figure 19

Average attributions to unstable and stable causal factors for Sequence Group 3.

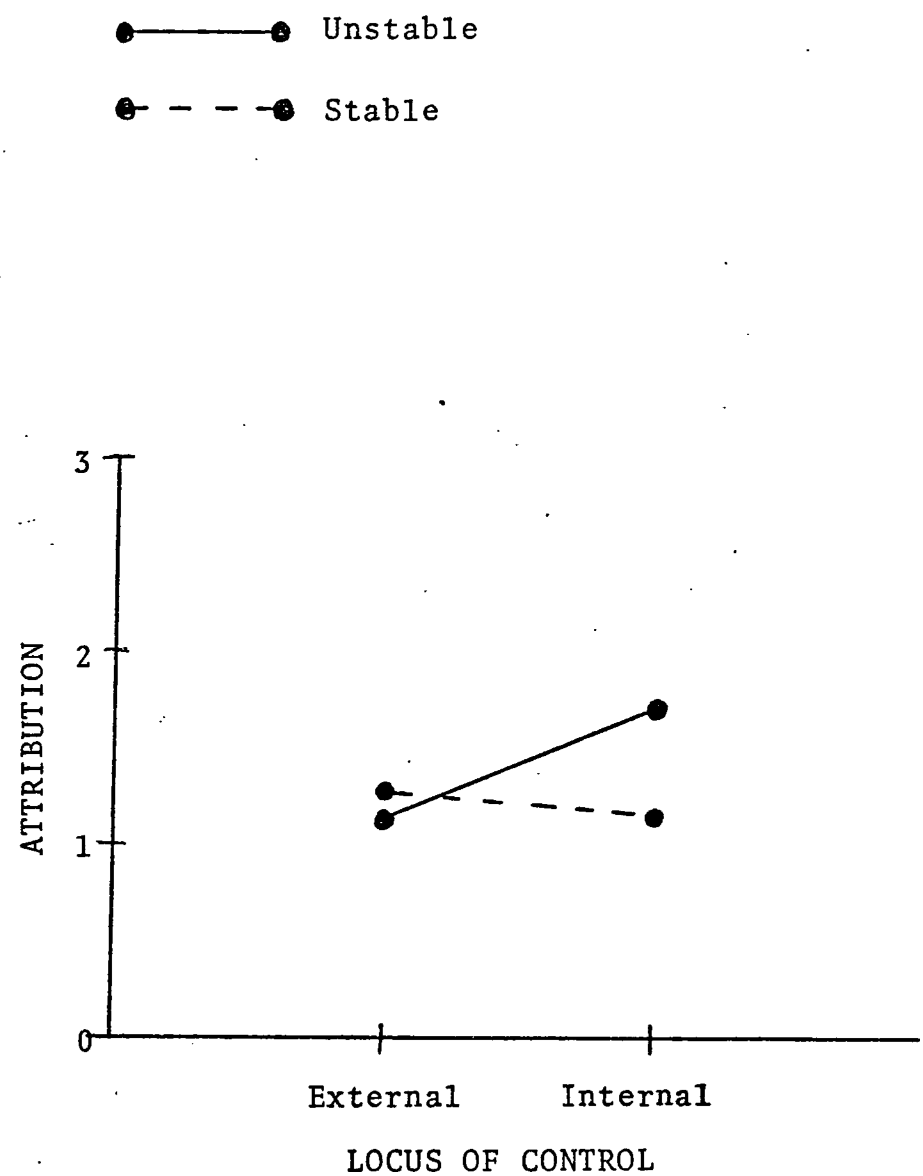

Figure 20

Average attributions to external and internal causal factors within unstable and stable categories for Sequence Group 3.

suggest no difference between external and internal attributions. The Sequence X Locus of Control interaction is a reflection of the higher internal attributions for Sequence 3 A-S only.

Average attributions to unstable elements were greater than attributions to stable elements, resulting in the significant Stability main effect. Average attributions to unstable and stable elements for each sequence in Group 3 is illustrated in Figure 19.

The significant Locus of Control X Stability interaction, illustrated in Figure 20, is characterized by average internal and external attributions that are virtually identical within the stable category, while internal attributions are hgiher than external attributions within the unstable category. Referring to Figure 6, it is obvious that for Sequences 3 A-S and 3 A-F effort attributions were higher than luck attributions, while for Sequences 3 B-S and 3 B-F the differences between effort and luck attributions were relatively small. The pattern of attributions to internal and external elements within the unstable category found here for Sequences 3 A-S and 3 A-F was noted earlier for all sequences in Group 1 and for two sequences in Group 2. In Group 1 sequences, the target outcome was identical to all prior outcomes, and identical to subsequent outcomes as well for two of the sequences. In Group 2, the pattern of higher effort than luck attributions was found only for the two sequences in which the target outcome was identical to other outcomes, in this case all subsequent outcomes. Returning to Group 3, the sequences in which the pattern was found, Sequences 3 A-S and 3 A-F, are those sequences in which the target outcome was identical to subsequent outcomes. Apparently consistency between target outcomes and immediately prior or subsequent outcomes, or both, results in higher internal than external attributions within the unstable category.

The significant Sequence X Locus of Control X Stability interaction apparently reflects the different attributions to internal and external elements within the unstable category for the different sequences (just discussed), as well as sequence differences between attributions to internal and external elements within the stable category. Task attributions appear to be greater than ability attributions for Sequences 3 A-F and 3 B-F, about equal to ability attributions for Sequence 3 B-S, and lower than ability attributions for Sequence 3 A-S.

In summary, the results for the embedded target sequences indicate that relatively high attributions to task difficulty and ability, the stable elements, occur only in the presence of relatively high consistency between the target outcome and most other outcomes in the sequence. This finding conforms to predictions from the Weiner, *et al.* classification model. Findings in connection with luck attributions also conform to the model's predictions: Relatively high luck attributions seem to occur only when the target outcome is markedly inconsistent with other outcomes in the sequence. In contrast, relatively high attributions to effort seem to occur in the presence of moderate inconsistency between the target outcome and most other outcomes, as well as in the presence of consistency between the target outcome and other outcomes. This finding suggests that effort is perceived to be a more stable causal element than is luck, and does not conform to the classification of effort as a stable element in the Weiner, *et al.* model. As noted earlier, the findings for the embedded target sequences also suggest that subjects' attributions are systematically related to sequence structure.

Ending Target Sequences. As noted earlier, sequences in Groups 4, 5, 6, 7, and 8 contained target outcomes located at the end of the sequences and preceeded by 50% success and 50% failure outcomes in different arrangements. Sequences in Groups 4 and 5 contained "random" arrangements of success and failure outcomes, sequences in Group 6 were arranged so that outcomes appeared to change very gradually from success to failure (or failure to success), the change in Group 7 sequences was more pronounced, and an abrupt change from success to failure (or from failure to success) was present in Group 8 sequences.

As previously discussed, subjects were apparently sensitive to the different arrangements of success and failure outcomes. Similarities in attribution patterns appear to exist between Group 4, illustrated in Figures 7, 21, 22, and 23, and Group 5, illustrated in Figures 8, 24, 25, and 26. Groups 4 and 5 contained randomly arranged outcomes prior to the target outcome. For the groups in which outcomes were arranged so as to suggest change, similarities in attribution patterns also appear to be present. Attribution patterns for Group 6 are illustrated in Figures 9, 27, 28, and 29; patterns for Group 7 are illustrated in Figures 10, 30, 31, and 32; and patterns for Group 8 are illustrated in Figures 11, 33, 34, and 35.

There appears to be some mirroring of attributions for the different sequences in Groups 4 and 5, resulting in the significant Sequence X Stability and Sequence X Locus of Control X Stability interactions found in each of the two "random" arrangement groups.

For the three changing arrangement groups, the following significant F values were found in each of the groups: Locus of Control, Sequence X Locus of Control, Sequence X Stability,

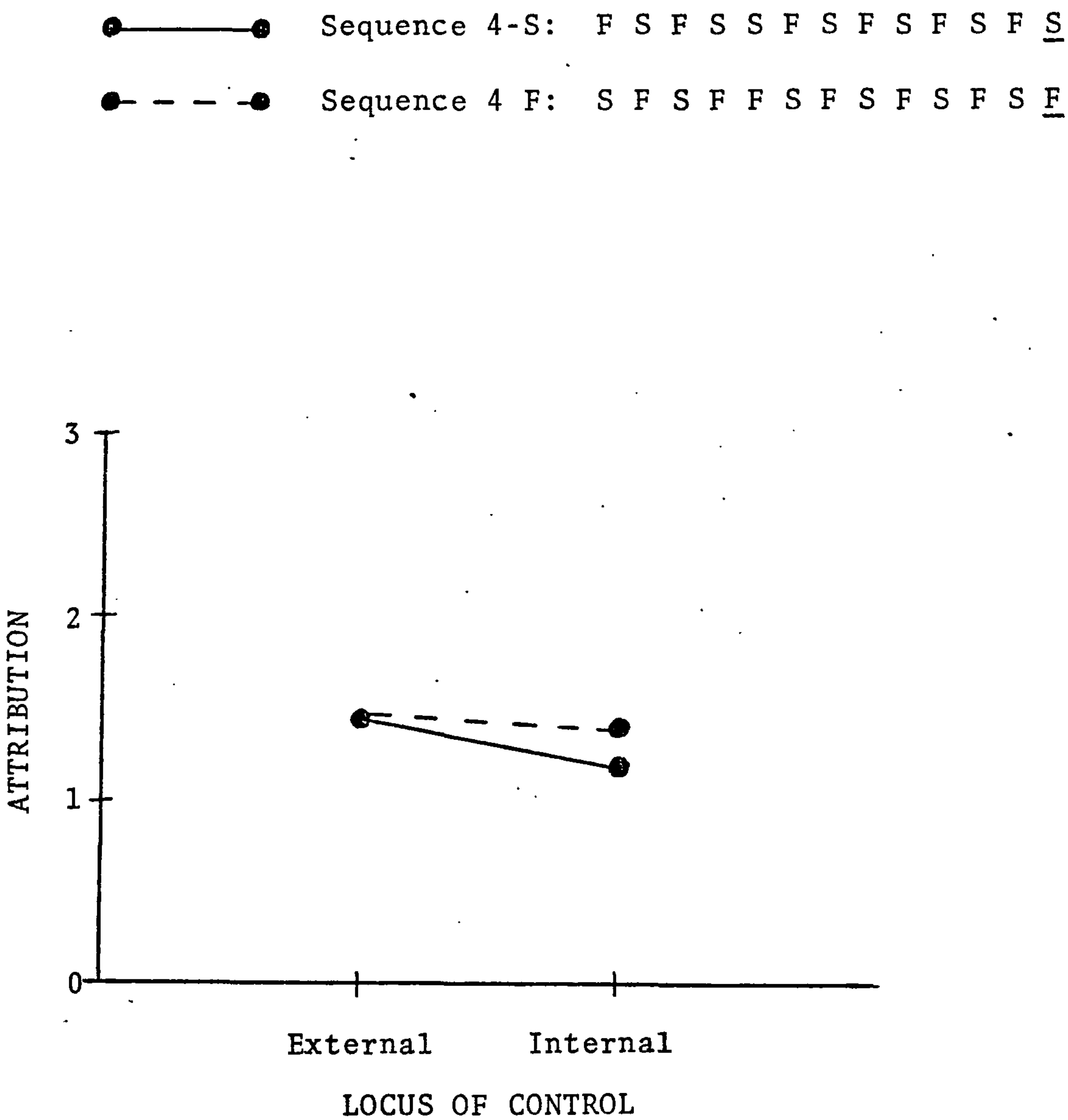

Figure 21

Average attributions to external and internal causal factors for Sequence Group 4.

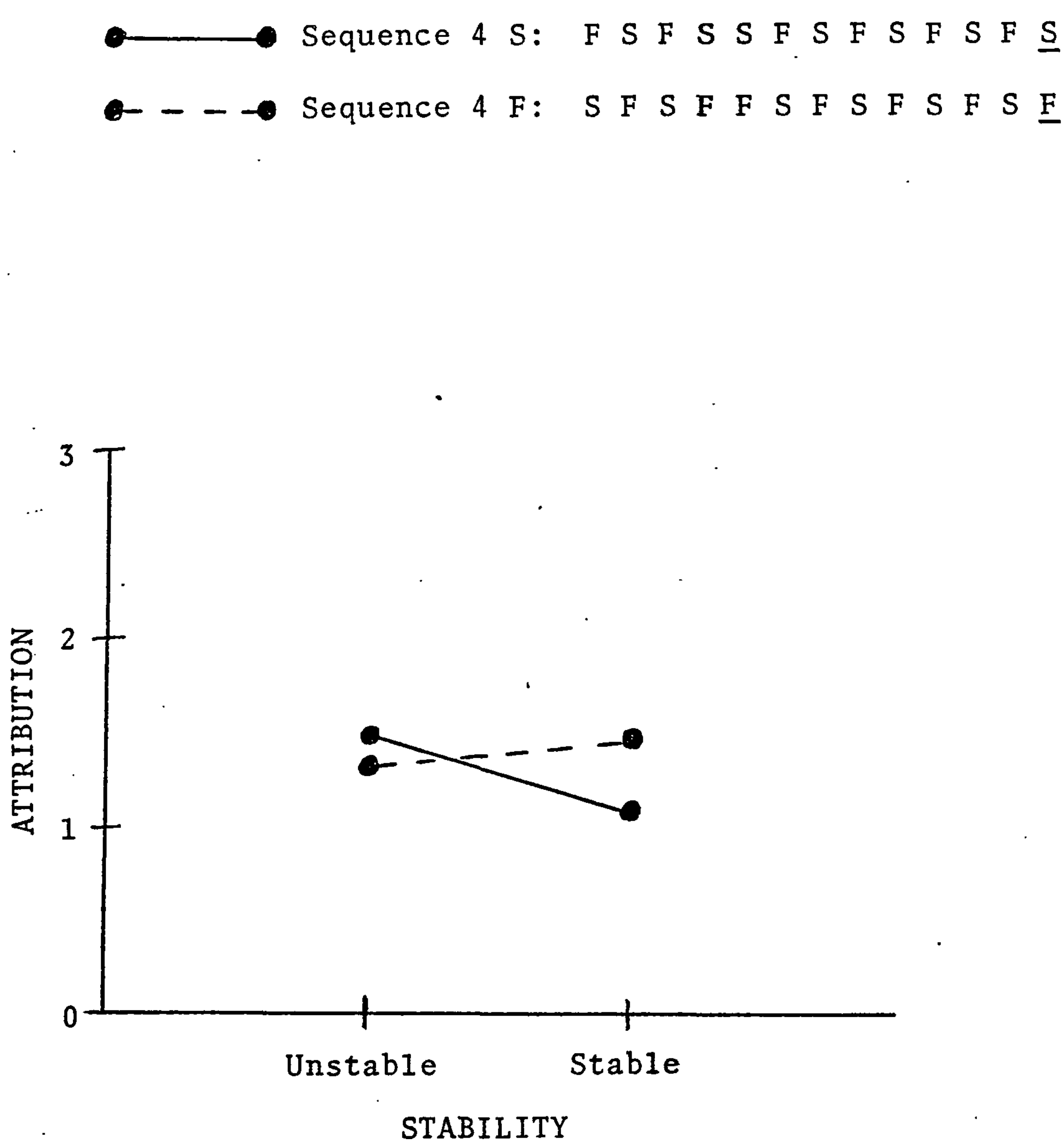

Figure 22

Average attributions to unstable and stable causal factors for Sequence Group 4.

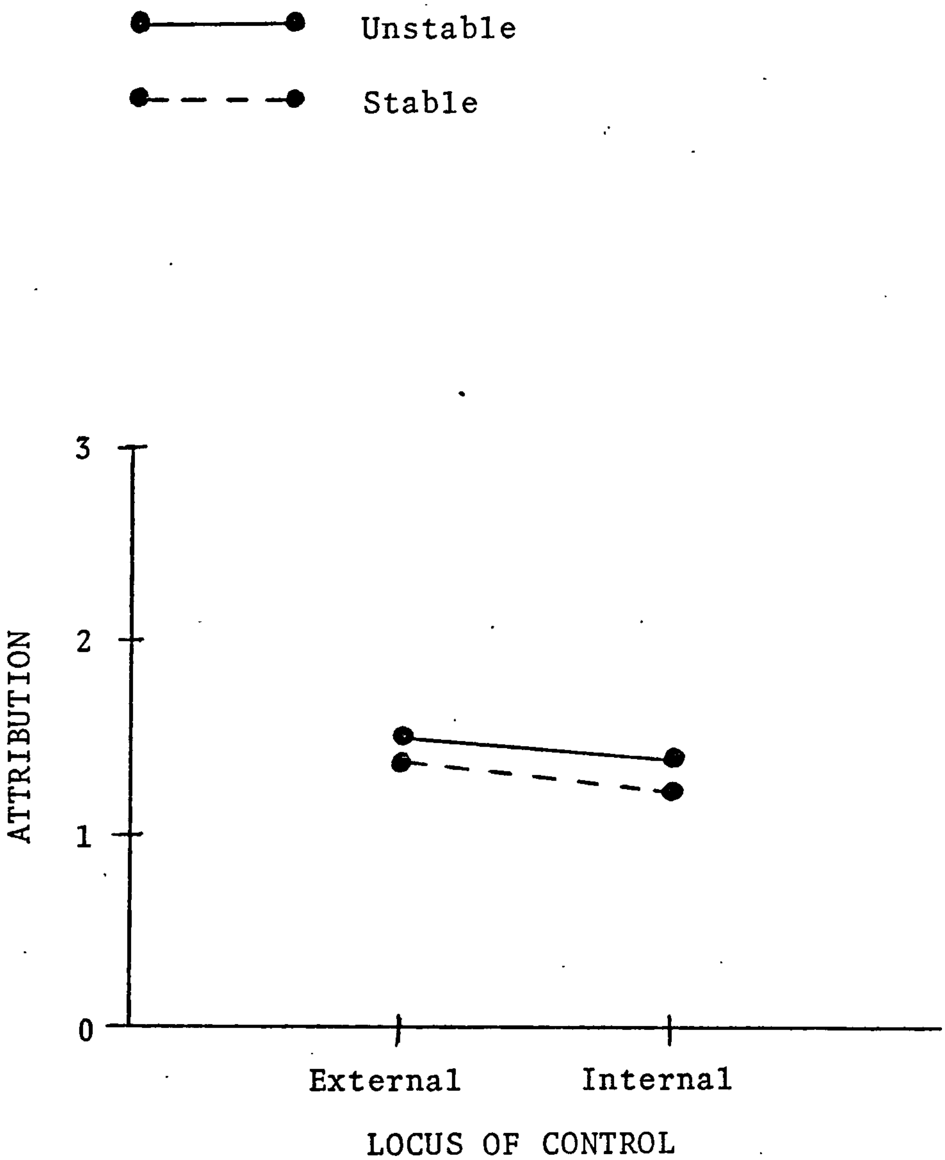

Figure 23

Average attributions to external and internal causal factors within unstable and stable categories for Sequence Group 4.

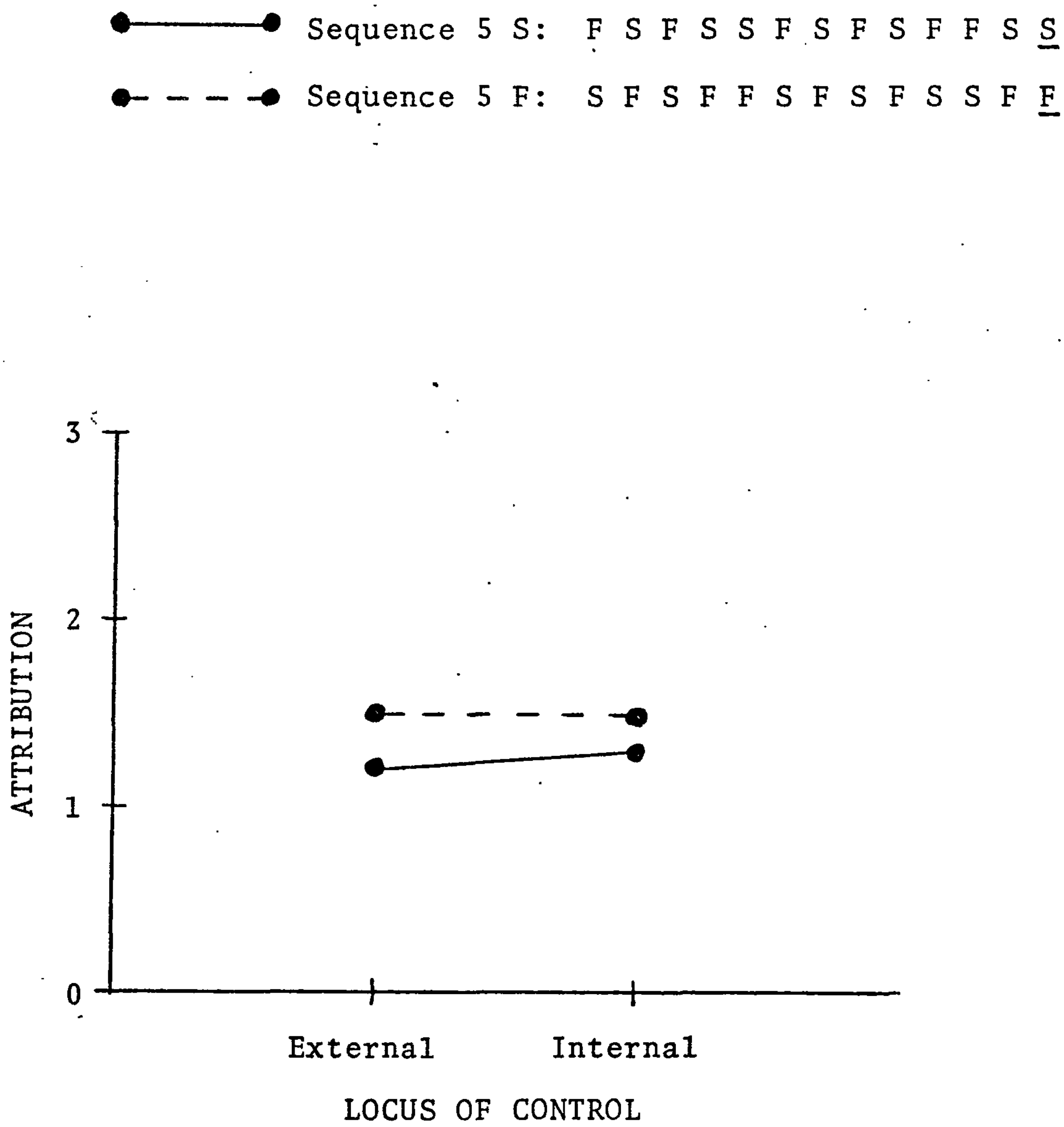

Figure 24

Average attributions to external and internal causal factors for Sequence Group 5.

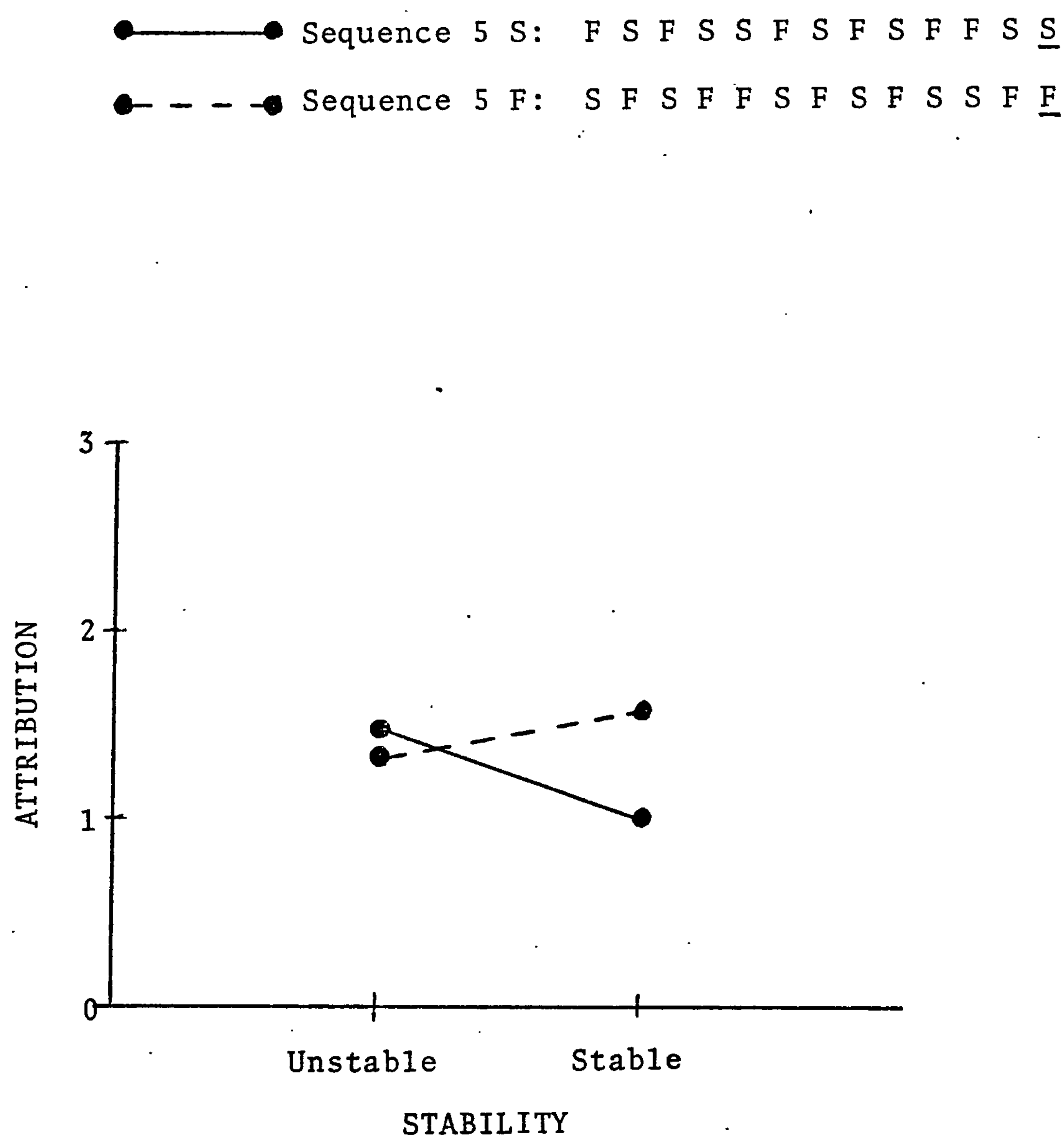

Figure 25

Average attributions to unstable and stable causal factors for Sequence Group 5.

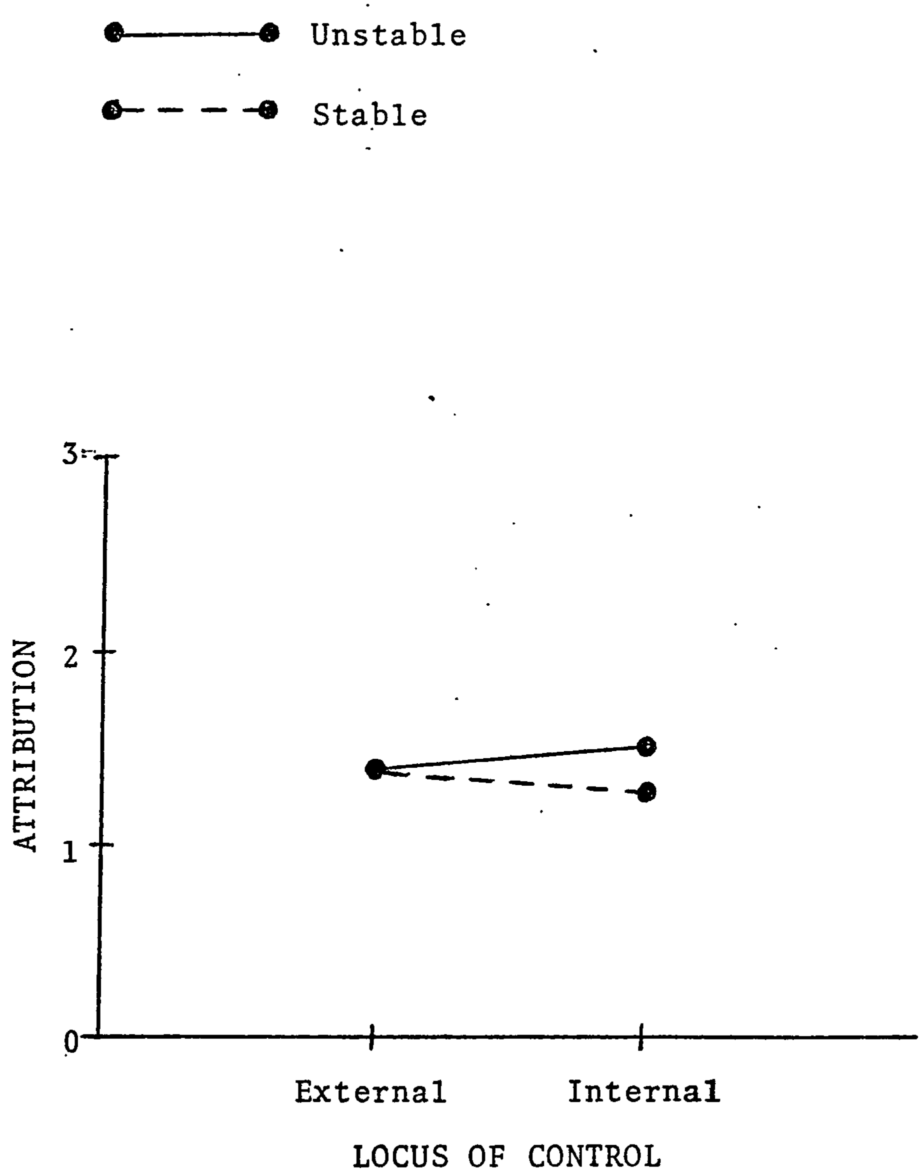

Figure 26

Average attributions to external and internal causal factors within unstable and stable categories for Sequence Group 5.

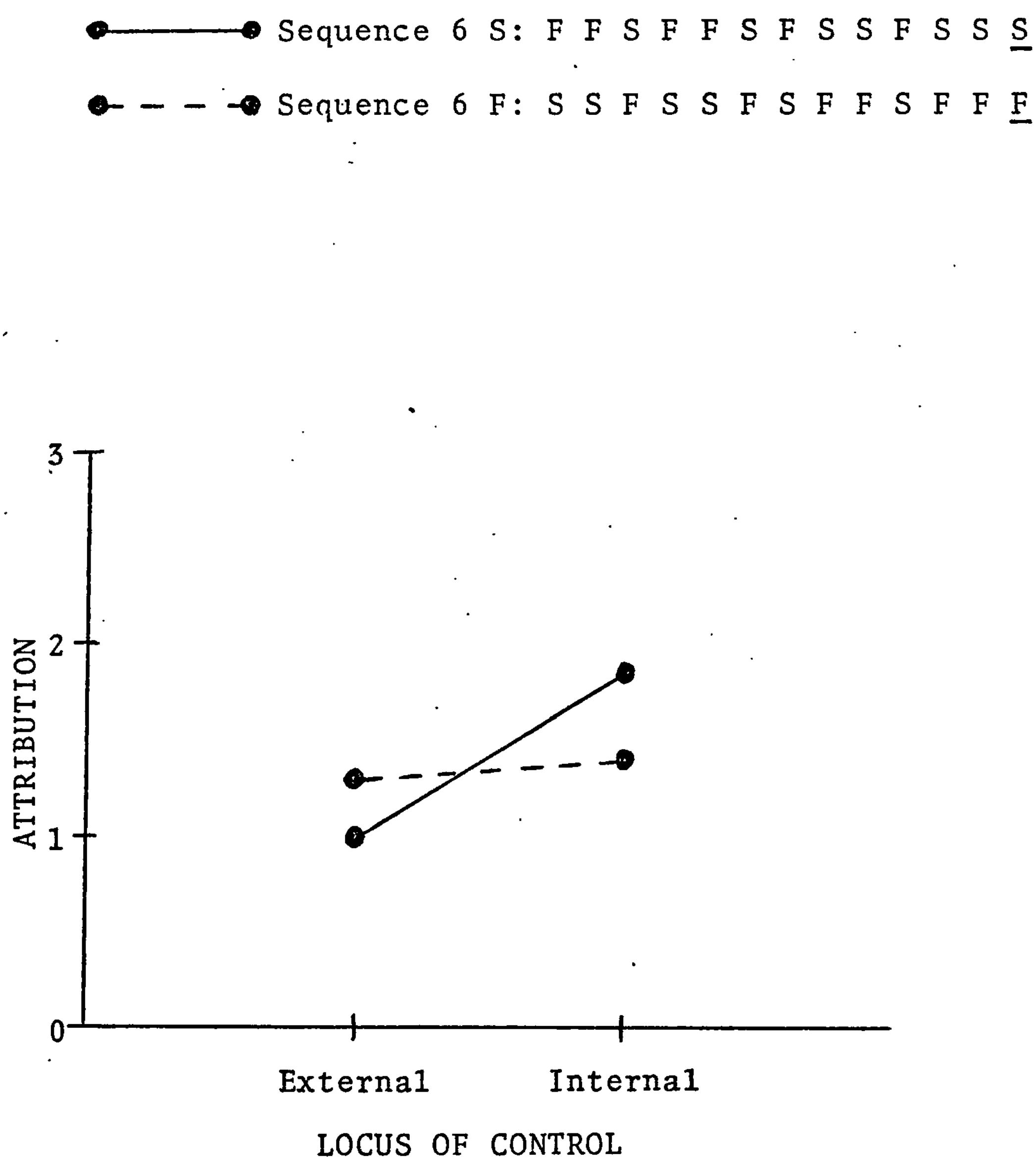

Figure 27

Average attributions to external and internal causal factors for Sequence Group 6.

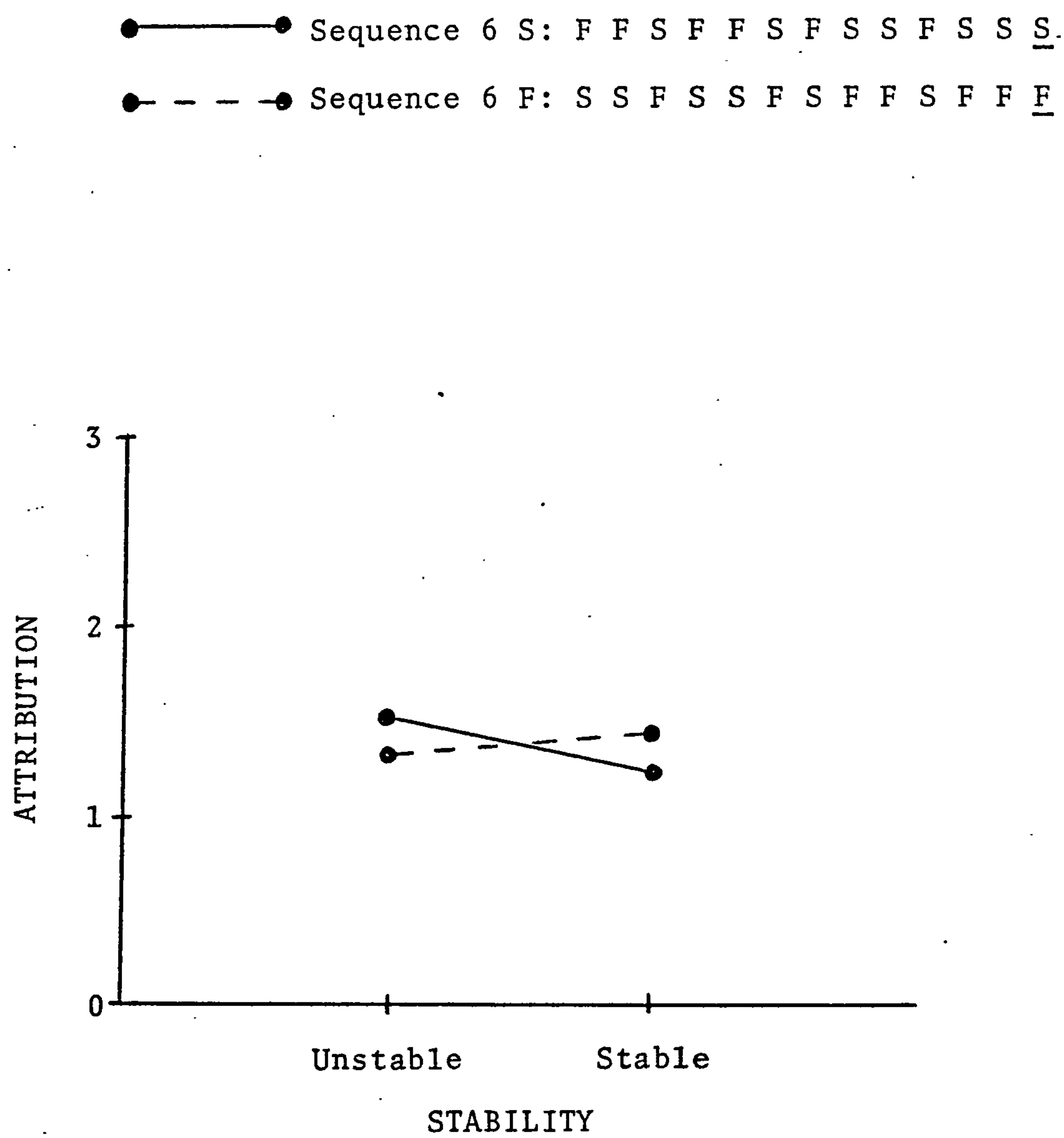

Figure 28

Average attributions to unstable and stable causal factors for Sequence Group 6.

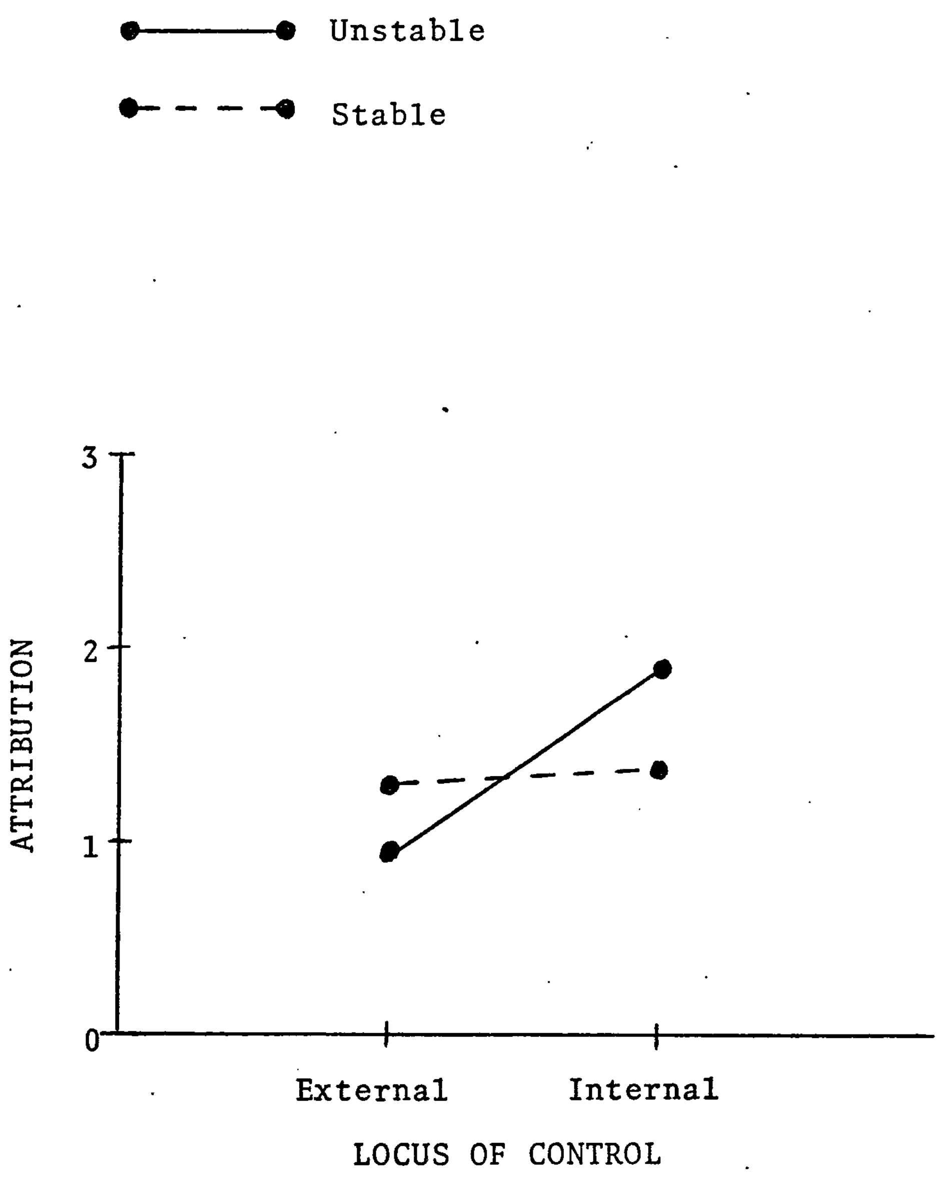

Figure 29

Average attributions to external and internal causal factors within unstable and stable categories for Sequence Group 6.

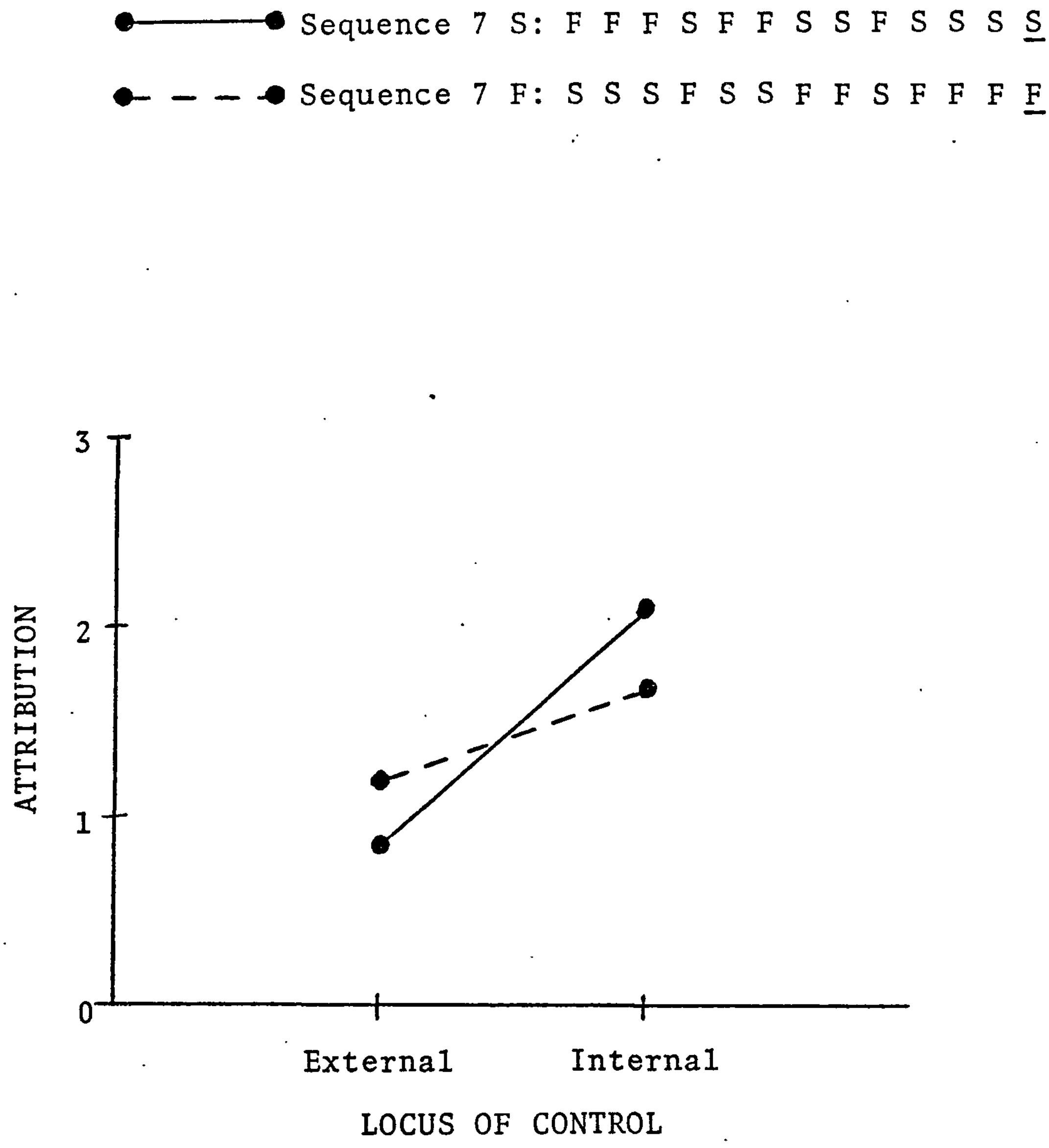

Figure 30

Average attributions to external and internal causal factors for Sequence Group 7.

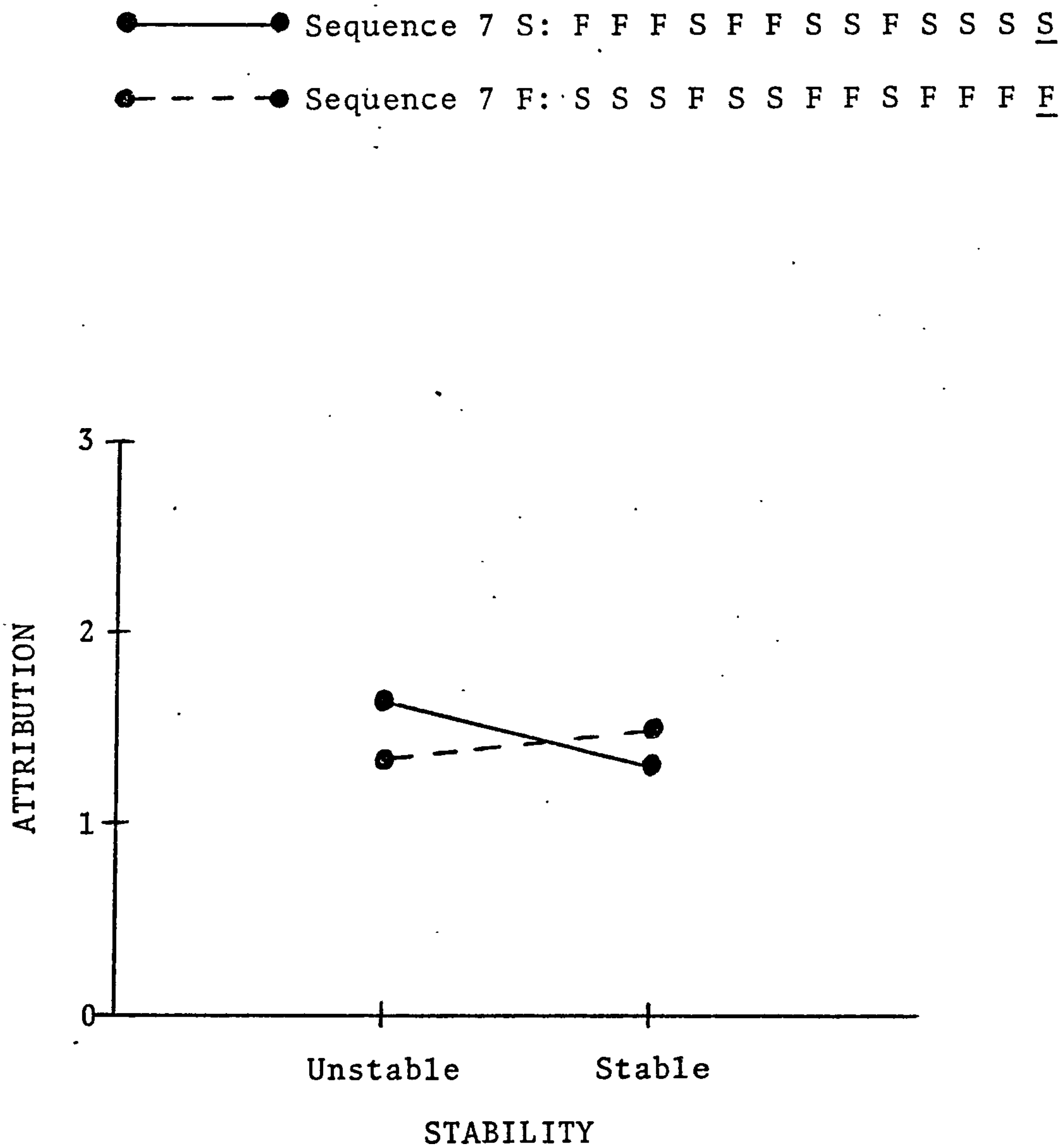

Figure 31

Average attributions to unstable and stable causal factors for Sequence Group 7.

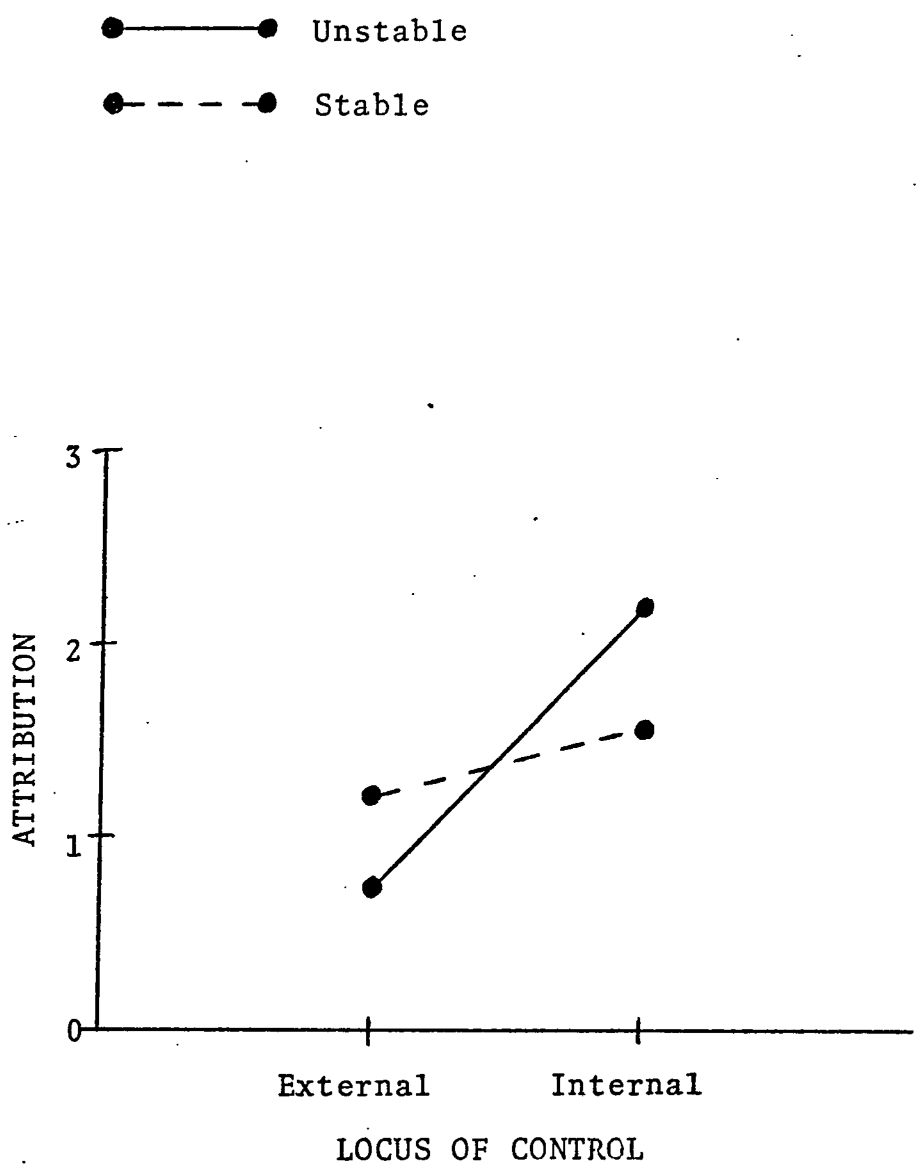

Figure 32

Average attributions to external and internal causal factors within unstable and stable categories for Sequence Group 7.

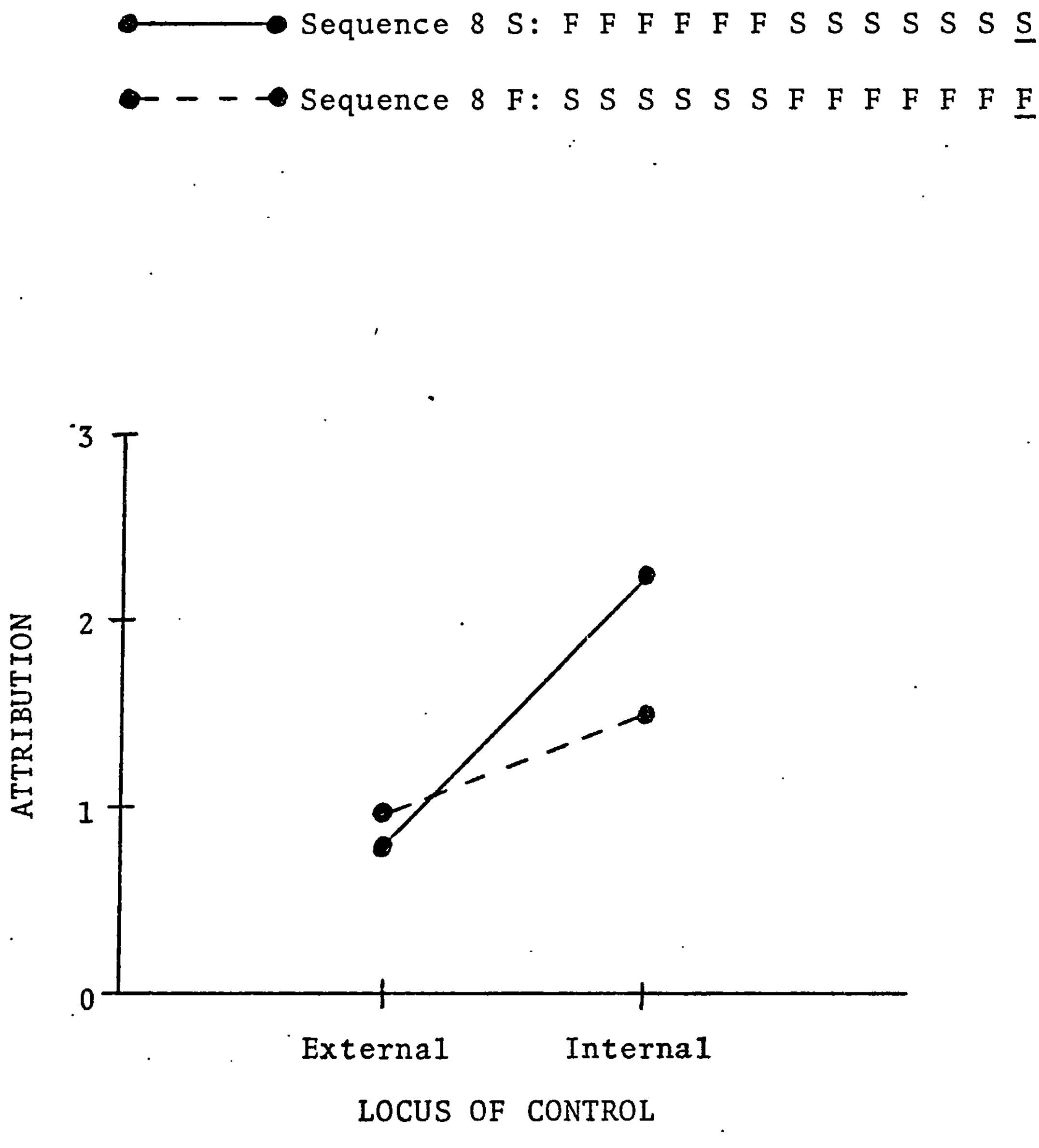

Figure 33

Average attributions to external and internal causal factors for Sequence Group 8.

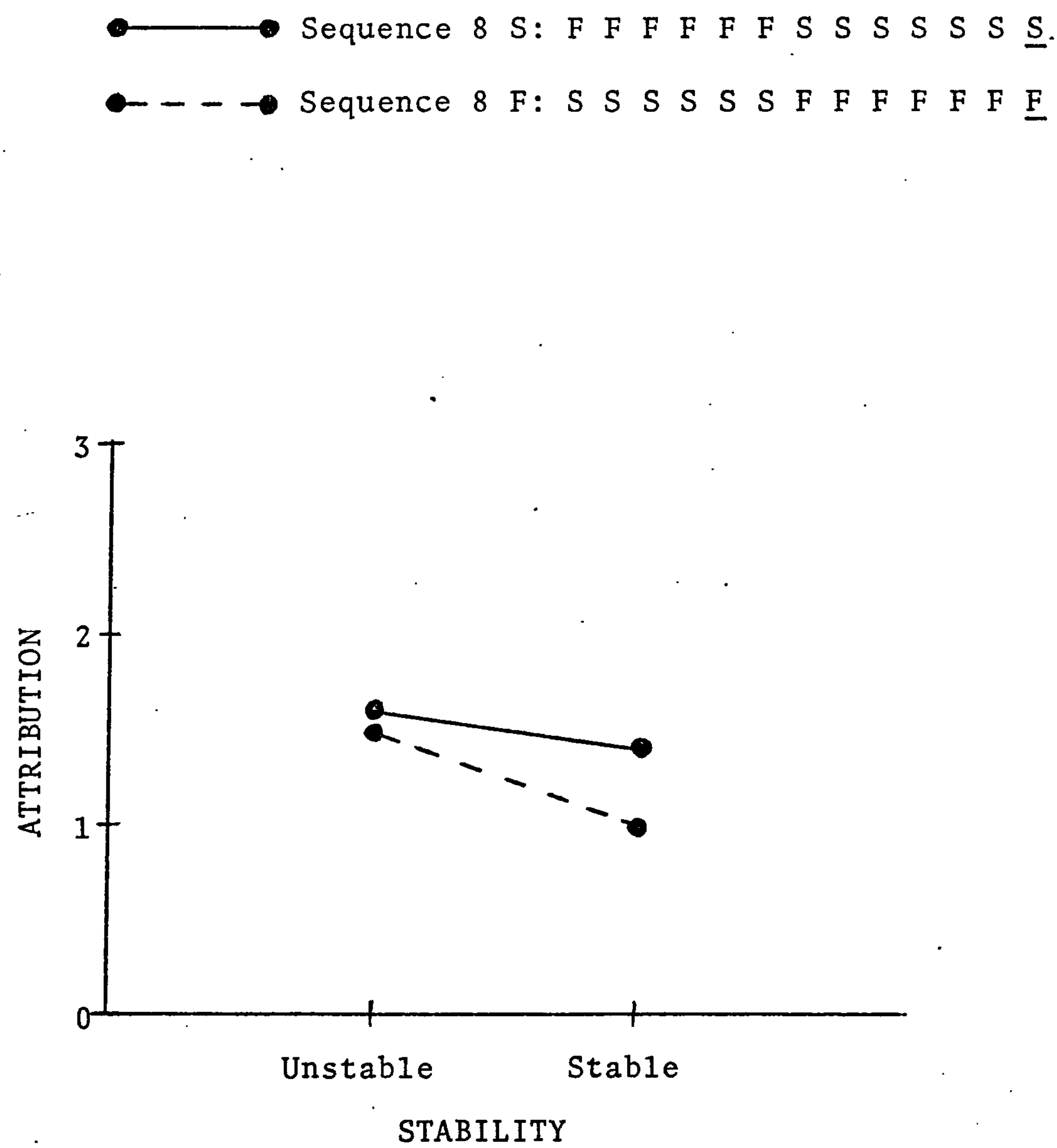

Figure 34

Average attributions to unstable and stable causal factors for Sequence Group 8.

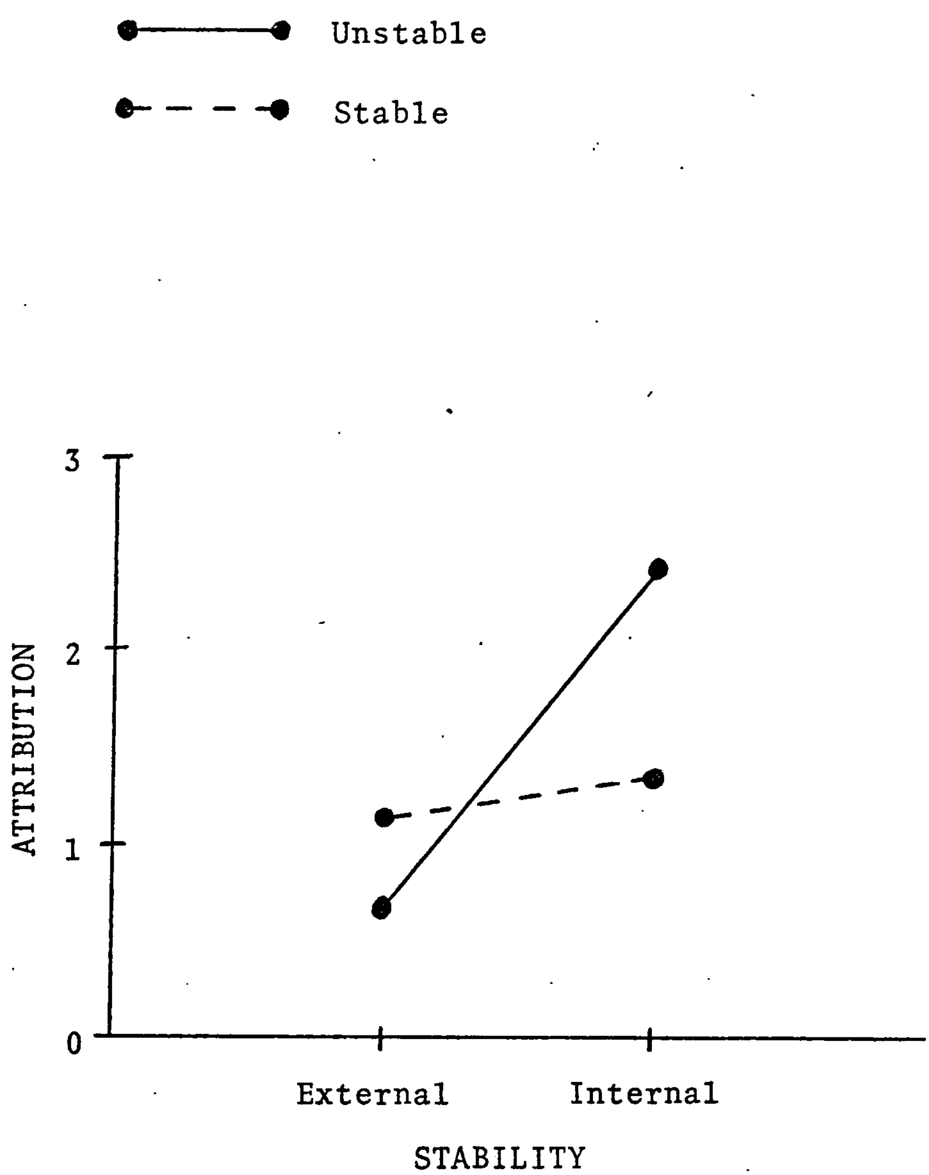

Figure 35

Average attributions to external and internal causal factors within unstable and stable categories for Sequence Group 8.

Locus of Control X Stability, and Sequence S Locus of Control X Stability. Significant F values were found for sequence and for Stability as well for the Group 8 sequences. Referring to Figures 9, 10, and 11, one can see that for sequences changing from failure to success (Sequences 6-S, 7-S, and 8-S), similar patterns of attributions occurred across the three groups, with attributions to the internal elements becoming more extreme as the degree of change within the sequence becomes more pronounced. The pattern for sequences changing from success to failure (Sequences 6-F, 7-F, and 8-F) is similar across the three groups for luck and effort attributions, while the pattern is less clear for task and ability attributions. The average attributions to the stable elements as causal factors for failure outcomes appear to be lower for the abrupt change sequence (8-F) than for the more gradual change sequences (6-F and 7-F), although the ability attribution for 6-F is nearly as low as for 8-F. Furthermore, the average attributions to stable elements were about the same for sequences changing from success to failure and sequences changing from failure to success in Groups 6 and 7, while the average attributions to stable elements were higher for the abrupt change from failure to success than for the abrupt change from success to failure in Group 8. An explanation for the pattern of attributions to stable elements obtained for Group 8 is in order.

For the abrupt change from success to failure, the performer wouldn't have succeeded repeatedly early in the sequence if the task were difficult. This would explain the low attributions to task difficulty as a cause for failure in the abrupt change from success to failure in Sequence 8-F. A similar line or reasoning can be used to explain the low attributions to ability as a cause for failure in Sequence 8-F: It would be unlikely that the performer would succeed repeatedly early in the sequence if he possessed low ability. In the absence of information about the nature of the task or the time span involved, subjects would not conclude that the performer had lost his high ability by the conclusion of the sequence. Therefore, subjects would eliminate low ability as a likely cause for a failure in this situation. However, a complementary sort of reasoning would not hold up in the case of an abrupt change from failure to success (Sequence 8-S). Repeated failures early in the sequence would eliminate an easy task as a cause for a later success, but failures early in the sequence would not eliminate the possibility of high ability as a cause for later successes. The performer may have required a "warm-up" period before his high ability became evident, or his early low ability may have changed to high ability through practice at the task. The results noted here may also reflect the subjects' use of an availability heuristic.

Tversky and Kahneman (1973) suggest that people evaluate the probability of events by the ease with which relevant instances come to mind or are available. Instances in which an increase in ability is reflected in outcomes suggesting improvement are perhaps more available than instances in which a decrease in ability is reflected in outcomes suggesting more frequent failures. If so, the use of an availability heuristic in connection with Sequences 8-S and 8-F would result in higher attributions to ability as a cause for 8-S as compared to 8-F.

The foregoing explanations of the attributions to task and ability for the abrupt change from failure to success may hold for the more gradual change sequences as well. The pattern for the sequences changing gradually from failure to success (6-S and 7-S) is similar to that for the abrupt change sequence (8-S). However, the explanations offerred for the attributions to stable elements for the abrupt change from success to failure does not seem to transfer so readily to the gradual change sequences. Perhaps the presence of ambiguity in the early part of the gradual change sequences permits subjects to conclude that low ability and a difficult task have not been eliminated from consideration as a cause for failure in the gradual change from success to failure sequences, while such a conclusion would seem extremely unlikely in the abrupt change situation.

It is interesting to note that attribution patterns for final target outcomes resemble attribution patterns for certain embedded target outcomes. For example, the attribution patterns for the "random" sequences in Group 4 resemble the patterns for Sequences 3 B-S and 3 B-F (see Figures 7 and 6). Note that sequences 3 B-S and 3 B-F are somewhat "random" in the arrangement of outcomes, with the less frequent outcome represented in the target outcome.

Similarly, attribution patterns for groups 6 and 7 sequences resemble the patterns for sequences 3 A-S and 3 A-F (see Figures 9, 10, and 6). The early portions of all these sequences are quite similar, with outcomes identical to the target outcome occurring less frequently earlier in the sequence and more frequently later in the sequence.

Similarities are also present between attributions for group 8 sequences and those for sequences 2 A-S and 2 A-F, and in each of these sequences an abrupt change to outcomes identical to the target outcomes from outcomes different from the target is present.

Apparently the outcomes within a run receive similar attributions regardless of their location within the run. The final outcome of the runs in groups 6 and 7 received attributions similar to those received by the first outcome of runs in sequences 3 A-S and 3 A-F.

In summary, the results for the ending target sequences indicate that attributions to the different causal elements are logically related to the structure of the sequence in which the target outcome occurs. This notion gains further support from the similarity of attribution patterns found for similar embedded and ending target sequences.

The findings for the ending target sequences do not conform to the predictions of the Weiner, *et al*. classification model. On the basis of consistency, all ending target sequences would be expected to receive similar attributions, since all target outcomes are preceded by sequences in which the probability of success is equal to the probability of failure. If only the last half of the sequence is considered, the model would predict higher effort attributions for the gradual change as opposed to the abrupt change sequences, since the degree of inconsistency between the target outcome and the seven immediately preceding outcomes would be greater for the gradual change sequences. However, relatively higher effort attributions appear to occur in the case of the abrupt change sequences. Subjects again seem to treat effort as a relatively stable factor.

Conclusions

As from Experiments 1 and 2, results from Experiment 3 indicate that subjects' inferences concerning underlying causal processes are logically related to available information. Responses obtained in Experiment 3 demonstrate that subjects are quite sensitive to different arrangements of outcomes within sequences. Different attribution patterns occurred for different success-failure arrangements, and those patterns appear to be related to the arrangements in a fairly systematic fashion.

Subjects in Experiment 1 tended to conclude that the "stable" factors, luck and task difficulty, are sometimes changeable. The notion that such conclusions might be based upon sequence information is supported by the finding of subjects' sensitivity to sequence information in Experiment 3.

For both the embedded target and the ending target sequences in Experiment 3, high effort attributions relative to luck attributions were found when at least some degree of consistency between the target outcomes and nearby outcomes existed. In fact, effort attributions in that case were as high as or higher than attributions to stable elements. Luck attributions exceeding effort attributions tended to occur when the target outcome was obviously an atypical outcome, and approximately equal luck and effort attributions occurred when the target outcome was either a less frequent or an equally frequent outcome. The results obtained for Experiment 3 indicate that luck attributions occur as the Weiner, et al. classification model would predict: Luck is apparently perceived to be an unstable element in the skill task context, and is used to explain atypical outcomes. Effort attributions, however, did not occur as the model would predict. Although the model places effort within the unstable category, the results from Experiment 3, like Experiments 1 and 2, indicate that effort may often be conceptualized by subjects as a stable factor. Therefore, the Weiner, et al. classification model is involid with respect to the stability dimension.

CHAPTER VI

EXPERIMENT 4

Introduction

Experiment 4 is concerned with subjects' perceptions of luck attributions within both skill and chance situations. Weiner, et al. assume that luck is an unstable factor and make no distinction between its conceptualization in the chance situation and the skill situation. By contrast, Brown and Bane (1975) assume that luck in the chance situation is often viewed stable in a way that allows stable probabilities of particular outcomes. Experiment 4 represents an attempt to demonstrate that luck is perceived differently depending upon the locus of control of the task in which it operates.

In a skill task (or achievement task, to use the attribution terminology), luck is capricious. Luck may effect some outcomes, while having little or no effect upon other outcomes--one never knows if luck will enter in, and if it does, to what degree it will enter in. Luck is called upon to explain outcomes which may be otherwise unexplainable. If a performer has a record of successful outcomes, and if his effort, ability, and the task difficulty are thought to be unchanged, a failure will be attributed to bad luck.

In a chance task, luck is always a factor, possibly the only factor (as noted earlier, task difficulty may play a role if task difficulty is defined in terms of probability of success). Luck is not only omnipresent in the chance situation, but it is expected to produce representive sequences of outcomes. That is, if a particular outcome in a chance task has a probability of occurrence of .25, it is expected to occur on approximately 25% of the total number of outcomes. If this outcome is designated "success", a performer can expect to have good luck 25% of the time and bad luck 75% of the time. Such an expectation would not be found when the task is skill related--the percentage of outcomes determined by good or bad luck is never known in advance. Indeed, it is suggested that luck in a skill task is used merely to include a multitude of factors not known to the observer, and if all those factors could be enumerated and analyzed, luck would rarely if ever receive attributions. The highly skilled performer may attribute very few, if any, outcomes to luck. If he succeeds, he attributes the outcome to his ability, and if he fails he attributes the outcome to the fact that his ability is less than perfect. His failure is due not to bad luck, but rather to an imperfection in his ability. Only when an extraneous unpredictable event is an obvious cause of an outcome will the outcome be attributed to luck, as in the case of an outfielder who trips over a soda bottle thrown onto the field and fails to catch the fly ball.

If the cause of an outcome is attributed to luck, the consequences of that attribution may differ between skill and chance tasks. An outcome attributed to luck in a skill situation has no information value for performers' future outcomes. Such an outcome tells the observer nothing about the probability of success that might be expected for that performer on future trials. The outcome "doesn't count" in assessing the likelihood of success in the future. Attributions to luck occur when an outcome is inconsistent with previous outcomes (Frieze and Weiner, 1971) and when an outcome disconfirms a prior expectancy (McMahon, 1973). Furthermore, attributions to luck result in expectancies calling for future outcomes to differ from the current outcome and to resemble prior outcomes and expectancies. Outcomes attributed to luck seem to be effectively ignored in forming expectancies for future outcomes in a skill task.

It is not expected that outcomes attributed to luck in a chance task can be ignored in forming expectancies for future outcomes, since all outcomes can be attributed to luck in chance tasks, and the sum of all outcomes can be used in forming expectancies for future outcomes. A particular research procedure used by experimenters in the locus of control area may have resulted in some confusion on this point. Phares (1957) measured expectancies for the next single trial after an outcome, and found that expectancies for the next outcome to differ from the current outcome (unusual shifts in expectancies) were more likely under chance than skill instructions. Weiner, et al. take this as evidence that in a task where outcomes can be attributed to luck, the luck factor is perceived as unstable. However, the unusual shift phenomenon was interpreted by Phares (and Weiner, et al. apparently accept his interpretation) as a failure on the part of subjects to perceive each trial in a chance task as independent from all other trials--subjects apparently subscribe to the "gambler's fallacy" by assuming that the occurrence of a particular outcome on one trial lowers the probability of that outcome on an immediately subsequent trial. This phenomenon does not always occur. In their review of the literature based on human statistical inference, Peterson and Beach (1967) note that subjects' estimates of proportions of binary events are surprisingly accurate. This judgemental accuracy suggests that subjects are quite capable of producing accurate expectancies concerning future outcomes, provided the response called for is conducive to such accuracy. When subjects predict the next single event, they do not necessarily indicate their expectancies for the relative frequence of occurrence of that event over the long run--they merely state which event they expect to occur on the next single trial. To reduce or eliminate the effect of the gambler's fallacy on subjects' responses, it is necessary to require subjects to produce expectancies for the number of times a particular outcome will occur over several trials following the current outcome and attribution. Such a procedure would tap subjects' judgments of the long-run probability of occurrence of events beyond assumed momentary deviations from that long run probability.

If the assumption by Weiner, et al. that chance in the locus of control literature can be equated with luck in the attribution literature is justified, expectancies for future outcomes should be similar regardless of the type of task in which they occur. If, however, expectancies for future outcomes following identical sequences in which the last outcome was attributed to luck differ between chance and skill situations, support would be generated for the claim that luck is perceived differently in the two situations. Experiment IV was an attempt to demonstrate that luck in the skill situation is not equivalent to luck in the chance situation. The hypothesis for Experiment IV predicts that when subjects receive identical sequences of success and failure outcomes, the last outcome of which is attributed to luck, expectancies for outcomes on future trials will differ depending upon the locus of control of the task in which the outcomes occur.

More specifically, the outcome attributed to luck should be virtually ignored in forming expectancies for future outcomes in the skill situation, while the same outcome should enter into the formation of expectancies in the chance situation.

<u>Method</u>

A dart and a spinner game were chosen to represent the skill and chance conditions, respectively, for Experiment 4. These two games were chosen because each requires that an object (dart or spinner) land on a designated area to indicate success, and because the probability of success is not implied by the description of either game. If a coin-tossing game had been chosen for the chance conditions, a prior probability of .5 would have been implied. A between-subjects design was employed for Experiment 4. Subjects read a paragraph describing a situation in which a player would play either the dart game (skill condition) or the spinner game (chance condition), and would receive $1.00 for each time the dart landed or the spinner stopped on a designated area. The player was to have taken five throws or spins that didn't count, and the outcomes on these five trials were listed. The outcomes were identical for each condition: 0 $1 $1 $1 0. The final outcome was attributed to bad luck in both conditions. Subjects were then asked to predict the amount of money the player would win on the next ten trials. The stimulus items presented to subjects in each condition appear in Appendix D.

Results

The mean response of the 110 subjects in the chance condition was \$5.545, while the mean response of the 121 subjects in the skill condition was \$6.091. The difference between the means for the two conditions is significant at the .01 level using a two-tailed t test ($t = 2.57$, $df = 229$).

Discussion

Since no other information concerning the probability of success was available, subjects in the two locus of control conditions had to rely upon identical sequences and upon identical attributions for the final unsuccessful outcome in producing expectancies for future outcomes. The higher average prediction made by subjects in the skill condition indicates that "unsuccessful" outcomes attributed to bad luck are viewed differently depending upon the skill or chance nature of the task. Subjects in the skill condition may have given less weight to unsuccessful outcomes thought to have been caused by bad luck than did subjects in the chance condition. As noted earlier, such a strategy would be logical, in view of the fact that all outcomes in a chance situation are attributable to luck, and these outcomes attributable to luck must all be considered in predicting future outcomes. In contrast, outcomes attributable to luck in a skill situation are thought to be aberrations, and as such, may be ignored or weighted only slightly in predicting future outcomes.

The higher average prediction found in the skill condition was expected, and tends to support the hypothesis that subjects' expectancies for future outcomes following a failure attributed to bad luck differ depending upon the locus of control of the task in which the outcome occurs. Some difficulty is encountered in connection with this interpretation, however. Howell (1972) has identified an internality bias which appears to result in higher expectancies for success in a skill situation than in a chance situation when subjects predict their own performances. Whether or not an internality bias would be active in the present study, in which subjects were asked to predict the performance of a fictitional other is an open question.

Another plausible alternative explanation for the differences in expectancies between the two locus of control conditions turns on subjects' possible assumptions of probabilities of success in the two conditions without reference to the attribution for the final failure outcome. If subjects in the skill condition believed that the performer's self-attribution of the final outcome to luck was incorrect, they may have failed to discount that outcome and used the observed proportion of successes in the five trial sample as the best estimate of future outcomes, predicting a win of $6.00 on the next ten trials. While some subjects in the chance condition may have used the observed proportion of successes in the sample as the best estimate, others may have assumed a probability of success in a chance task of .5 and predicted that the player would win $5.00, resulting in the average prediction of $5.545 noted in the chance condition. This explanation requires that some subjects in the chance condition assumed a prior probability of .5, in spite of the investigator's attempt to avoid suggesting prior probabilities in either condition. It may not be unreasonable to postulate such a .5 response bias under the chance condition, although the spinner game employed should not necessarily have resulted in such a bias.

The actual dollar amount of the average predictions made by subjects in Experiment 4 may have been depressed somewhat by the operation of two factors. First, subjects may have predicted the amount of money they expected the performer to win on the next five trials rather than on the next ten trials. The presentation of five "sample" trials may have led some subjects to think that they were being asked to make predictions for that number of future trials. Second, subjects apparently read more into the stimulus items than the investigator intended to convey. One subject noted that the player would "win what it cost him to play", indicating that this subject, at least, assumed that the player was required to pay to play, but that the game was "fair" in that the player would probably win the same amount.

In answer to a post-experimental request for comments on the game in the chance condition, several subjects noted that the player could not be expected to come out ahead in a gambling situation. These subjects apparently misperceived the game as a "sucker game" in which the player is allowed to win on a few trials as a come-on, and is subsequently relieved of as much money as he can be persuaded to part with.

Subjects' misperceptions of either the number of trials or of the integrity of the situation in which the trials occur, would tend to lower average predictions, although the effects of such misperceptions should apply equally to either experimental condition. If average predictions were depressed by either of the factors mentioned above, the explanation based upon a possible response bias in the chance condition would be eliminated, since the average prediction in that condition would be greater than a .5 response bias would produce.

Conclusions

Since the absolute values of the average predictions for success over 10 trials in skill and chance situations permit several different explanations, the results of Experiment 4 cannot be unambiguously interpreted. Future research should employ modifications of the task instructions to eliminate the likelihood of depressed predictions due to subjects' misperceptions of the number of trials or of the integrity of the situation.

CHAPTER VII

EXPERIMENT 5

Introduction

If skill tasks are thought to involve changing probabilities of success while chance tasks usually do not, as claimed by Brown and Bane, subjects should differentiate between skill generated and chance generated tasks on the basis of the arrangements of success and failure outcomes within sequences. That is, when sequences are arranged so that the probability of success remans fairly stable over the entire sequence, subjects should judge those sequences to have been generated by a chance process. In contrast, when probabilities do vary within sequences, subjects should judge those sequences to have been generated by a skill process. Research discussed by Kahneman and Tversky (1972) offers support for the position that subjects will perceive stable probability sequences as chance generated sequences. Kahneman and Tversky maintain that the subjective probability of the likelihood that a sample has been drawn from a particular population is determined by the degree to which it is similar in essential characteristics to its parent population and by the degree to which it reflects the salient features of the process by which it was generated. A sample which is highly similar to the parent population and which reflects the salient features of the process by which it was generated is characterized by Kahneman and Tversky as a sample that is highly representative. These authors claim that the representativeness of the sample determines the subjective probability on the part of an observer that the sample was drawn from a particular population. Subjects seem to believe that local representativeness will obtain; that small samples are just as likely as are large samples to reflect overall proportion. On the basis of representativeness, ascending or descending patterns of successes would be expected to elicit judments that the sequence is skill derived, since changing probabilities of success and runs of failures and successes do not appear "random" and would be assumed to be unlikely in a chance task. These characteristics may not be thought to be unlikely in some skill tasks. Sequences in which the probability of success remains stable over the entire sequence, and in which the distributions of successes and failures appears "random" should elicit judgments that the sequence is chance derived. The hypothesis for Experimenk 5 predicts that subjects will judge sequences displaying ascending or descending patterns of successes to be skill derived, and judge sequences displaying "random" patterns of successes to be chance derived.

Confirmation of this hypothesis would lend support to the notion that chance tasks are perceived as stable probability tasks, and that luck within a chance task is a more stable influence than is luck within a skill task.

Method

A within-subjects design was employed in Experiment 5. Each of 71 subjects received each of 19 stimulus items. Each item was printed on an individual sheet, and sheets were stapled together in a different random order for each subject. Stimulus items consisted of sequences of 14 outcomes in which 7 successes and 7 failures were included in various arrangements. The probability of success or failure in any sequence was equal to .50 for the sequence as a whole, but local probabilities within sequences varied from sequence to sequence. An attempt was made to construct either "random" or "non-random" sequences. Random or stable probability sequences were defined as those containing thoroughly mixed or scrambled arrangements of successes and failures; local proportions were not allowed to deviate markedly from .50-.50, and long runs of one type of outcome were not included. Not more than two runs of three identical outcomes were included in any one random sequence, and no run of more than three was included. These random sequences were intended to fulfill the criteria of "representativeness" as described by Kahneman and Tversky.

Non-random or changing probability sequences were defined as those containing runs of four or more identical outcomes, and in which local proportions did deviate markedly from .50-.50. Non-random sequences were designed to change from one kind of outcome to the other. If the early portion of a sequence consisted of a preponderance of outcomes of one kind, the latter part of that sequence was constructed with a preponderance of outcomes of the other kind, resulting in non-random sequences in which the overall probability of either outcome was equal to .50, while local probabilities were allowed to depart from .50-.50. The degree of the change from one kind of outcome to the other varied from one sequence to another among the non-random sequences. In a sequence like F F S F F F S F S F S S S S, the change from failure to success outcome is gradual and not so noticeable as the obvious abrupt change in a sequence like F F F F F F F S S S S S S S. (The letter "F" indicates a failure and the letter "S" indicates a success in the foregoing sequences.)

Upon construction of a sequence, the complement of that sequence was constructed by the substitutions of a success for each failure and a failure for each success in the original sequence. Thus for any sequence, a complementary sequence was presented, with the exception of sequence 9, which was inadvertantly included without its complement. Non-random sequences changing from failure to success outcomes and sequences changing from success to failure outcomes were thus included.

Constructed sequences were printed, one sequence on a page, and were randomly arranged and stapled together to form booklets. A printed sequence consisted of a horizontal row of capital letters S and F, where the letter "S" signified success and the letter F signified failure. As noted previously in connection with the sequences presented in Experiment 3, this simultaneous method of sequence presentation might result in greater salience of patterns as compared to a method by which outcomes were presented one at a time.

Instructions informed subjects that the sequences represented records of outcomes from either skill or chance games, and asked subjects to indicate what kind of game had generated each sequence. The presentation of the different sequences on individual pages should have minimized any tendency on the part of subjects to compare sequences directly, although subjects were not explicitly instructed to refrain from such comparisons.

Instructions and sequences are included in Appendix E. Sequences are labeled random, changing from failure to success and changing from success to failure, according to the author's classifications. Labels are presented here to simplify discussion, and were not presented to subjects.

Results

As predicted, "random" or stable probability sequences were thought to have been generated by chance games. Responses to each "random" sequence favored the chance category, and all choices were significant beyond the .05 level using the normal approximation to the binomial distribution, two-tailed test.

Frequencies of each response for each random sequence are presented in Table 13. In some cases the responses for a sequence total less than 71, because sequences were overlooked by subjects.

Changing probability sequences in which outcomes changed from failure to success were all thought to have been generated by skill games. All choices were significant beyond the .05 level.

Results for those changing probability sequences in which outcomes changed from success to failure were as follows: For sequence 15, choices favored the chance category, $p < .05$, for sequence 16, neither category was favored, for sequence 17, choices in favor of the skill category approached significance, and for sequences 18 and 19 choices in favor of skill were significant. Frequencies of responses

Table 13

Response frequencies and associated probability levels for each "random" sequence, Experiment 5

	SEQUENCE	RESPONSE FREQUENCY CHANCE	SKILL	PROB. LESS THAN
(1)	F S F S S F S F S F S F F S	61	10	.001
(2)	F S S F S F S F S F F S F S	54	17	.001
(3)	F S F S S S F F S F S F F S	57	14	.001
(4)	F S S F S F S S F F F S F S	60	11	.001
(5)	S F S F F S F S F S F S S F	64	6	.001
(6)	S F F S F S F S F S S F S F	62	9	.001
(7)	S F S F F F S S F S F S S F	58	13	.001
(8)	S F F S F S F F S S S F S F	59	12	.001
(9)	F F S S F S S S F S S F F F	55	16	.001

and probability levels for the changing sequences are presented in Table 14.

Discussion

Subjects apparently found the "random" or stable probability sequences to be representative of a parent population generated by a chance process. This result was expected, and is entirely consistent with the evidence reported by Kahneman and Tversky. The fact that subjects in the present study favored the skill category for all those changing probability sequences in which early failures were replaced by later successes and for two of those sequences in which early successes were replaced by later failures lends support to the notion that chance tasks are perceived as stable probability tasks while skill tasks are perceived as changing probability tasks, as suggested by Brown and Bane (1975).

The fact that only those sequences exhibiting a change from success to failure were not categorized as expected suggests that something peculiar to this type of changing sequence was responsible for the negative findings in connection with some of these sequences. Subjects may have been quite comfortable with the categorization of failure-to-success sequences as skill derived, since such a categorization is consistent with common sense notions of improved

Table 14

Response frequencies and associated probability levels for each "changing" sequence, Experiment 5

SEQUENCE	RESPONSE FREQUENCY CHANCE	SKILL	PROB. LESS THAN
"Changing from failure to success"			
(10) F F S F F F S F S F S S S S	20	50	.001
(11) F F F S F F F S S F S S S S	16	55	.001
(12) F F F F S F F S F S S S S S	12	59	.001
(13) F F F F F S F S F S S S S S	15	55	.001
(14) F F F F F F F S S S S S S S	8	62	.001
"Changing from success to failure"			
(15) S S F S S S F S F S F F F F	50	21	.001
(16) S S S F S S S F F S F F F F	30	41	n.s.
(17) S S S S F S S F S F F F F F	29	42	n.s.
(18) S S S S S F S F S F F F F F	24	45	.05
(19) S S S S S S S F F F F F F F	26	45	.025

performance with practice on skill tasks. Subjects' use of the availability heuristic postulated by Tversky and Kahneman (1973) may explain these findings. As noted earlier, instances of skill tasks in which early failures give way to later successes may be easier for subjects to imagine, hence, more available, than skill tasks in which early successes give way to later failures. It was also possible for subjects to interpret early failures as a "warm-up" period, while later successes reflected the performer's true ability. By contrast, the success-to-failure sequences would be more difficult to categorize. If the performer had demonstrated his ability early in the game, it would be difficult to explain his later failures, especially in the absence of information about the difficulty of the task, the length of the time period within which the outcomes occurred, or the likelihood of fatigue as a factor. However, when sequences 18 and 19 were encountered, most subjects apparently could not convince themselves that such abrupt changes in probabilities were to be found in a chance process, and labeled these sequences as skill derived.

Subjects categorized only one of the five sequences in which outcomes changed from success to failure as a chance derived sequence, and the one sequence so categorized was the sequence in which change was most gradual, sequence 15.

Sequence 15 resembles the stable sequences more than do the other non-random success-changing-to-failure sequences: Only two runs are present, and both are fairly short runs, the longer one consisting of four failure outcomes. Sequence 16, for which neither the skill nor the chance response was favored, is adjacent to sequence 15 as sequences progress from gradual to abrupt change. It contains two runs of three identical outcomes and one run of four. Sequence 17, for which the skill response was favored but at a probability level only approaching significance, contains two runs of four outcomes each. Sequences 18 and 19, in which the change from success to failure is more pronounced, were both categorized as skill tasks, $p < .05$. There appears to be a relationship between subjects' categorization of sequences and the degree of change from success to failure outcomes. The presence of such a relationship would permit a logical explanation of subjects' clear preference for the skill response when outcomes change from failure to success, but the lack of a clear preference for skill in three of the sequences in which outcomes change from success to failure. Two factors may contribute to subjects' preference for the skill response when outcomes change from failure to success: (1) the sequence does not seem to fit subjects' criterion for a chance-generated sequence, and (2) a change from failure to success is not inconsistent with the skill response. Both factors would tend to lead to a skill response when outcomes change from failure to success. However, the subject must deal with a greater amount of ambiguity when outcomes change from success to failure, since this change is somewhat inconsistent with the skill response. The subject is at a loss to explain the performer's apparent loss of skill. If the sequence were chance-generated, a change from success to failure would not require explanation. Only when the change is very pronounced, making the sequence highly unlikely as a chance-generated sequence, would the subject resort to the skill response.

Conclusions

In line with the findings reported for Experiments 1 and 3 of this thesis, the results of Experiment 5 also indicate that subjects are sensitive to arrangements of success and failure outcomes within sequences. Subjects apparently perceive chance tasks as stable probability situations and skill tasks as changing probability situations. This finding is in accord with the results reported by Brown and Bane (1975). Change from failures to successes is more likely to be perceived as a skill situation than is change from successes to failures, except where the change is quite sudden. Subjects' judgements of the skill or chance nature of the generating process conform to those that would be expected to occur given subjects' use of representativeness and availability heuristics.

CHAPTER VIII

GENERAL DISCUSSION

The results of Experiment 1 indicate that subjects can be easily induced to treat ability and task difficulty as unstable elements even though the Weiner, et al. classification model places these elements in the stable category.

Although the context information and outcome sequences used in Experiment 1 were intentionally conducive to the perception of ability and task difficulty as unstable elements, real life attribution situations are not unlike those presented to subjects. The difficulty encountered by people in real world achievement situations may often differ from trial to trial. A real estate salesman, for example, would be the first to admit that the difficulty of selling an undesireable house is far greater than that of selling a more attractive property. Similarly, ability may be observed to change over relatively long time periods, and possibly over short time periods in certain situations. Since the utility of making attributions lies in their use in explaining past and present events and in predicting future events, research in the area of attribution should not be limited to momentary or short-term situations.

In Experiment 2, the motivation manipulation did not have the predicted effect upon expectancies following successes and failures attributed to effort and luck. As noted earlier, these negative findings may be explained by subjects' differential acceptance of performer's self-attributions. If subjects' own attributions were used, the predicted effect might occur.

The results of Experiment 2 are somewhat equivocal, since the paradigm employed did not control for unequal prior probabilities among the different conditions. Considered in conjunction with the results of Experiment 3 in the present investigation and with results of other investigators, however, the results suggesting that effort is stable in relation to success are not unacceptable. In a recent study of the influence of causal attributions upon affect and expectancy, Riemer (1975) reports that expectancies following success attributed to effort did not conform to predictions based upon the Weiner, et al. classification model. Riemer questions the validity of the classification of effort as an unstable element. The evidence reported here casts more doubt upon the validity of that classification.

The striking finding of Experiment 3 is the sensitivity of subjects' attributions to the different sequential arrangements presented. Subjects' systematic use of such information becomes apparent when the response patterns for the different types of sequences are compared. The attributions made by subjects for target outcomes in the different sequences can be explained by Kelley's covariation principle and the Bayesian analysis of causal attribution proposed by Ajzen and Fishbein. Bayes' theorem predicts revision of subjective probabilities concerning the validity of certain hypotheses in the light of new information--it is a normative model of optimal use of available information. If the probability of a datum given a particular hypothesis is greater than the probability of that datum given an alternative hypothesis, the datum should result in revisions of subjective likelihoods favoring the first hypothesis. The ratio between the datum given one hypothesis and the same datum given an alternative hypothesis is known as the likelihood ratio. Ajzen and Fishbein propose that "the extent to which a potential causal factor is viewed as responsible for the behavior corresponds to the likelihood ratio in Bayes's theorem, where the behavior serves as the datum and the proposed explanation is the hypothesis (p. 265)." Ajzen and Fishbein employ the operation or the failure to operate by the causal factor in question as the two alternative hypotheses between which the likelihood ratio determines subjects' judgments. For example, subjects attributing cause for target outcomes in Group 2 of Experiment 3 produce likelihood ratios for the two alternative hypotheses "luck was an important causal factor" and "luck was not an important causal factor" for the noted effect. For Sequences 2 B-S and 2 B-F, the covariation principle suggests that luck may have had an effect--the fact that the target outcome is an atypical outcome allows the inference that an atypical cause operated in this case--the effect covaried with luck. The covariation between luck and the effect results in a weighting of the likelihood ration in favor of the luck hypothesis: The probability of the effect given the operation of luck is greater than the probability of the effect given than luck did not operate.

Compared to Sequences 2 B-S and 2 B-F, the target outcomes in 2 A-S and 2 A-F are not so unusual. Since luck is not thought to operate consistently in skill tasks, the effect observed is less likely to have covaried with luck, and the likelihood ratio reflects this lower probability of the datum given the hypothesis that luck operated. If this ad hoc explanation is correct, subjects' attributions to luck should have been higher for Sequences 2 B-S and 2 B-F than for 2 A-S and 2 A-F, which is the pattern that did occur. The covariation principle and the Bayesian approach can be used to explain other attributions found in Experiment 3.

As noted earlier, subjects' attributions in Experiment 3 indicate that effort is often treated as a stable element by subjects. Subjects' treatment of effort as a stable factor occurred for both success and failure outcomes in Experiment 3. Earlier experimental evidence for effort as an unstable factor in connection with success outcomes is questionable. It is very likely that the findings that have suggested that effort is unstable in connection with failure outcomes are artifacts of the experimental situation. Failures attributed to effort have occurred in situations in which subjects would assume high motivation. A performer who is motivated to succeed and who fails because of low effort can be expected to increase his future efforts, resulting in success. However, the unmotivated performer would not increase his effort, and failure would result. A teacher whose unmotivated student fails because of his low effort does not hold much hope for his future successes, since his effort is not expected to increase in the future.

Experiments 4 and 5 are concerned with subjects' perceptions of skill and chance situations and with the perceived operation of luck within those situations. The results for Experiment 4 are somewhat ambiguous. The higher average prediction for success on ten future trials in the skill condition may indicate that negative outcomes attributed to bad luck are weighted more heavily in chance as opposed to skill situations. The same evidence, however, can be explained by a response bias of .5 in the chance situation together with the assumption that subjects rejected the performer's self-attribution and failed to discount the final outcome in the skill situation. Further research is needed to determine which is the better explanation.

Subjects were again sensitive to sequential arrangements of outcomes in making judgments of the chance or skill nature of the generating process in Experiment 5. Random sequences were judged to be chance derived, changing probability sequences suggesting improvement were judged to be skill derived, as were the sequences that changed rather abruptly to failure from success. The findings may be explained by the representativeness and the availability heuristics. Subjects apparently used the representativeness heuristic to assign "random" sequences to the chance category, while those sequences that were obviously not representative of a fifty-fifty chance process were assigned to the skill category. For the more ambiguous sequences that, by using the representativeness heuristic, could be classified as either skill or chance derived, subjects may have resorted to the availability heuristic. Use of the availability heuristic would result in the assignment of sequences changing from failure to success to the skill category since subjects could readily call up instances of such patterns from their own experiences with learning and practice situations. Subjects would have fewer accessible skill instances in which outcome patterns change from success to failure, and would be less likely to categorize such sequences as skill derived.

The results of Experiment 5 provide evidence to support the hypothesis that changing probabilities of success are thought to exist in skill situations and that stable probabilities are thought to exist in chance situations. Since outcomes in chance tasks are determined by luck, luck must contribute to the stability apparently perceived in chance tasks. Since luck is thought to contribute to a lack of stability in skill tasks, luck within the skill framework must be perceived differently than is luck within the chance framework.

CHAPTER IX

CONCLUSIONS

On the basis of the evidence reported here, the following conclusions are warranted:

1. Subjects make use of available context information in determining the nature of underlying causal processes.
2. Subjects are sensitive to sequence information, and make systematic use of such information in attributing cause for an outcome within a sequence.
3. Subjects can be induced to treat task difficulty and ability, the "stable" causal factors, as changeable.
4. Subjects treat effort as a relatively stable factor under some conditions, while they treat luck as a more unstable factor.
5. Subjects' judgements of the skill or chance nature of a process generating sequences of outcomes indicate that stable probability sequences are thought to be chance-derived while most changing probability sequences are thought to be skill-derived.

The foregoing conclusions have implications for several approaches to the attribution process.

Implications for Heider's Psychology of Interpersonal Relations. The evidence reported here conforms well to Heider's classic formulation: Subjects apparently make use of outcomes and any other available information (context information, task structure information, earlier attributions) to determine the nature of underlying core processes. Heider's belief that trying is a relatively invariant factor is supported by subjects' apparent treatment of effort as a relatively stable factor in Experiments 2 and 3 of the present thesis. The perception of task difficulty and ability as changeable factors in Experiment 1 indicate that Heider is correct in permitting change in those factors, even though they may be relatively stable in many cases.

Implications for Kelley's Covariation Principle. Kelley's covariation principle receives support from the results of Experiments 1 and 3. In Experiment 1, subjects' perceptions of change in "stable" rather than "unstable" causal factors appears to be related to the covariation of the process in question with the sequence of outcomes. Attributions made by subjects in Experiment 3 suggest that people do use the covariation principle in attributing cause to underlying processes. The sensitivity of subjects' attributions to sequence structure suggests that the subjective likelihood of the operation of an underlying process is determined by the extent to which that process might have covaried with the observed outcomes.

Implications for the Weiner, et al. Classification Model. The conclusions reached here cast serious doubt upon the validity of the Weiner, *et al*. classification scheme. The stability dimension in particular is inadequate. Subjects in the present study judged ability and task difficulty, the "stable" elements, to be sometimes unstable, while they treated effort, an "unstable" element, as a stable element.

The Weiner, *et al*. model, while based upon Heider's formulation, fails to take careful account of Heider's intent. Heider indicates that effort is a relatively stable factor, and further indicates that even the stable factors are subject to change. These considerations must be dealt with in a classification of the causal factors. Heider lists fatigue and mood as transient internal factors and luck as a transient external factor, each of which can interrupt the usual relationship between personal power and environmental difficulty. Weiner, *et al*. would do well to include transient personal factors in their scheme--how is an observer to explain a performer's current repeated failures subsequent to earlier successes without resorting to fatigue or mood? Since effort is sometimes stable and task and ability are sometimes unstable, a valid classification model needs to indicate when each of these elements takes on its stable and unstable characteristics.

The present evidence also tends to refute the criticism by Weiner, et al. that a confound between stability and locus of control is responsible for the differences noted in the locus of control literature between subjects' responses in skill situations and their responses in chance situations. The evidence presented here indicates that the assumption that "luck" is the same concept regardless of the nature of the task in which it operates is unwarranted.

Implications for Ajzen and Fishbein's Bayesian Approach to Attribution. The present findings are consistent with the Bayesian approach to attribution advocated by Ajzen and Fishbein (1975). As discussed earlier, subjects' attributions in Experiment 3 can be explained by a Bayesian model whose likelihood ratio is developed through the use of Kelley's covariation principle. The results of Experiment 1 can be explained in much the same way, although context information probably contributed to subjects' perceptions of the kind of variability possible for the different underlying causal processes.

The Bayesian model is also applicable to the task employed in Experiment 5. Here, subjects were required to decide whether each outcome sequence had been generated by skill or chance processes, choices which can be viewed as the two alternative hypotheses for the Bayesian likelihood ratio. For each sequence, subjects could have generated the probability of this sequence given a skill process and the probability of this sequence given a chance process. They would than have decided which process was more likely on the basis of the larger of the two probabilities. These probabilities could have been generated by using heuristics, an approach to be discussed below.

Implications for Kahneman and Tversky's Heuristic Approach to Judgment. The notion of subjects' use of representativeness and availability heuristics as proposed by Kahneman and Tversky (1972) and Tversky and Kahneman (1973) appear reasonable in light of the present thesis. When deciding whether an observed sequence has been generated by a skill or a chance process, subjects' responses conformed to those that would be expected if they had actually used the two heuristics.

The Bayesian approach to attribution advocated by Ajzen and Fishbein (1975) does not preclude the use of heuristics. A Bayesian model requires subjects to produce probability values for use in the likelihood ratio, but does not indicate where these probabilities are to be found. Subjects might employ representativeness and availability heuristics to produce subjective probabilities. For example, if a sequence of outcomes were thought to be highly representative of a particular underlying causal process, the probability of the datum (the sequence) given that the process had operated would be great relative to the probability of the datum given that the process had not operated, and the likelihood ratio would be weighted in favor of the operation of the process. Similarly, if the subject were able to generate numerous examples of instances in which the operation of a particular causal process resulted in situations similar to the present situation, use of the availability heuristic would result in a likelihood ratio in favor of the process. In both examples, the probabilities used in the Bayesian model could be produced through the use of heuristics.

The representativeness and availability heuristics may be involved in Kelley's covariation principle as well. Subjects may use these heuristics in determining whether a particular causal process might have varied in the same manner as the observed effect. For example, a single success embedded within a series of failures would not be representative of the variation in outcomes that would be expected if high ability were responsible for the success. Hence, ability would not be thought likely to have covaried with success in this example, and the success would not be attributed to high ability. Such a sequence would be representative of the kind of outcomes that would be expected if luck were responsible for the success, and the success would be attributed to luck. Subjects' use of heuristics in connection with the attribution process appears to be a strong possibility.

The research reported here has produced evidence with implications for the several different possible approaches to the attribution process just discussed. Although the findings of this research may be limited by the simulation paradigm employed, their implications are intriguing enough to warrant further study along the same lines as well as attempts at verification in more realistic settings.

BIBLIOGRAPHY

BIBLIOGRAPHY

Ajzen, I., and Fishbein, M. A Bayesian analysis of attribution processes. Psychological Bulletin, 1975, 82(2), 261-277.

Brown, E. R., and Bane, A. L. Probability estimation in a chance task with changing probabilities. Journal of Experimental Psychology: Human Perception and Performance, 1975, 104(2), 183-187.

Frieze, I., and Weiner, B. Cue utilization and attributional judgments for success and failure. Journal of Personality, 1971, 39, 591-605.

Heider, F. The psychology of interpersonal relations. New York: Wiley, 1958.

Howell, W. C. Compounding uncertainty from internal sources. Journal of Experimental Psychology, 1972, 95(1), 6-13.

Jones, E. E., and Nisbett, R. E. The actor and the observer: Divergent perceptions of the causes of behavior. New York: General Learning Press, 1971.

Jones, E. E., Rock, L., Shaver, K. G., Goethals, G. R., and Ward, L. M. Pattern of performance and ability attribution: An unexpected primacy effect. Journal of Personality and Social Psychology, 1968, 10(4), 317-340.

Jones, M. R. From probability learning to sequential processing; a critical review. Psychological Bulletin, 1971, 153-185.

Kahneman, D., and Tversky, A. Subjective probability: A judgment of representativeness. Cognitive Psychology, 1972, 3, 430-454.

Kelley, H. H. The process of causal attribution. American Psychologist, 1973, 107-128.

McMahon, I. Relationships between causal attributions and expectancy of success. Journal of Personality and Social Psychology, 1973, 28(1), 108-114.

Peterson, C. R., and Beach, L. R. Man as an intuitive statistician. Psychological Bulletin, 1967, 68(1), 29-46.

Phares, E. J. Expectancy changes in skill and chance situations. Journal of Abnormal and Social Psychology, 1957, 54, 339-343.

Riemer, B. S. Influence of causal beliefs on affect and expectancy. Journal of Personality and Social Psychology, 1975, 31(6), 1163-1167.

Tversky, A., and Kahneman, D. Availability: A heuristic for judging frequency and probability. Cognitive Psychology, 1973, (5), 207-232.

Tversky, A., and Kahneman, D. Judgment under uncertainty: Heuristics and biases. Science, 1974, 185, 1124-1131.

Weiner, B., Frieze, I., Kukla, A., Reed, L., Rest, S., and Rosenbaum, R. M. Perceiving the causes of success and failure. From Jones, et al.: Attribution: Perceiving the causes of behavior. General Learning Press, 1971.

Weiner, B., Heckhausen, H., Meyer, W., and Cook, R. C. Causal ascriptions and achievement behavior: A conceptual analysis of effort and reanalysis of locus of control. Journal of Personality and Social Psychology, 1972, 21(2), 239-248.

APPENDIX A

Stimulus items, Experiment 1

A person attempted to swim across a pool within a certain length of time, and tried very hard on each attempt. He attempted the swim on each of 10 days, and his record is presented below:

F F F F S F S S S S

Indicate which of the following statements you consider to be more likely:

___ The person's luck changed over the 10 attempts; he had better luck on later attempts than on earlier attempts.

___ The person's ability changed over the 10 attempts; his ability was higher on later attempts than on earlier attempts.

Stimulus item 1, Experiment 1.

A golfer has attempted to qualify for a certain tournament every year for the past 10 years. The record of his qualifying attempts is presented below:

S S S S S S S F F F

Indicate which of the following statements you consider to be more likely:

___ The golfer's effort changed over the 10 years; he tried harder on his earlier attempts than on his later attempts.

___ The golfer's ability changed over the 10 years; his ability was higher on his earlier attempts than on his later attempts.

Stimulus item 2, Experiment 1.

A chess player entered a tournament in which the winner of one match played the winner of another match, and losers played losers. The player attempted to do his best in each match. The record of his matches is as follows:

S S S S F S F S F F

Indicate which of the following statements you consider to be more likely:

___ The player's luck changed over the 10 matches; he had bad luck on the later matches, but not on earlier matches.

___ The difficulty of the task changed over the 10 matches; it was harder to win on later matches than on earlier matches.

Stimulus item 3, Experiment 1.

A person performed 10 trials on a skill task. The identical task was used for each of the 10 trials. The person tried as hard as possible on each trial. The record of his performance on the 10 trials is as follows:

F F F F S F S S S S

Indicate which of the following statements you consider to be more likely:

___ There was a change in the person's luck over the 10 trials; he had bad luck at first, but his luck improved on later trials.

___ There was a change in the person's ability over the 10 trials; his ability was low at first, but improved.

Stimulus item 4, Experiment 1.

A person performed 10 trials on a skill task. A very easy version of the task was used for the first trial, a slightly harder version of the task was used for the second trial, a still harder version was used for the third trial, and so on. The record of the person's performance on the task is as follows:

S S S S S S S S S S

Indicate which of the following statements you consider to be more likely:

___ The person's ability changed over the 10 trials; his ability was fairly low at first, but increased so that by the time the harder tasks were presented he was able to succeed on them.

___ The person's effort changed over the 10 trials; he didn't try very hard at first, but his effort increased so that by the time the harder tasks were presented he was ablt to succeed on them.

Stimulus item 5, Experiment 1.

A person performed 10 trials on a skill task. A very hard version of the task was used for the first trial, a slightly easier version of the task was used for the second trial, a still easier version was used for the third trial, and so on. The record of the person's performance on the task is as follows:

F F F F F F F F F F

Indicate which of the following statements you consider to be more likely:

___ The person's ability changed over the 10 trials; his ability was fairly high at first, but declined so that by the time the easier tasks were presented he was unable to succeed on them.

___ The person's effort changed over the 10 trials; he tried hard at first, but his effort declined so that by the time the easier tasks were presented he was unable to succeed on them.

Stimulus item 6, Experiment 1.

APPENDIX B

Sample stimulus item, Experiment 2.

Imagine that you are watching someone perform a task. The person has performed the task before, and has sometimes succeeded and sometimes failed at it. He is very much concerned with success at the task. He has just completed a trial, and has failed on that trial. He believes that his failure was due to low effort. He is now ready to perform the task again. How likely is he to succeed on this next trial?

Please indicate your estimate of the likelihood of success on the next trial by making one mark through the line. Your mark should be made at the point along the line that corresponds to your estimate.

0%	100%
Certainly will not succeed	Certainly will succeed

Sample item and instructions to subjects, Experiment 2.

APPENDIX C

Instructions to subjects, sample item,
and stimulus sequences, Experiment 3

INSTRUCTIONS: For each problem in this booklet, imagine that a person has performed a certain task a number of times. The record of that person's outcomes on the different trials is presented in the order in which they occurred. The letter "S" indicates a success, and the letter "F" indicates a failure. In each record, one outcome is underlined. You will be asked to decide how much of the underlined outcome is dut to the different factors of luck, effort, the difficulty of the task, or the person's ability. After each record, the different factors are listed, with the numbers 0, 1, 2, 3 beside each factor. Cirle one of these numbers to indicate your decision: 0 means that the factor is not a cause of the outcome, e means that the factor is very much a cause of the outcome. Circle a number for <u>each</u> of the factors listed. Consider each record as a separate situation.

Instructions to subjects, Experiment 3.

F F F S F F S S F S S S <u>S</u>

good luck	0	1	2	3
high effort	0	1	2	3
easy task	0	1	2	3
high ability	0	1	2	3

Sample item, Experiment 3.

Sequence 1 A-S:	S	S	S	S	S	<u>S</u>	S	S	S
Sequence 1 A-F:	F	F	F	F	F	<u>F</u>	F	F	F
Sequence 1 B-S:	S	S	S	S	S	<u>S</u>	F	F	F
Sequence 1 B-F	F	F	F	F	F	<u>F</u>	S	S	S

Sequence Group 1, Experiment 3.

Seauence 2 A-S:	F	F	F	F	F	S	S	S	S
Sequence 2 A-F:	S	S	S	S	S	F	F	F	F
Sequence 2 B-S:	F	F	F	F	F	S	F	F	F
Sequence 2 B-F:	S	S	S	S	S	F	S	S	S

Sequence Group 2, Experiment 3.

Sequence 3 A-S:	F	F	S	F	F	S	F	_S_	S	S
Sequence 3 A-F:	S	S	F	S	S	F	S	_F_	F	F
Sequence 3 B-S:	F	F	S	F	F	S	F	_S_	F	F
Sequence 3 B-F:	S	S	F	S	S	F	S	_F_	S	S

Sequence Group 3, Experiment 3.

Sequence 4 S: F S F S S F S F S F S F <u>S</u>

Sequence 4 F: S F S F F S F S F S F S <u>F</u>

Sequence Group 4, Experiment 3.

Sequence 5 S: F S F S S F S F S F F S <u>S</u>

Sequence 5 F: S F S F F S F S F S S S <u>F</u>

Sequence Group 5, Experiment 3.

Sequence 6 S: F F S F F S F S S F S S <u>S</u>

Sequence 6 F: S S F S S F S F F S F F <u>F</u>

Sequence Group 6, Experiment 3.

Sequence 7 S: F F F S F F S S F S S S S

Sequence 7 F: S S S F S S F F S F F F F

Sequence Group 7, Experiment 3.

Sequence 8 S:	F	F	F	F	F	F	S	S	S	S	S	S	<u>S</u>
Sequence 8 F:	S	S	S	S	S	S	F	F	F	F	F	F	<u>F</u>

Sequence Group 8, Experiment 3.

APPENDIX D

Stimulus items, Experiment 4

Imagine that a person has the opportunity to play the following game. He will throw darts at a dart board on which certain areas are marked \$1 and other areas are marked 0. If the dart lands on one of the \$1 areas, he wins \$1.00, and if the dart lands on one of the 0 areas, he wins nothing. He takes five throws that don't count, after which he will take 10 throws for which he will win \$1.00 for each time the dart lands on a \$1 area. The record of his first five throws is as follows:

0 $1 $1 $1 0

He feels that the 0 on the last spin was due to bad luck. He is now ready to take the 10 throws for money. How much money do you expect him to win on the 10 throws? ________

Item presented to subjects in skill condition, Experiment 4.

Imagine that a person has the opportunity to play the following game. He will spin a spinner on which certain areas are marked \$1 and other areas are marked 0. If the spinner stops on one of the \$1 areas, he wins \$1.00, and if the spinner stops on one of the 0 areas, he wins n thing. He takes five spins that don't count, after which he will take 10 spins for which he will win \$1.00 for each time the spinner stops on a \$1 area. The record of his first five spins is as follows:

0 \$1 \$1 \$1 0

He feels that the 0 on the last spin was due to bad luck. He is now ready to take the 10 spins for money. How much money do you expect him to win on the 10 spins? __________

Item presented to subjects in chance condition, Experiment 4.

APPENDIX E

Instructions to subjects, sample item,
and stimulus sequences, Experiment 5

INSTRUCTIONS: The problems in this booklet are concerned with two kinds of games, skill games and chance games. A skill game is one in which a successful outcome is dependent upon the skill or ability of the player. Examples of skill games include throwing a basketball into a net, solving puzzles, and shooting at a target. A chance game is one in which a successful outcome is in no way dependent upon the player. Examples of chance games include tossing coins, rolling dice, and drawing names from a hat.

For the following problems, records were kept of the outcomes on both skill and chance games. One such record is printed on each of the following pages. In these records, the letter "S" indicates a success, and the letter "F" indicates a failure. The successes and failures are printed in the order in which they occurred. Please read each record carefully, and decide whether that record came from a skill game or a chance game. Write your answer in the space provided.

Instructions to subjects, Experiment 5. Note: Order of skill and chance in instructions was counterbalanced.

S F F S F S F F S S S F S F

____

Sample item, Experiment 5.

"RANDOM"

(1) F S F S S F S F S F S F F S

(2) F S S F S F S F S F F S F S

(3) F S F S S S F F S F S F F S

(4) F S S F S F S S F F F S F S

(5) S F S F F S F S F S F S S F

(6) S F F S F S F S F S S F S F

(7) S F S F F F S S F S F S S F

(8) S F F S F S F F S S S F S F

(9) F F S S F S S S F S S F F F

"CHANGING FROM FAILURE TO SUCCESS"

(10) F F S F F F S F S F S S S S

(11) F F F S F F F S S F S S S S

(12) F F F F S F F S F S S S S S

(13) F F F F F S F S F S S S S S

(14) F F F F F F F S S S S S S S

"CHANGING FROM SUCCESS TO FAILURE"

(15) S S F S S S F S F S F F F F

(16) S S S F S S S F F S F F F F

(17) S S S S F S S F S F F F F F

(18) S S S S S F S F S F F F F F

(19) S S S S S S S F F F F F F F

Stimulus sequences, Experiment 5.