THE UNIVERSITY OF MANITOBA

THE EFFECTS OF CONTROL AND PREDICTION OF AVERSIVE STIMULI ON EXPECTANCY FOR SUCCESS, SKILL AND CHANCE ATTRIBUTIONS OF CONTROL, PROOFREADING PERFORMANCE AND PAIN RATINGS

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF PSYCHOLOGY

WINNIPEG, MANITOBA

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A dissertation submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

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ACKNOWLEDGEMENTS

I would like to express my appreciation to Dr. Marvin Brodsky under whose supervision this research was carried out. His sustained encouragement, comments, and advice were of great assistance to me.

I am also grateful to Dr. John Adair, Dr. Lawrence Breen, and Dr. James Brown who read and contributed to both the original proposal and the final manuscript; to Dr. James Nickels who contributed to the original proposal and helped to determine the requirements for the necessary apparatus; to Les Bell who designed and built the necessary apparatus; and to Lorne Sexton and Dr. Lawrence Breen for their assistance in the data analysis. Finally, I am grateful for the use of the data processing facilities of the Computer Center at the University of Manitoba.

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CHAPTER I

INTRODUCTION

Although a number of environmental stimuli are capable of producing stress responses in an individual, it is not these stimuli alone that determine the extent of stress reactions. Cognitive factors determined by the psychological structure of the individual are seen as crucial in determining an individual's reaction to specific aversive events in his life (Lazarus, 1966). Two of the important cognitive factors, controllability and predictability of the aversive stimuli, have been studied extensively. Control is viewed as important in terms of: (1) one's general belief about his ability to control what happens to him (Lazarus, 1966); and, (2) one's belief about his capacity for control in a particular situation (Glass & Singer, 1972; Lazarus, 1966). The former type of control is a personality variable while the latter is a situational variable. The predictability of an aversive event also reduces stress responses (Glass & Singer, 1972; Seligman, Maier & Solomon, 1971).

The term "stress" has had multiple meanings and other terms have been used to refer to similar phenomenon. Lazarus (1966) discusses the many uses of this term and suggests a new terminology. However, stress has been generally defined as the affective, behavioral and physiological response to aversive stimuli (Appley & Trumbell, 1967).[1] Noise as a

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[1]This general definition of stress will apply to this paper. "Aversive stimuli" will refer to painful or fearful events (Seligman, Maier & Solomon, 1971).

stressor has been discussed in detail by Glass and Singer (1972) and there are several reviews of the literature on the effect of noise (Broadbent, 1957; Kryter, 1950; 1970). In general, noise is capable of eliciting stress responses and the degree of stress appears to be mediated by cognitive factors. Thus, noise under certain conditions influences affective, behavioral, and physiological responses. Both the predictability and controllability of noise have been found to influence response to the noise (Glass & Singer, 1972).

Previous investigators of the effects of control of unavoidable events have typically: (1) compared controllable to uncontrollable stimuli; (2) varied either the onset or the duration of the stimuli; and (3) focused more on control as a situational than as a personality variable. Previous researchers have also compared the predictability versus the unpredictability of aversive events. The dependent variables investigated can be categorized as affective (e.g., pain ratings), behavioral (e.g., proofreading performance), or physiological (e.g., skin conductance) responses. When control and prediction have been compared in the same study, predictability of the onset and controllability of the duration were varied. Although the findings have been contradictory, there is evidence that both control and prediction reduce the impact of aversive stimuli (Seligman, Maier & Solomon, 1971).

The purpose of the present study was to investigate the relative effects of control and prediction of unavoidable aversive events for subjects who differed in their general beliefs about control (as determined by Rotter's (1966) Internal-External Scale). The effects of control and pre-

diction of both the onset and the duration of white noise were compared. The following measures were utilized as the dependent variables: expectancy for success, skill attribution, chance attribution, proofreading performance, and pain ratings. The following review of the literature attempts to show the relationship between situational control, prediction, and generalized expectancies for control.

Control of Aversive Events

Individuals have been placed in potentially aversive situations and then have been allowed some degree of control over what happens to them in these situations. When such control was possible, there was often less stress than when no control was possible. For example, it has been shown that subjects who could control the order of intelligence subtests to be taken had no increase in galvanic skin response during the instruction period while subjects with no control had significant increases in galvanic skin response (Stotland & Blumenthal, 1964); subjects who could advance slides of travel pictures at their own rate tolerated ice water immersion longer than subjects whose slides were changed by the experimenter (Kanfer & Seidner, 1973); subjects who could avoid shock selected a higher level of shock and rated themselves as less anxious than did random shock subjects (Bowers, 1968); subjects who could control rest periods from a shock avoidance procedure had lower systolic blood pressure levels than subjects who had no control of the rest periods (Hokanson, DeGood, Forrest & Brittain, 1971); and, subjects who expected to be able to escape shock if they exhibited skill in a recognition-learning situation showed heightened perceptual vigilance in comparison to subjects who did not expect to escape

shock (Phares, 1962).

The results of a well-known study contradicts the typical findings of the effects of control. Brady, Porter, Conrad and Mason (1958) placed pairs of monkeys in a shock avoidance condition. Only one monkey in each pair, the "executive", could prevent the shocks. By pressing a lever he could prevent both himself and his partner from being shocked. The "executives" were the ones which tended to develop massive stomach ulcers while the partners who had no control did not develop ulcers. This study has been criticized by Seligman, Maier and Solomon (1971) on the grounds that the monkeys were not randomly assigned to the groups. It was the monkeys which learned an avoidance response first that were chosen as executives. They point out that Sines, Clelland and Adkins (1963) found that rats which are susceptible to ulcers acquire an avoidance response faster than controls. It is possible, then, that the executive monkeys were constitutionally more emotional and prone to ulcers than were their partners. In addition, when Weiss (1968) used rats in a similar experiment, uncontrollable shocks resulted in more ulcers and a greater decrease in body weight than controllable shocks.

Control of the onset of aversive events when studied in terms of individuals being able to administer shocks to themselves also has been found to reduce stress. Haggard (1943) found that subjects who could administer their own shocks showed less anxiety, as measured by galvanic skin response, than subjects who could not administer the shocks. Pervin (1963) found that subjects preferred shocks that they could deliver to themselves more than those delivered by the experimenter. Staub, Tursky

and Schwartz (1971) found that subjects who could administer shocks to themselves and control the intensity of the shocks reached greater levels of shock before they reported it as uncomfortable and endured stronger shocks than subjects who had no control of the administration and intensity of the shocks.

Control of the duration of aversive events also influences stress. A classical study by Mowrer and Viek (1948) led to later research in this area. In this early study, one group of rats was trained to escape shocks by rearing up on their hind legs. A second group received unescapable shocks of the same duration. The group that had received uncontrollable shocks refused food more frequently than did the group which had received controllable shocks. This finding was subsequently confirmed (Lindner, 1968).

The results of some studies with humans have also indicated that control of the duration of aversive stimuli influences stress; however, the findings have been inconsistent. Physiological, affective, and behavioral responses have been utilized as dependent variables in examining the effects of control of the duration of aversive stimuli.

Physiological responses to the aversive stimuli when the duration was controllable have been studied in terms of skin conductance and heart rate measures. Control of the duration of aversive stimuli has been found to reduce skin conductance responses to the aversive stimuli. Corah and Boffa (1970) found that trials in which subjects could not escape (i.e., influence the duration) from white noise led to greater skin conductance changes than trials in which subjects could escape. Geer and Maisel (1972)

found that control of the duration of aversive photographs led to a lower skin conductance than no control. Several studies found that even the perception of having control reduced skin conductance responses (Champion, 1950; Geer, Davidson & Gatchel, 1970).

On the other hand, Bandler Madaras and Bem (1968) found no differences in skin conductance responses between trials in which subjects could escape aversive stimuli and those in which subjects could not escape the aversive stimuli. And Glass and Singer (1972) reported on a number of studies that indicate that skin conductance responses decrease (i.e., adaptation takes place) after repeated exposure to the stimuli regardless of the controllability of the duration. However, when they looked at the skin conductance responses during the first few exposures to the aversive stimuli, they found that control led to smaller skin conductance responses than no control. In a later study (Glass, Singer, Skipton, Kranz & Cohen, 1973) adaptation was not found to occur in either control or no control conditions.

The findings regarding heart rate are also inconsistent. Elliott (1969) found that there was greater heart rate acceleration in a shock controllable condition than in a shock uncontrollable condition. However, Geer, Davidson, and Gatchel (1970) found no differences in heart rate measures for perceived control and no perceived control subjects.

Affective responses to aversive stimuli as a function of the controllability of the duration of the aversive stimuli have also been examined. Again, the findings have been inconsistent. For example, controllable in comparison to uncontrollable aversive stimuli were found to

be less aversive (Glass, Singer & Friedman, 1969), to lead to the endurance of stronger shocks (Bowers, 1968), to produce more tension (Elliott, 1969), to produce less anxiety (Bowers, 1968), and to be rated equally in the degree of painfulness (Geer, Davidson & Gatchel, 1970). In terms of discomfort ratings, the results of one study (Corah & Boffa, 1970) suggests that controllable aversive stimuli produces less discomfort than uncontrollable ones while the results of another study (Bandler, Madaras & Bem, 1968) suggest that uncontrollable aversive stimuli produce less discomfort than controllable ones.

Behavioral responses to aversive stimuli which are controllable in terms of the duration have been examined through the use of a performance task after exposure to the aversive stimuli. Glass, Singer, and Friedman (1969) found that subjects with perceived control of the duration showed greater tolerance for frustration (that is, tried more insoluble puzzles) and performed better on a proofreading task than subjects with no perceived control of the duration. These findings were confirmed by Mayhew (1969).

Thus the findings regarding the effect of control of the duration of aversive stimuli on physiological and affective responses have been contradictory. The effects on behavioral responses have received relatively little attention but the present evidence suggests that perceived control of the duration reduces impairment following exposure to aversive stimuli. Two factors which have been neglected in previous research and which may help account for the contradictory findings are: (1) the predictability of the onset of aversive stimuli and (2) generalized expectancies for control (internal versus external). The implications of these two factors are discussed below.

Prediction of Aversive Events

The type of predictable or unpredictable aversive events which are relevant to this paper are those which are certain to occur but the time of onset or duration are either known (predictable) or unknown (unpredictable). In the studies on the effects of predictable versus unpredictable aversive events on behavior, the focus has been on the predictability of the onset of the aversive stimuli rather than the duration.

Prediction of aversive events appears to influence stress. Pervin (1963) found that subjects reported less anxiety when they knew when shocks were to occur than when they did not know when the shocks were to occur. Predictable shocks were also preferred to unpredictable ones. Jones, Bentler and Petry (1966) reported two studies in which it was possible to make responses that would provide information about the scheduling and sequencing of unavoidable shocks. They found that such information served as a positive reinforcement. Monat, Averill and Lazarus (1972) found that subjects preferred a condition in which the time of shock onset was known rather than a condition in which the time of shock onset was unknown. Behavioral aftereffects have also been reduced by making the aversive events predictable (Glass, Singer and Friedman, 1969; Mayhew, 1969).

The above studies suggest that being able to predict when aversive events are to occur is less stressful than not being able to predict their onset. However, prediction may have a different effect on heart rate measures. Two studies (Deane, 1961; Elliott, 1969) found that knowledge

regarding when shocks were to occur increased heart rate acceleration.

Thus, prediction under certain conditions does play a role in reducing stress. The previously mentioned studies regarding the effect of control of the duration of aversive stimuli have not taken into account that the predictability of the onset and/or duration of the aversive stimuli may have influenced the results. The onset of the aversive stimuli has sometimes been predictable and at other times unpredictable. In addition, the duration in the no control conditions varied in their predictability.

The Relationship Between Control and Prediction of Aversive Events

In general, the results of the previously mentioned studies suggest that when aversive events are made either predictable or controllable the adverse effects of the events are reduced. Some studies have varied both the predictability of the onset and the controllability of the duration of aversive stimuli; however, only one study attempted to directly compare the effectiveness of the two variables (i.e., prediction versus control of the duration).

Glass, Singer and Friedman (1969) exposed their subjects to loud unpredictable (randomly occurring) noise. Half of the subjects were given a button which would enable them to terminate the noise for the rest of the experiment. These subjects were encouraged to use the button only if the noise became too much for them to bear. Subjects with the button showed greater tolerance for frustration (that is, tried more insoluble puzzles) and performed better on a proofreading task than subjects without a button.

The effectiveness of the possession of a button to terminate aversive stimuli was also found by Mayhew (1969). Subjects were exposed to either unpredictable or predictable high intensity noise. Within each of these conditions, some subjects were given a button with which to terminate the noise while other subjects did not have a button. Possession of the button during exposure to the unpredictable noise reduced the number of proofreading errors missed and increased subjects' tolerance for frustration. When the noise was predictable, both button and no button subjects performed at a similar level as a no noise control group.

In general, the above mentioned studies provide more support for the idea that both prediction and control reduce the impact of aversive stimuli. However, since these studies varied predictability in terms of the onset of the aversive stimuli and varied control in terms of a potential escape response, no direct comparisons of control and prediction were possible. More information about the relative effectiveness of the two variables might be obtained by comparing the control of the onset of the aversive stimuli with prediction of the onset and by comparing prediction of the duration with control of the duration.

Prediction and control of the duration of aversive stimuli were compared in one study. Geer and Maisel (1972) investigated the possibility of a prediction-control confound operating in previous studies on the effects of control of the duration of aversive stimuli. They asked the following question: "Are the effects of control due primarily to the ability of the subject to predict or is the effect of control somehow more directly related to the effect of control itself?" (Geer & Maisel, 1972,