

1976

## Locus of control and response to predictable and unpredictable noise.

Edward L. Yeats  
*University of Massachusetts Amherst*

Follow this and additional works at: <https://scholarworks.umass.edu/theses>

---

Yeats, Edward L., "Locus of control and response to predictable and unpredictable noise." (1976). *Masters Theses 1911 - February 2014*. 2088.  
<https://doi.org/10.7275/6871704>

This thesis is brought to you for free and open access by ScholarWorks@UMass Amherst. It has been accepted for inclusion in Masters Theses 1911 - February 2014 by an authorized administrator of ScholarWorks@UMass Amherst. For more information, please contact [scholarworks@library.umass.edu](mailto:scholarworks@library.umass.edu).

UMASS/AMHERST



312066013692578

LOCUS OF CONTROL AND RESPONSE TO  
PREDICTABLE AND UNPREDICTABLE NOISE

A Thesis Presented

By

EDWARD L. YEATS

Submitted to the Graduate School of the  
University of Massachusetts in partial fulfillment  
of the requirements for the degree of

MASTER OF SCIENCE

April 1976

Psychology



LOCUS OF CONTROL AND RESPONSE TO  
PREDICTABLE AND UNPREDICTABLE NOISE

A Thesis Presented

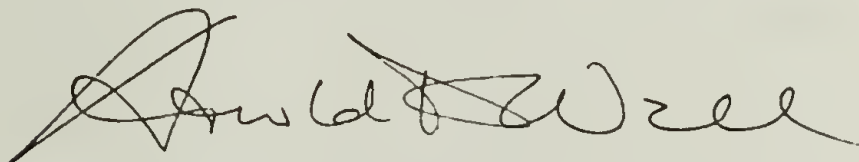
By

EDWARD L. YEATS

Approved as to style and content by:



Bonnie R. Strickland, Chairperson of Committee



Arnold Well, Member



Alvin Winder, Member



Jerome Myers, Department Head

## ABSTRACT

Using a modified version of the Glass et al. (1969) Predictable and Unpredictable noise design, 72 male college students were given the Rotter Internal-External Locus of Control Scale and assigned to three experimental conditions: Unpredictable Noise, Predictable Noise, and No Noise (control). Two repeated measures of noise adaptation were used: Anagram Solutions and Digit Symbol. Two measures of Cost of Adaptation--quality of Proofreading Performance and Tolerance for Frustration--were taken after termination of the noise. Results showed adaptation to the noise in both noise conditions. Post-noise aftereffects were greatest in the unpredictable noise condition. Differences in post-noise aftereffects between conditions were greater for externals than for internals. Thus, it was concluded that (1) there is a cost of adaptation to noise stress, and (2) the cost of adaptation is more present among subjects holding external locus of control beliefs. These results were compared with previous findings in the field of stress adaptation. Implications for the meaning of the locus of control construct and suggestions for further research were discussed.

## ACKNOWLEDGMENTS

The author wishes to express his gratitude to his committee chairperson and advisor, Dr. Bonnie R. Strickland for her continued support, encouragement and patience. Special appreciation is felt for Dr. Arnold Well's expert tutelage in the techniques of data analysis, and for Dr. Alvin Winder's understanding and support. I would like also to thank Guillermo Bernal for his generous consultation on the data analysis, and Sally Ives for her help in the editing and typing of the thesis.

I would like to express both gratitude and apologies to the innocent undergraduates whom I blasted with noise. I would like to thank my parents for their unfailing love, support and confidence. And especially, I feel very blessed by the care, love, and tolerance I receive from my wife, Suzanne Y. Loughlin, to whom this thesis is dedicated.

## TABLE OF CONTENTS

Abstract.....	iii
Acknowledgments.....	iv
List of Tables.....	vi
List of Figures.....	vii
Introduction.....	1
Chapter I. Review of the Literature.....	3
Chapter II. Method.....	24
Chapter III. Results.....	36
Chapter IV. Discussion.....	86
References.....	102
Appendix I. Noise Schedule for Predictable Noise.....	116
Appendix II. Noise Schedule for Unpredictable Noise.....	117
Appendix III. Packet.....	118
Appendix IV. Counterbalancing Schedule.....	151
Appendix V. Soluble and Insoluble Puzzles.....	152
Appendix VI. Histogram of the I-E Distribution.....	153

## LIST OF TABLES

Table 1.	Results of the Anagram Pretest.....	28
Table 2.	Results of the Digit Symbol Pretest.....	31
Table 3.	Analysis of Variance for Anagram Solutions.....	40
Table 3a.	Analysis of Variance for Anagram Errors.....	41
Table 4.	Analysis of Variance for Digit Symbol.....	43
Table 5.	Analysis of Variance for Proofreading Number of Lines Read.....	46
Table 5a.	Analysis of Variance for Proofreading Number of Lines Read for Extreme Groups.....	47
Table 6.	Analysis of Variance for Proofreading Perform- ance: Full Sample.....	49
Table 6a.	Analysis of Variance for Proofreading Perform- ance: Extreme Groups.....	50
Table 7.	Analysis of Variance and Cell Means for First Soluble Puzzle: Puzzle #2.....	55
Table 8.	Analysis of Variance and Cell Means for Second Soluble Puzzle: Puzzle #4.....	56
Table 9.	Analysis of Variance for Insoluble Puzzle: Puzzle #1.....	58
Table 9a.	Analysis of Variance for Insoluble Puzzle: Puzzle #1 for Extreme Groups.....	59
Table 10.	Analysis of Variance for Insoluble Puzzle: Puzzle #3.....	66
Table 10a.	Analysis of Variance for Insoluble Puzzle: Puzzle #3 for Extreme Groups.....	67
Table 11.	Analysis of Variance for Insoluble Puzzle: Puzzle #3 for IE Median Split within Each Condition.....	74
Table 12.	Analysis of Variance and Cell Means for Noise Evaluation: Irritating.....	78



Table 13.	Analysis of Variance and Cell Means for Noise Evaluation: Unpleasant.....	79
Table 14.	Analysis of Variance and Cell Means for Noise Evaluation: Distracting.....	80
Table 15.	Analysis of Variance and Cell Means for Noise Evaluation: Unpredictable.....	81
Table 16.	Correlation Coefficients.....	83

## LIST OF FIGURES

Figure 1.	Experimental Design Plan.....	19
Figure 2.	Crosstabulation of Cells for Full-Sample IE Median Split (Non-Orthogonal).....	38
Figure 2a.	Crosstabulation of Cells for IE "Extreme Groups" Analysis.....	38
Figure 3.	Adaptation Plots.....	44
Figure 4.	Cell Means for Proofreading Performance.....	51
Figure 4a.	Cell Means for Proofreading Performance: Extreme IE.....	52
Figure 5.	Plotted Cell Means for Puzzle #1.....	60
Figure 5a.	Plotted Cell Means for Puzzle #1: Extreme I-E.....	61
Figure 6.	Cell Means for Puzzle #3.....	68
Figure 6a.	Cell Means for Puzzle #3 Extreme IE.....	69
Figure 7.	Cell Means for Puzzle #3 IE Median Split within Each Condition.....	75

## INTRODUCTION

In recent years, investigators in several fields have shown an increasing interest in stress and adaptation. In considering human response to aversive stimulation, several experimenters have found that a stimulus that might ordinarily be stressful can be far more easily tolerated by a subject who perceives the stimulus situation as predictable and/or under personal control.

Studies concerned with individual differences along various dimensions suggest that, along with the situational factors of predictability and control, human adaptation to the stress of aversive stimulation may also be affected by individual differences in coping with stress. On the situational level, a significant factor in stress adaptation is the presentation of the situation as controllable. Locus of control, the generalized expectancy for control of reinforcement that the individual brings to the situation, may be a relevant personality variable to consider in testing the hypothesis that individual differences as well as situational variables mediate human response to stress.

The purpose of this study was to evaluate the effects of differences in locus of control in interaction with the situational variable of stimulus predictability on subjects' responses to a situation that is stressful but not damaging--distraction by noise bursts during performance on experi-

mental cognitive tasks. An experimental design similar to that used in an original study which demonstrated the importance of situational variables in stress response (Glass, Singer & Friedman, 1969) was employed. The individual difference variable, locus of control, was introduced into this basic design.



## C H A P T E R I

REVIEW

The basic experimental design for the present research was based upon Glass, Singer, and Friedman's (1969) study #1. The first of several studies by Glass and his associates, it was presented as an investigation of the "psychic cost of adaptation to an environmental stressor."

In this experiment the "environmental stressor" was noise bursts composed of several different sounds (human speech, office machines) superimposed on each other on tape and delivered through a loudspeaker. Subjects (college students) were tested individually, randomly assigned to one of four noise conditions or a no-noise control group. The noise was varied in the different conditions for intensity (loud, 110 decibels; soft, 56 decibels), and for predictability. Subjects in the predictable noise condition (fixed intermittent) received a 9-second burst of noise at the end of each minute for a 23-minute period. Subjects in the unpredictable (random intermittent) noise condition received the same total amount of noise during the 23-minute period, but the bursts came at random intervals and were of random duration, between 3 and 15 seconds each.

During the noise exposure period, subjects' performance was measured on three separate standardized cognitive tasks (French, Elkstrom, & Price, 1963), each done in two sections

of equal difficulty. Error rate on the first section of each task was compared with the second, yielding a measure of adaptation to the noise stimulation--the decrement in the number of errors. In this way the 23-minute noise exposure period was split in two and performance on the task block in the first 11-1/2 minutes compared with performance in the second. A second measure of adaptation was taken in the form of changes in phasic skin conductance (GSR). It was found that subjects in all four noise conditions showed evidence of adaptation on both physiological and behavioral levels although the behavioral data was only marginally significant. There were no significant differences in adaptation between conditions, indicating that the predictability and intensity of the noise did not significantly affect subjects' capacity for adaptation.

There were significant differences, however, between conditions on two measures of "postadaptive consequences." "Cost of adaptation" measures of persistence or tolerance for frustration (insoluble puzzles) and performance on a task requiring care and attention (proofreading) were taken after termination of the noise. On both measures, a highly significant main effect due to fixed versus random scheduling of the noise emerged, indicating that adaptation to the unpredictable noise, both soft and loud, was significantly more "costly" than adaptation to the predictable noise. That is, subjects exposed to the unpredictable stressor, although

able to adapt, had lower tolerance for frustration and relatively poor proofreading performance after adaptation when compared with subjects exposed to a predictable stressor. In fact, for the frustration tolerance measure, predictable noise conditions did not differ significantly from no-noise controls,<sup>1</sup> indicating that there is hardly any cost of adaptation to predictable noise.

These findings were later replicated with a sample of middle-aged urban residents (Reim, Glass, & Singer, 1971). Glass et al. explained the greater cost of adaptation to unpredictable noise as the result of the feeling of powerlessness that accompanies exposure to an unpredictable and uncontrollable stressor. The ever-present threat of interruption by the unpredictable noise requires constant vigilance, and is thus more taxing on the functional economy of the subject's attention system.

In a study which utilized a primary task (following a target with a steering wheel apparatus) and a subsidiary task (the repetition of stimulus digits at two-second intervals), Finkelman and Glass (1970) found that adaptation to medium intensity noise (80 decibels) affected subsidiary task performance in the unpredictable noise condition without interfering with the primary task. The predictable noise condition showed significantly less decrement in performance. The

---

<sup>1</sup>Differences between predictable noise conditions and controls on the proofreading task were not reported.



decrement in subsidiary task performance in the unpredictable noise condition was explained as the result of an "information overload" situation. Subjects' attentional channels were taxed by adaptation to the unpredictable stressor. This made them unable to maintain previous levels of primary and subsidiary task performance in the face of the information input of an unpredictable stressor. The cost of selective attention to the tasks in the fixed intermittent (predictable) noise condition was not as great, however, and performance could be successfully maintained.

Research with noise has shown that if subjects exposed to unpredictable noise feel that they have control over the noise (random intermittent/perceived control) post-adaptive stress effects are significantly reduced. Glass, Singer, and Friedman (1969) and Glass, Reim, and Singer (1971) investigated perceived control in studies in which subjects were told they could stop the noise directly at any time by pressing the provided button, and in which indirect control could be exercised through a partner subject (confederate) who possessed a control button. Perceived control significantly reduced the negative aftereffects of adaptation to uncontrollable noise in both indirect and direct control situations (Glass & Singer, 1972; Mayhew, 1972).

Other studies have shown that perceived control leads to a reduction in the perceived aversive quality of other noxious stimuli (Averill, 1973). White noise (Corah & Boffa,



1970) was reported less noxious and caused less increase in GSR in the perceived control situation. Self-administered shock (Mowrer & Vieck, 1948) produced smaller GSR deflections and was preferred by subjects (Pervin, 1963) to shock delivered by the experimenter. Self-controlled (intensity) shock (Staub, Tursky, & Schwartz, 1971) was also found to be more tolerable than shock delivered by the experimenter. Subjects who chose to remain in the experimental situation evaluated shock as less painful (Zimbardo, 1969). This result was explained as a function of cognitive dissonance, but can also be seen as a personal control effect. Information about shock apparatus and the nature and effects of shock, explained by the authors (Staub & Kellest, 1972) as increasing the predictability of the shock, increased subjects' tolerance for shock and increased the intensity of shock necessary before subjects evaluated it as painful. Indices of stress arousal decrease (Azrin, 1958; Seligman, Maier, & Solomon, 1971; Geer, Davison, & Gatchel, 1970) when the non-occurrence of a stressor is made contingent on the subject's response, thus providing a perceived control situation.

All of these studies point to a relationship between perceived predictability, personal control and the stressfulness of potentially aversive stimulation. The tendency for individuals to be less disturbed by predictable stressors or stressors that are perceived to be under personal control seems to hold across subjects, and, as noted by Lefcourt

(1975), across several species including rats, dogs and monkeys.

One final study which bears mention in relation to situational variables concerns the effect of personal control of present behaviors on tolerance for a concurrent noxious stimulus. Kanfer and Seidner (1973) found that subjects who presented a series of slides to themselves while holding one hand in ice-water were capable of tolerating exposure of one hand to cold longer than subjects to whom slides were presented by the experimenter. This study suggests that a sense of control over one's present behavior can enhance stress tolerance even if the controlled behavior is not directly related to the noxious stimulus itself. Thus the belief that there is control in some aspects of the present context or situation may enhance one's ability to adapt to the aspects of the situation which are not under personal control. This raises the central question to which this thesis is addressed: To what degree are individual differences significant in human response to stress? Subjects who carry a generalized expectancy for internal locus of control into a stressful situation may respond differentially to that situation. A generalized expectancy for control of reinforcement might enhance one's ability to tolerate stress and capacity to function in a stressful situation since the expectancy implies an understanding of the contingencies of reinforcement in other aspects of the individual's present context or life

situation; it might also reflect a cognitive style which, by coping adaptively, potentially renders stressful situations less aversive. The personality construct assessing beliefs about internal versus external locus of control is a measure of this generalized expectancy.

The concept of locus of control was clearly defined in Rotter's (1966) monograph:

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

As Phares (1973) has explained, I-E is a generalized belief regarding the connection between one's behavior and the occurrence of reward and punishment. An individual's score on an I-E scale reflects his/her place on the continuum of internality-externality. The higher the score, the more external the person. In any given situation, the expectancy that a given behavior will lead to a given reward is determined by the locus of control expectancy ( $GE_{1e}$ ) in conjunction with two other factors: (1) the previous frequency of reward in this situation ( $E'$ ); and, (2) the previous frequency of similar rewards in other situations ( $GE_r$ ). This was expressed by



Phares (1973) in the following formula:

$$E_{s_1} = \frac{f(E' + GE_r + GE_{le} + \dots + GE_n)}{N_{s_1}} \quad (\text{p. 3})$$

Locus of control, or I-E, has, as an individual difference variable, been related to a variety of behaviors. The scope and variability of this work has been well documented in various reviews (Lefcourt, 1966, 1972, 1975; Joe, 1971; Strickland, 1973; Phares, 1973, 1976; Hill, Chapman, & Wuertzer, 1974).

Most researchers agree that internals exhibit more adaptive behavior in general. This can be seen as reflecting a positive learning history in which the individual has made the causal connection between his/her behaviors and the rewards and punishments that follow. The making of causal connections allows the individual to evaluate the efficacy of his/her actions, thus increasing the probability of adaptive behavior change. "Internality" has been related to an impressive array of positive attributes including academic achievement (Crandall, Katovsky, & Crandall, 1965; Coleman et al., 1966; McGhee & Crandall, 1968; Nowicki & Strickland, 1973), good psychological adjustment (Feather, 1967; Hersch & Scheibe, 1967; Platt & Eisenman, 1968; Shipe, 1971; Powell & Vega, 1972), tendency to seek and use situation-relevant information (Seeman & Evans, 1962; Seeman, 1963; Davis & Phares, 1967; Phares, 1968; Lefcourt & Wine, 1969), the tendency



toward independent judgment (Getter, 1966; Ritchie & Phares, 1969; Hjelle & Clouser, 1970; Biondo & MacDonald, 1971; Gozali & Sloan, 1971), and keen awareness of reinforcement contingencies (Lefcourt & Wine, 1969; Strickland, 1970; Jolley & Speilberger, 1973) to name a few.

On the basis of studies concerning locus of control as a variable in cognitive style it seems likely that highly internal subjects would be more capable of maintaining persistent, focused attention in the face of noxious, distracting stimuli. Studies which investigated individual differences in information seeking have shown that internals tend to seek more information regarding their personal circumstances than externals in a sample of reformatory inmates (Seeman & Evans, 1962) and a sample of tuberculosis patients (Seeman, 1963). Davis and Phares (1967) found that internals in an experimental situation sought more task related information, and Phares (1968), Lefcourt and Wine (1969) and Ducette and Wolk (1973) found internals to seek and use information in experimental situations more persistently and effectively than externals. These findings suggest a tendency on the part of internals to focus attention on their environmental circumstances. In fact, Lefcourt, Lewis, and Silverman (1968) demonstrated that, in a skill situation, internals paid more attention to the experimental tasks as measured by the amount of time their eyes were focused on them. In the same study,

internals, in the skill condition, reported more task-relevant thoughts than externals. Waters (1972) also reports that internals, especially males, have fewer attention breaks than externals during performance on a skill task.

Lefcourt and Wine (1969) found that in an ambiguous situation internals are "more likely to be attentive to cues which provide information that may help to reduce uncertainty." Internals spend more time than externals in deliberating before making decisions (Rotter & Mulry, 1965). How much time they spend in decision making depends upon the level of difficulty of the task (Julian & Katz, 1968).

Besides what seems to be a tendency to attend to situations, gather information, and thoughtfully consider decisions on the basis of available information, internals show greater perceptual sensitivity (DuCette & Wolk, 1973), greater capacity for incidental learning (Wolk & DuCette, 1974), and the tendency to form and test hypotheses in ambiguous situations (Lefcourt, Gronnerud, & McDonald, 1973). Ude and Volger (1969) report internals more aware of reinforcement contingencies in conditioning situations, and both Butterfield (1964) and Brisset and Nowicki (1973) found internals to report more constructive responses to frustration than externals.

These results point to a cognitive style for the internal which is actively attentive and engaged in interaction with his/her environment. Clearly this follows from an ex-

pectancy for internal control, which implies previous experience of the ability to predict and control reinforcements. This kind of active coping style described for the internal implies self-control, an ability to focus and control attention, and a tendency to actually try to predict and control situations as well as carry an expectancy for control. This is further substantiated by data presented by Julian, Lichtman, and Ryckman (1968) which demonstrates internals' experimental choice behavior to be aimed at controlling outcomes, and by studies (Bailer, 1961; Zytoskee, Strickland, & Watson, 1970; Strickland, 1972a, 1973b) which report internals' greater tendency to delay gratification. It has been noted in several articles that externals, whose expectancy is that control of reinforcements is in the hands of luck, fate, chance, or powerful others, seem to attend to experimental situations better under chance conditions (Lefcourt, Lewis, & Silverman, 1968), and that their performance improves when cues in an ambiguous situation are explicated (Lefcourt & Wine, 1969; Lefcourt, 1967). Wolk and DuCette (1974) report that, although externals' performance improves with explication of a dual proofreading/incidental learning task, it never equals the performance of internals. As they put it:

The external, relative to the internal, possesses a less active perceptual-attentive system, . . . [and] also fails to use this system as efficiently as possible, especially under conditions of ambiguity (p. 99).



Here, competing tasks and competing instructions may be seen as distracting, both together demanding more attention than the external's limited information-attention capacity can handle, and interfering with performance in a way analogous to noise information overload in the Finkelstein and Glass (1970) subsidiary task paradigm.

The attentive, cognitively active internal who engages his/her environmental situation has also been found to be more persistent in experimental task situations. Several studies (DuCette & Wolk, 1972; Waters, 1972; Strickland, 1972b; Shepel & James, 1973; Mischel, Zeiss, & Zeiss, 1974) report consistent findings in this direction. The result that internals are more persistent has been found most strongly with males in skill conditions. In chance conditions, externals seem to display greater persistence, at least in relation to chance condition performance of internals. Thus, as Shepel and James (1973) maintain, "persistence is greatest when the task situation is congruent with subjects' locus of control expectancy." DuCette and Wolk (1972) in reporting a study which found, along with low persistence, that externals exhibit extreme risk taking behavior and atypical LOA shifts, remark that the external's risk taking behavior, low persistence, preference for chance situations, etc. prevent the positive feedback that might affect a change in locus of control expectancy. Thus the external,



in a way that seems analogous to the neurotic's self-fulfilling prophecy, never discovers his/her ability to control reinforcement outcome.

Studies which have investigated locus of control and response to influence attempts have shown that internals tend to resist subtle attempts at influencing their behavior (Gore, 1963; Getter, 1966; Strickland, 1970; Biondo & MacDonald, 1971; Doctor, 1971; Jolley & Spielberger, 1973). There is strong evidence that internals respond to personal restrictions on their freedom (Cherulnik & Citrin, 1973) in a manner described by Brehm (1966) as "reactance". Several studies show externals to be more responsive to attempts at attitude change by persuasive communications (Ritchie & Phares, 1969; Hjelle & Clouser, 1970; Biondo & MacDonald, 1971; Ryckman, Rodda, & Sherman, 1972; Sherman, 1973) especially from "expert" sources, and that externals are more conforming in general (Crowne & Liverant, 1963; Gozali & Sloan, 1971). Johnson, Ackerman, Frank, and Fionda (1968) report that internals produce more TAT themes with heros that resist pressure and temptation.

Internals seem less suggestible, more independent in their judgment and, as demonstrated by Pines and Julian (1972), more oriented towards mastery of the environment through gathering and processing as much information as possible than towards pleasing the experimenter and being re-

sponsive to social influence, as is the case with externals.

While no work has been reported to this author's knowledge on the specific relationship between I-E and distractibility, several studies (Stein & Langer, 1966; Peixotto & Rowe, 1969; Golden & Golden, 1974a, 1974b) relate degrees of psychopathology to susceptibility to cognitive interference as measured by the Stroop Color Word Test. One explanation for these findings was offered by Peixotto and Rowe (1969), who found greatest susceptibility to interference (distractibility) in schizophrenics, middle scores for neurotics, and low scores for normals. They postulate that psychopathology is related to the ability to attend to the environment and inhibit distractions. There is a clear parallel here to the I-E literature which suggests that externals, who attend less to mastery of the environment and exhibit more psychopathology (Powell & Arnold, 1972; Lefcourt, 1975; Abramowitz, 1969; Nadich et al., 1974; Cromwell et al., 1961) and debilitating anxiety (Feather, 1967) are likely to be more distractable.

Indeed, as several studies presented by Lefcourt and his associates suggest, internals are more likely to use humor to cope with a potentially anxiety-provoking surprise situation. Externals, on the other hand, tend to become serious and annoyed (see Lefcourt, Sordoni, & Sordoni, 1974; Lefcourt, 1976 in preparation). These findings suggest that internals may find it easier to cope with stress.

Selective attention, as investigated in the information

processing literature by Cherry (1953), Broadbent (1958), Treisman (1965), and discussed by Norman (1968, 1969), Deutsch and Deutsch (1963), and Neisser (1967), is the cognitive process through which incoming stimuli are filtered, and attentional channels are chosen and maintained. It follows from the above line of reasoning that internals should be more capable of maintaining selective attention in the stress of a distracting information-overload situation.

We might expect, also, that internals' greater ability to focus and maintain attention in spite of an environmental stressor would lead to lower adaptation cost, as defined by Glass et al. (1969). That is, if selective attention is easier for internals because of a more adaptive cognitive style, it is likely that maintaining selective attention (adaptation to noise) will be less taxing on the attentional system of the internal as compared with the external, resulting in a lower cost of adaptation.

In summary, it was the purpose of this study to demonstrate the effects of both situational variables and individual differences on subjects' response to an environmental stressor--undifferentiated noise. Employing a modified version of the experimental design used in Glass et al.'s (1969) study #1, adaptation to predictable and unpredictable noise as well as the cost of such adaptation was measured and considered in the light of individual differences in locus of control among subjects. It was expected, on the basis of the



differences in cognitive style outlined above, that internals would be able to adapt to the noise at less post-adaptive cost than externals across experimental conditions, and that unpredictable noise would result in more difficult adaptation at a higher cost across subjects.

Design. Subjects were randomly assigned to one of three noise conditions: No-noise, predictable noise (fixed intermittent), and unpredictable noise (random intermittent). Subjects within each condition, under the appropriate noise treatment, received measures of adaptation during the noise exposure period and measures of adaptation cost after termination of the noise.

-----  
 Insert Figure 1 about here  
 -----

Measures of adaptation. The major difference between the design for the present study and the original Glass, Singer, and Friedman (1969) Study #1 design, besides the introduction of the locus of control individual difference variable, is the method of measuring adaptation to the noise.

The original study employed physiological measures as well as behavioral measures of adaptation. Glass and Singer (1972) report that three cognitive tasks--Number Comparison, Addition, and Finding A's--were used during the noise adaptation period of several of their studies, including Glass, Singer, and Friedman (1969). These were relatively simple



Figure 1. Experimental Design Plan

	No-Noise	Predictable Noise	Unpredictable Noise
Males	Internals 12*	12	12
	Externals 12	12	12

Within each cell, all subjects received three forms of two measures of adaptation: anagram and digit symbol lists--spaced in three trial blocks during the noise exposure period.

After termination of the noise, all subjects were given two measures of adaptation cost: quality of proofreading performance and tolerance for frustration.

---

\*Due to sampling problems, the actual cell frequencies were uneven. For the actual distribution of subjects see Figure 6.

cognitive tasks, presented in two parts of equal difficulty. During the first half of the noise session, subjects worked on the first part of each test, and during the second half of the 23-minute noise exposure period, subjects worked on the second part of each task. This was expected to provide a behavioral measure of noise adaptation between the first and second 11.5 minutes of noise exposure in the form of a decrement in the number of errors made on each task.

The evidence for adaptation on these behavioral measures alone was not very strong. Physiological measures of adaptation (GSR and Vasoconstriction changes) were highly significant, indicating adaptation to the noise, but the Number Comparison test was the only cognitive task used in which the decrement in the number of errors was significantly different from zero. The Number Comparison test was also presented first of the three tasks in each of the studies reported. The Addition test and the Finding A's test did not seem to be affected by the noise.

It was suggested by the investigators (Glass & Singer, 1972) that "high-intensity noise has minimal effects on simple task performance." While these results are in agreement with other investigators (Kryter, 1950, 1970; Broadbent, 1957), it is noteworthy that only the first of three measures (Number Comparison), which cut in half a seemingly arbitrary 23-minute period of noise exposure, should be significant. In addition to the fact that the tasks used by Glass et al.

to measure adaptation behaviorally were not cognitively complex enough to be effectively sensitive, it may be that the adaptation process takes place in the early part of the 23-minute period and levels off early enough to prevent task measures after the first task from reaching significance. Indeed, physiological evidence presented in several of the Glass et al. tables (Glass & Singer, 1972) indicates that the sharpest changes in GSR as well as vasoconstriction scores took place well within the first half of the 23-minute noise exposure period.

The design of the present study (see Figure #1) is such that it approaches the original Glass et al. paradigm as closely as possible with the exception of the physiological measures, addition of the individual difference variable, and the use of more sensitive behavioral measures of adaptation. Two complex cognitive tasks, both of which require considerable short term memory and attention, were used: Anagram Solutions and Digit Symbol. These were presented in a sequence designed to pick up adaptation performance changes during the early part of the 23-minute noise exposure period. This was accomplished by breaking the noise exposure period into six equal parts, much as was done in the Glass et al. studies, but instead of presenting each of three tasks twice, cutting the 23-minute period in half, two tasks were presented in alternation three times, breaking the 23-minute period into thirds, and providing three measures of adaptation staggered

across the 23-minute period.

Hypotheses. During the noise exposure period the hypotheses were that:

1. Performance levels will drop across subjects in the two noise conditions (decrement) as compared with the no-noise condition for the first task block.
2. Performance levels will increase across subjects in the two noise conditions (adaptation) for the second and third task blocks.
3. Internals' performance levels will be higher than externals' across experimental conditions.

After termination of the noise the hypotheses were that:

4. Subjects in the unpredictable noise condition will show lower performance levels on the proofreading task and lower tolerance for frustration than subjects in the predictable noise and no-noise conditions.
5. Internals will show higher performance levels on the proofreading task and higher tolerance for frustration than externals across experimental conditions.

Situational variable hypotheses (#1, 2, and 4) were based on the original findings of Glass et al. (1969) Study #1 with this research design. Predictions of differences between internals and externals in performance levels during the noise exposure period (Hypothesis #3) and predictions of differences on measures of cost adaptation (Hypothesis #5)



were based on differences in cognitive style between internals and externals outlined in the above literature review. These differences in cognitive style lead to the expectation that stress adaptation should be easier and less costly for internals as compared to externals.

## C H A P T E R    I I

## METHOD

Subjects. Subjects for this research were 72 men from University of Massachusetts' undergraduate psychology classes. Male subjects were used because findings in studies of persistence reviewed above have shown more consistent results with males. Participation in the study served as partial fulfillment of course requirements.

Experimenter. The experimenter was a male caucasian graduate student of Clinical Psychology from the University of Massachusetts.

Noise apparatus. Three types of noise stimuli were used: (a) fixed intermittent (predictable), in which noise bursts of approximately 9 seconds duration were presented at the same point each minute over a 23-minute period; (b) random intermittent (unpredictable), in which the intervals between the 23 noise bursts were random as with the length of the bursts themselves; and (c) no-noise, in which only the background sound of the tape recorder apparatus was heard. The noise was delivered through two-ear headphones (Grason-Stadler model D30 matched left and right) from the standardized tape recordings made from the noise that was used in the original Glass et al. studies. Both the random intermittent and the fixed intermittent noise was delivered at a peak level of 90 decibels and consisted of the following

sounds superimposed upon one another: (a) two people speaking Spanish; (b) one person speaking Armenian; (c) a mimeograph machine; (d) a desk calculator; and (e) a typewriter. These sounds were not, however, distinguishable on the final tape recording.

Appendices I and II show the placement of noise bursts during the noise exposure period for the predictable and unpredictable conditions respectively. In the fixed condition, the noise was presented at the same point of every minute of the 23-minute period. In the random condition, delivery of the noise bursts was randomized by dividing each minute into quarter parts, and then randomly assigning a burst to a different part of each one-minute period. The length of these noise bursts was also varied in random fashion ranging from 3 seconds to 15 seconds. However, the total time to which subjects were exposed to noise was identical in both the random and the fixed condition (3 minutes, 17 seconds). This procedure is similar to that described by Glass et al. (1969).

Procedure. Subjects were ordinarily tested three (3) at a time. On some occasions, when scheduled subjects did not appear, the experiment was run with only one or two subjects. Upon entering the laboratory they were told that "this is a study to test the effects of auditory stimuli on human performance."

Experimenter asked subjects to be seated in individualized cubical-like desks, designed to prevent them from dis-

tracting each other. Each desk was provided with a set of headphones, three pencils, and a packet including questionnaires and standardized cognitive tasks to be used during the experiment.

Subjects were asked first to fill out three brief paper and pencil items: The Rotter Internal-External Locus of Control Scale (Rotter, 1966); an information sheet which gathered some demographic data and information regarding subjects' past and present exposure to environmental noise. Subjects also completed an experiment consent form (See Appendix III, Packet). When subjects had completed these, the experimenter re-entered the room and asked subjects to put on the headphones provided. Experimenter then returned to the control room and switched on taped standardized instructions for the cognitive tasks, which were followed by practice trials and then the onset of the noise. Instructions to stop working and begin the next task were placed on the tape at the appropriate intervals during the noise exposure period, but did not at any time overlap the noise itself.

Measures of adaptation. Two relatively complex cognitive tasks were presented to the subjects during the 23-minute noise exposure period: Anagram Solution and Digit Symbol. Each task was presented three times, Anagram Solution for four minutes, thirty seconds (4:30) and Digit Symbol for two minutes and fifteen seconds (2:15) each time. Task segments were matched for difficulty and counterbalanced



to prevent order effects, so that performance comparisons on the three segments of each task would yield a measure of noise adaptation.

Anagram solution. Three lists of fifty four-letter anagrams were used. These lists were matched for difficulty, and chosen on the basis of speed and accuracy scores from among six fifty-word lists completed by 27 subjects working under normal conditions. To obtain pre-test data, the six lists were administered after subjects were given a practice list to prevent practice effects from interfering with the standardization norms. Three lists were administered to each subject. The order of list presentation was varied to determine the effects of order of presentation on performance. The results of this pretest are presented in Table 1.

-----  
 Insert Table 1 about here  
 -----

Each of the anagram lists used was comprised of 50 common simple English words of descending frequencies between 145 and 19 per million in present day American English as reported in a computational analysis provided by Kucera and Francis (1967) (see Appendix III, Packet).

Word frequency and letter order are primary factors in determining anagram solution times (Mayzner & Tresselt, 1958; Dominowski, 1967; Vinacke, 1974). To prevent subjects' vocabulary from being a factor only highly frequent words were

Table 1  
Results of the Anagram Pretest

	List #					
	<u>1</u>	<u>2</u> *	<u>3</u> *	<u>4</u>	<u>5</u> *	<u>6</u>
N	13	12	12	14	15	15
M	18	14	17	17	15	20
SD	10	5.4	5.5	10.2	7.4	9.1

Lists 2, 3 and 5 were selected for use as measures of adaptation on the basis of the data presented in the above table. It was decided that the three lists whose means were closest together and whose standard deviations were smallest, would provide the most reliable and closely matched measures.

---

\*Indicates selected list.

chosen, excluding plurals, proper names, and words in which one letter is repeated twice. These words were placed in six letter-order combinations designed to make solution dependent upon present cognitive activity (attention and short-term retention) rather than previous learning. The six combinations --2413, 2143, 3142, 3241, 4132, 4213--arrange the letters of the original word such that not more than one of the letters remains in its original position, no two letters are in the same order as in the original word, and the letters are not presented in simple reversed order.

A practice list of 50 words of similar difficulty (see Appendix III, Packet) was given to subjects before the beginning of the noise exposure period to prevent practice effects during the noise exposure period. The number of anagrams on each list was more than could be completed in the time allotted. Scores are based upon the number of anagrams completed and the number of errors made during each time-limited period (4:30 minutes for each list).

Digit Symbol. The second cognitive task requiring attention and short-term retention was Digit Symbol (see Weschler, 1955, 1958; Rapaport, Gill, & Schafer, 1968).

Four forms of the Digit Symbol were prepared using symbols as similar as possible to those used in the WAIS and the WISC. These forms were pretested on a sample of ten (10) subjects. To obtain the pretest data, all four lists were presented to each subject and the order of list presentation

was varied to determine the effects of order of presentation on performance. The results of this pretest are presented in Table 2.

-----  
 Insert Table 2 about here  
 -----

Since the means for each form were so close, form 2 was chosen as a practice form and forms 1, 3, and 4 of the test were chosen for use during the noise exposure period. The forms used during the noise exposure period were presented in counterbalanced order. The pretest data also suggested that there would likely be no practice effect operating over the noise exposure period trials.

Counterbalancing. All subjects were presented with the same Anagram Lists and Digit Symbol forms during the noise exposure period. These tasks were, however, presented to different subjects in pre-planned counterbalancing orders to prevent order effects.

All subjects received six tasks during the 23-minute period, in an alternating fashion, with half of the subjects in each condition receiving an Anagram list first and half receiving a Digit Symbol list first. A latin square design was used to counterbalance the order of presentation of the three forms of each task, thus resulting in six task orders within each condition (See Appendix IV).

Measures of cost of adaptation. At the end of the noise



Table 2  
Results of the Digit Symbol Pretest

	A	B	C	D
Means for Digit Symbol by order of presentation N = 10	76	76.1	75.6	77.3
Means for Digit Symbol by Test Form N = 10	76.6	75.5	76.9	76.0

Since differences between means were negligible, forms 1, 3, and 4 were chosen to be test forms. Form #2 served as a practice form.

and completion of the three blocks of cognitive tasks, subjects were told through the earphones that there would be no more noise. They were asked to complete several more tasks, and given instructions for the first of two measures of cost of adaptation (See Appendix III, Packet).

The Glass et al. studies presented in Glass and Singer (1972) report using the tolerance for frustration measure before the quality of performance measure during this part of the experimental design. In the present study, the two cost of adaptation tasks were presented in counterbalanced order, with half the subjects receiving the Proofreading task first, and half doing the Puzzle task first, as shown in the counterbalancing schedule (See Appendix IV).

Quality of performance. To obtain a measure of performance quality on a task which requires careful, focused attention, subjects were asked to detect the errors in a literary passage six pages in length taken from The Death and Life of Great American Cities by Jane Jacobs (1961) and adapted by Glass et al. (see Appendix III, Packet). Subjects were told to read each page carefully, detect and underline the errors, and place a check mark on the end of each line on which an error was detected (see instructions in Packet). The passage contains a total 198 lines with 62 detectable errors, which were introduced deliberately into the text. Errors consist of misspellings, grammatical mistakes, incorrect punctuation, and typographical errors. Subjects were given 15 minutes

during which to work on this task. Quality of performance was measured on the basis of the number of lines read as well as percentage of errors found of the total number of errors which could have been detected given the number of lines read.

Tolerance for frustration. The postnoise task measuring frustration tolerance was adapted by Glass et al. from one used by Feather (1961). It consists of four geometric diagrams printed on 5X7 inch cards, one diagram on each card. The cards were placed face down in front of each subject in piles about one inch high (see Appendix V, Soluble and Insoluble Puzzles).

The task is to trace all the lines of a diagram without tracing any line twice and without lifting the pencil from the figure. Subjects were told that they could take as many trials as they wanted on each puzzle, but that there was a time limit (20 seconds) on how long they could work on each trial (see instructions in Packet). When the subject heard the experimenter say "Next trial, please," over the earphones, subject had to discard the card he was working on and either take another card from the same pile or go on to the next pile and a new puzzle. If subject decided to go on to the next puzzle, he could not return to one he left unsolved. After a successful solution, subject was to go on immediately to the next puzzle.

Two of the puzzles, the first and the third, were mathe-

matically insoluble, even though they appear possible. Trials on these two items are presumed to lead to failure and frustration. The number of trials the subject takes on these items provided a measure of persistence or tolerance for frustration.

In the interest of maintaining a standardized procedure, subjects were provided with a "finished" switch and told to turn on that switch after completion of the last trial on the last puzzle. Subjects were told that this task would be followed by a brief rest period. The "finished switch", when activated, turned on a light corresponding to the subject's earphone number in the experimental control room. When the experimenter saw this light go on, he temporarily disconnected the subject's earphone, stopping for that subject the continuing taped instructions to go on to the next trial each 20 seconds. When all three subjects completed the last puzzle and activated their lights, the tape was moved forward to the taped instructions for the Proofreading task (if the Puzzles task was first) or for the post-experimental questionnaires (see Packet). All headphones were then turned on again.

Debriefing. Subjects were asked to complete a post-experimental questionnaire, which asked for evaluation of the noise on four dimensions: irritating, unpleasant, distracting, unpredictable. An open-ended questionnaire was also completed, which included questions designed to determine if



the subject had any hypotheses regarding the purpose of the experiment, if he had been suspicious of any deception, and what strategy he used to cope with the noise.

When both questionnaires had been completed, the experimenter re-entered the experimental room and led a discussion with the subjects about their reactions to the experiment. He asked if they had encountered any part of the experiment before, and what they believed the experiment was designed to test. A full explanation of the study was then given. Subjects were asked not to discuss the experiment with anyone who might be in it at a later time. All questions were answered, credit slips were distributed, and subjects were thanked for their participation.

## C H A P T E R    I I I

RESULTS

The data analysis to be presented in this section falls logically into several sections which follow the chronological organization of the experiment itself as well as the hypotheses presented above. The analysis includes the results of the replication of several related studies of the effects of predictable and unpredictable noise reported by Glass and his associates as well as an examination of the effects of the locus of control variable on stress adaptation and adaptation cost.

The IE Distribution

The locus of control dimension of the primary analysis of variance and relevant comparisons for the four cost of adaptation dependent measures was based upon scores on the Rotter Internal-External Control Scale for all 72 subjects, split at the median. A histogram of the IE distribution for this sample is presented in Appendix VI.

As a result of the median split, which was performed after all of the data were collected, there is an unequal distribution of subjects among the six Condition X IE cells. Also, it is evident from the histogram presented in Appendix VI that the IE distribution for this sample approaches the classical normal distribution. Thus, the majority of sub-

jects cluster close to the mean of the distribution, yielding very few extreme cases.

Two problems, therefore, were encountered at the outset of this analysis. One, the analysis of variance would not be orthogonal, causing the results to be difficult to interpret (see Myers, 1972; Appelbaum & Cramer, 1974); and, two, the IE factor would not be a very powerful variable statistically, since most of the subjects fall close to the mean of the sample.

To appropriately handle these problems, two sets of analyses were performed on the data for the four cost of adaptation measures, since these measures did yield results for the locus of control factor. The primary analysis was done on the entire sample of 72 subjects with the IE factor split at the median (non-orthogonal), and a secondary analysis was performed with a smaller sub-sample ( $N = 48$ ) comprised of extreme groups with 8 subjects in each of the six condition X IE cells. A cross-tabulation of subjects for each of these analyses is presented in Figures 2 and 2a.

-----  
 Insert Figures 2 and 2a about here  
 -----

### Measures of Adaptation

Anagram solutions. An analysis of variance for repeated measures (BIOMED P2V program) was performed for scores on the three scrambled word lists done by all subjects during the

Figure 2. Crosstabulation of Cells for Full-Sample  
IE Median Split (Non-Orthogonal)

	<u>Conditions</u>			<u>Row Total</u>
	Unpredictable Noise	Predictable Noise	No-Noise	
Internals	15	8	13	36
Male Subjects = 72				
Externals	9	16	11	36
Column Totals	24	24	24	72

Figure 2a. Crosstabulation of Cells for  
IE "Extreme Groups" Analysis

	<u>Conditions</u>			<u>Row Total</u>
	Unpredictable Noise	Predictable Noise	No-Noise	
"Extreme" Internals	8	8	8	24
Male Subjects = 48				
"Extreme" Externals	8	8	8	24
Column Totals	16	16	16	48



noise exposure period. The results of this analysis are presented in Table 3. Only the main effect for the repeated measure was significant ( $F = 7.413$ ,  $p < .001$ ) indicating a change in scores over the three trial blocks. There were no significant main effects for condition, IE or the condition x IE interaction. No significant effects were found for these factors in interaction with the repeated measure.

-----  
 Insert Table 3 about here  
 -----

Anagram errors. A measure of adaptation was also taken in the form of number of errors made on each of the three anagram lists done during the noise exposure period. Results of the repeated measures analysis of variance performed on these error scores are presented in Table 3a. While there was a change in the direction of fewer errors made over the repeated measure factor ( $F = 3.668$ ,  $2/132$ ,  $p < .028$ ). This was the only significant main effect and there were no significant interactions. The data do indicate a trend ( $p = .094$ ) suggesting that externals made more errors than internals on this task.

-----  
 Insert Table 3a about here  
 -----

Digit Symbol performance. An analysis of variance for repeated measures was performed for scores on the three Digit

Table 3  
Analysis of Variance for Anagram Solutions\*

Main Effects

Source	DF	MS	F	Prob. of F.
Condition	2	56.779	<1	
IE	1	384.867	<1	
Condition X IE	2	19.472	<1	
Error	66	423.004		

Repeated Measures Effects

Source	DF	MS	F	Prob. of F.
Repeated Measure	2	119.624	7.414	.001
R X Condition	4	22.701	1.407	
R X IE	2	2.972	.184	
R X Condition X IE	4	30.119	1.867	
Error	132	16.135		

---

\*BIOMED program P2V.

Table 3a  
Analysis of Variance for Anagram Errors\*

Main Effects				
Source	DF	MS	F	Prob. of F
Condition	2	2.955	<1	
IE	1	25.225	2.893	.094 Trend
Condition X IE	2	3.113	<1	
Error	66	8.721		

Repeated Measure Effects				
Source	DF	MS	F	Prob. of F
Repeated Measure	2	5.458	3.668	.028
R X Condition	4	2.009	1.350	
R X IE	2	.982	.660	
R X Condition X IE	4	3.290	2.211	
Error	132	1.488		

---

\*BIOMED program P2V.

Symbol Lists completed by all subjects during the noise exposure period (see Table 4). The repeated measures factor was significant ( $F = 13.998$ ,  $p < .001$ ). While there were no other significant main effects, the effect for the repeated measure x condition factors did yield a significant result ( $F = 5.62$ ,  $p < .001$ ). Cell means by condition over the trial factor for Anagrams and Digit Symbol are plotted in Figure 2.

-----  
 Insert Table 4 and Figure 3 about here  
 -----

Summary of adaptation measures. As can be seen by comparing the plots in Figure 2, the general trend, statistically significant for the Digit Symbol Task, is for an increase in performance in the second and third trial blocks in both noise conditions as was predicted in Hypothesis #2. It would seem, however, that, contrary to the expectation presented in Hypothesis #1, scores in the first trial block for subjects in the two noise conditions are not lower than for the no-noise control group. The implications of this result will be discussed in Chapter IV. Except for the trend ( $p = .094$ ) in the predicted direction for Anagram Errors, the data do not strongly support the prediction in Hypothesis #3 that internal subjects would perform at a higher level than externals.



Table 4  
Analysis of Variance for Digit Symbol \*

Main Effects

Source	DF	MS	F	Prob. of F
Condition	2	1287.863	2.359	
IE	1	80.686	<1	
Condition X IE	2	693.553	<1	
Error	66	947.732		

Repeated Measures Effects

Source	DF	MS	F	Prob. of F
Repeated Measure	2	318.669	13.998	<.001
R X Condition	4	119.796	5.262	.001
R X IE	2	5.909	.250	
R X Condition X IE	4	23.046	1.012	
Error	132	22.765		

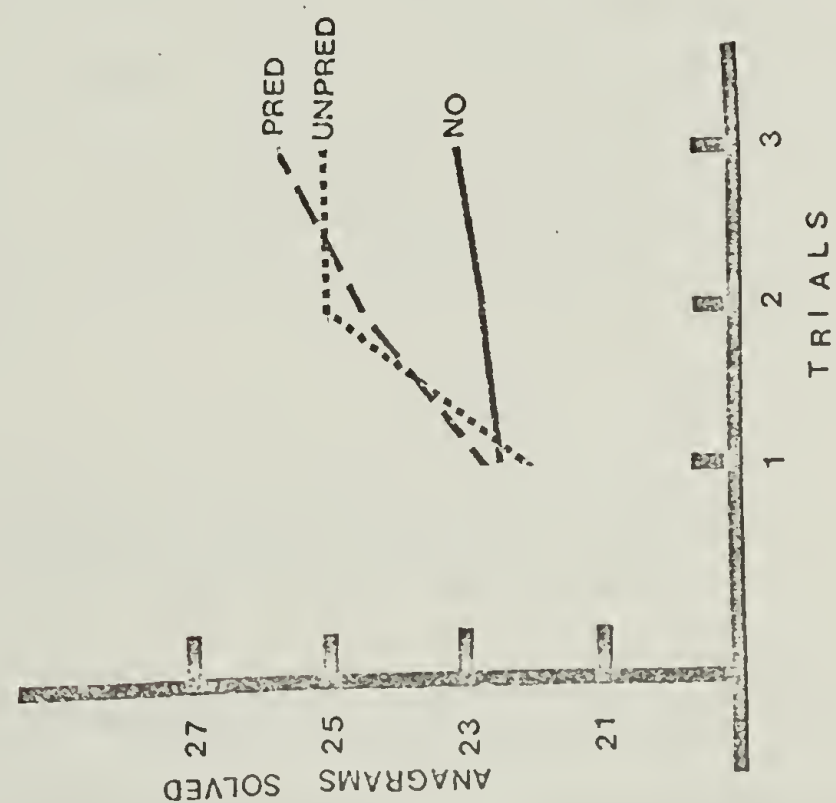
---

\*BIOMED program P2V.

Figure 4. Adaptation Plots.

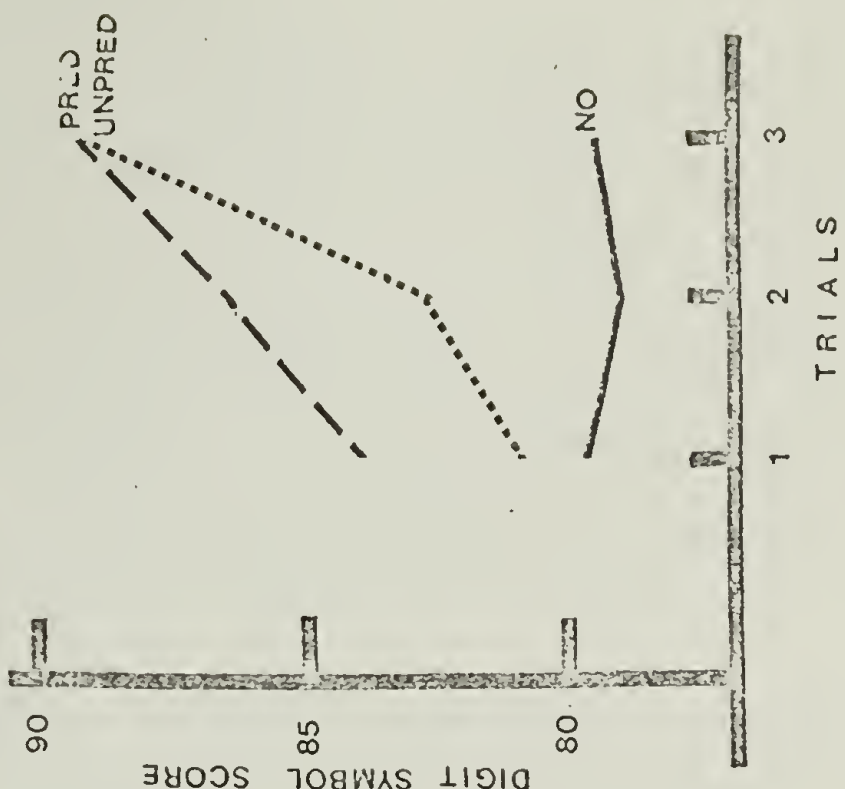
Cell Means for the Anagram Task

Condition	Trials	
	1	3
Unpred	22.2	25.0
Pred	22.8	24.6
No-Noise	22.7	22.8



Cell Means for the Digit Symbol Task

Condition	Trials	
	1	3
Unpred	81.0	82.7
Pred	84.0	86.4
No-Noise	79.7	79.0



## Measures of Cost of Adaptation

As noted earlier, two separate analyses were performed on each of the principal dependent variables to be presented in this section. For each variable reported, therefore, results of the analysis with median split of the full-sample locus of control distribution will be reported first. Results for the orthogonal "extreme groups" analysis will follow for each variable.

Proofreading task. A two-way analysis of variance was performed on the data from the proofreading task for the median-split ( $N = 72$ ) sample as well as for the smaller ( $N = 48$ ) orthogonal "extreme groups" subsample. The results of these analyses appear on Table 5 and Table 5a.

Scores for number of lines read on the proofreading task yielded no significant differences across either the condition or the IE factor. There was also no significant condition X IE interaction. The by condition result is in keeping with previous findings reported by Glass et al. No IE differences were predicted.

-----  
Insert Tables 5 and 5a about here  
-----

Table 6 and Table 6a show the results of the analysis of variance for the proofreading quality of performance scores: percentage of errors found given number of lines read. Cell means for the two analyses are listed on Figure 3 for the

Table 5

Analysis of Variance for Proofreading Number of Lines Read\*

Source	DF	MS	F	Prob. of F
Condition	2	1916.107	1.268	
IE	1	12.357	<1	
Cond. X IE	2	1268.551	<1	
Error	66	1511.371		

---

\*SPSS ANOVA Program.



Table 5a

Analysis of Variance for Proofreading Number of Lines Read  
for Extreme Groups\*

Source	DF	MS	F	Prob. of F
Condition	2	163.583	<1	
IE	1	188.021	<1	
Cond. X IE	2	2332.333	1.530	
Error	42	1524.467		

---

\*SPSS ANOVA Program.

full sample, Figure 3a for "extreme groups". The analysis of variance done on these data failed to yield the significant by condition result ( $F = 1.076$ ,  $2/11$ , n.s.) predicted in Hypothesis #4. The locus of control factor did produce a difference in the expected direction across conditions. This result was a trend, marginally significant in the full sample analysis ( $F = 3.738$ ,  $2/66$ ,  $p < .054$ ), and significant at  $p < .027$  in the analysis of "extreme group" data ( $F = 5.099$ ,  $2/42$ ).

-----  
 Insert Tables 6 and 6a about here  
 -----

Internals' proofreading performance scores were higher than externals in all three experimental conditions (see Figures 4 and 4a). This difference is a weak trend for the median split analysis in the unpredictable noise condition only ( $F = 3.291$ ,  $1/22$ ,  $p < .083$ , trend). The "extreme group" analysis yielded a significant difference between Internals and Externals ( $F = 5.112$ ,  $1/14$ ,  $p < .040$ ) in the unpredictable noise condition. Differences between internals and externals in proofreading performance were not significant in either the predictable noise or the no-noise condition taken separately.

-----  
 Insert Figures 4 and 4a about here  
 -----

The contrasts reported above and all other contrasts be-

Table 6

Analysis of Variance for Proofreading Performance:

Full Sample\*

Source	DF	MS	F	Prob. of F
Condition	2	117.105	<1	
IE	1	831.252	3.738	.054 Marg.
Condition X IE	2	171.610	<1	
Error	66	222.368		

---

\*SPSS ANOVA Program.

Table 6a

Analysis of Variance for Proofreading Performance:

Extreme Groups\*

Source	DF	MS	F	Prob. of F
Condition	2	234.646	1.076	
IE	1	1111.687	5.099	.027 Sig.
Condition X IE	2	210.437	<1	
Error	42	218.003		

---

\*SPSS ANOVA Program.



Figure 4

Cell Means for Proofreading Performance.

	Unpredictable -Noise	Predictable Noise	No-Noise	All
Internal	69.3	67.9	60.6	65.8
External	58.1	58.5	59.6	58.8
All	65.1	61.6	60.2	62.3

Figure 4a

Cell Means for Proofreading Performance: Extreme IE

	Unpredictable Noise	Predictable Noise	No-Noise	All
Internal	74.5	67.9	59.6	67.3
External	57.8	58.0	57.4	57.7
All	66.1	62.9	53.5	62.5

tween cell means in this study are reported without statistical correction for the probability of at least one Type I error. That is, although each statistical test used here may have a probability of Type I error of .05, a number of tests are being performed. This changes the probability that if the null hypothesis is rejected, the result may have been caused by chance and a Type I error made. Therefore, only results of  $p < .05$  for planned analyses of variance, and  $p < .02$  for post hoc comparisons will be reported as significant. Results at these levels still should and will be interpreted conservatively.

Summary of results from the proofreading task. As expected, no significant effects were present for condition, IE or condition X IE factors on the number of lines subjects read on the proofreading task. For the percentage of errors found, quality of proofreading performance yielded no significant condition effect. Thus the proofreading task provided no support for the prediction in Hypothesis #4, that subjects in the unpredictable noise condition would show lower performance levels than subjects in the predictable and no-noise conditions. Evidence supporting Hypothesis #5, that internals' quality of performance on the proofreading task would be superior to that of externals was found across conditions (see Figures 4 and 4a). These differences were strongest in the "extreme groups" analysis, especially in the unpredictable noise condition.

### Tolerance for Frustration

The frustration tolerance task consisted of a series of four geometric line puzzles (see Appendix V). On each of the puzzles the subject was permitted to take as many trials as he wished. Puzzles #1 and #3 were mathematically insoluble. The number of trials taken by a subject on these puzzles was considered a measure of persistence or tolerance for frustration. All subjects were successful in solving puzzles #2 and #4. Analysis of variance performed on the data for each of these puzzles yielded no differences of note for condition, IE or a Condition X IE interaction. Results of the analysis of variance and a breakdown of cell means for each of these puzzles are presented in Table 7 and Table 8.

-----  
 Insert Tables 7 and 8 about here  
 -----

Puzzle #1. Analysis of variance on data for all subjects on Puzzle #1 are presented in Table 9. These results show a weak trend ( $F = 2.297, 2/66, p < .107$ ) for the condition factor. There were no significant IE or interaction effects. When "extreme group" data were considered, however, (see Table 9a) effects for the condition factor and the condition X IE interaction were significant beyond the .05 level ( $F = 3.390, 2/42, p < .042$  cond.;  $F = 4.653, 2/42, p < .015$  interaction. The locus of control factor accounts for a trend in the data ( $F = 3.797, 1/42, p < .055$ ) which approaches signi-



Table 7

Analysis of Variance and Cell Means for First Soluble Puzzle:

Puzzle #2\*

Source	DF	MS	F	Prob. of F
Condition	2	2.479	<1	
IE	1	.000	<1	
Condition X IE	2	1.315	<1	
Error	66	2.669		

	Unpredictable Noise	Predictable Noise	No-Noise
Internal	2.53	1.75	2.23
External	2.67	2.19	1.73
.	2.58	2.04	2.00

Table 8

Analysis of Variance and Cell Means for Second Soluble Puzzle:  
Puzzle #4\*

Source	DF	MS	F	Prob. of F
Condition	2	2.720	<1	
IE	1	1.788	<1	
Condition X IE	2	9.909	<1	
Error	66	11.231		

	Unpredictable Noise	Predictable Noise	No-Noise
Internal	4.00	4.25	3.54
External	3.22	2.81	4.64
	3.71	3.29	4.04

---

\*SPSS ANOVA Program.

ficance.

-----  
 Insert Tables 9 and 9a about here  
 -----

Figure 4 and Figure 4a show plotted cell means for the all-subjects and "extreme groups" analyses respectively. Post hoc tests of differences between means were performed on these data to determine the nature of the effects reflected in the analysis of variance results. While the results of contrasts such as these must be interpreted conservatively, they may be useful in providing some indications of the trends in the data.

-----  
 Insert Figures 5 and 5a about here  
 -----

Looking first at between-condition differences across the IE factor, for both the full-sample and "extreme groups" analyses, there was considerable difference in the predicted direction between scores for subjects in the unpredictable noise condition and subjects in the no-noise condition (full sample:  $t = -.2198$ ,  $df = 69$ ,  $p < .031$ ; "extreme groups":  $t = -2.346$ ,  $df = 45$ ,  $p < .023$ ), although these differences must be considered marginally significant. Comparisons between unpredictable noise and the average of the predictable and no-noise conditions taken together also were noteworthy, yielding trends with  $p < .05$  in both analyses (full-

Table 9

Analysis of Variance for Insoluble Puzzle: Puzzle #1\*

Source	DF	MS	F	Prob. of F
Condition	2	255.968	2.297	.107 Trend
IE	1	63.241	<1	
Condition X IE	2	149.483	1.347	
Error	66	111.417		

---

\*SPSS ANOVA program.



Table 9a

Analysis of Variance for Insoluble Puzzle: Puzzle #1\*  
for Extreme Groups

Source	DF	MS	F	Prob. of F
Condition	2	154.021	3.390	.042
IE	1	172.521	3.797	.055 Marg.
Condition X IE	2	211.396	4.653	
Error	42	45.432		

---

\*SPSS ANOVA Program.

Figure 5. Plotted Cell Means for Puzzle #1.

		Cell Means		N=72	
		<u>Condition</u>			
		Unpred	Pred	No	All
<u>I-E</u>	Internal	12.7	12.8	15.2	13.6
	External	8.8	16.4	21.1	15.9
	All	11.2	15.2	17.9	14.8

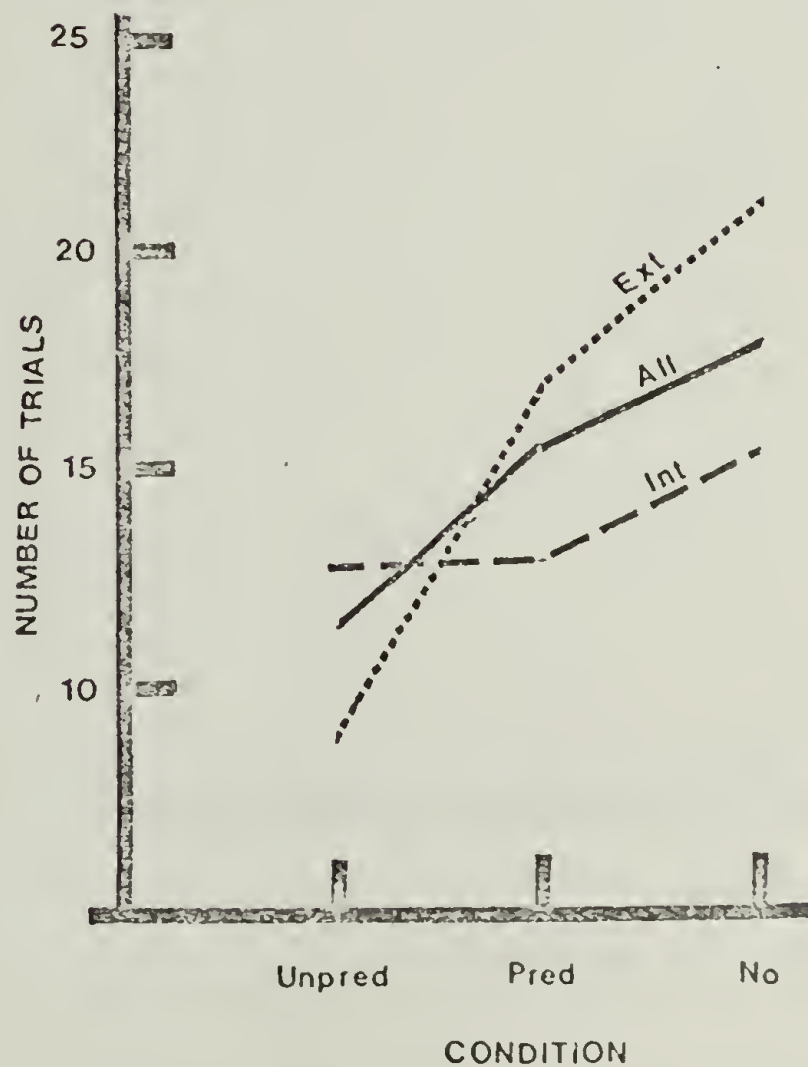
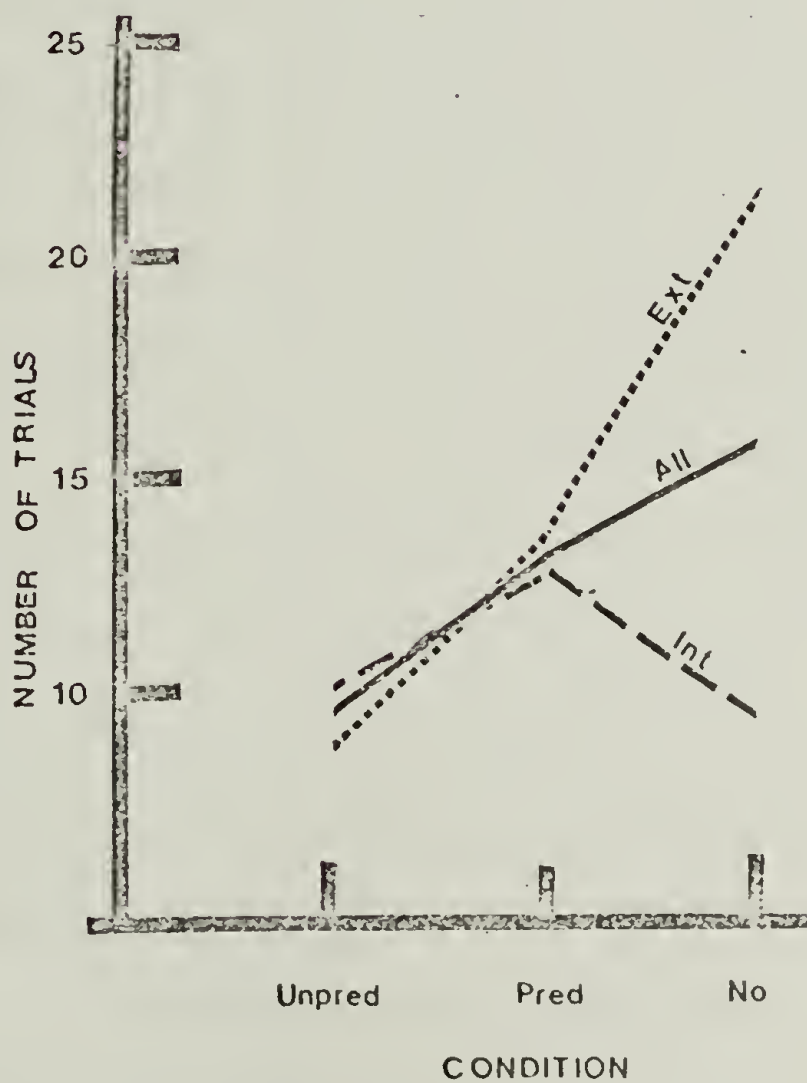


Figure 5a. Plotted Cell Means for Puzzle #1: Extreme I-E.

		Cell Means		N=48	
		<u>Condition</u>			
		Unpred	Pred	No	All
<u>I-E</u>	Internal	10.1	12.8	9.6	10.8
	External	8.9	13.3	21.8	14.7
	All	9.5	13.0	15.7	12.7



sample:  $t = -2.025$ ,  $df = 69$ ,  $p < .047$ ; "extreme groups":  $t = -2.121$ ,  $df = 45$ ,  $p < .039$ ). There were no significant differences between predictable noise and no-noise or predictable and unpredictable noise in either the full-sample or the "extreme groups" analysis.

When the two noise conditions were compared with the no-noise condition a marginally significant difference was found (full sample:  $t = -1.781$ ,  $df = 69$ ,  $p < .079$ ; "extreme groups":  $t = -1.943$ ,  $df = 45$ ,  $p < .059$ ). Since this and the other contrasts are not independent, the strength of the unpredictable vs. no-noise contrast contributes to these results. This makes interpretation of these data complicated. Further discussion of this will follow in Chapter IV.

It can be concluded that these comparisons provide some evidence in support of Hypothesis #4, which predicted lower persistence or tolerance for frustration in the unpredictable noise condition as compared with the predictable and no-noise conditions. The result is complicated by the failure of the unpredictable and predictable noise conditions to differ significantly from each other. The implications of these results will be considered in more depth in Chapter IV.

Figures 4 and 4a show plotted cell means for Puzzle #1. As is immediately evident, the results do not support the prediction of Hypothesis #5 that internals would take more trials than externals on the persistence or tolerance for



frustration measure. In fact, the general direction of differences in both analyses is opposite to that prediction. The difference between internals and externals in the "extreme groups" analysis is significant in the no-noise condition (contrast  $F = 7.188$ ,  $1/14$ ,  $p < .018$ ), which accounts for the overall  $F$  for IE across conditions, reported in the analysis of variance (see Table 9a), especially when one notes how close the cell means are to each other for both noise conditions in the graph presented in Figure 4a.

With regard to the interaction between the condition and locus of control factors, the only within-condition difference found was the one in the no-noise condition with "extreme group" data reported above. Interesting hints as to the nature of the IE X condition interaction were obtained, however, by considering differences between conditions among internals and among externals taken separately. When differences between condition means were considered for the sample of "extreme" internals, the overall one-way analysis of variance did not yield a significant result ( $F = .628$ ,  $2/21$ ,  $p < .544$ ), nor did any of the post hoc comparisons between means show between condition trends. Data for extreme externals taken alone, however, produced a significant one-way analysis of variance ( $F = 6.240$ ,  $2/21$ ,  $p < .007$ ). The comparison between the unpredictable and no-noise conditions among extreme externals was significant at  $p < .002$  ( $t = -3.474$ ,  $df = 21$ ). Predictable noise differed from no-noise at  $p < .032$  ( $t =$

-2.293,  $df = 21$ ), which difference must be seen as approaching significance. The comparison of the two noise conditions with no-noise is significant at  $p < .003$  ( $t = -3.330$ ,  $df = 21$ ), and the comparison of predictable and no-noise with unpredictable noise is strong at  $p < .014$  ( $t = -2.687$ ,  $df = 21$ ).

Comparable results were found in post hoc comparisons among internals and among externals taken separately using the median-split on the full sample of 72 subjects. Among internals the between conditions overall analysis of variance was not significant ( $F = 2.42$ ,  $2/33$ ,  $p < .787$ ) and there were no noteworthy contrasts between means or weighted contrasts. Among externals, however, the overall analysis of variance between conditions was a trend approaching significance with  $p < .046$  ( $F = 3.374$ ,  $2/33$ ). Between condition comparisons yielded a significant difference between the unpredictable and the no-noise condition ( $t = -2.586$ ,  $df = 33$ ,  $p < .014$ ). Unpredictable noise compared with the means for predictable and no-noise yielded  $t = -2.438$  ( $df = 33$ ,  $p < .020$ ), and the comparison of the two noise conditions compared with the no-noise control group yielded  $t = -2.185$  ( $df = 33$ ,  $p < .036$ ).

Puzzle #3. The results of two-way analysis of variance performed on data for the number of trials taken by subjects on the second insoluble puzzle are presented in Table 10 and Table 10a. For the full sample there was a trend in the data

approaching significance for the noise condition factor ( $F = 3.001, 2/66, p < .055$ ). There were no significant results for either the locus of control factor or a condition X IE interaction. When extreme group data were considered the locus of control factor produced an effect significant at  $p < .038$  ( $F = 4.473, 1/42$ ), while there were no significant effects for the condition factor or a condition X IE interaction.

-----  
 Insert Tables 10 and 10a about here  
 -----

Figure 6 and Figure 6a show cell means for the all-subjects and "extreme groups" analyses, respectively. Post hoc comparisons between means were performed where appropriate to determine the nature of the effects reflected in the analysis of variance results. As noted above, post hoc contrasts must be interpreted conservatively.

-----  
 Insert Figures 6 and 6a about here  
 -----

Contrasts for the full sample of 72 subjects revealed a significant difference with  $p < .019$  ( $t = -2.404, df = 69$ ) between the unpredictable noise condition and the no-noise condition. Noise conditions compared with the no-noise condition also yielded a significant contrast ( $t = -2.360, df = 69, p < .021$ ). There was no significant difference between

Table 10

Analysis of Variance for Insoluble Puzzle: Puzzle #3\*

Source	DF	MS	F	Prob. of F
Condition	2	271.272	3.001	.055 Marg.
IE	1	143.140	1.583	
Condition X IE	2	10.432	<1	
Error	66	90.406		

Table 10a

Analysis of Variance for Insoluble Puzzle: Puzzle #3\*

Extreme Groups

Source	DF	MS	F	Prob. of F
Condition	2	117.250	1.513	
IE	1	346.687	4.473	.038
Condition X IE	2	85.750	1.106	
Error	42	77.503		

---

\*SPSS ANOVA Program.



Figure 6. Cell Means for Puzzle #3

N = 72

	Unpredictable Noise	Predictable Noise	No-Noise	All
Internal	9.5	11.8	15.4	12.1
External	12.7	13.1	19.5	14.9
All	10.7	12.7	17.3	13.5

Figure 6a. Cell Means for Puzzle #3 Extreme IE

N = 48

	Unpredictable Noise	Predictable Noise	No-Noise	All
Internal	7.5	11.8	10.4	9.9
External	12.6	12.6	20.5	15.2
All	10.1	12.2	15.4	12.6

unpredictable and predictable noise ( $t < 1$ , n.s.). While there was a tendency in the data toward a difference between predictable noise and no-noise, it was not very strong ( $t = -1.684$ ,  $df = 69$ ,  $p < .097$ ). The contrast between unpredictable noise and the average of the predictable and no-noise conditions shows a slight, but not significant, trend, ( $t = -1.803$ ,  $df = 69$ ,  $p < .076$ ).

Results of contrasts comparing condition means performed for the extreme group subjects were not significant, as might be expected from the analysis of variance (see Table 10).  $t$ -Values did reflect, however, the same direction of differences, corresponding in relative value with those from the full-sample.

Since the two noise conditions did not differ significantly from each other, the results reported here do not provide clear evidence in support of Hypothesis #4, which predicts differences between the unpredictable noise condition and the predictable and no-noise conditions. These results will be discussed in some detail in Chapter IV.

Next we consider the effects of locus of control on the data for the second insoluble puzzle (see Figures 10 and 10a). As is immediately evident, results for both analyses provide evidence contrary to the prediction in Hypothesis #5 that internals would take more trials than externals. This difference was significant for the extreme groups analysis of vari-

ance as reported above (see Table 10a). One-way contrasts within each condition did not yield any significant within-condition differences, although, as for Puzzle #1, the spread was greatest in the no-noise condition.

As concerns any evidence of a condition X IE interaction, between-condition contrasts were performed among internals and among externals for both full-sample and "extreme group" data. While the analysis of variance results did not call for these contrasts, they were performed in order to determine if any trends were present in the data, since there was reason to expect similar results on this puzzle as were found on the first insoluble puzzle. Contrasts indicated that the general direction of differences was similar to Puzzle #1. Externals tended to reflect more of the between-condition differences than internals. None of these differences, however, was statistically significant. The only noteworthy contrast, consistent in both full and extreme group analyses, was that between the average of the two noise conditions as compared with the no-noise condition. A mild trend was present among externals in both analyses (for full sample  $t = -1.802$ ,  $df = 33$ ,  $p < .081$ ; for extreme groups  $t = 1.967$ ,  $df = 21$ ,  $p < .063$ ). For internals in the full sample there was a hint of a difference in this direction ( $t = -1.481$ ,  $df = 33$ ,  $p < .148$ ), for internals in the extreme group sample there was no difference ( $t < 1$ ).

Since the results of the full-sample analysis with un-

equal cell sizes and the analysis for "extreme groups" failed to provide any results that could be interpreted with clarity, a third analysis was performed on the data for insoluble Puzzle #3. A third approach, splitting at the median within each condition, was employed. Subjects in each condition were placed in internal and external groups on the basis of their position in relation to the median IE score within that condition. When more than one subject scored at the median, the subject with the lower ID number (a variable which did not correlate significantly with any of the dependent variables) was placed in the internal group. This yielded 12 subjects in each of the condition X IE cells.

It should be acknowledged that this procedure was a post hoc manipulation of the data. As such, the results of the analysis can be seen only as indicating trends in the data that might be explicated by further investigation. The results are reported, therefore, in the hope that the meaning of the data for Puzzle #3 can be somewhat clarified.

Results of analysis of variance performed on these transformed data are presented in Table 11. These results are, of course, quite similar to the full-sample analysis. The condition factor yielded a trend of  $p < .051$  ( $F = 3.074, 2/66$ ). The results of between means contrasts over the condition factor do not differ from those for the full-sample median split.



-----  
 Insert Table 11 about here  
 -----

Cell means by condition for internal and external groups are presented in Figure 7. There were no significant differences between internals and externals within any of the conditions. When comparisons were made among internals and among externals between experimental conditions, however, some results, noteworthy in their similarity to results found for the first puzzle, were found.

-----  
 Insert Figure 7 about here  
 -----

Comparisons between conditions for this sample of internal subjects revealed no significant differences. The external subjects, however, did show some between-condition differences, although again these differences must only be treated as trend indications. There were no differences between the two noise conditions, but predictable noise differed from no-noise ( $t = -2.402$ ,  $df = 33$ ,  $p < .022$ ), and a weak difference appeared between unpredictable noise and no-noise ( $t = -1.893$ ,  $df = 33$ ,  $p < .067$ ). Scores for externals in the two noise conditions taken together were different from no-noise condition ( $t = -2.480$ ,  $df = 33$ ,  $p < .018$ ). While these results are in no way conclusive, they are consistent with the results from the same comparisons made on the data for the

Table 11

Analysis of Variance for Insoluble Puzzle: Puzzle #3\*  
 for IE Median Split within Each Condition

Source	df	MS	F	Prob. of F
Condition	2	270.542	3.074	.051 Marg.
IE	1	105.125	1.195	
Condition X IE	2	108.792	1.236	
Error	66	88.001		

---

\*SPSS ANOVA Program.

Figure 7. Cell Means for Puzzle #3  
IE Median Split within Each Condition

	Unpredictable Noise	Predictable Noise	No-Noise	All
Internal	8.3	13.9	14.8	12.3
External	13.2	11.4	19.7	14.8
All	10.7	12.7	17.3	13.5

first insoluble puzzle. In both cases there were no between-condition differences found among internals, but differences were found between conditions among the externals.

Summary of puzzle results. All subjects were successful in solving puzzles #2 and #4, and there were no condition or locus of control effects on subjects' trials to solution. Results for the two insoluble puzzles provide some evidence in support of Hypothesis #4, which predicted that subjects in the unpredictable noise condition would take fewer trials than subjects in the predictable and no-noise conditions. Data for both insoluble puzzles provide evidence consistently contrary to Hypothesis #5, which predicted that internals would take more trials than externals on the insoluble puzzles. Although much more salient in the data for the first puzzle, data for both insoluble puzzles showed a tendency for between-condition differences to be significant among externals, and either very weak or statistically absent among internals. These results will be discussed in some detail in Chapter IV.

Post-experimental questionnaire. Measures of subjects' evaluation of the noise were taken on a 1 to 9 Likert format (see Packet) on the following four dimensions: irritating, unpleasant, distracting, unpredictable.

Analysis of variance data presented in Tables 12 to 15 indicate that there was a condition effect on subjects' rating of the noise as irritating, unpleasant and distracting.

There was no condition effect, however, for subjects' ratings of unpredictability of the noise. Subjects' ratings of the noise on all four dimensions did not vary as a function of locus of control or the interaction of conditions X IE.

-----  
 Insert Tables 12 to 15 about here  
 -----

Post hoc contrasts between conditions showed subjects in the noise conditions as compared with the no-noise condition rated the noise as more irritating, unpleasant, and distracting at  $p < .001$  ( $t = 9.219$ ,  $df = 69$  for irritating;  $t = 9.825$ ,  $df = 69$  for unpleasant;  $t = 4.551$ ,  $df = 69$  for distracting). Subjects in the unpredictable noise condition found the noise significantly more irritating ( $t = 2.792$ ,  $df = 69$ ,  $p < .007$ ) than subjects in the predictable noise condition. There is a mild trend in the data suggesting that subjects receiving the unpredictable noise report it as more unpleasant than subjects receiving predictable noise ( $t = 1.726$ ,  $df = 69$ ,  $p < .089$ ). There were no significant differences between the two noise conditions in subjects' ratings of how distracting or how unpredictable the noise was to them.

This last result is particularly interesting. One would expect subjects exposed to "predictable" noise to rate it as more predictable than subjects exposed to the unpredictable noise. Yet, these data do not show differences by condition



Table 12

Analysis of Variance and Cells Means for Noise Evaluation:

## Irritating

Source	df	MS	F	Prob. of F
Condition	2	77.590	44.953	.001 Sig.
IE	1	.287	<1	
Condition X IE	2	.548	<1	
Error	66	1.726		

	Unpredictable Noise	Predictable Noise	No-Noise
Internal	8.00	7.25	4.62
External	8.44	7.06	4.73

1 = extremely relaxing

9 = extremely irritating

Table 13

Analysis of Variance and Cell Means for Noise Evaluation:

Unpleasant

Source	df	MS	F	Prob. of F
Condition	2	68.318	49.402	.001 sig.
IE	1	1.110	<1	
Condition X IE	2	1.038	<1	
Error	66	1.384		

	Unpredictable Noise	Predictable Noise	No-Noise
Internal	8.27	8.13	5.00
External	8.11	7.38	5.09
	8.21	7.63	5.04

1 = extremely pleasant

9 = extremely unpleasant

Table 14

Analysis of Variance and Cell Means for Noise Evaluation:  
Distracting

Source	df	MS	F	Prob. of F
Condition	2	28.433	10.107	.001 sig.
IE	1	.327	<1	
Condition X IE	2	2.842	1.010	
Error	66	2.413		

	Unpredictable Noise	Predictable Noise	No-Noise
Internal	6.73	6.00	4.54
External	6.11	6.81	4.73
	6.50	6.54	4.63

Table 15

Analysis of Variance and Cell Means for Noise Evaluation:

## Unpredictable

Source	df	MS	F	Prob. of F
Condition	2	2.904	<1	
IE	1	.002	<1	
Condition X IE	2	3.025	<1	
Error	66	5.521		

	Unpredictable Noise	Predictable Noise	No-Noise
Internal	4.00	4.38	4.69
External	4.78	3.69	4.55
	4.29	3.92	4.63

of subjects' ratings of the noise on the dimension of predictability. This curious result will be discussed in Chapter IV below.

### Correlation Coefficients

Listed in Table 16 is a matrix of correlation coefficients between the principal variables in the experiment.

-----  
 Insert Table 16 about here  
 -----

Of particular note among these correlations are the relationships present between College Board Scores, Locus of Control and Proofreading scores. More external subjects score lower on both Verbal and Math SAT ( $-.363$  Verbal,  $-.275$  Math). They also seem to score lower in proofreading performance ( $-.222$ ). As might be expected, high SAT scores are correlated with high proofreading scores (Verbal SAT  $.387$ , Math  $.348$ ).

A partial correlation was performed on these data to determine the relationship of IE and Proofreading with the Verbal SAT held constant. The result of this partial correlation ( $r_{12.3} = .115$ ) is not a significant correlation. This result is discussed below.

Other noteworthy relationships are present for responses to Likert-style questions about past and present environmental noise exposure and difficulty concentrating. Externals



Table 16

Correlation Coefficients

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
a	1.000																	
b	.335+	1.000																
c	.069	.526\$	1.000															
d	.123	.259*	.348\$	1.000														
e	.350\$	.064	-.011	.008	1.000													
f	-.139	.056	.008	-.068	.128	1.000												
g	-.204*	-.028	-.068	.046	-.123	.161	1.000											
h	.060	-.309+	-.133	-.248*	-.145	.024	.276+	1.000										
i	-.222*	-.363\$	-.275+	-.089	-.079	.359\$	.121	.229*	1.000									
j	.094	.205*	.385\$	.056	-.105	-.021	.245*	.095	-.067	1.000								
k	.007	-.027	-.203*	-.079	.015	-.013	.235*	-.058	.040	.226*	1.000							
l	-.261*	.021	-.010	.149	-.038	-.106	.007	-.145	.222*	.374\$	.194	1.000						
m	.165	.337+	.348\$	.096	-.002	.098	.122	-.180	.115	-.097	.162	.131	1.000					
n	.141	-.033	-.078	.004	.165	.038	-.129	-.229*	.142	-.092	.154	.111	.193	1.000				
o	.166	.024	-.085	.180	.308+	-.025	-.091	-.195*	.060	-.082	.170	.146	.073	.669\$	1.000			
p	-.126	-.032	.070	-.088	.250*	.011	.091	.177	.040	-.082	-.168	-.001	.020	-.246*	-.267*	1.000		
q	-.181	.007	.087	-.049	.186	.045	.090	.140	.040	-.109	-.125	.050	.053	-.118	-.186	.824\$	1.000	
r	-.155	-.127	-.092	-.188	.201*	.064	.070	.362\$	.053	-.068	-.125	.077	-.001	-.135	-.150	.598\$	.591\$	1.000

- a = Age
- b = Verbal SAT
- c = Math SAT
- d = Grade Point Average
- e = Year in School
- f = Noise where Grew Up
- g = Noise where Live Now
- h = Difficulty Concentrating
- i = IE
- j = Anagram Score I
- k = Anagram Errors I
- l = Digit Symbol Score I
- m = Proofreading Performance
- n = Puzzle 1
- o = Puzzle 3
- p = Irritating
- q = Unpleasant
- r = Distracting

\*p < .05  
+p < .01  
\$p < .001

reported more noise where they grew up ( $.359, p < .001$ ), more noise where they live now ( $.276, p < .01$ ), and greater difficulty concentrating ( $.229, p < .05$ ).

The locus of control score correlates with subjects' age ( $-.222, p < .05$ ). Age also correlates with noise where live now ( $-.264, p < .05$ ). Thus younger subjects, who are more external, report greater environmental noise. A partial correlation, holding age constant, still showed a correlation between I-E and noise where live now ( $.231, p < .05$ ). The fact that externals report their present environment to be noisier, then, cannot be attributed simply to the fact that they are younger and therefore living in the University dormitories.

Subjects who reported more difficulty concentrating found the experimental noise more distracting ( $.362, p < .001$ ). They took fewer trials on the insoluble puzzles (Puzzle 1 =  $.229, p < .05$ ; Puzzle 2 =  $-.195, p < .05$ ), although these relationships are not very strong. Subjects who have more difficulty concentrating also seem to have lower grades ( $-.248, p < .05$ ) and lower Verbal SAT scores ( $-.309, p < .01$ ).

Thus there is no evidence to indicate that previous or present exposure to environmental noise was a significant intervening variable mediating subjects' response to the noise encountered in this experiment. There are some interesting results, although none of these correlations is of compelling strength, suggesting that externals have more difficulty con-

centrating than internals and report their environments to be noisier. These results will be discussed below.

## C H A P T E R    I V

DISCUSSION

Since the results presented in Chapter III are rather complicated and extensive, an attempt will be made in the following section to explain these results in a systematic way. Results reported above for each of the dependent measures will be discussed in the order of their presentation and compared where appropriate with the original research upon which this study was based. Results will also be considered in the light of the locus of control and perceived control literatures reported in Chapter I.

Before any substantive discussion of the results of this experiment can be undertaken, it should be noted that the distribution of IE scores obtained from the sample of subjects run (see Appendix VI) yielded few extreme cases. Even in the so-called "extreme groups" analysis, the majority of cases could not truly be defined as extreme or even very strongly internal or external. As a result, locus of control effects are quite diluted. In the light of this, discussion of the role of the IE variable in stress adaptation will rely on relatively weak, but consistent, trends in the data, and will at times be somewhat speculative.

Evidence of adaptation. While the result was significant only for the Digit Symbol Task, results for performance measures taken during the noise exposure period (see plots in

Figure 2) show that scores for subjects in the two noise conditions increased over time while scores for subjects in the no-noise condition remained approximately unchanged. This pattern initially suggests adaptation to the distracting effects of the noise, as predicted by Hypotheses #1 and #2, and found by Glass et al. However, the interpretation of the performance increases in the noise conditions (which do not seem to differ appreciably from each other), is complicated by the fact that on neither of the tasks was the noise detrimental to task performance during the first trial block. Indeed, it would appear that subjects scored about equally in both the noise and no-noise situations at first, and that the noise actually had some kind of facilitative effect on performance for the two subsequent task blocks. It is hard to treat these data as evidence of adaptation if there was no initial decrease in performance.

One possible explanation for this curious result is that performance needs to be seen simply as an index of arousal. Certainly, if performance reflects arousal, the stimulus situation consisting of working on what seem tedious cognitive tasks has much more arousing properties if the subject is periodically blasted with 90 decibels of undifferentiated noise.

Glass et al. (1969) in their reporting of evidence of adaptation used as one of their measures the decrement in log GSR conductance. Their study showed that arousal, as measured



by skin conductance, dropped significantly during the 23-minute period in the noise conditions after an initial increase. This effect, if applicable to the present study, would cast doubt on the hypothesis that arousal alone could account for performance increases.

Clearly then, the results on these measures of performance during the noise cannot be taken to show adaptation, at least in the sense of recovery from an initial deficit. Neither can they be accounted for simply by the hypothesis that noise condition subjects became increasingly aroused as compared with relatively bored subjects in the no-noise condition. Another explanation is necessary.

There is reason to believe that the increase in performance scores may be a reflection of an active coping process in which subjects exposed to noise were engaged. When asked how they coped with the noise, numerous subjects, distributed evenly between the two noise conditions, reported in debriefing and on the open-ended post-experimental questionnaire that they worked harder when the sound came on. Immersion in the task was used as a way to ignore the aversive noise. This kind of active coping may account for higher performance scores. Active coping might also be considered a kind of adaptation which could have a post adaptive cost after termination of the noise, in as much as selective attention to the task could be seen as "energy depleting" (see Selye, 1956). Active coping as a form of adaptation could also ac-

count for the Glass et al. findings of decrement in number of errors made on simply cognitive tasks during the period of noise exposure. Physiological arousal measures may have been reduced in their study as a function of successful selective attention to the task and the subjects' cognitive redefinition of the situation as under control.

Whether or not active coping was truly the process through which subjects responded to the stress of noise exposure, it seems that subjects were equally capable of coping whether they were exposed to predictable or unpredictable noise, which result is consistent with previous findings. It also appears that, as far as can be determined from this sample of subjects, internals and externals were equally effective in coping with the noise stress during the noise exposure period.

### Cost of Adaptation

Quality of performance. As mentioned in the section on Results, differences were not predicted on either condition or IE factors for the number of lines subjects read in the proofreading task. Results on this variable did not show any significant condition effect, in keeping with results reported previously (cf. Glass et al., 1969) using the same measures. However, it was predicted that subjects would do poorly in quality of performance after exposure to unpredictable noise as compared to subjects exposed to predictable

noise or controls. Contrary to previously reported findings, the present data fail to support that hypothesis. In fact, the data show no significant differences ( $F < 1$ ) (see Table 6), with the mean for the unpredictable noise condition at a slightly higher level than the others (see Figure 3).

Since the post-noise tasks were counterbalanced, and since the puzzles task provided evidence for a noise effect, it cannot be said that the failure of the proofreading measure to replicate the post-noise effect is simply a reflection of a failure of the noise manipulation. However, one possible explanation for these results becomes apparent when one considers what differences there are between the stimulus situation in the Glass et al. study and the present one. In the present study subjects wore earphones, whereas the previous experiments used a loudspeaker. In previous studies subjects completed extremely simple tasks during the noise, here tasks completed during the noise were more complex, requiring considerable attention and short-term retention. Noise apparatus and testing situation would likely effect both proofreading performance and persistence, if either. The nature of the tasks used during the noise, however, might be more likely to effect proofreading than the puzzles task. Proofreading is a complex cognitive task requiring considerable attention, clearly more similar to anagram solution and digit symbol than to the puzzles task. Speculative as it is, this suggests one explanation for the fact that subjects exposed to the unpredict-



able noise did not do poorly on the proofreading segment in the same way that Glass' subjects did. Since the subject in the present study had been engaged in a challenging task and was functioning at a high level, it did not require as much of a cognitive adjustment when he was faced with a relatively similar proofreading task. In contrast, a subject in previous studies, after doing a fairly simple clerical task under noise stress, was faced with a more demanding proofreading segment and had to adjust his cognitive attentive system to a new, more difficult task after the noise. Thus, the relative ease of adjustment in this study to the demands of the post-noise proofreading task may account for the subjects' ability to maintain a relatively high performance level, even though they had been exposed to stress.

It was expected that externals would be poor proofreaders as compared to internals based on the cognitive style differences outlined above. This prediction was also based on the Wolk and DuCette (1972) finding in this direction. In the present study correlations were found between Verbal and Math SAT scores as reported by subjects and the locus of control score (see Table 16). Correlations were also found between the two SAT scores and performance on the proofreading task.

The partial correlation result showed that, with SAT scores held constant, IE does not significantly correlate with proofreading performance scores. This suggests that an intel-

ligence-like variable may be operating on the proofreading task. When intelligence is controlled for, then, IE does not strongly predict proofreading performance.

The original finding that internals were better proofreaders than externals was presented by Wolk and DuCette (1972). In that article, they used subjects' mid-term and paper grades (which did not correlate with IE) as a "control" for intelligence. The present results suggest that mid-term and paper grades were not an adequately sensitive control for intelligence as an intervening variable.

Tolerance for frustration. The number of trials taken by subjects on both insoluble puzzles was clearly affected by the noise. Effects on the whole were stronger for the first insoluble puzzle than the second, but for both puzzles the general trend in the data is similar. Again we are dealing here with data in which what differences exist are mostly marginally significant, and it is necessary, therefore, to be conservative in interpretation.

With regard to between-condition effects, results show consistently that subjects who were exposed to the unpredictable noise took fewer trials than subjects who heard no noise. The data failed to replicate, however, the Glass et al. finding of a strong effect caused by fixed versus random scheduling of the noise. That is, for neither puzzle was there a significant difference between the two noise conditions. Instead the predictable noise condition seemed to fall nearly



in the middle between unpredictable noise and no-noise for both puzzles. In Puzzle #1 predictable noise fell slightly closer to no-noise, while in the second insoluble puzzle (Puzzle #3) subjects in the predictable noise condition scored closer to subjects exposed to the unpredictable noise. In neither puzzle did the predictable condition differ significantly from either no-noise or unpredictable noise.

The Glass et al. findings state, in effect, that subjects who were exposed to predictable noise did not show cost of adaptation in the form of lower tolerance for frustration. Their data reveal no difference between predictable noise and no-noise. Here the data seem to indicate that both predictable and unpredictable noise take their toll, but that the cost is greater when the noise is unpredictable.

Contrary to the prediction made in Hypothesis #5, across conditions externals took a greater number of trials on the insoluble puzzles than internals. This difference approached significance for Puzzle #1 and was significant in Puzzle #3, when data for "extreme" internals and externals were considering (see Tables 9a and 10a). The prediction that internals would take more trials was based on several studies reported above which showed internals to be more persistent than externals in experimental situations. These situations, however, did not include the present measure of persistence. Perhaps a closer look at the nature of the task situation will shed some

light on this seemingly inconsistent result.

Glass et al. have operationally defined number of trials taken on the insoluble puzzle to be a measure of persistence or tolerance for frustration. By their explanation each trial taken on the puzzle results in "failure and frustration." The more persistent subject will continue to take trials in the face of this frustration, and "by interpretation" he shows a higher tolerance.

It becomes clear that Glass and his associates referred to persistence and measured it as a "state" variable, determined by noise as an independent variable. When locus of control differences are considered across conditions in the present study, we are dealing with more stabilized expectancy differences. The results are determined by a more complex personality variable.

It has been established that the internal is one who is more perceptually sensitive, seeks more information about his environment, chooses skill situations and is more persistent in them. This is in contrast with the external, who is less attentive to cues, chooses and is more persistent in chance situations. Perhaps after ten or twelve trials on an insoluble puzzle, it becomes apparent to the internal that solution will only come if by chance he happens upon the correct formula. The situation, seen at first as a test of skill, becomes a chance situation which, as Shepel and James (1973) put it, is no longer "congruent with (the subject's) locus of control ex-

expectancy." The situation has thus become one in which we would expect low "persistence" for the internal. The external, on the other hand, may not be so cognitively active, may judge the whole business as a matter of luck in the first place, and so appear more persistent and tolerant of frustration, maintaining a cognitive definition of the task as a chance situation, which is "congruent with (his) locus of control expectancy."

There are, therefore, two related explanations for the finding that externals take more trials than internals on this task. One is that the internal is more aware, testing hypotheses, more likely to try to use skill to solve the puzzle, so he realizes after a relatively short time that the puzzle is insoluble. The external, who is less actively judging the situation, does not make this discovery and simply gives up in frustration somewhat later. A more complicated, but in this writer's opinion, more compelling, analysis would have both internal and external begin the task viewing the situation as "congruent with locus of control expectancy"--that is, skill for the internal and chance for the external. For the internal, after about ten trials the situation becomes redefined as chance-determined and a decision is made not to take further trials. The external, who does not engage in such an active evaluation of the task, continues to view it as chance-determined and continues on taking almost twice as many trials.

These explanations are, of course, highly speculative

and must be tested with further research. The failure lies not in the theoretical notion that internals and externals differ in cognitive style or in persistence, but in the application of such notions to this particular experimental situation.

As might be expected, the strongest difference between internals and externals on the insoluble puzzles was present in the "extreme groups" analysis. The difference for both puzzles was greatest in the no-noise condition. If performance in the no-noise control condition is taken as an index of normal performance, it is apparent that externals in both noise conditions did show noise after-effects. Taking another look at the plotted means for "extreme" externals on Puzzle #1 (Figure 4a), it is evident that the number of trials taken decreases rather sharply for noise exposure, yielding a significant comparison between the two noise conditions and no-noise. Internals, by contrast, did not take any fewer trials in either noise condition, and, as the plotted means seem to indicate, did not show any noise aftereffects.

Puzzle #3 shows comparable, although less compelling, results. Here, in the "extreme groups" analysis for externals, the contrast between noise conditions and no-noise was a trend of  $p < .063$ , which as a post hoc comparison cannot be considered a very strong result. The same contrast performed for the internals in the sample, however, yielded  $t < 1$ , which



would suggest that what differences were present showed up more among the externals. Cell means for this puzzle (see Figure 5a) show that the general trend for this puzzle is similar to the results for Puzzle #1--that is, scores for externals, who took many trials in the control situation, drop in the two noise conditions. Scores for the internals seem relatively unchanged in the two noise conditions.

It would seem, then, that there is some evidence in the data for both puzzles pointing to greater post-adaptive after-effects for externals, and that this is true for both unpredictable and predictable noise.

One possible explanation for this effect follows from the comparative cognitive styles outlined in Chapter I for internals and externals. This perspective portrays the external as an individual whose cognitive-attentive capacity is not as great as the internal. He is less likely to attend to environmental cues, seek and use information, or actively try to control outcomes. This follows logically from the generalized expectancy that luck, chance, fate, or some powerful other, will control outcomes. It stands to reason, then, that, while he might be able to maintain his performance in a situation of stress-distraction, the cost of his adaptation might show up later in lowered tolerance for frustration.

The internal has been presented as an individual who is quite actively engaged in coping with and controlling his environment. He has even been characterized by some as "react-



ant", resisting outside influence. It is not surprising that he successfully copes in an active way with the stress of noise distraction, and there are no significant performance or frustration tolerance aftereffects.

The significant correlation between external locus of control and reported difficulty concentrating is further support for the general notions presented here about differences in cognitive style between internals and externals. The fact that externals also report greater past and present environmental noise exposure can be interpreted in several ways. It may simply be that externals find themselves in noisier circumstances and that this has been true for their entire lives, possibly contributing to the external control beliefs they hold. Perhaps the relatively weak correlation is the result of "complaining" or "blame projection" by the subset of externals whom Rotter (1966) and Hochreich (1974, 1975) have termed "defensive externals". As has been tentatively shown in this experiment, the external seems to be more susceptible to noise effects. He reports more difficulty concentrating, and would thus likely find environmental noise more distracting and troublesome. Since it is harder for the external to cope with environmental noise, it is not surprising that he is more likely to be aware of it and to report more noise in his environment.

Evaluation of the noise. Subjects' responses on post-experimental self-report evaluation of the noise both give

confirmation of the predictable vs. unpredictable noise manipulation as well as cast doubt upon its effectiveness. Glass et al. report no noise-condition differences for subjects' ratings of the noise as irritating, unpleasant or distracting. In this study, however, subjects in the unpredictable condition found the noise more irritating and somewhat more unpleasant than subjects exposed to predictable noise. On the question asking subjects to rate the noise on a dimension of unpredictability, however, there was no difference between the two noise conditions.

In debriefing there was a notable difference in subjects' mood and attitude after exposure to the two types of noise. After unpredictable noise, subjects seemed quieter, less enthusiastic about the experiment, and generally eager to leave, while in general predictable noise subjects, while they complained of being startled by the first one or two noise blasts, were comparatively lively.

It would seem, then, that although the noise effects did vary somewhat on the basis of its scheduling, subjects did not report the "predictable" noise as more predictable than the "unpredictable" noise. In fact means for both groups were 4.291 for "unpredictable" and 3.917 for "predictable" on a scale of 1 to 9 where 9 is "extremely unpredictable" (see Table 15).

Two possible interpretations emerge for this result. One is that the noise scheduling used in this study or the

changes in its mode of presentation (randomization, headphones) simply caused the random noise to be more predictable, or the fixed noise to be less predictable than in the studies reported by Glass et al. This would account for the failure of noise conditions in this study to differentiate strongly from each other, since differences between conditions might still exist, but would be weaker. This would not account, however, for the stronger differences found here between noise conditions for reported irritating and unpleasant properties of unpredictable vs. predictable noise.

Another possible interpretation is that, while predictability has been demonstrated to be a crucial determinant of the stressfulness of a stimulus, unpredictability may be experienced as pain or discomfort. There may not be specific awareness on the part of the subject of the fact that the lack of predictability or control is a significant factor in the experience. Thus, at least in this study, perceived predictability of the noise was a less important factor in its being evaluated as irritating and unpleasant than the actual predictability of the stimulus. Unfortunately Glass et al. did not ask their subjects to rate the noise on this dimension, so we cannot compare the present findings with previous results.

This study was designed to determine whether locus of control as an individual difference variable might predict differences in subjects' response to stress. It has already

been shown that the situational variables of predictability and control do predict stress response. The results found here suggest that there are individual differences. Further investigation with more extreme internal and external samples is indicated to show more conclusive evidence.



## REFERENCES

- Abramowitz, S. Locus of control and self-reported depression among college students. Psychological Reports, 1969, 25, 149-150.
- Appelbaum, M. & Cramer, E. Some problems in the nonorthogonal analysis of variance. Psychological Bulletin, 1974, 81, 335-343.
- Averill, J. Personal control over aversive stimuli and its relation to stress. Psychological Bulletin, 1973, 80, 286-303.
- Azrin, N. H. Some effects of noise on human behavior. Journal of Experimental Analysis of Behavior, 1958, 1, 183-200.
- Bailer, I. Conceptualization of success and failure in mentally retarded and normal children. Journal of Personality, 1961, 29, 303-320.
- Biondo, J. & MacDonald, A. P. Internal-external locus of control and response to influence attempts. Journal of Personality, 1971, 39, 407-419.
- Brehm, J. W. A theory of psychological reactance. New York: Academic Press, 1966.
- Brisset, M. & Nowicki, S. Internal versus external control of reinforcement and reaction to frustration. Journal of Personality and Social Psychology, 1973, 25, 35-44.
- Broadbent, D. E. Effects of noise on behavior. In C. M. Har-



- ris (Ed.) Handbook of noise control. New York: McGraw-Hill, 1957.
- Broadbent, D. E. Perception and communication. London, England: Pergamon, 1958.
- Butterfield, E. Locus of control, test anxiety, reactions to frustration, and achievement attitudes. Journal of Personality, 1964, 32, 355-370.
- Cherry, E. C. Some experiments on the recognition of speech with one and with two ears. Journal of the Acoustical Society of America, 1953, 25, 975-979.
- Cherulnik, P. D. & Sitrin, M. M. Individual differences in psychological reactance: The interaction between locus of control and mode of elimination of freedom. Journal of Personality and Social Psychology, 1974, 29, 398-404.
- Coleman, J. S. et al. Equality of educational opportunity. Washington, D.C.: Department of Health, Education, and Welfare, 1966.
- Corah, N. J. & Boffa, J. Perceived control, self-observation, and response to aversive stimulation. Journal of Personality and Social Psychology, 1970, 16, 1-14.
- Crandall, V. C., Katkovsky, W., & Crandall, V. J. Children's beliefs in their control of reinforcements in intellectual-academic achievement situations. Child Development, 1965, 36, 91-109.
- Cromwell, R. L., Rosenthal, D., Shakow, D., & Zahn, T. I. Reaction time, locus of control, choice behavior, and

description of parental behavior in schizophrenia and normal subjects. Journal of Personality, 1961, 29, 363-379.

Crowne, D. & Liverant, S. Conformity under varying conditions of personal commitment. Journal of Abnormal and Social Psychology, 1963, 66, 547-555.

Davis, W. L. & Phares, E. J. Internal-external control as a determinant of information-seeking in a social-influence situation. Journal of Personality, 1967, 35, 547-561.

Deutsch, J. A. & Deutsch, D. Attention: Some theoretical considerations. Psychological Review, 1963, 70, 80-90.

Doctor, R. M. Locus of control of reinforcement and responsiveness to social influence. Journal of Personality, 1971, 39, 542-551.

Dominowski, R. L. Anagram solving as a function of bigram rank and word frequency. Journal of Experimental Psychology, 1967, 75, 299-306.

DuCette, J. & Wolk, S. Locus of control and extreme behavior. Journal of Consulting and Clinical Psychology, 1972, 39, 253-258.

DuCette, J. & Wolk, S. Cognitive and motivational correlates of general expectancy of control. Journal of Personality and Social Psychology, 1973, 26, 420-426.

Feather, N. T. The relationship of persistence at a task to expectation of success and achievement related motives. Journal of Abnormal and Social Psychology, 1961, 63,

552-561.

- Feather, N. T. Some personality correlates of external control. Australian Journal of Psychology, 1967, 19, 253-260.
- Finkelman, J. M. & Glass, D. C. Reappraisal of the relationship between noise and human performance by means of a subsidiary task measure. Journal of Applied Psychology, 1970, 54, 211-213 .
- French, J. W., Ekstrom, R. B., & Price, L. A. Manual for kit of reference tests for cognitive factors. Princeton, New Jersey: Educational Testing Service, 1963.
- Geer, J. H., Devison, G. C., & Gatchel, R. I. Reduction of stress in humans through nonveridical perceived control of aversive stimulation. Journal of Personality and Social Psychology, 1970, 16, 731-738.
- Getter, H. A personality determinant of verbal conditioning. Journal of Personality, 1966, 34, 397-405.
- Glass, D. C., Reim, B., & Singer, J. E. Behavioral consequences of adaptation to controllable and uncontrollable noise. Journal of Experimental Social Psychology, 1971, 7, 244-257.
- Glass, D. C. & Singer, J. E. Urban stress: Experiments on noise and social stressors. New York: Academic Press, 1972.
- Glass, D. C., Singer, J. E., & Friedman, L. N. Psychic cost of adaptation to an environmental stressor. Journal of

Personality and Social Psychology, 1969, 12, 200-210

- Golden, C. & Golden, D. Resistance to interference as a function of MMPI profile. Unpublished research, University of Hawaii, 1974a.
- Golden, C. & Golden, D. Self-reported behavioral correlates of resistance to interference. Unpublished research, University of Hawaii, 1974b.
- Gore, P. Individual differences in the prediction of subject compliance to experimenter bias. Unpublished doctoral dissertation, Ohio State University, 1962.
- Gozali, J. & Sloan, J. Reflections on the categorization of human excellence. The Journal of Psychology, 1971, 77, 207-211.
- Hersch, P. D. & Scheibe, K. E. On the reliability and validity of internal-external control as a personality dimension. Journal of Consulting Psychology, 1967, 31, 609-613.
- Hill, R. A., Chapman, M. L., & Wuertzer, V. J. Locus of control: A study of the correlates. Part X of Achievement Competence Training: A Report, Philadelphia, Pa.: Research for Better Schools, Inc., 1974.
- Hjelle, L. A. & Clouser, R. Susceptibility for attitude change as a function of internal-external control. The Psychological Record, 1970, 20, 305-310.
- Hochreich, D. Defensive externality and attribution of responsibility. Journal of Personality, 42, 543-557.
- Hochreich, D. Defensive externality and blame projection fol-



lowing failure. Journal of Personality and Social Psychology, 32, 540-546.

Jacobs, J. The death and life of great American cities. New York: Random House, 1961.

Joe, V. C. A review of the internal-external control construct as a personality variable. Psychological Reports, 1971, 28, 619-640.

Johnson, R. C., Ackerman, J. M., Frank, H., & Fionda, A. J. Resistance to temptation and guilt following yielding and psychotherapy. Journal of Consulting and Clinical Psychology, 1968, 32, 169-175.

Jolley, M. T. & Spielberger, C. D. The effects of locus of control and anxiety on verbal conditioning, Journal of Personality, 1973, 41, 443-456.

Julian, J. W. & Katz, J. B. Internal versus external control and the value of reinforcement. Journal of Personality and Social Psychology, 1968, 8, 89-94.

Julian, J. W., Lichtman, C. M., & Ryckman, R. M. Internal-external control and the need to control. Journal of Social Psychology, 1968, 76, 43-48.

Kanfer, E. H. & Seidner, M. L. Self-control: Factors enhancing tolerance for noxious stimulation. Journal of Personality and Social Psychology, 1973, 25, 381-389.

Kryter, K. D. Noise and behavior. Journal of Speech and Hearing Disorders, 1950, No. 1.

Kryter, K. D. The effects of noise on man. New York: Academic Press, 1970.



- Kucera, H. & Francis, W. N. A computational analysis of present-day American English. Providence, Rhode Island: Brown University Press, 1967.
- Lefcourt, H. M. Internal versus external control of reinforcement: A review. Psychological Bulletin, 1966, 65, 206-220.
- Lefcourt, H. M. Effect on cue explication upon persons maintaining external control expectancies. Journal of Personality and Social Psychology, 1967, 5, 372-378.
- Lefcourt, H. M. Recent developments in the study of locus of control. In B. A. Maher, (Ed.) Progress in experimental personality research, Vol. 6, New York: Academic Press, 1972, pp. 1-39.
- Lefcourt, H. M. Fatalism versus personal control: Theory and research with the locus of control. 1975, in press.
- Lefcourt, H. M. Locus of control and response to aversive events. Paper in preparation, University of Waterloo, 1976.
- Lefcourt, H. M., Gronnerud, P., & McDonald, P. Cognitive activity and hypothesis formation during a double entendre word association test as a function of locus of control and field dependence. Canadian Journal of Behavioural Science, 1973, 5, 161-173.
- Lefcourt, H., Lewis, L., & Silverman, J. W. Internal versus external control of reinforcement and attention in a decision making task. Journal of Personality, 1968, 36, 663-682.

- Lefcourt, H. M., Sordoni, C., & Sordoni, C. Locus of control and the expression of humor. Journal of Personality, 1974, 42, 130-143.
- Lefcourt, H. & Wine, J. Internal versus external control of reinforcement and the deployment of attention in experimental situations. Canadian Journal of Behavioural Science, 1969, 1, 167-181.
- Mayhew, P. Perceived control and behavioral aftereffects of predictable and unpredictable noise. Unpublished doctoral dissertation, Columbia University, 1973.
- Mayzer, M. S. & Tresselt, M. E. Anagram solution times: A function of letter order and word frequency. Journal of Experimental Psychology, 1958, 56, 376-379.
- McGhee, P. E. & Crandall, V. C. Beliefs in internal-external control of reinforcements and academic performance. Child Development, 1968, 39, 91-102.
- Mischel, W., Zeiss, R., & Zeiss, A. Internal-external control and persistence: Validation and implications of the Stanford Pre-school Internal-External Scale. Journal of Personality and Social Psychology, 1974, 29, 265-278.
- Mowrer, O. H. & Vick, P. An experimental analogue of fear from a sense of helplessness. Journal of Abnormal and Social Psychology, 1948, 43, 193-200.
- Myers, J. Fundamentals of experimental design. Boston: Allyn and Bacon, Inc., 1972.
- Nadich, M., Gargan, M., & Michall, L. Denial, anxiety, locus

of control, and the discrepancy between aspirations and achievements as components of depression. Unpublished research, Cornell University, 1974.

Neisser, U. Cognitive psychology. New York: Meridith Publishing Company, 1967.

Nie, N., Hull, C., Jenkins, J., Steinbrenner, K., & Bent, D. Statistical package for the social sciences, 2nd Ed. New York: McGraw-Hill Book Company, 1975.

Norman, D. A. Toward a theory of memory and attention. Psychological Review, 1968, 75, 522-536.

Norman, D. A. Memory and attention: An introduction to human information processing. New York: John Wiley & Sons, Inc., 1969.

Nowicki, S. & Strickland, B. R. A locus of control scale for children. Journal of Consulting and Clinical Psychology, 1973, 40, 148-154.

Peixotte, H. E. & Rowe, A. Effects of cognitive interference on performance in relation to psychopathology. Perceptual and Motor Skills, 1969, 29, 523-527.

Perwin, L. A. The need to predict and control under conditions of threat. Journal of Personality, 1963, 31, 570-587.

Phares, E. J. Differential utilization of information as a function of internal-external control. Journal of Personality, 1968, 36, 649-662.

Phares, E. J. Locus of control: A personality determinant

- of behavior. Morristown, New Jersey: General Learning Press, 1973.
- Phares, E. J. Locus of control in personality. Morristown, New Jersey: General Learning Press, 1976.
- Pines, H. A. & Julian, J. W. Effects of task and social demands on locus of control differences in information processing. Journal of Personality, 1972, 40, 408-416.
- Platt, J. & Eisenman, R. Internal-external control of reinforcement, time perspective, adjustment, and anxiety. Journal of General Psychology, 1968, 79, 121-128.
- Powell, A. Alternative measures of locus of control and the prediction of academic performance. Psychological Reports, 1971, 29, 47-50.
- Powell, A. & Vega, M. Correlates of adult locus of control. Psychological Reports, 1972, 30, 455-460.
- Rapaport, D., Gill, M., & Schafer, R. Diagnostic psychological testing. New York: International Universities Press, 1968.
- Reim, B., Glass, D. C., & Singer, J. E. Behavioral consequences of exposure to uncontrollable and unpredictable noise. Journal of Applied Social Psychology, 1971, 1, 44-56.
- Ritchie, E. & Phares, E. J. Attitude change as a function of internal-external control and communicator status. Journal of Personality, 1969, 37, 429-443.
- Rotter, J. B. Generalized expectancies for internal versus



external control of reinforcement. Psychological Monographs, 1966, 80, No. 1 (Whole No. 609).

Rotter, J. B. & Mulry, R. Internal versus external control of reinforcement and decision time. Journal of Personality and Social Psychology, 1965, 2, 598-604.

Rychman, R. M., Rodda, W. C., & Akerman, M. F. Locus of control and expertise relevance as determinants of changes in opinion about student activism. Journal of Social Psychology, 1972, 88, 107-114.

Seeman, M. Alienation and social learning in a reformatory. American Journal of Sociology, 1963, 69, 279-284.

Seeman, M. & Evans, J. W. Alienation and learning in a hospital setting. American Sociological Review, 1962, 27, 772-783.

Seligman, M., Maier, S. & Solomon, R. Unpredictable and uncontrollable aversive events. In F. R. Brush (Ed.), Aversive conditioning and learning. New York: Academic Press, 1971.

Selye, H. The stress of life. New York: McGraw-Hill, 1956.

Shepel, L. & James, W. Persistence as a function of locus of control, task structure and reinforcement schedule. Proceedings of the 81st Annual Convention of the American Psychological Association, Montreal, Canada, 1973, Volume 8, 301-302.

Sherman, S. J. Internal-external control and its relationship to attitude change under different social influence



- techniques. Journal of Personality and Social Psychology, 1973, 23, 23-29.
- Shipe, D. Impulsivity and locus of control as predictors of achievement in mildly retarded and borderline growth. American Journal of Mental Deficiency, 1971, 76, 12-33.
- Staub, E. & Kellet, D. Increasing pain tolerance by information about aversive stimuli. Journal of Personality and Social Psychology, 1972, 21, 198-203.
- Staub, E., Tursky, B., & Schwartz, G. Self-control and predictability: Their effects on reactions to aversive stimulation. Journal of Personality and Social Psychology, 1971, 18, 157-162.
- Stein, K. & Langer, J. The relation of covert cognitive interference in the color-phonetic symbol test to personality characteristics and adjustment. Journal of Personality, 1966, 34, 241-251.
- Strickland, B. R. Individual differences in verbal conditioning, extinction, and awareness. Journal of Personality, 1970, 38, 364-378.
- Strickland, B. R. Delay of gratification as a function of race of the experimenter. Journal of Personality and Social Psychology, 1972, 22, 108-112. (a)
- Strickland, B. R. Locus of control and competence in children. Paper presented at the American Psychological Association Meetings, 1972. (b)
- Strickland, B. R. Delay of gratification and internal locus

of control in children. Journal of Consulting and Clinical Psychology, 1973, 40, 338. (a)

Strickland, B. R. Locus of control: Where have we been and where are we going? Paper presented at American Psychological Association, Montreal, Canada, 1973. (b)

Triesman, A. M. verbal cues, language and meaning in selective attention. American Journal of Psychology, 1965, 77, 215-216.

Ude, L. K. & Volger, R. E. Internal versus external control of reinforcement and awareness in a conditioning task. Journal of Psychology, 1969, 73, 63-67.

Vinacki, W. The psychology of thinking (2nd Ed.). New York: McGraw-Hill Book Company, 1974.

Waters, D. B. Differential effects of skill and chance instructions on persistence time and attention breaks as a function of locus of control in elementary school children. Unpublished doctoral dissertation, Emory University, 1972.

Weschler, D. Weschler Adult Intelligence Scale. New York: Psychological Corporation, 1955.

Weschler, D. The measurement and appraisal of adult intelligence (4th Ed.). Baltimore, Maryland: Williams and Wilkens, 1958.

Wolk, S. & DuCette, J. Intentional performance and incidental learning as a function of personality and task dimensions. Journal of Personality and Social Psychology,

1974, 29, 90-101.

Zimbardo, P. The cognitive control of motivation. Glenview, Illinois: Scott, Foresman, 1969.

Zytkoshee, A., Strickland, B. R., & Watson, J. Delay of gratification and internal versus external control among adolescents of low socio-economic status. Developmental Psychology, 1971, 4, 93-98.

## APPENDIX I

## Noise Schedule for Predictable Noise

Minute #	Quarter-Minute in which Noise was presented	Length of Burst
1	3	9 sec.
2	3	9 sec.
3	3	9 sec.
4	3	9 sec.
5	3	9 sec.
6	3	9 sec.
7	3	9 sec.
8	3	9 sec.
9	3	9 sec.
10	3	9 sec.
11	3	9 sec.
12	3	9 sec.
13	3	9 sec.
14	3	9 sec.
15	3	9 sec.
16	3	9 sec.
17	3	9 sec.
18	3	9 sec.
19	3	9 sec.
20	3	9 sec.
21	3	9 sec.
22	3	9 sec.
23	3	9 sec.

Noise was presented for 9 seconds each minute during the third quarter of the minute each minute for 23 minutes.

## APPENDIX II

## Noise Schedule for Unpredictable Noise

Minute #	Quarter-Minute in which Noise was presented	Length of Burst
1	3	13 sec.
2	1	11 sec.
3	3	5 sec.
4	1	15 sec.
5	3	8 sec.
6	4	5 sec.
7	3	4 sec.
8	1	14 sec.
9	2	7 sec.
10	2	12 sec.
11	4	4 sec.
12	3	5 sec.
13	2	10 sec.
14	4	14 sec.
15	1	15 sec.
16	4	11 sec.
17	4	13 sec.
18	1	9 sec.
19	4	6 sec.
20	2	4 sec.
21	3	13 sec.
22	3	3 sec.
23	4	8 sec.

Noise was presented at a randomly determined point in each minute for a randomly determined number of seconds (3-15).



## APPENDIX III

## Packet

Included are all questionnaires, forms, and instructions as they were presented to each subject (for counterbalancing orders see Appendix IV).

## PERSONAL REACTION INVENTORY

This is a questionnaire to find out the way in which certain important events in our society affect different people. Each item consists of a pair of alternative statements lettered a or b. Please select the one statement of each pair (and only one) which you more strongly believe to be the case as far as you're concerned. Be sure to select the one you actually believe to be more true rather than the one you think you should choose or the one you would like to be true. This is a measure of personal belief: obviously there are no right or wrong answers.

Please answer these items carefully but do not spend too much time on any one item. Be sure to find an answer for every choice. Indicate your response to each item by circling the letter (a or b) which appears in front of the statement that you have chosen as most true.

In some instances you may discover that you believe both statements or neither one. In such cases, be sure to select the one you more strongly believe to be the case as far as you're concerned. Also, try to respond to each item independently when making your choice; do not be influenced by your previous choices.

1. a. Children get into trouble because their parents punish them too much.  
b. The trouble with most children nowadays is that their parents are too easy with them.
2. a. Many of the unhappy things in people's lives are partly due to badk luck.  
b. People's misfortunes result from the mistakes they make.
3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.  
b. There will always be wars, no matter how hard people try to prevent them.
4. a. In the long run people get the respect they deserve in this world.  
b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
5. a. The idea that teachers are unfair to students in nonsense.  
b. Most students don't realize the extent to which

their grades are influenced by accidental happenings.

6.
  - a. Without the right breaks one cannot be an effective leader.
  - b. Capable people who fail to become leaders have not taken advantage of their opportunities.
7.
  - a. No matter how hard you try some people just don't like you.
  - b. People who can't get others to like them don't understand how to get along with others.
8.
  - a. Heredity plays the major role in determining one's personality.
  - b. It is one's experiences in life which determine what they're like.
9.
  - a. I have often found that what is going to happen will happen.
  - b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.
10.
  - a. In the case of the well-prepared student there is rarely if ever such a thing as an unfair test.
  - b. Many times exam questions tend to be so unrelated to course work that studying is really useless.
11.
  - a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
  - b. Getting a good job depends mainly on being in the right place at the right time.
12.
  - a. The average citizen can have an influence in government decisions.
  - b. This world is run by the few people in power, and there is not much the little guy can do about it.
13.
  - a. When I make plans, I am almost certain that I can make them work.
  - b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.
14.
  - a. There are certain people who are just no good.
  - b. There is some good in everybody.
15.
  - a. In my case getting what I want has little or nothing to do with luck.
  - b. Many times we might just as well decide what to do by flipping a coin.

16.
  - a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
  - b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.
17.
  - a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand nor control.
  - b. By taking an active part in political and social affairs the people can control world events.
18.
  - a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
  - b. There is really no such thing as "luck."
19.
  - a. One should always be willing to admit mistakes.
  - b. It is usually best to cover up one's mistakes.
20.
  - a. It is hard to know whether or not a person really likes you.
  - b. How many friends you have depends upon how nice a person you are.
21.
  - a. In the long run the bad things that happen to us are balanced by the good ones.
  - b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.
22.
  - a. With enough effort we can wipe out political corruption.
  - b. It is difficult for people to have much control over the things politicians do in office.
23.
  - a. Sometimes I can't understand how teachers arrive at the grades they give.
  - b. There is a direct connection between how hard I study and the grades I get.
24.
  - a. A good leader expects people to decide for themselves what they should do.
  - b. A good leader makes it clear to everybody what their jobs are.
25.
  - a. Many times I feel that I have little influence over the things that happen to me.
  - b. It is impossible for me to believe that chance or luck plays an important role in my life.
26.
  - a. People are lonely because they don't try to be friendly.
  - b. There's not much use in trying too hard to please



people, if they like you, they like you.

- 27. a. There is too much emphasis on athletics in high school.  
b. Team sports are an excellent way to build character.
- 28. a. What happens to me is my own doing.  
b. Sometimes I feel that I don't have enough control over the direction my life is taking.
- 29. a. Most of the time I can't understand why politicians behave the way they do.  
b. In the long run the people are responsible for bad government on a national as well as on a local level.



## Information Sheet

Note: All information will be kept confidential.

Name \_\_\_\_\_ Age \_\_\_\_\_

Student # \_\_\_\_\_ Place of Birth \_\_\_\_\_  
(or Social Security #)

SAT Scores: Math \_\_\_\_\_ Verbal \_\_\_\_\_ Approx. GPA \_\_\_\_\_  
(Grade point average)

Year of College: Fresh \_\_\_\_\_ Soph \_\_\_\_\_ Junior \_\_\_\_\_ Senior \_\_\_\_\_

Do you have any hearing problems? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, please describe.

On the questions below, please circle the number that is the best answer:

How noisy was it where you grew up. (i.e. country/city; sub-urban/downtown)

extremely quiet - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - extremely noisy

How noisy is it where you live now? (i.e. small dorm/large dorm; country/town, etc.)

extremely quiet - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - extremely noisy

Do you enjoy listening to loud music?

enjoy loud music - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - dislike loud music

Is it easy for you to concentrate? (i.e. read while the radio is on; converse with the TV on, etc.)

easy to concentrate - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - hard to concentrate

## IDEAS

## Human Subjects' Consent Form

I understand that the purpose of today's experiment is to determine the effects of noise on verbal and cognitive performance. I understand that while I am working I may hear some loud noises that may be an unpleasant distraction, but, I have been informed, can cause me no actual harm.

I understand that I am free to withdraw from this experiment at any time without penalty, and I expect to receive a full description of the project and its implications as part of my participation.

I agree to participate in the project IDEAS.

\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
name /date

\_\_\_\_\_  
student # (or social sec. #) age

## Instructions for SCRAMBLED WORDS

For the next few minutes after I say to turn the page, you will be working on a list of fifty four-letter SCRAMBLED WORDS. These words, listed on the next page, are simple English words--no plurals or proper names--whose letters have been arranged in scrambled order. Work as quickly and as accurately as you can to unscramble the letters and write the correct word in the space provided. Turn the page when I say "begin".

Please Do Not Turn the Page Until Told to Begin.

## SCRAMBLED WORDS

Below is a list of scrambled words. They are common English words--no plurals or proper names. Working as quickly and as carefully as you can, unscramble the letters and write the correct word in the space provided.

1. lypa \_\_\_\_\_
2. etpy \_\_\_\_\_
3. aenm \_\_\_\_\_
4. enra \_\_\_\_\_
5. ardo \_\_\_\_\_
6. egno \_\_\_\_\_
7. daie \_\_\_\_\_
8. rief \_\_\_\_\_
9. tekp \_\_\_\_\_
10. evwi \_\_\_\_\_
11. rakd \_\_\_\_\_
12. seta \_\_\_\_\_
13. aelt \_\_\_\_\_
14. eohep \_\_\_\_\_
15. ilev \_\_\_\_\_
16. olts \_\_\_\_\_
17. drae \_\_\_\_\_
18. lodc \_\_\_\_\_
19. eomv \_\_\_\_\_
20. lhdo \_\_\_\_\_
21. tsro \_\_\_\_\_
22. setr \_\_\_\_\_
23. acer \_\_\_\_\_
24. nfei \_\_\_\_\_
25. tcne \_\_\_\_\_

26. aktl \_\_\_\_\_
27. aerh \_\_\_\_\_
28. rahi \_\_\_\_\_
29. mhwo \_\_\_\_\_
30. lcbu \_\_\_\_\_
31. otcl \_\_\_\_\_
32. iecp \_\_\_\_\_
33. eafm \_\_\_\_\_
34. alpm \_\_\_\_\_
35. loep \_\_\_\_\_
36. ksna \_\_\_\_\_
37. ugsn \_\_\_\_\_
38. atyr \_\_\_\_\_
39. giwn \_\_\_\_\_
40. odem \_\_\_\_\_
41. eulf \_\_\_\_\_
42. lsae \_\_\_\_\_
43. ukbl \_\_\_\_\_
44. mdpa \_\_\_\_\_
45. hids \_\_\_\_\_
46. aenr \_\_\_\_\_
47. algf \_\_\_\_\_
48. wgol \_\_\_\_\_
49. ongw \_\_\_\_\_
50. agbr \_\_\_\_\_

---



---

1	2	3	4	5	6	7	8	9
↶	↷	0	+			+	×	÷

---



---

2	1	4	6	3	5	2	1	3	4	2	1	3	1	2	3	1	4	2	6	3	1	2	5	1

3	1	5	4	2	7	4	6	9	2	5	3	4	7	6	1	8	7	5	4	3	6	9	4	3

1	8	2	9	7	6	2	5	4	7	3	6	6	5	9	4	1	6	6	9	3	7	5	1	4

9	1	5	6	7	6	9	7	8	2	4	8	3	5	6	7	1	9	4	3	6	2	7	8	3

2	1	3	7	2	4	8	1	5	4	2	1	3	2	1	4	2	3	5	2	3	1	4	6	3

1	5	4	2	7	6	3	5	7	2	8	5	4	6	3	7	2	8	1	9	5	6	4	7	3

6	2	5	1	9	2	3	3	7	4	6	5	9	4	8	3	7	2	6	1	5	4	6	3	7

9	2	8	1	7	9	4	6	6	5	9	7	1	8	5	2	9	4	8	6	3	7	9	6	6



Please Do Not Turn the Page Until You Are Told to

## SCRAMBLED WORDS

Below is a list of scrambled words. They are common English words--no plurals or proper names. Working as quickly and as carefully as you can, unscramble the letters and write the correct word in the space provided.

- |          |           |
|----------|-----------|
| 1. orhu  | 26. acto  |
| 2. espt  | 27. eaht  |
| 3. eiwd  | 28. edna  |
| 4. hsto  | 29. aldg  |
| 5. taed  | 30. thru  |
| 6. kwla  | 31. ahcs  |
| 7. atwi  | 32. sfhi  |
| 8. nkgi  | 33. namd  |
| 9. phsi  | 34. lbwo  |
| 10. alyd | 35. aekw  |
| 11. mapc | 36. elna  |
| 12. dsne | 37. uecr  |
| 13. etba | 38. aolr  |
| 14. gpea | 39. kids  |
| 15. eist | 40. otnr  |
| 16. udyt | 41. rodfr |
| 17. sakt | 42. lbwo  |
| 18. elso | 43. iksn  |
| 19. uepr | 44. rhde  |
| 20. lmki | 45. meba  |
| 21. dogl | 46. amet  |
| 22. uheg | 47. laet  |
| 23. meyd | 48. pcor  |
| 24. lsuo | 49. uend  |
| 25. atcs | 50. ispl  |

Please Do Not Turn the Page Until You Are Told to

---



---

1	2	3	4	5	6	7	8	9
÷	4	6	4	÷	3	7	6	3

---



---

2	1	4	6	3	5	2	1	3	4	2	1	3	1	2	3	1	4	2	6	3	1	2	5	1

3	1	5	4	2	7	4	6	9	2	5	8	4	7	6	1	8	7	5	4	8	6	9	4	3

1	8	2	9	7	6	2	5	4	7	3	6	8	5	9	4	1	6	8	9	3	7	5	1	4

9	1	5	8	7	3	9	7	8	2	4	8	2	5	6	7	1	9	4	3	6	2	7	9	3

2	1	3	7	2	4	8	1	5	4	2	1	3	2	1	4	2	3	5	2	3	1	4	6	3

1	5	4	2	7	6	3	5	7	2	8	5	4	6	3	7	2	8	1	9	5	8	4	7	3

6	2	5	1	9	2	3	3	7	4	6	5	9	4	8	3	7	2	6	1	5	4	8	3	7

9	2	8	1	7	9	4	6	8	5	9	7	1	8	5	2	9	4	8	6	3	7	9	3	6

Please Do Not Turn the Page Until You Are Told to



## SCRAMBLED WORDS

Below is a list of scrambled words. They are common English words--no plurals or proper names. Working as quickly and as carefully as you can, unscramble the letters and write the correct word in the space provided.

- |          |          |
|----------|----------|
| 1. edla  | 26. oinr |
| 2. afre  | 27. eipk |
| 3. ptso  | 28. ored |
| 4. iwhs  | 29. roec |
| 5. intu  | 30. ynva |
| 6. thae  | 31. oths |
| 7. akjc  | 32. ptea |
| 8. sreo  | 33. fogl |
| 9. eifl  | 34. afet |
| 10. afts | 35. orni |
| 11. cokr | 36. ebra |
| 12. tbao | 37. ldfe |
| 13. ltfa | 38. rcda |
| 14. nhgu | 39. kapc |
| 15. phso | 40. awdr |
| 16. avts | 41. nakr |
| 17. niem | 42. edvi |
| 18. esfa | 43. onwr |
| 19. idwl | 44. kjeo |
| 20. srki | 45. eocp |
| 21. kisc | 46. enta |
| 22. imel | 47. greu |
| 23. ialm | 48. pgir |
| 24. nlao | 49. lmsi |
| 25. etna | 50. iwph |

Please Do Not Turn the Page Until You Are Told to



Please Do Not Turn the Page Until You Are Told to

## SCRAMBLED WORDS

Below is a list of scrambled words. They are common English words--no plurals or proper names. Working as quickly and as carefully as you can, unscramble the letters and write the correct word in the space provided.

- |                |                |
|----------------|----------------|
| 1. etsn _____  | 26. lseo _____ |
| 2. mary _____  | 27. rotu _____ |
| 3. mafr _____  | 28. oced _____ |
| 4. tsya _____  | 29. ixas _____ |
| 5. loer _____  | 30. egta _____ |
| 6. ycal _____  | 31. ahws _____ |
| 7. insg _____  | 32. lcma _____ |
| 8. kmei _____  | 33. nocr _____ |
| 9. kamr _____  | 34. avyr _____ |
| 10. rgya _____ | 35. aolc _____ |
| 11. iadl _____ | 36. xful _____ |
| 12. hrci _____ | 37. tmse _____ |
| 13. anri _____ | 38. efwl _____ |
| 14. rwma _____ | 39. gahn _____ |
| 15. wrge _____ | 40. tsra _____ |
| 16. asev _____ | 41. urgd _____ |
| 17. olws _____ | 42. ozre _____ |
| 18. ehlo _____ | 43. lgpu _____ |
| 19. rwda _____ | 44. lgfu _____ |
| 20. adre _____ | 45. eitr _____ |
| 21. dabn _____ | 46. ajli _____ |
| 22. ohyl _____ | 47. netr _____ |
| 23. iuts _____ | 48. ecpa _____ |
| 24. dslo _____ | 49. etns _____ |
| 25. aewv _____ | 50. rfyu _____ |



Please Do Not Turn the Page Until You Are Told to

---



---

1	2	3	4	5	6	7	8	9
T	U	V	W	X	Y	Z	A	B

---



---

2	1	4	6	3	5	2	1	3	4	2	1	3	1	2	3	1	4	2	6	3	1	2	5	1

3	1	5	4	2	7	4	6	9	2	5	3	4	7	6	1	8	7	5	4	8	6	9	4	3

1	8	2	9	7	6	2	5	4	7	3	6	8	5	9	4	1	6	8	9	3	7	5	1	4

9	1	5	8	7	6	9	7	8	2	4	8	3	5	6	7	1	9	4	3	8	2	7	9	3

2	1	3	7	2	4	3	1	5	4	2	1	3	2	1	4	2	3	5	2	3	1	4	6	3

1	5	4	2	7	6	3	5	7	2	8	5	4	6	3	7	2	8	1	9	5	8	4	7	3

6	2	5	1	9	2	8	3	7	4	6	5	9	4	8	3	7	2	6	1	5	4	3	3	7

9	2	6	1	7	9	4	6	8	5	9	7	1	8	5	2	9	4	8	6	3	7	9	3	3

## Instructions for PROOFREADING

This task is a test of proofreading. Read the following passage as carefully and as quickly as you can. Underline each error you find and put a checkmark in the space provided on the end of the line on which the error was found. Errors include mistakes in spelling, grammar, typing, punctuation, etc. When I say begin, turn the page and start. Remember to underline each error and put a check at the end of each line on which you find an error.

Please Do Not Turn the Page Until Told to Begin.

p13

"Slumming and unslumming"

from The Death and Life of Great American Cities, by Jane Jacobs,  
copyright 1961, Random House, Inc.

Page

Slums and their populations are the victims (and the perpetrators) of seemingly endless troubles that reinforce each other. Slums operate as vicious circles. In time, these vicious circles enmesh the whole operations of cities. Spreading slums requires even greater amounts of public money - and not simply more money for publicly financed improvement, or to stay even, but more money to cope with ever widening retreat and regression. As needs grow greater, the wherewithal grows less.

Our present urban renewal laws are an attempt to break this particular linkage in the vicious circles by forthrightly wiping away slums and their populations, and replacing them with projects intended to produce higher tax yields, or to lure back easier populations with less expensive public requirements. The method fails. At best: it merely shifts slums from here to there, adding its own tincture of extra hardship and disruption. At worst, it destroys neighborhoods where constructive and improving communities exist and where the situation calls for encouragement rather than destruction.

Slum shifting fails because it tries to overcome causes of trouble by diddling with symptoms. Sometimes even the very symptoms that preoccupy the slum shifters are, in the main vestiges of former troubles rather than significant indications of future ills.

Conventional planning approaches to slums and slum dwellers is thoroughly paternalistic. The trouble with paternalists is that they want to make impossible profound changes, and they choose impossibly superficial means for doing so. To overcome slums, we must regard slum dwellers as people capable of understanding and acting upon their own self-interests, which they certainly are. We need to discern, respect and build upon the forces for regeneration that exists in slums themselves, and that demonstrably work in real cities. This is far from what is done to day.

Vicious circles, to be sure, are hard to follow. Cause and affect become confused precisely because they do link and relink one another in such complicated ways.

Yet there is one particular link that is crucial. If it is broken (and to break it is no simple matter of supplying better housing),



p14

Page 2

a slum spontaneously unslums.

The key link in a perpetual slum is that too many people move out of it too fast - and in the meantime dream of getting out. This is the link that has to be broken if any other efforts at overcoming slums are to be of the least avail. This is the link that actually was broken and has stayed broken in places like North End, or the Back-of-the-Yards in Chicago, or North beach in San Francisco, or the unslummed former slum in which I live. If only a handful of American city slums had ever managed to break this link, we might regard them skeptically as grounds for hope. These places might be freaks. More significant are the great number of slum neighborhoods in which unslumming starts, goes unrecognized, and too often is discouraged or destroyed. The portions of East Harlem in New York which had proceeded far along in unslumming were first discouraged by unavailability of necessary money; then where this slowed the unslumming process but still did not bring regression to slum conditions, most of these neighborhoods were destroyed outright - to be replaced by projects which became almost pathological displays of slum troubles. Many areas in the Lower East side which have started unslumming have been destroyed. My own neighborhood, as recently as the early 1950's was saved from disastrous amputation only because its citizens were able to fight city hall and even at that, only because the officials were confronted with embarrassing evidence that the area was drawing in newcomers with money, although this symptom of its unslummed status was possibly the least significant of the constructive changes that had occurred unnoticed.

Herbert Gans, a sociologist at the University of Pennsylvania; has given, in the February 1959 Journal of the American Institute of Planners, a sober but poignant portrait of an unrecognized unslumming slum, the West End of Boston, on the eve of its destruction. The West Ends, he points out, although regarded officially as a slum, would have been more accurately described as a "stable, low-rent area". If, writes Gans, a slum is defined as an area which "because of the nature of its social environment can be proved to create problems and pathologies", then the West End was not a slum. He speaks of the intense attachment of residents to the district, of its highly developed informal social control, of the fact that many



p15

Page 3

residents had modernized or improved the interiors of their apartments - all typical characteristics of an unslumming slum.

Unslumming hinges, paradoxically, on the retention of a very considerable part of a slum population within a slum. It hinges on whether a considerable number of the residents and businessmen of a slum find it both desirable and practical to make and carry out their own plans right there, or whether they must virtually all move elsewhere.

I shall use the designation "perpetual slums" to describe slums which show no signs of social or economic improvement with time, or which regress after a little improvement. However: if the condition for generating city diversity can be introduced into a neighborhood while it is a slum, and if any indications of unslumming are encouraged rather than thwarted, I believe there is no reason that any slum need be perpetual.

The inability of a perpetual slum to hold enough of its population for unslumming is a characteristic that starts before the slum itself starts. There is a fiction that slums, in forming malignantly supplant-healthy tissue. Nothing could be farther from the truth.

The first sign of an incipient slum, long before visible blight can be seen, is stagnation and dullness. Dull neighborhoods are inevitably deserted by their energetic, ambitious, or affluent citizens, and also by their young people who can get away. They inevitably fail to draw newcomers by choice. Furthermore, aside from these selective desertions and the selective lack of vigorous new blood, such neighborhoods eventually are apt to undergo rather sudden wholesale desertions by their nonslum populations.

Nowadays, the wholesale desertion by nonslum populations which give a slum its initial opportunity to form, are sometimes blamed on the proximity of another slum (especially if it is a Negro slum) or on the presence or proximity of Italian or Jewish or Irish families. Sometimes the desertion is blamed on the age and obsolescence of dwellings, or on vague, general disadvantages such as lack of playgrounds or proximity of factories.

However, all such factors are immaterial. In Chicago, you can see neighborhoods only a block or two blocks in from the Lakefront Parkland, far from the settlements of minority groups, well endowed

p16

Page 4

with greenery, quiet enough to make one's flesh creep, and composed of substantial, even pretentious buildings. On these neighborhoods are the literal signs of desertion; "For Rent," "To Let," "Vacancy" Rooms for permanent and Transient Guests," "Guests Welcome," "Sleeping Rooms," "Furnished Rooms," "Unfurnished Rooms," "Apartments Available." These buildings have trouble drawing occupants in a city where the colored citizens are cruelly overcrowded in their shelter and cruelly overcharged for them. The buildings are going begging because they are being rented or sold only to whites - and whites, who have so much more choice, do not care to live here. The beneficiaries of this particular impasse, at least for the moment, turn out to be immigrating hillbillies, whose economic choice is small and whose familiarity with city life are still smaller. It is a dubious benefit they receive: inheritance of dull and dangerous neighborhoods whose unfitness for city life finally repelled residents more sophisticated and competent than they.

Sometimes to be sure, a deliberate conspiracy to turn over the population of a neighborhood does exist - on the part of real estate operators who make a racket of buying houses cheaply from panicked white people and selling them at exorbitant prices to the chronically housing-starved and pushed-around colored population. But even this racket work is only in already stagnated and low vitality neighborhoods. (Sometimes the racket perversely improves a neighborhood's upkeep, when it brings in colored citizens more competent in general and more economically able than the whites they replaced; but the exploitative economics sometimes results instead in replacement of an uncrowded, apathetic neighborhood with an overcrowded neighborhood in considerable turmoil.)

If there were no slum dwellers or poor immigrants to inherit city failures, the problem of low-vitality neighborhoods abandoned by those with choice would still remain and perhaps would be even more troubling. This condition can be found in parts of Philadelphia where "decent, safe and sanitary" dwellings go empty in stagnated neighborhoods, while their former populations move outward into new neighborhoods which are little different, intrinsically, from the old except that they are not yet embedded by the city.

It is easy to see where new slums are spontaneously forming today, and how dull, dark and undiverse are the streets in which



p17

Page  
5

they typically form, because the process is happening now, What is harder to realize, because it lies in the past, is the fact that lack of lively urbanity has usually been an original characteristic of slums. The classic repfirm literature about slums does not tell us this. Such literature - Lincoln Steffens' Autobiography is a good example - focused on slums that had already overcome their dull beginnings (but had aquired other troubles in the mean time). A teeming, bustling slum was pinpointed at a moment in time, with the deeply erroneous implication that as a slum is, so it was - and as it is, so it shall be, unless it is wiped away root and branch.

The unslummed former slum in which I live was just such a teeming place by the early decades of this century, and its gang, The Hudson Dusters, was notorious thoghout the city, but its career as a slum did not begin in any such bustle. The history of the Episcopal chapel a few blocks down the street tells the tale of the slum's formation, almost a century ago in this case. The neighborhood had been a place of farms, village streets and summer homes which evovled into a semi-suburb that became embedded in the rapidly growing city. Coloured people and immigrants from Europe were surrounding it; neither physically nor socially was the neighborhood equipped to handle their presence - no more, apparently, than a semisuburb is so equipped today. Out of this quiet residential area - a charming place, from the evidence of old pictures - there were at first many random desertions by congregation families; those of the congregation who remained eventually panicked and departed en masse.. The church building was abandoned to Trinity parish, which took it over as a mission chapel to minister to the influxof the poor who inherited the semisuburb. The former congregation re-established the church far uptown, and colonized in its neighborhood a new queit residential area of unbelievable dullness; it is now a part of Harlem. The records do not tell where the next preslum was built by these wanderers.

The reasons for slum formation, and the processes by which it happens, have changed surprisingly little over the decades. What is new is that unfit neighborhoods can be deserted more swiftly, and slums can and do spread thinner and farther, than was the case in the days before automobiles and government-guaranteed morgages for suburban developments, when it was less practical for families with choice

p18

Page 6

to flee neighborhoods that were displaying some of the normal and inevitable conditions that accompany city life such as presence of strangers), but none of the natural means for converting these conditions into assets.

At the time a slum first forms, its population may rise spectacularly. This is not a sign of popularity, however. On the contrary, it means the dwellings are becoming overcrowded; this is happening because people with the least choice, forced by poverty or discrimination to overcrowd, are coming into an unpopular area.

The density of the dwelling units themselves may or may not increase. In old slums, they customarily did increase because of the construction of tenements. But the rise in dwelling density typically did not cut down the overcrowding. Total population increased greatly instead, with overcrowding superimposed on the high dwelling densities.

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

## Instructions for PUZZLES

In front of you there are four stacks of 5X7 cards, a discard bin, and in the upper righthand corner of your desk, a switch. These items are important for this task.

Each pile of cards contains copies of a geometric line design. The task is to trace all the lines in the diagram with your pencil so that you do not trace over any line twice or lift the pencil off of the figure.

You will have twenty (20) seconds to work on each card you take, starting with #1 on your left. Take as many twenty-second trials on each puzzle as you wish. When time is called on a trial it means you must immediately discard the card you are working on into the discard bin. You must then decide whether to take another card from the same pile as the card you were working on or go on to the next pile and a new puzzle. This is your decision, but remember that once you do go on to a new puzzle, you cannot return to one that you left unsolved.

If you wish another trial, just drop the unsuccessful card into the discard bin and take another card from the same pile. If you want to go on to the next item, you may, but you may not return to the unsolved item. After a successful solution, put the correctly solved card face up on top of the pile it came from and go immediately to the next puzzle.

When you have completed the last trial you want on the



last puzzle, activate the switch on the upper righthand side of your desk. This will begin a short rest period.

# Experimental Reaction Sheet

Please circle the number which most accurately reflects your reaction to the following items:

1. The noise I heard while working on the verbal and numerical tasks was:

a. extremely relaxing 1\_\_2\_\_3\_\_4\_\_5\_\_6\_\_7\_\_8\_\_9 extremely irritating

b. extremely pleasant 1\_\_2\_\_3\_\_4\_\_5\_\_6\_\_7\_\_8\_\_9 extremely unpleasant

2. To what extent was the noise you heard distracting? The noise made it:

extremely easy 1\_\_2\_\_3\_\_4\_\_5\_\_6\_\_7\_\_8\_\_9 extremely difficult to concentrate to concentrate

3. Did you notice any pattern or predictability to the noise? The noise was:

extremely 1\_\_2\_\_3\_\_4\_\_5\_\_6\_\_7\_\_8\_\_9 extremely predictable unpredictable

Thank you for your help. The Experimenter will come into the room in a moment to explain and discuss the experiment with you.

## Open Ended Questionnaire

1. What do you think is the true purpose of this experiment?
2. Do you think you were deceived in any way? If so, how?
3. If you heard loud noises during the scrambled words and digit symbol tasks, how did it affect you?
4. Were there any specific sounds that you could identify? If so, what?
5. If you heard noise during the tasks, how did you cope with it? Was it difficult to cope with? Did you employ a particular strategy?

## APPENDIX IV

## Counterbalancing Schedule

N=	First Task	Presentation Order	First Post-Noise Task	Ss Per Condition
6	Anagrams	1,2,3	Proofreading	2
6	Digit Symbol	1,2,3	Proofreading	2
6	Anagrams	1,2,3	Puzzles	2
6	Digit Symbol	1,2,3	Puzzles	2
6	Anagrams	2,3,1	Proofreading	2
6	Digit Symbol	2,3,1	Proofreading	2
6	Anagrams	2,3,1	Puzzles	2
6	Digit Symbol	2,3,1	Puzzles	2
6	Anagrams	3,1,2	Proofreading	2
6	Digit Symbol	3,1,2	Proofreading	2
6	Anagrams	3,1,2	Puzzles	2
6	Digit Symbol	3,1,2	Puzzles	2
<u>72</u>				

For Anagrams:    Order #1 = Form #5  
                          Order #2 = Form #2  
                          Order #3 = Form #3

For Digit Symbol:    Order #1 = Form #1  
                          Order #2 = Form #4  
                          Order #3 = Form #3

Two subjects in each condition received the experimental tasks in each of the twelve counterbalancing orders shown above. Thus an equal number of subjects received each of the treatments and each of the task orders in the experiment.

The same presentation order was used to present the different forms for both anagrams and Digit Symbol within each counterbalancing order.

Appendix VI. Histogram of the I-E Distribution.

