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CONTINGENCY-LIKE EFFECTS IN AN
ASSOCIATIVE ACCOUNT OF
INVARIANCE SEEKING ACTION

A Thesis
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
in
Psychology

by
Robin Sue William

June 1994


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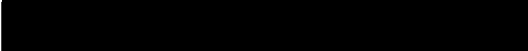
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ABSTRACT

A social analog of a short-delay conditioning paradigm in Pavlovian learning was used to test predictions concerning the influence of stimulus context on human judgments of causality. The learning experiment was masked by describing it as a study testing a computerized employee evaluation system. Subjects were presented information about a hypothetical worker and a fictitious company's level of productivity representing a nine month period. Consistent with contemporary conditioning models of associative learning, the results indicated that subject judgments of the worker's causal priority for the company productivity effect progressively strengthened as a function of repeated worker-productivity pairings. And, limits of this acquisition effect of causal judgments were influenced by the frequency with which the production goal was met in the worker's absence. The problem of context effects in supervisor-worker and therapist-client evaluations are discussed.

ACKNOWLEDGEMENTS

During my years at CSUSB I have felt especially blessed by the presence of excellent mentorship and many good friends. I am deeply indebted to Dr. Robert Cramer for his unending patience, encouragement, feedback, and support. I discovered through his friendship that having someone believe in you makes all the difference in the world. I also want to thank Lynda Warren and Gloria Cowan who served on my thesis committee and taught me lessons I could have never learned in the classroom. I especially want to extend my gratitude to all the SLRG members for their contribution, without their help this manuscript would not have been possible. I also want to express heartfelt appreciation to my car pool friends, Jean Gerth, who shared her experience, strength, and hope; Jeanie Kieley, who continually brought me back down to earth; and Jeanne Hogan, who unconditionally nurtured my "inner child." Warm thanks to my family who patiently hoped that someday this would all be over. My son, Billy, in his "old soul" wisdom continually put life in perspective and my daughter, Kylie, never let me forget that being a mother is an education in itself. Finally, I want to thank my husband who provided the financial assistance to make this challenging and humbling experience possible.

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INTRODUCTION

The effects of context on psychological processes is a problem of fundamental importance in all major areas of psychology. Figure and ground in perception, adaptation-level in psychophysics, Lewin's concept of life space and stimulus selection in learning are only a few of the examples of context effects. Despite the recognized interest in context effects in social psychology, and in psychology generally, scant attention has been devoted to context effects in social causal judgments (attribution). One of Heider's (1944) most celebrated insights captures this neglect. He stated that although "changes in the environment are almost always caused by acts of persons in combination with other factors, the tendency exists to ascribe the changes entirely to persons" (p.361).

Presently, attribution theory is an amorphous collection of observations about naive causal inferences. Cook and Campbell (1979) have pointed out that, "The epistemology of causation....is at present in a productive state of near chaos" (p.10). Despite noble attempts by social psychologists, Jones and Davis (1965) and Kelley (1972), to clarify the rules the average person uses to infer the causes of observed behavior, attribution theories

are arguably in need of synthesis. The present study is part of a series of research projects designed to investigate human causal judgments from a contemporary learning-theoretical perspective. Specifically, the following research attempted to develop a Neo-Hullian paradigm to generate and test predictions concerning the influence of context on social causal judgments.

Social Psychology

Psychology is not alone in presenting an indistinct view of causality. In philosophy, the meaning of causality has been an issue of controversy for centuries (for a review, see Bunge, 1979). The majority of contemporary ideologies concerning causal judgment issues originated from the seminal works of British associationist, David Hume. Employing a highly deterministic associative process to explain causal judgments, Hume (1739/1964) postulated several rules: spatio-temporal contiguity - the cause and effect must be contiguous in time and space; temporal priority - the cause must be prior to the effect; and constant union - the cause and effect must occur together. Also, Hume added a fourth rule: that the same cause always produces the same effect and that the same effect never arises but from the same cause.

Although generally credited to John Stuart Mill, Hume postulated two final rules of inference concerning causal judgment: similarity - if several different objects produce

the same effect, it must be by means of some quality common among them, and difference - the difference in the effects of two resembling objects must proceed from that particular in which they differ. The coordinated application of these two rules also lends itself to later models of attribution which investigated choosing among rival causes the one most predictive of a particular effect (see Kelley, 1972; Wasserman, 1990).

Critical realists (e.g., Harre, 1972) describe causal perceptions as subjective constructions of the mind. They argued that seeking causes and effects is an innate tendency, and has an evolutionary adaptive role. Critical Realists purport that although causal relationships exist independent of our consciousness, perceptions do not. We therefore focus on manipulative relations between cause (X) and effect (Y) and use the information for survival. Critical realists echo Aristotle's assumption that observation in and of itself is not sufficient to understand nature. They suggest that, in order to observe the relationship between X and Y, variables must be manipulated (i.e., causal inference results from actions). As a result, experimentation is a natural outgrowth of our innate tendency to search for causal laws.

Historical observations (e.g., Hume, 1739/1964; Mill, 1972) of causality suggest that the insights of the earliest thinkers about behavior can importantly apprise and motivate

current research and theory in causal judgment. As a result, psychologists within various research traditions have focused on specific facets of causality which were emphasized by different philosophers and made operational tests of these concepts. For example, Einhorn and Hogarth (1986) reported that, "workers in attribution theory have tended to follow Kelley (1967) in emphasizing Mill's criteria of concomitant variation and the method of differences; Michottes (1946) classic demonstrations of how people perceive causes relies heavily on ideas advanced by Hume; and Shultz's (1982) work has been influenced by Kant's notions that causal relations are characterized by forces of generative transmission between cause and effect" (p. 3).

The relevance of contextual factors in determining probable cause has only recently developed in social psychology (Einhorn & Hogarth, 1986). Previously, behavior was generally seen as more salient than the situation, exemplified by Heider's (1958) statement that "behavior engulfs the field" (p. 1). Although attribution research is quite diverse, much of it can be traced to the work of Heider as operationalized by Jones and Davis (1965) and Kelley (1967, 1972, 1973). Similar to the critical realist's perspective, Heider's early work on phenomenal causality (1944) emphasized the human motive to stabilize the perceived environment by appropriate cause-effect assignments. Heider suggested that people strive to bring

order and meaning to their world by determining the attribution of intention, ability, and environmental properties.

Specifically, Heider argued that perceivers seek the invariances underlying behavior in order that people and the environment appear more predictable. Consistent with Heider's view, the learning-theoretical viewpoint of this thesis is that "social effects or outcomes" will elicit automatically a search for causes and a generation of cause-effect statements on the part of the observer (see Dickinson & Balleine, 1994). We term this activity invariance seeking action, and consider it to be analogous to an unconditioned response (See Rule 3 below, p.18).

In an effort to make Heider's theory more amenable to empirical test, Jones and Davis (1965) formulated the theory of correspondent inference which examined the relationship between the effects of an action and the personal disposition inferred by those effects. In particular, Jones and Davis suggested that we pay more attention and infer dispositional "cause" to those behaviors of others which are freely chosen, produce noncommon effects, and are low in social desirability. Jones and Davis argued that this initial reaction creates a dispositional "perceptual anchor" in the observer which is resistant to amelioration when additional information concerning situational constraints surrounding the behavior is provided. Similarly, empirical

evidence (e.g., Ajzen, 1971) demonstrated support for the Jones and Davis theory of noncommon effects which suggested that the fewer distinctive effects an actor has for an action, the more informative is that action about identifying dispositions of the actor.

Kelley (1973) examined Heider's suggestion that people might employ a variant of Mill's method of difference when choosing an actual cause from a large repertoire of potential causes. Consistent with early Pavlovian conditioning models which discussed contiguity of events, Kelley developed a comprehensive model of causation which described the covariation principle of attribution: "An effect is attributed to the one of its possible causes with which over time it covaries" (p. 108). In other words, the effect is attributed to that condition which is present when the effect is present and which is absent when the effect is absent (Kelley & Michela, 1980). Kelley explicitly distinguished between two different cases of attribution theory - one in which the observer has information from multiple observations and one in which the attributor has information from only a single observation. Contemporary researchers also distinguish between what are termed experienced and described causal situations. The covariation principle as defined requires multiple observations, experienced causal situations, or Bertrand Russell's concept of "knowledge by acquaintance" (see

Shanks, 1991).

In addition, Kelley (1972) identified three attributional criteria which employ the covariation principle: consensus (the extent to which others react in the same manner to a stimulus or event as the individual in question); consistency (the extent to which the individual reacts to this same stimulus or event in the same way on other occasions); and distinctiveness (the extent to which the individual reacts in the same manner to other, different stimuli or events). McArthur (1972) systematically varied consensus, distinctiveness, and consistency information pertaining to a behavioral act (e.g., John laughs at the comedian). Subjects were instructed to indicate the cause they perceived as most plausible. Consistent with previous trends in the literature (e.g., Jones & Nisbett, 1969), and Heider's insightful analysis, the results indicated that observers tend to attribute behavior to dispositions rather than context.

When multiple observations are not possible, however, attribution for a single instance is presumed to follow Kelley's (1972, 1973) principles of discounting and augmenting, rather than the principle of covariation. The discounting principle, according to Kelley (1973) holds that "The role of a given cause in producing a given effect is discounted if other plausible causes are also present" (p. 113). For example, in personnel assessment (the masking

task in this thesis) the evaluation of a specific worker's effectiveness in contributing to a company's production outcome will be discounted if other workers (i.e., plausible causes) are present.

According to Kelley's (1973) theory of attribution, causes can also be facilitative. Kelley's augmenting principle suggests, "if for a given effect, both a plausible inhibitory cause and a plausible facilitative cause are present, the role of the facilitative cause in producing the effect will be judged greater than if it alone were present as a plausible cause for the effect" (p. 114). In other words, a cause can succeed in producing the behavior in the face of important barriers. For example, suppose Bill is a worker at a company which in the past has not met its production quotas. Bill predicts the company will not meet its productivity goal. The company hires a new employee, Joe, to work with Bill and the productivity level of the company increases. As a result, Joe's perceived effectiveness as a contributor to the company meeting its productivity goal, in the context of a worker Bill, who does not predict meeting the company goal, is expected to be augmented.

Although, discussions of attribution do not often focus on what Tolman and Brunswick (1935) called the "causal texture of the environment," contemporary learning theory has focused much attention on the topic of context in

conditioning (e.g., Rescorla & Wagner, 1972; Wagner & Rescorla, 1972). And, contemporary learning theorists (e.g., Alloy & Tabachanik, 1984; Gluck & Bower, 1988) have suggested that human causal judgments closely parallel the conditioned responses in animals in associative learning studies (See Lovibond, 1988). Specifically, Rescorla (1988) noted that "The CS/US relations required for conditioning are very similar to those that a rational scientist would demand to conclude that the CS is the cause of the US" (p. 340, see also Dickinson, 1980).

Contemporary learning theorists have also extended the role of contiguity in causal judgments to include a contingency mechanism (Shanks & Dickinson, 1987; Williams, 1994). Attribution research which has relied heavily on a simple contiguity mechanism (Kelley's covariation principle), may also benefit from this extension. We suggest that contemporary learning theory may provide valuable theoretical tools needed to extend our understanding of human casual analysis.

Learning Psychology

Our approach to examining cause-effect relationships is to employ a number of learning-theoretical concepts. This particular research strategy has developed an impressive record with regard to the explanation of existing empirical relationships and the generation of testable new predictions. Previously, the most basic and well-studied

learning model has been Pavlovian conditioning. In Pavlovian conditioning a previously neutral stimulus, the conditioned stimulus (CS), is associated with a biologically significant stimulus, the unconditional stimulus (US). As a result of the pairings of the CS and US, the conditioned stimulus (CS) comes to elicit a response, termed the conditioned response (CR). Pavlov and other early learning theorists (e.g., Hull, 1943; Spence, 1956) assumed that this simple temporal contiguity or joint occurrence of a CS (cause) and US (effect) was sufficient for associative learning. Over the two past decades, however, it has become apparent that conditioning is neither this simple nor this mechanical.

Conditioning is no longer seen as a low-level mechanical process in which the control over a response is passed from one stimulus to another. Drawing from the associationist tradition in philosophy, conditioning is viewed as the learning that results from exposure to relations among events in the environment. The insufficiency of contiguity for producing conditioning can be illustrated by results that have been available for some time. Rescorla (1968) examined the insufficiency of contiguity for producing Pavlovian conditioning and determined that it is the contingency between the CS and US which allows conditioning to occur. Rescorla described contingency as "the relative probability of occurrence of

the US in the presence of the CS as contrasted with its probability in the absence of the CS" (p.1).

Kamin (1969) in a critical investigation of conditioning known as the "blocking effect" contributed evidence for Rescorla's (1968) contingency principle. Kamin demonstrated that conditioning to one element (X) of a compound stimulus (AX) could be blocked by prior training to the other element (A). For example, a light (A) was conditioned to predict a shock, and then a compound stimulus consisting of a light (A) and a tone (X) was paired with the same level of shock. When the tone (X) was tested alone conditioning to X was attenuated compared to the responses to X in another group receiving only AX compound conditioning trials (i.e., no prior experience with A). The blocking effect demonstrated by Kamin's experiment undermined the sufficiency of contiguity for associative learning even though both groups received equal pairings of light+ tone/shock.

According to simple contiguity both groups should have responded similarly to the X stimulus. Hence, the effectiveness of the shock US for producing associative learning depended on the relationship between the tone CS and the expected outcome (Kamin, 1969; Kremer, 1978; Rescorla, 1968; Wagner, 1969). In Kamin's research the tone was redundant relative to the light CS in predicting the shock and therefore responding to the tone CS was reduced.

Rescorla and Wagner advanced a distinct formulation of this general proposition (see Rescorla & Wagner, 1972; Wagner & Rescorla, 1972).

As a result of the work described above, contemporary learning literature reveals a lively interest in the impact of context on conditioning. The issues raised by contextual variation fall within a general class of problems termed stimulus selection. Rudy and Wagner (1975) briefly describe the stimulus selection problem as "one of specifying the rules whereby a relationship will or will not appear to be learned about depending upon the context of environmental events in which it is embedded" (p. 270). For instance, if the CS is a compound of two stimuli, and one of them is more salient or noticeable than the other, nearly all conditioning which occurs may be controlled exclusively by the more salient stimulus; the less salient stimulus may be completely overshadowed. Overshadowing is another phenomena that argues against the simple contiguity mechanism in associative learning.

Another example of the stimulus selection problem is inhibitory conditioning which occurs when a stimulus signals the absence of the reinforcer (i.e., US). A conditioned inhibitor is produced when one CS (A), is consistently reinforced (+), and a compound containing A, and a second CS (X) is consistently nonreinforced (-). As a result of such training, X can be shown to possess inhibitory properties.

That is, presenting X can reduce the level of responding to another independently trained, excitatory stimulus (e.g., Bouton, 1994; Konorski, 1948; Pavlov, 1927). A series of experiments strongly suggests that simple contiguity of the CS and US fails to capture the relation required to produce excitatory and inhibiting conditioning. In other words, conditioning depends not simply on the contiguity between the CS and US but rather on the information that the CS provides about the US.

Contemporary Learning Perspective

An interest in contextual variables, and their effect on causal judgments, although not normally addressed in terms of stimulus selection, has recently developed in contemporary studies of causality judgments (Shanks & Dickinson, 1987; Algom & Bizman, 1983; Alloy & Tabachnik, 1984; Gluck & Bower, 1988; Wasserman, 1990). Shanks and Dickinson (1987), for example, echoed Hume's belief that, "a causal judgment is seen as reflecting no more than the strength of the relevant association between the mental representations of the cause and effect, with the principles governing such attributions being those of associative learning" (p. 230). Hence, the impact of event contingencies developed within conditioning research may well illuminate the processes underlying human judgments of causality.

Similar to other contemporary learning theorists (e.g.,

Rescorla, 1968; Rescorla & Wagner, 1972), Shanks and Dickinson also suggested that contiguity alone does not provide evidence about the necessity of a cause. They argued that a simple contiguity-sensitive mechanism could not answer the question, "Is the target cause necessary for the action to occur?" Shanks and Dickinson reported that contiguity mechanisms could not distinguish between pairings in which the putative cause was imperative for the effect from those in which the conjunction was fortuitous (illusory correlation).

In an effort to demonstrate that causal judgments are affected by the factors critical for the type of associative learning seen in conditioning, Shanks and Dickinson arranged contiguous pairings of events within different causal backgrounds. Judgments based simply upon the number of pairings were expected to yield the same rating for effectiveness of the target cause. The first sequence was considered a positive contingency between the action (CS) and outcome (US), whereas the US occurred only in the presence of the CS. In the second sequence, there was a noncontingent relationship between the action and the outcome, the US was just as likely to occur in the absence of the CS as in its presence. The results indicated that the higher the base rate of the US alone, the less conditioning to the target stimulus occurred. In effect, conditioning and therefore the judgments of cause, were

sensitive to the base rate of US occurrence against which a CS/US contiguity occurred.

STATEMENT OF THE PROBLEM

In summary, several theoretical frameworks have been postulated to explain human perception of causation (e.g., Heider, 1958; Jones & Davis, 1965; Kelly & Michela, 1980; Michotte, 1963; Shanks & Dickinson, 1987; Wasserman, 1980). Although the historical work of attribution theorists using inferential or rule governed models is clearly sophisticated, they do not yet contain a mechanism for predicting and explaining social attributional contextual phenomena (e.g., acquisition, blocking, contingency effects, overshadowing). As a result, traditional attribution research may be subject to limitations when explaining cause-effect judgments. By employing a general programmatic approach termed "extension of liberalized S-R theory" by Neal Miller (1959), we offer a context sensitive theory of social attribution modeled on Rescorla and Wagner (1972). The Neo-Hullian theory developed by Rescorla and Wagner powerfully addresses the stimulus selection problem in learning research. Neo-Hullian theory has been developed primarily to predict individual behavior in controlled laboratory situations, however, it has been extended to many social processes with considerable success (e.g., Cottrell, 1968; Cramer, Weiss, Steigleder, & Balling, 1985; Dollard &

Miller, 1950; Lott & Lott, 1968; 1972; Steigleder, Weiss, Cramer, & Feinberg, 1978; Zajonc, 1965). The context sensitive theory developed here is designed to predict and explain acquisition effects, contingency effects, and other related contextual phenomena in attribution. Specifically, the influence of a contingency mechanism for determining the acquisition and strength of causality judgments in a common social situation will be tested.

Technique of Theory Construction

Through the use of analogy, a relatively well understood conditioning paradigm will be used to guide the investigation of a less well-understood research area (e.g., social causal judgments in context). In particular, analogies will be drawn between contemporary associative learning variables and the variables assumed to be important in the development of social causal judgments. A dictionary of analogies (*Rules of Correspondence*) relates the independent and dependent variables of the model to the corresponding (analogous) independent and dependent variables of social attribution. Consistent with this construction, the relations holding among the variables in the conditioning model should, theoretically, hold among the corresponding social attribution variables (Campbell, 1920; Hesse, 1966, 1974, 1980; Masterman, 1980; Oppenheimer, 1956).

The *Rules of Correspondence* relating the variables in

classical conditioning to the variables of social attribution are given here and are numbered for later reference. Corresponding to a conditioned stimulus (CS), or antecedent stimulus, is a discriminable social stimulus, such as a worker (Rule 1). Corresponding to an unconditioned stimulus (US), or a consequent stimulus, is a social stimulus, such as a fictional company's productivity level, which elicits "invariance seeking action (ISA)" (Rule 2), and the ISA so elicited is analogous to an unconditioned response (UR; Rule 3). The conditioned form of the UR analog (speed, probability, or amplitude of "invariance seeking action") corresponds to a conditioned response (CR; Rule 4). The number of CS-US pairings (reinforced trials) corresponds to the number of CS analog-US analog pairings, such as the number of times a worker is paired with a company's productivity goal being met (Rule 5). Rule 5 constitutes an "invariance seeking action" acquisition trial. A trial on which a worker is not followed by information regarding a company meeting its productivity goal represents a CS alone or extinction trial (Rule 6). Presenting US-analogs in the absence of CS-analogs constitutes a US alone trial, such as the company meeting its productivity goal when a specific worker was not present (Rule 7). Corresponding to a reinforced compound CS trial is a ISA trial where two or more social stimuli, such as two workers, are jointly paired with the company meeting its

productivity goal (Rule 8). Corresponding to CS saliency is the saliency or vividness of the CS analog (Rule 9). The power of a social stimulus, such as the level of company productivity, to elicit "invariance seeking action" corresponds to the intensity or strength of the US (Rule 10).

Although the rules developed above are illustrative, rather than exhaustive, they are sufficiently detailed to permit the generation of acquisition and contingency effect hypotheses using classical conditioning as a model.

Hypotheses

Acquisition Effects. In classical conditioning acquisition of a conditioned response is an increasing function of the number of CS-US pairings, or reinforced trials. Hence, we predict, as a function of repeated pairings of a worker, Joe (CS analog) and company productivity information (US analog) judgments of Joe as a cause of the company meeting its productivity goal (CR analogs ISA's) will progressively strengthen (Rules 1-5).

Contingency Effects. The contingency effects noted above suggest that causal judgments will not simply be a function of the frequency of CS-US analog presentations. Rather they are expected to be influenced by how often the worker and productivity information appear together and how often the productivity information occurs in the absence of the worker. Based upon contemporary learning research, and the

Rules of correspondence listed above, we predict that the limits of the above stated acquisition effect will be determined by the frequency with which the productivity information is provided without the worker present (Rule 7). More specifically, we predict a negative relationship between the number of times the productivity goal is met in the absence of the worker, and the strength of causal judgments to the worker.

GENERAL METHOD

Subjects

Subjects were 40 males and 40 females ranging in age from 18 to 52 who were recruited from courses offered at California State University. All subjects were naive with respect to the experimental task and were randomly assigned to one of four experimental conditions. All subjects were treated in accordance with the ethical principles of the American Psychological Association. Five female and two male experimenters, all members of the Social Learning Research Group, conducted the experiment.

Experimental Design

In classical conditioning a discriminable antecedent stimulus CS, is paired with a discriminable consequent stimulus, US. Similarly, in the present study the CS was a fictional part-time worker, named Joe, and the US was the productivity information of a fictional company where Joe worked. The primary independent variable was the US alone baserate, or number of times the US (productivity information) appeared in the absence of the CS (Joe). A repeated variable, number of acquisition trials, constituted the second independent variable. The experimental design can be described as a 4 x 18 (Groups x Trials) design. The

subjects' strength of causal judgments (i.e., invariance seeking action) defined the primary dependent variable. A secondary dependent variable was the subjects' ratings of confidence in their causal judgments.

Masking Task

The learning experiment was masked by describing it as a study testing a computerized Employee Evaluation System. This procedure allowed for repeatedly pairing a worker with information about the company's productivity level. The instructions indicated that, "In this experiment we are interested in testing a computerized employee evaluation system. Your cooperation is necessary for testing the usefulness of this automated program. In order to carefully test the effectiveness of the system, it will be necessary for you to assume the role of a production supervisor in a large company." Further instructions indicated that, "Joe is a college student who is available for part-time employment. It is important to evaluate him carefully because he will be considered for full-time employment upon graduation." (see Appendix A for the complete instructions.)

Apparatus and Materials

Previous research (Shanks & Dickinson, 1987) suggested that computer presentation of stimuli is an effective way to study the learning of causal relationships. Therefore, all communication between researcher and participant occurred via an IBM 360 PC subject module. The computer program,

Micro Experimental Language (MEL) version 120, served to present a series of visual cues and response manipulanda. The MEL program controlled presentation of the instructions, the CS (Joe) and the US (company productivity information), and the employee evaluation items. The timing of all stimulus material was controlled automatically and remained constant for each subject.

The subject module included a key pad numbered 0 to 100 which allowed the subject to respond to a three-item Employee Evaluation Scale (EES) designed to measure the worker's effectiveness following presentation of the CS and the US analogs. Subjects were asked to rate the effectiveness of the worker Joe in causing the company's productivity level, and also rate their confidence in their causality judgments. The two questions were anchored with the phrases; totally ineffective and totally effective, and no confidence and complete confidence, respectively. In addition, the third item on the EES required subjects to indicate Joe's chances for becoming a permanent employee. The question was included to sustain the masking task and was anchored with the phrase no chance and very good chance. The subject responses to item 3 were not included in the analysis. All subjects were asked to respond to the three-item EES using a 0 to 100 point scale where lower scores equaled lower response strength.

Procedure

Upon entering the lab subjects were asked to read and sign a consent form (See Appendix B). After the subject consented to participate, the experimenter sat the subject in front of the subject module and started the MEL program. Subjects received instructions via computer monitor for 60 seconds. Following the instructions Joe, presented as a computer generated drawing (See Appendix D), appeared for 5 seconds on the left side of the computer monitor. After the 5 second period, a graph depicting the company's productivity information appeared on the right side of the computer monitor. After both the CS and the US had been visible for an additional 10 seconds, the entire computer monitor went blank and item one from the EES appeared for 17 seconds. This general procedure is analogous to delay conditioning in Pavlovian learning. Subjects were asked to respond to item one using a 0-100 point scale. Regardless of the speed in which subjects entered their response the item remained illuminated on the screen for a full 17 seconds. Following the 17 second time period the entire screen went blank and item two appeared, again for 17 seconds. This sequence was repeated for item three. Following the subject's response to item three, the program recycled to a picture of the worker, Joe. The cycle was repeated for a total of 18 trials. After the subjects completed 18 cycles they were debriefed (See Appendix C) and

were provided the opportunity to have any questions answered.

From the subjects' perspective the experiment progressed as a continuous employee evaluation cycle. Conceptually, across eighteen trials subjects received a combination of CS/US (acquisition) trials, no CS/US (US alone) trials, and no CS/no US (control) trials. Subjects in all four groups viewed nine pairings of Joe and the company's productivity information. The four groups were distinguished by changes in the US alone baserate (Stimulus materials for all 4 groups are presented in Appendix D).

Noncontingency (NC) Group. The purpose of the NC Group was to establish a noncontingent relationship between the CS and the US. That is, the US was just as likely to occur in the absence of the CS as in its presence. In addition to the nine acquisition trials, subjects received nine US alone trials. Hence, on nine of the trials subjects received information about the company productivity in the absence of the worker. Following each trial, NC Group subjects responded to the EES described above. The items included, "Given all of the information you have received, on the scale below indicate the extent to which Joe is an effective employee in causing the company's level of productivity", "How confident are you about your judgment of Joe's being effective in causing the company's level of productivity", and "Given all of the information you have received, on the

scale below indicate Joe's overall potential for becoming a permanent employee."

Group 2. The purpose of Group 2 was to vary the baserate of US alone trials against which a CS/US contiguity occurred. Subjects followed the same general procedure as subjects in the NC Group except that, in addition to the nine acquisition trials, subjects were presented just six US alone trials. Also, in order to balance the number of trials received by the subjects, three control trials were included to make the total equal 18 for each group. Subjects evaluated Joe on the EES following each trial as in the NC Group.

Group 3. The purpose of Group 3 was to vary the baserate of US alone trials against which a CS/US contiguity occurred. Subjects followed the same general procedure as subjects in the NC Group except that, in addition to the nine acquisition trials, subjects were presented with only three US alone trials, and six control trials. Subjects evaluated Joe on the EES following each trial as in the NC Group.

Positive Contingency (PC) Group. The purpose of the PC Group was to establish a positive contingency between the CS and US. That is, the CS occurred only in the presence of the US. Subjects followed the same general procedure as subjects in the NC Group except that in addition to the nine acquisition trials, subjects were presented with nine

control trials. Hence, the subjects never received information about the company productivity alone. Subjects evaluated Joe on the EES after each trial as in the NC Group.

RESULTS

The analyses focused on the subjects' ratings of causal strength to the worker, Joe, and the subjects' confidence in their causal judgments. Both dependent variables used to test the hypothesis were measured following each of the 9 acquisition trials. The means and standard deviations for the subjects' estimates of cause are presented in Table 1. A simple repeated measures model and a Groups by Trials model was used to test predictions regarding acquisition effects and contingency effects, respectively.

Acquisition

An inspection of the causal strength means presented in Figure 1 indicates that the performance in Group 2 and Group 3, although hypothesized to be intermediate, revealed no predicted effects. It is evident that further analysis of those two particular groups would not prove meaningful in terms of testing the proposed hypotheses. Mean casual strength ratings between Groups NC and PC, however, where differences were expected to be maximized, evidenced a predictable outcome. Therefore, all analyses were performed on data from Groups NC and PC across 9 trials. To clarify the visual presentation of the acquisition effects a baseline was established using the subjects' mean

Table 1

Descriptive Statistics for the Independent and the
Dependent Variables.

Groups		Trials				
		(1)	(2)	(3)	(4)	(5)
Noncontingent						
<u>M</u>		61.5	67.8	66.9	66.7	63.9
<u>SD</u>		18.1	11.5	15.8	16.8	19.9
Group 2						
<u>M</u>		66.3	67.8	70.3	68.5	66.7
<u>SD</u>		15.2	22.7	21.9	21.1	22.6
Group 3						
<u>M</u>		61.9	62.3	69.4	66.3	62.1
<u>SD</u>		21.9	21.9	20.1	17.7	23.9
Positive Contingency						
<u>M</u>		68.2	75.0	75.4	79.7	78.9
<u>SD</u>		18.6	15.2	17.8	14.3	15.9

Note: N = 20

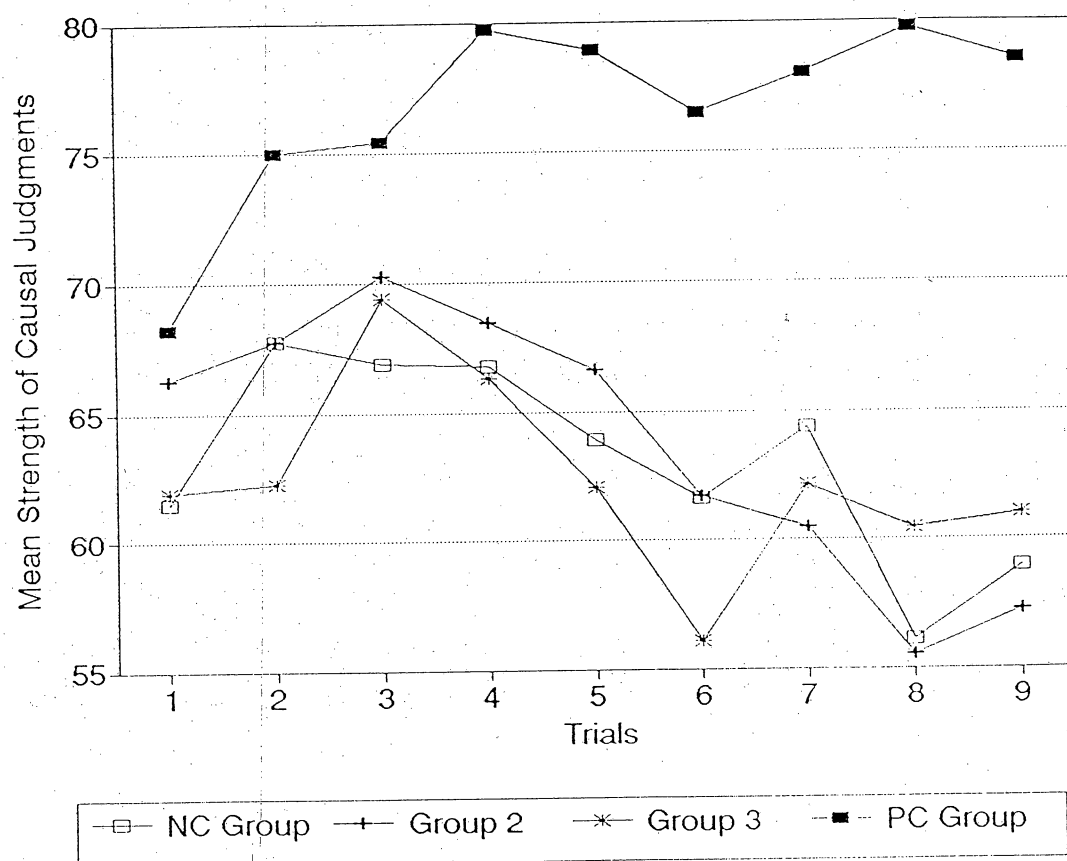
Table 1 (cont'd)

Groups	Trials			
	(6)	(7)	(8)	(9)
Noncontingent				
<u>M</u>	61.6	64.4	56.1	59.0
<u>SD</u>	21.5	18.4	23.9	26.6
Group 2				
<u>M</u>	61.7	60.45	55.5	57.2
<u>SD</u>	25.5	28.3	29.8	28.4
Group 3				
<u>M</u>	56.1	62.1	60.4	61.0
<u>SD</u>	27.3	26.7	27.7	25.6
Positive Contingency				
<u>M</u>	76.5	78.0	80.0	78.5
<u>SD</u>	15.4	15.2	16.1	15.9

Note: N = 20

Figure 1

Acquisition Curves of Causal Judgments for Each Experimental Group



causal strength rating on Trial 1 (see Figure 2).

Inspection of overall mean differences from baseline for the remaining 8 trials indicated that the groups differed with regard to their average deviation from the initial performance measure (NC Group deviation $M = 1.79$ vs PC Group deviation $M = 9.48$).

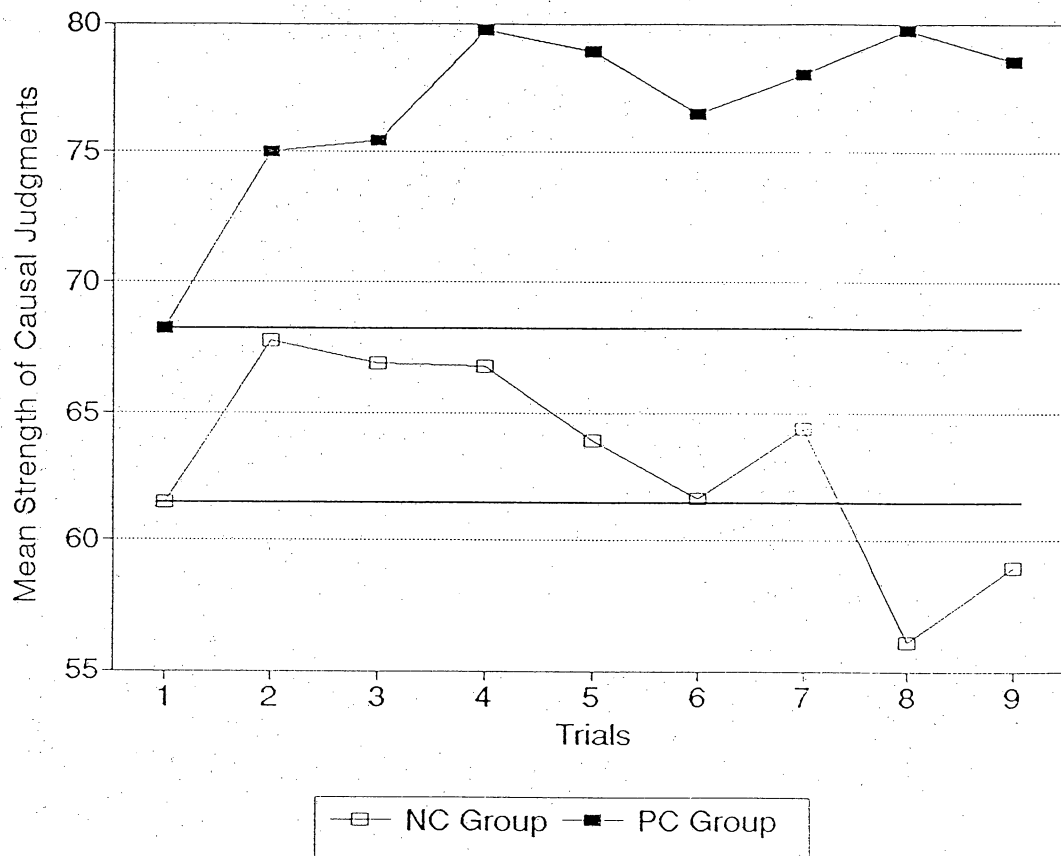
To further examine the conditioned stimulus acquisition of causal strength, using a less descriptive strategy, a simple repeated measures ANOVA was performed on subjects' causal ratings across 9 trials. Similar to learning research, the PC Group evidenced a gradual learning curve of causal strength. The simple repeated measures ANOVA performed on the subjects' causal judgments revealed a significant acquisition effect, $F(8, 152) = 2.36, p < .02$. As expected, the NC Group did not evidence an acquisition effect despite receiving the same number of worker-productivity pairings as subjects in the PC Group.

Contingency

Drawing from contemporary learning research, we predicted that social causal judgments are not simply a function of covariation, but are influenced by contextual conditions. In particular, conditioned and unconditioned stimulus pairings (i.e., Joe/company productivity) were presented an equal number of times in each group where the additional contextual information provided was varied. A

Figure 2

Acquisition Curves of Causal Judgments for the Noncontingent (NC) Group and the Positive contingency (PC) Group



2 X 9 (Groups X Trials) repeated measures ANOVA revealed significant Group differences, $F(1,38) = 9.29$ $p < .004$, and significant Group by Trial effect $F(1,38) = 2.27$ $p < .02$. As expected, the PC and NC Groups differed significantly in causal strength ratings (see Figure 2).

Although the Groups began similarly, differences between means increased and then maximized with continued training. Specifically, selected pairwise comparisons revealed that on Trial 1 the two groups did not differ significantly with regard to the strength of their causal judgments, $t(\text{corrected df} = 220) = 1.88$, $p > .05$. However, with experience, significant differences were observed between the NC and PC Groups (e.g., Trial 6, $t(\text{corrected df} = 220) = 2.61$, $p < .05$; Trial 7, $t(220) = 2.40$, $p < .05$; Trial 8, $t(220) = 4.16$, $p < .05$; Trial 9, $t(220) = 3.44$, $p < .05$).

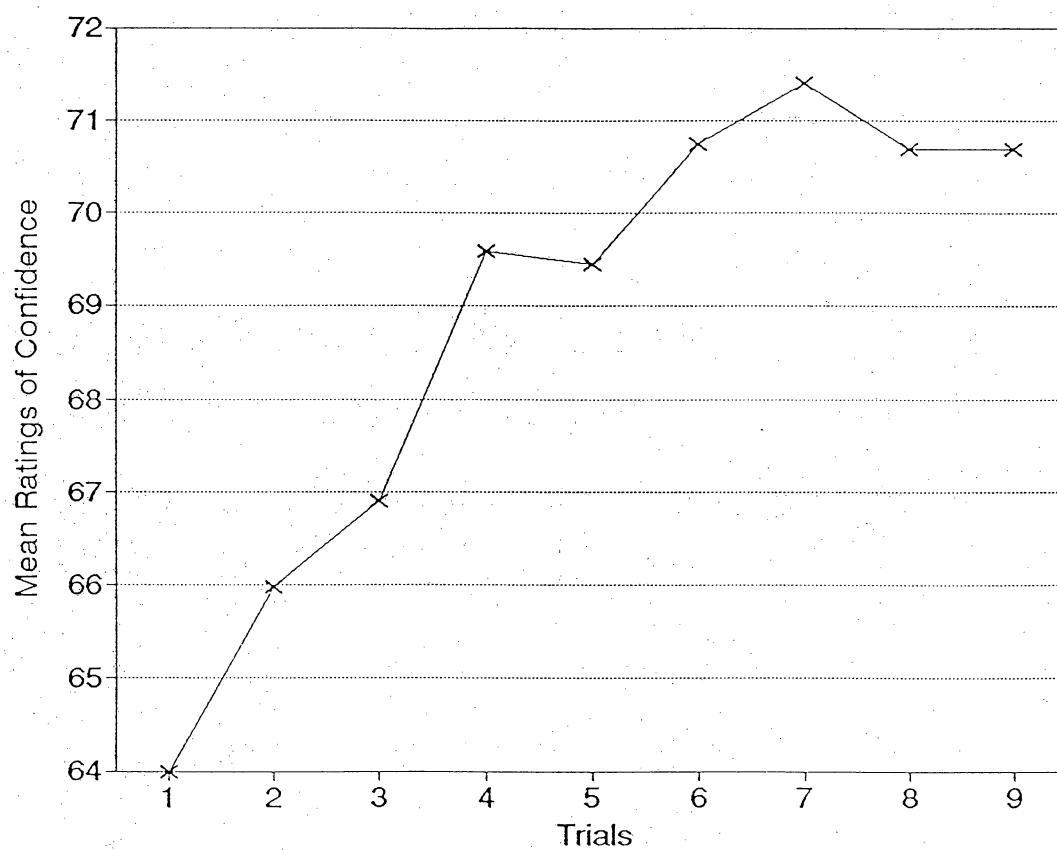
Confidence

Given the importance of the primary measure, causal judgment strength or strength of "invariance seeking action," it was important to determine that the results were not an artifact of the conditioning procedure. In particular, we wanted to eliminate an alternative explanation that conditioned causal judgment strength ratings differed as a result of the subjects' confidence in their judgments. Drawing from contemporary learning research (e.g., Shanks & Dickinson, 1987) subjects were

asked to rate their confidence in their causality judgment on each conditioning trial. A 2 X 9 (Groups X Trials) repeated measures ANOVA revealed that neither the Groups effect nor the interaction were statistically reliable, suggesting that subjects' confidence was not confounded with the conditioning treatment. As expected, the trials effect was significant $F(8, 304) = 2.19, p < .02$; that is, with increasing experience, the subjects' confidence in their causal judgments predictably increased across trials (see Figure 3).

Figure 3

Acquisition Curve of Confidence Ratings



DISCUSSION

The goal of the present study was to use modern conditioning theory to examine processes underlying human judgments of causality. The present study is part of a larger program of research designed to extend previous work in causal attribution, and as such will not only overlap current thinking in social psychology but can eventually contribute novel explanations and predictions for familiar and unfamiliar results. The causal attribution research described in the literature, although clearly sophisticated, does not yet contain a systematic foundation for predicting and explaining social attributions in context. It was our intention to extend attribution theory, which has primarily focused on a simple contiguity mechanism, to include those additional principles which guide contemporary associative learning. Contingency effects, in learning psychology, have not eliminated the explanatory power of contiguity but have indicated that the contiguity explanation of relationship (cause/effect) results is not sufficient for explaining those results. Attribution theory can be extended by testing specific predictions about how causal attributions acquire strength over repeated presentations of relevant

information. And, by specifying group differences based upon different cause and effect (CS/US) contingencies.

Further, the associative tradition in philosophy views conditioning not as a low-level mechanical process in which the control over a response is passed from one stimulus to another, but instead, as the learning that results from exposure to relations among events in the environment. Given this distinction between historical models of conditioning and contemporary learning theory, hypotheses analogous to those developed by modern conditioning researchers were tested. More specifically, we generated hypotheses to test acquisition effects and contingency effects in social attribution.

Acquisition Effects

The hypotheses were tested by pairing a worker (CS) and a company's productivity information (US) an equal number of times across four groups. Although all groups experienced equal contiguity of the CS and the US, they differed with regard to the base rate of the productivity information provided (US) in the worker's absence. According to the simple contiguity model, where context is not an issue, all groups should have demonstrated equal levels of causal judgment strength to the worker.

In contrast to simple contiguity model, we predicted that acquisition was a function of CS/US contingency. In particular, we expected that estimates of the worker as a

cause of the company productivity would progressively strengthen across trials in the PC Group, and in Groups 2 and 3 where the probability of the occurrence of the US without the CS increased, we expected lower levels of acquisition. In the NC Group, the company was equally likely to meet its productivity level whether or not the worker was present. The worker, Joe, therefore, provided no additional information and no acquisition effects were predicted. In general, support for the acquisition hypothesis was found.

As predicted, the PC Group evidenced acquisition effects and no conditioning occurred in the NC Group. That is, subjects made the strongest causal attributions when there was no legitimate alternative to the worker. In Groups 2 and 3, however, where results were expected to be intermediate between the extreme Groups (PC and NC), subjects responded similar to the NC Group. The results for Groups 2 and 3 were contrary to our predictions and also inconsistent with previous research which examined contingency effects using intermediate groups (Shanks & Dickinson, 1987). It should be noted, however, that Shanks and Dickinson, in contrast to the present study, did not measure causal judgment regarding human action.

Arguably, the group differences reported above are not at variance with Kelley's covariation principle. However, the specificity regarding the acquisition of

causal judgment strength is only obtainable from contemporary learning theory and serves to extend previous work in causal attribution. Current social theory does not contain a mechanism for predicting the form (e.g., additive or multiplicative) of acquisition of causal judgment strength. For example, simply saying that causal attributions get stronger as more information is made available is not sufficient to describe the results observed in the present research. Rather, the causal judgments measured in the present study follow a form frequently observed in learning psychology. That is, the judgment strength started at a relatively low level and progressively increased in strength until an asymptotic level of causal judgment strength was reached.

One possible explanation for the results is that any productivity which occurred in the worker's absence undermined his causal status, suggesting that in human conditioning there may be an "all or none" mechanism. We could speculate that in human causal judgments the role of the background (productivity information without Joe present) can serve to diminish the causal priority of the worker. This is especially true when the "social effect or outcome" was defined as "company productivity" rather than individual productivity. As a result, narrowing the effect level of analysis closer to the worker might increase the likelihood of finding intermediate effects.

This post hoc explanation requires further research.

However, the higher ratings in the PC Group may argue against the necessity of using an effect more representative of the individual worker.

Further, an inspection of Figure 1 indicates that subjects, unexpectedly, started out at a relatively high level of causal strength ($M = 64.88$). Theoretically, beginning at a lower level of causal strength would have enhanced the acquisition effect, defined as amount of change across conditioning trials. A possible explanation for the higher initial ratings is that subjects had information about a hypothetical "productivity goal" (See appendix D). The level of production reported each month exceeded the arbitrary goal, therefore a certain amount of productivity success could be inferred. As a result, judgments of causality and therefore acquisition of cause did not begin at "floor" level. In future research it is proposed that the arbitrary goal be eliminated.

Contingency Effects

Contingency effects hypotheses were tested by holding the frequency of the worker and company information provided constant across experimental groups and comparing strength of causal judgments between groups when the base rate of productivity information in Joe's absence was varied. Hence, across groups subjects received the same information about the worker and his level of productivity

(simple contiguity) but received this information in different stimulus contexts. Consistent with contemporary learning research (e.g., Shanks & Dickinson, 1987), the causal priority given to the worker for the observed effect was expected to differ as a function of the context in which the pairing of the worker and the company meeting it's goal took place. That is, we expected a negative relationship between the number of times the company goal was met in the worker's absence and the strength of the subject's causal judgments. Theoretically, a simple contiguity-sensitive process should have yielded similar causal judgments across the four groups, however, the results of the present research indicated that evaluations of the worker as an effective "cause" decreased as the base rate of the company meeting the goal in the worker's absence increased.

A simple-contiguity sensitive mechanism could not distinguish pairings in which the cause, in this case the worker, was necessary for the social outcome or "effect" from those in which the conjunction was accidental. One possible explanation for the differences between the NC and PC Groups, in particular, is that in the NC Group there was a potential source of causal agents for the outcome (productivity goal) other than the target cause (the worker) under consideration. This source can be defined as the causal background which includes all

plausible causal agents other than the target. Recall that what distinguished the NC and PC Groups was that the outcome (productivity level) was systematically paired with the causal background on those trials where the worker was absent in the NC Group, but not in the PC Group. Hence, the reduction in the worker's causal strength ratings in the NC Group may be the result of the background stimuli attenuating or blocking attributions to the worker.

The explanatory and predictive power of the contingency mechanism would have been strengthened had the middle level groups proved to be reliably different from each other and from the "extreme" conditions represented by the NC and PC Groups. Nevertheless, the results did support the expectation that causal judgments must be understood in terms of the context in which cause and effect are presented. From the contingency point of view, a subject's causal judgments do not require that causes and effects be mutually present and mutually absent. Associations develop because the CS and US are systematically paired. Hence, causal judgments develop because a cause and effect are systematically paired. The strength of associations do not require the subject to receive additional information that "no CS" is followed by "no US." Hence, from a learning view point causal judgments do not require the subject to receive

information that "no cause" preceded "no effect". Rather, effects are assumed to be present otherwise the invariance seeking action would not be initiated. There are no causal attributions in the absence of an effect. The contingency mechanism makes this assumption perfectly clear in its definition of positive, negative, and zero contingency.

The present research underscores the importance of the "causal environment" with regard to attributions in the work place. Consistent with our research, Japanese principles of management (e.g., Deming Model) suggest that performance appraisals can be confounded by the context, or "system" within which the individual works. In traditional employee evaluations, however, context effects are not usually a consideration and as a result may lead to erroneous conclusions regarding the worker's overall effectiveness. Recall that the worker's performance in the present study did not vary across experimental groups. However, the "supervisors" rated the worker as less effective when company productivity information was provided in his absence compared to the worker who was evaluated in a context which did not include additional productivity information.

Confidence Ratings

Theoretically, group differences in the subjects' causal judgments were expected to be the result of

experimental manipulations effecting the associative process, not the result of increases or decreases in confidence in making the judgments themselves. To determine that subjects' causality judgments were not confounded by their confidence in their judgments, subjects were asked to rate their confidence in their judgments using a 0 to 100 point scale. Consistent with a priori predictions, confidence ratings increased across the evaluation trials, indicating increased confidence resulting from experience, but the confidence ratings did not differ between the NC and PC Groups. Subjects were not confused, rather they responded in a predictable manner, making orderly judgments, to the stimuli presented. This outcome is consistent with confidence ratings reported by Shanks and Dickinson (1987), and provides additional support for the associative learning model of causal judgment strength.

Limitations on Reported Effects

The results, like the results from any theory-generated research program, should be interpreted within a narrow range of conditions (Logan, 1959). In fact, the method used here serves as an explicit statement of some of the boundary conditions, particularly in regard to the discrete trials procedure. In social psychology, investigations regarding strength of causal judgments frequently use descriptions of social action rather than

presenting information about behavior over time. That is, subjects are frequently asked to make an attribution based on information from a single observation. The present study, because it used analogies of a familiar learning paradigm, involved multiple presentations of the stimuli. Although Kelley's covariation principle pertains to attributions resulting from multiple observations, the context effects reported here, using the short delay conditioning paradigm, may generalize only to situations where information is presented repeatedly rather than merely described. However, this caution may be too pessimistic. Conditioning analogies from both instrumental and Pavlovian learning models have successfully been used to study a variety of social phenomena: attraction (Clore & Bryne, 1974; Cramer, Weiss, Steigleder, & Balling, 1985); competition (Steigleder, Weiss, Cramer, & Feinberg, 1978); altruism (Weiss, Buchanan, Altstatt, & Lombardo, 1971); and male sex-role action (Cramer, Lutz, Bartell, Dragna, & Helzer, 1989).

In addition to the limitations described above (e.g., arbitrary goal, definition of US, multiple observations), the "part-time" status of the worker may also have influenced subjects' causal strength ratings. For example, in the experimental groups where additional company productivity information was provided in the

worker's absence, subjects may have rated the worker as a less effective cause of the company's productivity because he was not employed full-time. This procedural constraint was necessary to explain the control trial information indicating when "No Report" was required, and served to equate the number of trials received by all of the subjects. It should be noted, however, that the worker was referred to as a part-time employee in all of the experimental groups, including the PC Group.

Implications for Future Research

The present study focused on the subjects' strength of causality judgments to one specific employee. Because of the trend toward forming small groups of employees or teams, future research is warranted when several employees are working together and being evaluated. Recall that the discounting mechanism in causal attribution noted above suggested that the priority of a given cause in producing an effect is attenuated if other plausible causes are present (Kelley, 1972). Hence, causal judgments to two or more workers paired with productivity information is expected to be attenuated relative to the causal judgment strength reported in the present study, where a single worker was evaluated. Naive scientist explanations of the discounting effect notwithstanding, analogies drawn from contemporary associative learning variables can be used to predict and explain the attenuation of causal judgment

strength when multiple plausible causes are present.

In Pavlovian learning conditioned responding is said to be influenced by the intensity of the US, and the intensity is said to represent a theoretical limit on the extent the US can influence responding. For example, if two CS's are conditioned individually, conditioned responding to each stimulus should approach the theoretical limit supportable by the US used in the conditioning situation. However, if the same two CS's are presented in a stimulus compound and paired with the US, conditioned responding to the individual stimuli is expected to be approximately one half the strength observed resulting from single stimulus conditioning.

Consistent with the principles guiding associative learning, we could predict that estimates of an individual employee (CS analog) being the cause of a company meetings it productivity goal (US analog) will weaken when he is evaluated with other team members (compound CS analog) present. In contrast, this discounting effect or loss in causal judgment strength to the individual worker is expected to be reversed if, after the addition of co-workers, there is an increase in the company's productivity level. This prediction follows from the Pavlovian expectation that elevations in US intensity increase conditioned responding to a relevant CS. In terms of causal attributions to the worker, increases in

production level will increase causal attribution strength despite the presence of team members. That is, an increase in causal judgment strength to the worker will evidence an "undiscounting effect." The test of these predictions awaits future research.

Clinical Implications

In addition to the social areas described above (attraction, competition, altruism, male sex-role action) causal judgments also play a fundamental role in clinical psychology (e.g., Seligman, 1975). Therapists observe potential causes and their effects occurring across a period of time or what Bertrand Russell termed, "knowledge by acquaintance" on a regular basis (see Shanks, 1991). For example, clients often manifest their developmental conflicts in therapy and are adept at eliciting and engaging therapists in their conflicts. These conflicts can be resolved, however, when the therapist's response repeatedly disconfirms their pathogenic developmental experiences (simple contiguity). As a result of this "corrective emotional experience," clients discover that it is safe to act in new and more adaptive ways (see Teyber, 1992). Learning is not usually complete until after several pairings of the cause and effect have been experienced (acquisition). In particular, a therapist may view a client's lack of progress as "resistance," rather than acknowledging that an insufficient number of

"learning trials" has occurred.

The Industrial-Organizational paradigm used in the present study provides mundane realism for our experimental situation (i.e., supervisor-worker evaluations). However, it would be more difficult to use a clinician-client paradigm because it would require that the subject take on the role of a therapist. The advantages for expanding the external validity of the present results using a clinician-client paradigm cannot be over estimated. For example, we could postulate that clinical assessments of a client (attributions of cause) who attends group therapy, in comparison to the client who attends individual therapy, may be more subject to the "context effects" described above.

Specifically, in the context of group therapy, attributions regarding a client's behavior (internally based causes), in particular, those behaviors which represent completion of treatment goals and objectives (outcome), may be influenced by context effects. In other words, causal judgments of a client's behavior reliably signaling treatment goal completions is expected to more salient in individual counseling than in group therapy. In individual therapy the "to be explained effects" (treatment goal completions) are only present when the client is present. The clinician's attributions regarding the cause of the effects should be the strongest in this

case. However, in group therapy it is possible that the "effect" could be observed in the presence of other group members, but if the client is not in attendance, also in the client's absence. Such a context is expected to produce weaker invariance seeking actions to the client.

APPENDIX A

Instructions for all Experimental Groups

Preliminary Instructions. In this study we are interested in testing a computerized employee evaluation system. Your cooperation is necessary for testing the usefulness of this automated program. In order to carefully test the effectiveness of the system, you will need to assume the role of a supervisor in a large company. You will be given information about a part-time employee, Joe and his company's level of productivity. After reviewing a monthly productivity report, it will be your responsibility as Joe's supervisor to evaluate his performance and how effective he was in causing the company's level of productivity. Joe is a college student who is available only for part-time employment. Therefore he will not be present during each rating cycle. But it is important to evaluate Joe carefully each month because he will be considered for full time employment upon graduation.

Instructions Prior to Practice Trial. On the left side of the screen a picture representing a part-time employee, Joe, will be presented. A blank screen will appear during an evaluation cycle if Joe had not been called in to work. On the right side of the screen a graph depicting the company's monthly productivity goal and the level of monthly productivity will be presented. During an evaluation cycle it is possible a blank screen would appear for a month where no report was submitted. Two blank screens may appear if Joe was not called in to work and a monthly report was not submitted.

Instructions Prior to Estimates of Causal Strength. Following each monthly productivity report you will be asked to answer five items on a '0 - 100' point scale. After reading the item carefully, please respond by using the numeric key pad on the right side of the keyboard. After entering your '0 - 100' response, please wait for the next evaluation item to appear.

APPENDIX B

CONSENT FORM

I am volunteering to participate as a subject in this study. I understand that the purpose of this study is to test the efficiency of a computerized employee evaluation system. I understand that the information will be presented via a computer monitor and that I will be asked to assume the role of a production supervisor in a large company. I understand that my name will NOT be included in the experiment itself and that my anonymity will be maintained at all times. I also understand that my participation in this study is voluntary and that I may refuse to answer any questions at any time. I also understand that I may withdraw from this study at any time without penalty or prejudice. I also understand that any questions I may have regarding this study will be answered.

I understand that all the information collected in this study will be treated as confidential with no details about my responses released to anyone outside the research staff without my separate and specific written consent. I understand that I may derive no specific benefit from participation in this study, except perhaps from knowing that I have contributed to the development of psychological knowledge.

I hereby allow this research group to publish the results of this study in which I am Participating, with the provision that my name and/or other identifying information be withheld. This study is being conducted by psychology students under the supervision of Dr. Robert Cramer, PS-211, extension 5576. I understand that if I have any questions or concerns about the study or the informed consent process I may also contact the Psychology Department Human Subjects Review Board at CSUSB.

Participant's Signature: _____

Participant's Name (Printed): _____

Date: _____

APPENDIX C

DEBRIEFING STATEMENT

The present study is part of a series of research projects designed to investigate human social causal judgments. Unfortunately, in order to adequately investigate this social phenomenon a small deception of the subjects was necessary. Rather than directly asking questions concerning your social causal judgments, we explained the study as testing the efficiency of a computerized Employee Evaluation System. The company, its employees, and the evaluation system were fictitious. We apologize for this deception, however, if we had asked directly about your causal judgments your responses may have been effected.

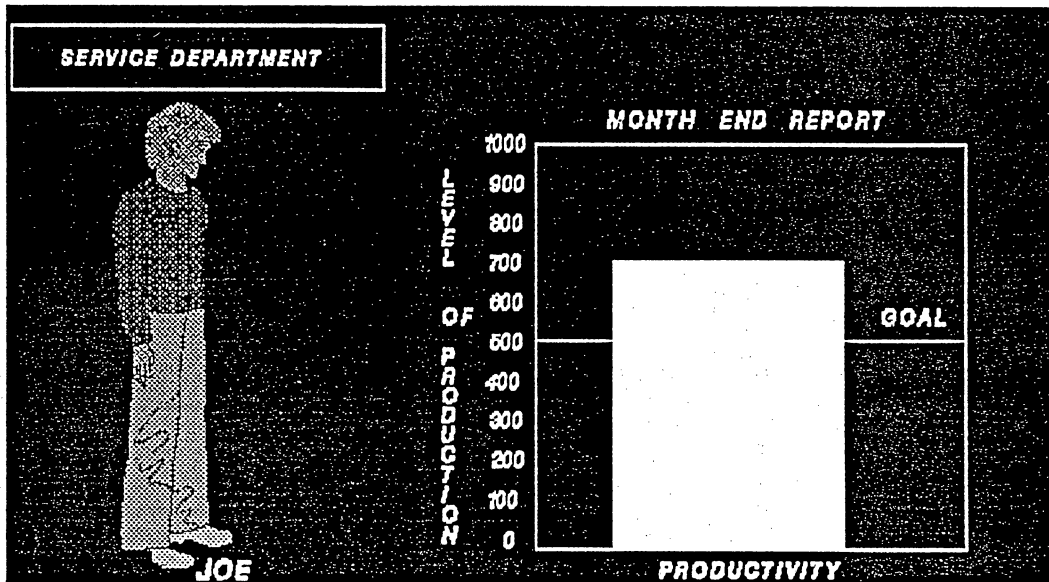
(Stop. Are there any questions?)

It is our sincere hope that the necessity for deception is understood. It is important for the completion of this study that you do not speak with other students on campus about your experiences here today. If other potential subjects are aware of the purpose of the experiment, the results of the study might be compromised.

The present study conforms to the ethical principles established by the American Psychological Association. We are interested in obtaining your comments or reaction regarding your participation in our experiment. This information would serve as a basis for checking and evaluating the quality and care with which our research is conducted. Please feel free to comment or ask questions. For results concerning the present study contact Dr. Robert Cramer, (714) 880-5576.

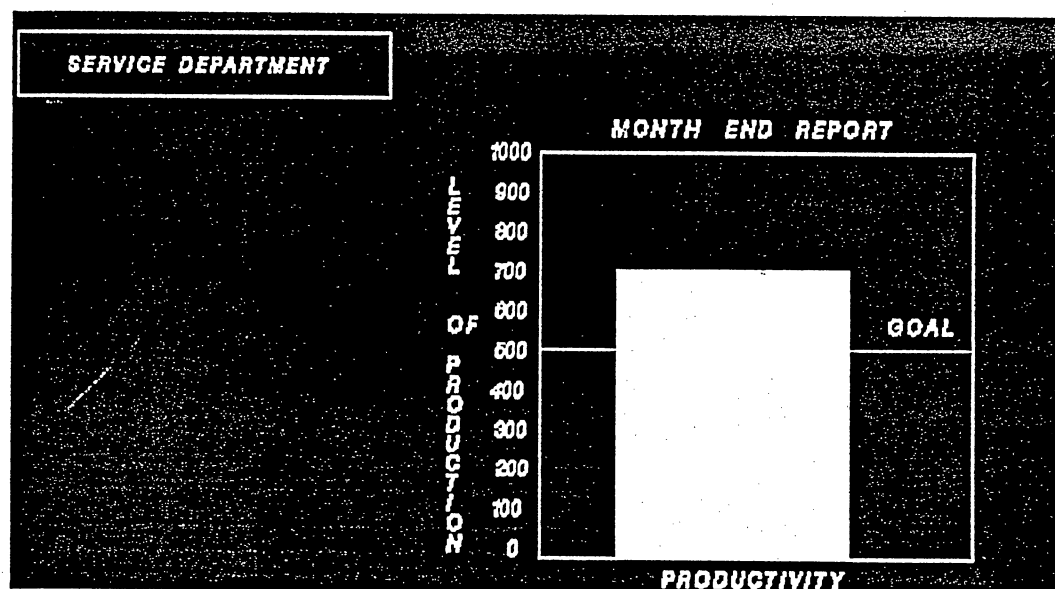
APPENDIX D

CS/US Acquisition Trial



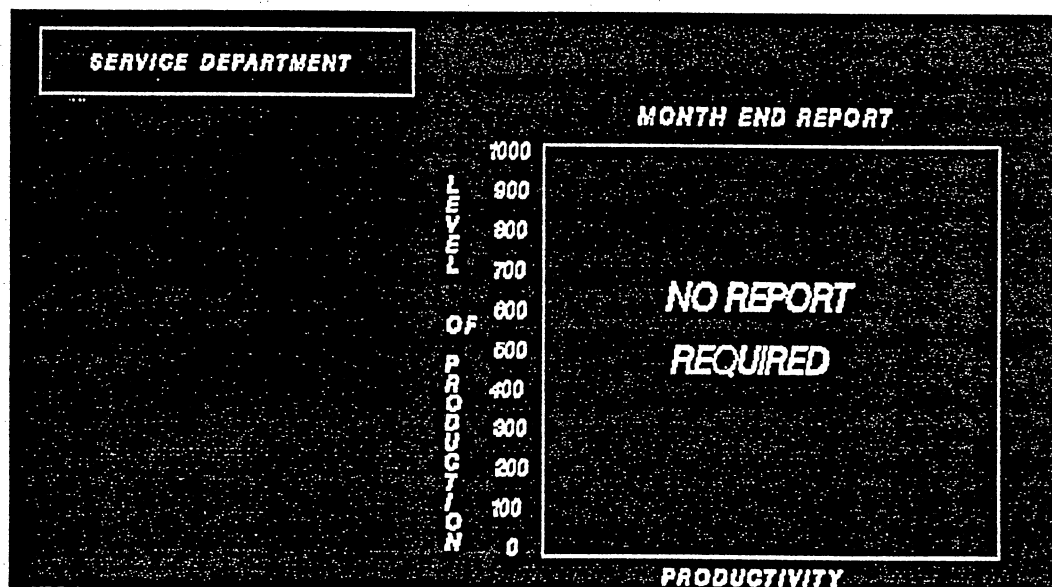
Appendix D (cont'd)

No CS/US US Alone Trial



Appendix D (con'd)

No CS/No US Control Trial



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