



National Library of Canada  
Collections Development Branch

Canadian Theses on  
Microfiche Service

Bibliothèque nationale du Canada  
Direction du développement des collections

Service des thèses canadiennes  
sur microfiche

## NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us a poor photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30. Please read the authorization forms which accompany this thesis.

THIS DISSERTATION  
HAS BEEN MICROFILMED  
EXACTLY AS RECEIVED

## AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de mauvaise qualité.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30. Veuillez prendre connaissance des formules d'autorisation qui accompagnent cette thèse.

LA THÈSE A ÉTÉ  
MICROFILMÉE TELLE QUE  
NOUS L'AVONS REÇUE

EFFECTS OF FENESTRATION AND ROOM SIZE  
ON MOOD AND MOOD CHANGE

by Barbara A. R. Znaniecki

Thesis presented to the School of  
Graduate Studies of the University  
of Ottawa as partial fulfillment  
of the requirements for the degree  
of Doctor of Philosophy in Clinical  
Psychology

Ottawa, Canada, 1978

© B.A.R. Znaniecki, Ottawa, Canada, 1979

## CURRICULUM STUDIORUM

Barbara A. R. Znaniecki received the Bachelor of Architecture degree from McGill University in 1945. She received the Bachelor of Arts (Honours) degree in Psychology from Carleton University in 1970. The title of her thesis was Investigation of a Method of Measuring Emotional Response to Architectural Space. She received the Master of Environmental Studies degree from York University in 1972. Her thesis was entitled A Study in Microenvironmental Perception: Effects on Perceptual Error and Preferred Behaviour of Varying the Height and Width of Model Rooms.

## ACKNOWLEDGMENTS

This thesis was prepared under the supervision of Assistant Professor Daniel Lee, Ph.D., of the Faculty of Psychology of the University of Ottawa. I wish to express my appreciation to him for his continuous guidance, encouragement, and availability for consultation throughout the period that the thesis was in preparation. The interest and personal contribution of other staff members is warmly appreciated.

I would like to express my gratitude to Mr. Mel Ransome of York University for permission to use the Committee Room as the basis for the test rooms, to Mr. D. J. Mitchell and Mr. David Atkinson for making the project possible, and to the staff and students of many other departments and faculties for their support and assistance throughout the testing period.

Consultation with Dr. Vincent Nowlis and permission to use his Mood Adjective Check List are gratefully acknowledged.

My sincere thanks are due to members of my family for their help in the preparation and checking of the thesis and, finally, to my father and to my husband for their patience, encouragement, and support at every stage of the work.

## ABSTRACT

The purpose of this study was to investigate effects of basic structural aspects of rooms on human behavior. Two sizes of unfurnished university offices were tested, each in three window conditions, for their effects upon mood change. The window conditions, (1) 100% of the window bays in the exterior wall, (2) 50%, and (3) 0%, were achieved by covering half or all of the windows with screens like the wall partitions. In fact, one long, rectangular room was divided into two--one exactly half the length of the other.

Sixty-three university employees and students were given three short mood tests (Nowlis' Short Form MACL of 24 adjectives, 1965) upon arrival, after entering the test room, and after delay in the room. Change in mood was measured by subtracting the earlier mood rating from the later one. Two measures were calculated--mood change upon Impact with the test room, and after Delay in the room. These were summed to give a total mood change in each room condition, both in gross (absolute) and net measures.

Five mood factors were extracted in factor analysis. Analyses of variance of mood change, both gross and net, by factors revealed no significant interaction between room size and window conditions.

v

All experimental subjects were given two personality inventories (Gordon Personality Profile and Inventory) before the experiment began. The results of these were correlated by the Pearson method with mood change for the five mood factors. No significant correlations were found of a value of .4 or greater.

The Architectural Evaluation (AE) task which was used to delay subjects in the test room consisted of the rating of six enlarged black-and-white photographs of the six test rooms on Canter and Wools' (1970) Friendliness scale. The results of these tests were subjected to split-plot analysis of variance with subjects' test rooms as blocks. This revealed a significant difference in "Friendliness" rating by photographs ( $p < .001$ ) and a significant trend ranging from the highest (friendliness) rating in the larger room with 100% windows to the lowest rating in the smaller room with no windows ( $p < .01$ ). When analyzed for a difference in rating by subjects' test rooms, no significant pattern was found.

Four control groups were given a single administration of the MACL in one of two room conditions (randomly selected). One half in each room condition was tested after entering the room, as with experimental subjects' second mood test, and half after delay, working on the AE task. Comparisons by  $t$  test with the appropriate room conditions

and MACL administration produced no significant differences between experimentals and controls.

Conclusions were that, in this study, the effect of size of the room and window proportions did not reach a significance greater than might be expected from chance alone. Personality variables correlated differentially with gross and net mood change measures, although none of these was of statistical significance. No evidence of interaction was found between windows and room size.

## TABLE OF CONTENTS

Chapter	page
INTRODUCTION . . . . .	xii
I. REVIEW OF THE LITERATURE . . . . .	1
Architectural Background	1
Environmental Psychology	1
Architectural Psychology	2
Architectural Determinism	7a
The Need for Theory	11
Windows	13a
Studies of Room Size	25
Personality Variables	25a
Mood Studies	27a
Mood as a Concept	27a
The Measurement of Mood	37a
Statement of the Problem	42
II. METHOD . . . . .	48
The Setting	48
The Instruments	53
The Mood Adjective Check List (MACL)	
Short Form	53
The Gordon Personal Profile (GPP) and Inventory	58
The Architectural Evaluation (AE) Friendliness Scale	67
The Questionnaire	74
The Subjects	76
Procedure	80
Hypotheses	84
Rationale for Hypotheses	84
Experimental Design	87
The Measurement of Mood and Mood Change	89
Statistical Analysis	92
III. PRESENTATION OF RESULTS . . . . .	95
Factor Analysis of Mood Adjective Ratings	95
Tests of Hypotheses	98
Hypothesis 4	98
Hypotheses 1a and 1b	99
Hypotheses 2a and 2b	112
Hypotheses 3a and 3b	114
Hypothesis 5a	115
Hypothesis 5b	117
Control Groups	117
Summary of Results	120

Chapter	page
IV. DISCUSSION OF RESULTS. . . . .	123
Factor Analysis of Mood Adjective Raw Scores	123
Discussion of Hypotheses	124
Limitations of the Study	142
SUMMARY AND CONCLUSIONS. . . . .	149
Suggestions for Further Research	151
REFERENCES . . . . .	153
Appendix	
1. PHOTOGRAPHS OF PERSONNEL DEPARTMENT RECEPTION AREA . . . . .	161
2. PHOTOGRAPHS OF THE PROJECT RECEPTION AREA. . . . .	163
3. A SHORT FORM OF THE MOOD ADJECTIVE CHECK LIST (MACL). . . . .	165
4. THE ARCHITECTURAL EVALUATION (AE) FRIENDLI- NESS SCALE . . . . .	167
5. PHOTOGRAPHS OF THE SIX TEST ROOMS, USED IN THE ARCHITECTURAL EVALUATION (AE) FRIENDLINESS TEST. . . . .	174
6. SUBJECT SHEET (PERSONAL QUESTIONNAIRE) . . . . .	181
7. SAMPLE ISSUE OF YORK UNIVERSITY BULLETIN . . . . .	183
8. SAMPLE OF BILLBOARD NOTICES. . . . .	185
9. LETTER TO DEPARTMENT HEADS . . . . .	187
10. INTRODUCTION FOR SUBJECTS. . . . .	190
11. WRITTEN INSTRUCTIONS TO SUBJECTS (INCLUDING SEPARATE INSTRUCTIONS FOR TWO TYPES OF CONTROL GROUPS). . . . .	192
12. SUMMARY TABLES OF THE ANALYSES OF VARIANCE FOR THE FIVE MOOD FACTORS OF NET MOOD CHANGE FOR IMPACT AND DELAY . . . . .	196
13. TABLES OF MEAN MOOD CHANGE, GROSS AND NET, BY ROOMS, FOR THE FIVE MOOD FACTORS . . . . .	207

LIST OF TABLES

Table	page
1. Number of Valid Tests in Each Room Condition. . . . .	96
2. Variables with Highest Loadings on the First Five Mood Factors. . . . .	97
3. Analysis of Variance Summary Table for Gross Mood Change upon Impact for Factor 1 . . . . .	101
4. Analysis of Variance Summary Table for Gross Mood Change upon Impact for Factor 2 . . . . .	102
5. Analysis of Variance Summary Table for Gross Mood Change upon Impact for Factor 3 . . . . .	103
6. Analysis of Variance Summary Table for Gross Mood Change upon Impact for Factor 4 . . . . .	104
7. Analysis of Variance Summary Table for Gross Mood Change upon Impact for Factor 5 . . . . .	105
8. Analysis of Variance Summary Table for Gross Mood Change after Delay for Factor 1 . . . . .	106
9. Analysis of Variance Summary Table for Gross Mood Change after Delay for Factor 2 . . . . .	107
10. Analysis of Variance Summary Table for Gross Mood Change after Delay for Factor 3 . . . . .	108
11. Analysis of Variance Summary Table for Gross Mood Change after Delay for Factor 4 . . . . .	109
12. Analysis of Variance Summary Table for Gross Mood Change after Delay for Factor 5 . . . . .	110
13. Gross Mood Change Summed over Factors in Conditions of Impact, Delay and Total by Test Rooms. . . . .	113
14. Significant Correlations between Gross Mood Change and Personality Traits on the GPP and GPI. . . . .	125

Table	page
15. Significant Correlations between Net Mood Change and Personality Traits on the GPP and GPI. . . . .	127
16. Analysis of Variance Summary Table for Net Mood Change upon Impact for Factor 1 . . . . .	197
17. Analysis of Variance Summary Table for Net Mood Change upon Impact for Factor 2 . . . . .	198
18. Analysis of Variance Summary Table for Net Mood Change upon Impact for Factor 3 . . . . .	199
19. Analysis of Variance Summary Table for Net Mood Change upon Impact for Factor 4 . . . . .	200
20. Analysis of Variance Summary Table for Net Mood Change upon Impact for Factor 5 . . . . .	201
21. Analysis of Variance Summary Table for Net Mood Change after Delay for Factor 1 . . . . .	202
22. Analysis of Variance Summary Table for Net Mood Change after Delay for Factor 2 . . . . .	203
23. Analysis of Variance Summary Table for Net Mood Change after Delay for Factor 3 . . . . .	204
24. Analysis of Variance Summary Table for Net Mood Change after Delay for Factor 4 . . . . .	205
25. Analysis of Variance Summary Table for Net Mood Change after Delay for Factor 5 . . . . .	206
26. Mean Gross Mood Change by Rooms for Factor 1: Negative Mood. . . . .	208
27. Mean Gross Mood Change by Rooms for Factor 2: Positive Mood. . . . .	209
28. Mean Gross Mood Change by Rooms for Factor 3: Egotistic Defiance . . . . .	210
29. Mean Gross Mood Change by Rooms for Factor 4: Fatigue. . . . .	211
30. Mean Gross Mood Change by Rooms for Factor 5: Concentration. . . . .	212

Table	page
31. Mean Net Mood Change by Rooms for Factor 1: Negative Mood. . . . .	213
32. Mean Net Mood Change by Rooms for Factor 2: Positive Mood. . . . .	214
33. Mean Net Mood Change by Rooms for Factor 3: Egotistic Defiance . . . . .	215
34. Mean Net Mood Change by Rooms for Factor 4: Fatigue. . . . .	216
35. Mean Net Mood Change by Rooms for Factor 5: Concentration. . . . .	217

## LIST OF FIGURES

Figure	page
1. Flow Diagrams for Experimental and Control Subjects and Results Expected from Each . . . .	78
2. Mean Gross Mood Change Summed over Factors, by Room Size. . . . .	111
3. Mean AE Rating by Room Photographs. . . . .	116
4. Rating of Room Photographs by Subjects in the Six Test Rooms . . . . .	118
5. Total Gross and Net Mood Change (Impact plus Delay) by Factors by Room Size. . . . .	133
6. Total Gross Mood Change (Impact plus Delay) by Factors by Windows . . . . .	135
7. Total Net Mood Change (Impact plus Delay) by Factors by Windows. . . . .	136
8. Total Mean Gross and Net Mood Change (Impact plus Delay) Summed over Factors for Window Conditions by Room Size . . . . .	139
9. Mean Gross Mood Change (Impact plus Delay) for the Two Room Sizes by Window Conditions . . . .	140
10. Photographs of Personnel Department. . . . .	162
11. Photographs of the Project Reception Area. . . .	164
12. Photograph of Large Room with 100% Windows Used in the Architectural Evaluation Test . . . .	175
13. Photograph of Small Room with 100% Windows. . . .	176
14. Photograph of Large Room with 50% Windows . . . .	177
15. Photograph of Small Room with 50% Windows . . . .	178
16. Photograph of Large Room with 0% Windows. . . . .	179
17. Photograph of Small Room with 0% Windows. . . . .	180

## INTRODUCTION

The whole field of research in architectural psychology is so new that theories have not yet been propounded on which experimentation may be based. Sufficient fundamental research data have not yet been accumulated. In order to learn about the effects on human beings of some of the most basic elements of structures, a number of studies have been made of certain single structural units such as rooms. An increasing body of research has examined the subjective evaluation of rooms and offices with regard to their comfort and satisfaction. Emotional reactions to rooms have received little attention in the form of objective studies. This gap is the subject of the present study.

This study investigated the possible effects of fenestration and room size on mood change in rooms. It is hoped to add a meaningful contribution to the accumulation of research data in the field, and if possible to narrow the focus for further research along these lines.

While the literature contains a number of papers on the pros and cons of fenestration in buildings, especially subjective measures, none has yet examined the possible effects of windows on change of emotional status, or mood. In addition, because of the difficulty of manipulating the physical variables, simulation methods have frequently been

used such as drawings, photographs, and models of rooms. The presence of the experimenter has always created a social relationship in the context of the experiment. In the present study the subject was alone in the room from the start. Three window conditions in two different rooms were examined, 100%, 50%, and 0% of windows in the window bays of the exterior wall.

Studies of human reaction to room size are extremely rare. Those few that are found in the literature have defined size by a fundamentally social characteristic of the room--the number of people in it. The question has not been asked how the human being relates to the physical size of the room alone. This study examined the effects of room size on mood change. Two sizes of room were included, one twice the length of the other.

A third aspect of the present study looked for possible interaction between fenestration and room size in their effects upon mood change.

Mood was measured three times--upon the subject's arrival for the experiment, upon entry into the room, and after delay in the room. The instrument employed was Nowlis' Mood Adjective Check List, the 24-adjective Short Form (Nowlis & Green, 1965).

Mood in the literature has been described as closely identified with emotion but less clearly defined and quite

changeable. Moods of very long duration have been seen as aspects of personality. In the present experiment, a pre-test measure of personality was obtained to determine whether any mood change which occurred was actually a function of personality, as well as of the room itself. Two instruments were used, the Gordon Personal Profile (Gordon, 1953, 1963) and the Gordon Personal Inventory (Gordon, 1956, 1963).

In order to fill the time during delay in the room without inappropriately distracting the subject's attention, a task was administered which consisted of an architectural evaluation of photographs of the six test room conditions, judged on the criterion of their appearance of friendliness. For this task, the Friendliness scale was used, developed by Canter and Wools in 1970. The results of this test permitted a comparison of the friendliness of the room across all test room conditions of windows and size, as judged from photographs. In addition, the average "friendliness" ratings given by subjects in the different test rooms furnished an additional comparison of behavior in relation to these rooms.

The review of the literature in Chapter I deals first with the architectural background to the study and the development of the field of architectural psychology. It also considers the role played by personality variables or individual differences in human response to the environment. The chapter ends with a review of the literature on mood.

Chapter II presents a detailed description of the setting. It looks at the historical development of each of the instruments used in the study--Nowlis' MACL to measure mood, the Gordon Personal Profile and Inventory to assess personality, Canter and Wools' Friendliness scale to rate the friendliness of rooms, and, finally, a questionnaire, administered at the very end of the experiment, relating to personal data in the subject's life which might affect mood on the testing day in some unusual manner. This chapter also includes a presentation of the experimental design, the statistical analysis, and a detailed account of the measurement of mood and mood change employed in this study.

Results of the experiment are presented in Chapter III and the discussion of results in Chapter IV. This is followed by Summary and Conclusions including suggestions for further research.

The appendix contains copies of papers and forms used, such as the introduction for subjects, the written directions to the test room, the Architectural Evaluation test, the personal questionnaire, the photographs used in the Evaluation test and other photographs of the setting, copies of publicity used to recruit subjects for the experiment, and certain summary tables.

## CHAPTER I

### REVIEW OF THE LITERATURE

#### Architectural Background

##### Environmental Psychology

The emergence and establishment of the field of environmental psychology has been progressing with increasing rapidity over the past 20 years. Its development has barely kept pace with the growing awareness of our environment through continual assault from the news media, current literature, and government legislation. Proshansky (1976) has described environmental psychology as "this very different if not virtually uncharted territory of human problems characterized by a multitude of undefined theoretical and empirical questions" (p. 303). Craik (1973) refers to it as "an inherently and demonstratively multidisciplinary field" (p. 403) involving, as it does, such areas as geography, architecture, natural resources management, political science, sociology and anthropology, as well as the psychology of humans and animals. "There are few if any fields that do not at some points touch on the relationship between man and his environment" (Wohlwill, 1970, p. 303). Although some of the areas of research are specifically classified and named, such as behavioral geography and psychological

ecology, Craik (1973) sees "environmental psychology" as an all-inclusive and "theoretically neutral term" (p. 403).

Some writers focus attention mainly on the built environment. Markus et al. (1972) studied the relationship between buildings and the activities which they house:

If it is to function properly, any activity system must have an appropriate environment. In most cases this is provided in buildings which modify the external environment in various ways and provide a controlled, internal environmental system within which the activity system can flourish. The relationship between these two systems is particularly intricate and the elucidation of this relationship is central to the development of an understanding of building and environmental design (p. 9).

In short, the new field of environmental psychology is almost limitless in extent and as yet ill-defined, and some writers feel that the relationship between the built environment and the activities housed within it requires greater understanding.

### Architectural Psychology

One field which intimately concerns the built environment is that known as Architectural Psychology. This area of study has developed only within the last 10 to 15 years and as yet has no clearly established theories, principles, or methodologies on which to base a definition. However, the need for such studies has been frequently and explicitly stated. Canter and Wools (1970) have likened the architect to the cuckoo which "lays his eggs in other peoples' [sic] nests and never returns to see into what they hatch" (p. 187).

Canter (1970b), too, points out that "there is no way of recording an architect's success or failure over a period of time" (p. 299). Craik (1970b) describes the increasing complexity of design problems with an even greater acceleration of change in technological and social structures, so that the designer is overwhelmed by the volume of specialized information in his field. He is under pressure to compete and to produce "yet, challenged by problems of ever greater scope and intricacy, the designer's cognitive capacity and intuitive gifts are taxed beyond their limits" (p. 18).

In general terms, Canter (1970b) expressed the goal of architectural psychology quite emphatically, stressing that it is the architect's responsibility "to convert the client's thoughts, wishes and feelings<sup>1</sup> into architectural terms" (p. 299) and to do this, he must have a scientific understanding of the relationship between buildings and people, and between clients' expectations and observed reality. Canter deplores the fact that, at present, design decisions are inhibited by inexplicit designer/user terms of reference, and a generally vague building/user framework. Today, the ultimate tenants, or users, of buildings are often unknown at the design and construction stages.

In fact, Canter (1970a) has described in some detail the three roles that one might expect an architectural

---

<sup>1</sup> Italics mine.

psychologist to play, as "scientist, consultant or journalist" (p. 4). He feels that the scientist's job is to define the problems, show how they relate to the studies of other scientists and attempt a solution. It is the journalist's job to communicate the findings of the scientist and consultant to others, especially designers.

The name, Architectural Psychology, seems to have originated in the early 1960s. A two-day conference was held at Salt Lake City, Utah, in 1961, "with 15 experts from the United States and Canada to discuss the feasibility of combining Architecture and Psychology and Medicine (Psychiatry) in a program of research" (Taylor, 1971, p. 4). A program of training in architectural psychology was begun the same year as a result of this conference.

In Britain, to pinpoint only a very few signposts en route to this new field of research, a Department of Building Science was set up in 1959 at the University of Liverpool. A commission to study "windowless factories" and their "daylight counterpart," developed into a multi-disciplinary research team to study the internal environment of buildings, with the long-term aim of demonstrating the interdependence of the many components that form the total environment. Manning (1967) commented:

There is a long history of studies of the separate components of the environment (for example, of light, heat and sound) but few researchers have attempted to show the relation of one to the other, and to the whole (p. 21).

Over the next eight years, the Pilkington Research Unit at the University of Liverpool undertook a systematic investigation of building types--factories, offices, primary schools and, finally, mental hospitals. The team consisted of four professionals--architect, psychologist, geographer, and physicist, together with a secretary and a technician.

In Glasgow, the Building Performance Research Unit (BPRU) was established in 1967 at the University of Strathclyde with its principal purpose to appraise building performance. In their published report (Markus et al., 1972), they said:

Appraisal is a design activity. It is the continuous introspection by the designer whereby he monitors his own performance. Design . . . can . . . be seen as a continuous process lasting as long as the building itself, . . .

Building performance is an idea which assumes that we know what buildings are for. Since the simple answer is that they are for people, building performance is constantly related to people. . . . Design, people and resources are the three basic themes around which we have built our work (Preface, p. v).

The Unit was in operation until 1971. Higginbottom (1974) stated that its objective was to develop a package of techniques suitable for appraising buildings with the ultimate goal of achieving more accurate prediction of performance.

In the meantime, a second international conference had been held at Salt Lake City in 1966 and, by 1973, four Environmental Design Research Association (EDRA) conferences had taken place in America, and in Europe no fewer than five under the title of Architectural Psychology--three in Great Britain and two in Sweden. Departments have now been set up in universities on both sides of the Atlantic for studies in the new field and some notable work has emerged also from Tokyo University in Japan.

One last observation remains to be made regarding the field of psychology in general. Taylor (1971) has noted that:

since architects design environments for people and psychologists study the reaction of people to environments, some feel that this architectural psychology teamwork should have occurred "from the beginning" (p. 1).

Yet, in the introduction to the proceedings of the 1973 Surrey Conference (Canter & Lee, 1974), the editors commented on the fact that the conference was the first one to be based in a university department of psychology. All previous conferences had had an architectural or design base. Proshansky, in writing of his change in "professional identification" (1976, p. 303) from social to environmental psychologist, remarks how surprising it is that psychologists in previous years showed little or no concern for the design or organization of the physical setting, or the use of

physical space "that delimited the environment which they studied." Thus, he said, "it [the physical setting] could never become part of the solutions that might result from their study and analysis" (p. 305). Wohlwill (1970) noted that, of the papers in the first issue of Environment and Behaviour (Winkel, 1969-), only two of the six authors were "psychologists by training or professional affiliation" (p. 303).

This situation has changed rapidly during the present decade and it seems significant that Hospital and Community Psychiatry (Hammersley, 1950-) recently devoted an entire issue of its journal to "Architecture and Design of Treatment Environments" (November, 1976).

It should be noted that three of the earliest studies that might now be considered classics in the field of architectural psychology were purely psychological studies-- those of Maslow and Mintz (1956) and Mintz (1956) in which

the effects of esthetic surroundings were studied, and that of Vielhauer (1965), developing a semantic scale for the description of the physical environment.

In summary, the field of architectural psychology has, as yet, no clearly established theories, principles, or methodologies. Design processes have become so complex that we tend no longer to accept the architect's intuition as the only basis for determining solutions to the client's needs. There is a great need for a better understanding of the relationship between the built environment and everyday life. Early studies have begun to develop a package of techniques for appraising buildings to achieve more accurate prediction of performance. Building appraisal could, and should, be a part of the design process.

#### Architectural Determinism

In describing the present-day design situation, Studer (1970) has spoken of the "crisis" mentality, and a related footnote states:

By this is meant the persistent warning from designers that humanity is most certainly doomed unless man takes drastic action to improve his "visual" surroundings. John Beshers (1962) has labelled this simplistic notion as "architectural determinism" (p. 70, footnote 12).

Craik (1970b) suggested that a behavioral orientation in environmental design is encouraged by a growing belief on the part of the design professions that the physical environment does influence psychological states, and he gives as examples, Rosow, 1961, and Lipman, 1968. But he also adds that "its extreme form has been repudiated as 'architectural determinism'" (p. 19).

Lee (1971) takes a rather positive approach to the situation:

Human behavior is not a response to but an interaction with the environment. . . . To assert that our behavior is shaped by environment is not to concede that we are helplessly moulded, it is merely to assert the need to generate and maintain, on our own volition, a man/environment interaction that will steer the development of ourselves and our children in directions of our own choosing (p. 255).

Kaye (1975) also argued for the empirical behavioral approach as a counter-argument to the notion of architectural determinism. While the latter, he said, holds that the built environment controls behavior, he suggested rather the opposite, that knowledge concerning man-environment interaction "will provide inputs to the design process in terms of the optimization of behavior, not its control" (p. 107).

According to Canter (1970a), architects have now become aware that the effect of the built environment upon its users is not a simple deterministic one "and, as a consequence, they have grown to expect more complex formulations from the social and behavioral scientists with whom they deal" (p. 6).

In general, authors seem to feel that the various influences of buildings on people in terms of activities, control, or responsive mood and feelings do not constitute an inevitable dynamic force manipulating human reactions as with puppets, but stimulate an interaction which could lead us to provide more varied and appropriate environments for all human activities.

Woolfs and Canter (1970) suggested that "a study concerned with systematically relating people's behavior to buildings, to test for the suitability of one to the other, would be worthwhile" (p. 144). Woolfs (1970) made the point that it is not one physical characteristic of a room alone which has an effect on people's behavior but consists of various interactions between familiar elements: Canter (1970c) has stressed that such effects are dependent also on the individual characteristics of the participant. In addition, the physical environment contributes only a part of the total sum of effects of any situation according to Proshansky (1976,

p. 305), and "the effects of buildings on behavior are likely to be subtle" (Wools & Canter, 1970, p. 144).

This calls for a broadminded approach. One way to study these phenomena is to look for interactions or combinations of characteristics of a room and furnishings which seem to produce certain human behavioral responses or evaluations, as we find in Wools and Canter (1970) and in Wools (1970), as well as in Maslow and Mintz (1956) and later, Mintz (1956).

A difficulty in the application of this approach is the infinite number of combinations of room and furnishing characteristics which are available to study, including many new developments of which we do not yet know. Also, one does not have any clear indication of the underlying causal factors. It has been suggested that the room itself does not perhaps directly affect human behavior (Wools, 1970). Nevertheless, if there be any, however subtle, combined effect arising from

the environmental conditions, then, by manipulating only one or two basic physical characteristics of the room and reducing all other potentially confounding variables to as near zero as possible, it seems one might provide some groundwork on which to build theory concerning such effects. This, the present study attempts to do.

In summary, the weight of evidence suggests that the physical environment does influence psychological states, although perhaps not directly, rather, that it is one of a number of factors which affect behavior, whose influence is subtle. It is thought that there may be an interaction between physical elements of the environment, in their effect on behavioral response. Awareness of this in the design process could contribute to the optimization of certain behavior in particular settings rather than control of it. Wools and Canter (1970) emphasized the desirability of systematic studies relating people's behavior to buildings. The present study attempts to relate behavioral (emotional) response to two basic components of the built environment-- room size and fenestration.

### The Need for Theory

The writer who has placed the most emphasis upon the need for a theory to guide the ever-increasing volume of exploration in architectural psychology is David Canter. He cited the common assumption that what the architect provides is what the client needs, but noted that the premise is never tested. Canter and Wools felt that the development of a theory would eventually tend to clarify some of the underlying factors or principles that make one building function more appropriately than another for certain purposes. "A theory is both more robust and more powerful than any relationship taken on its own" (Canter & Wools, 1970, p. 187). These authors also suggested that a theory would help to eliminate some of the clichés that exist in design.

In commenting on studies of building users' needs and satisfaction, Canter (1970d) complained that much of the literature, which taps user satisfaction or dissatisfaction, serves only to crystallize existing architectural solutions and does little to further the development of design principles, or to encourage a flexibility of approach to meet new situations in the future.

What is really being suggested is that more effort should be put into the development of a theory that will explain the facts we have at present and which will guide us in the facts we are to look for in the future (p. 3).

Wools and Canter (1970) described the development of a predictive relationship that would define the aims of a building when first designed, and would later be applicable to the building when completed and in use, to assess the success or failure of its performance in relation even to changing users and uses.

In their introduction to the proceedings of the 1973 Surrey Conference (the third architectural psychology conference held in Great Britain), Canter and Lee (1974) commented on the historical evolution of studies in this field. They compared the papers of this conference with those of the two earlier ones, at Dalandhui in 1969 (Canter, 1970e) and Kingston, 1970 (Honikman, 1971), and to the early work of the Department of the Environment's Building Research Station. They found the greatest difference is the reduced concern with methodology and increased interest in theory building. Yet, they saw all related publications as contributing "towards the formidable goal of a clear and valid understanding of man's interaction with his physical surroundings" (Canter & Lee, 1974, p. 9).

While most authors have forthrightly rejected the concept of architectural determinism, nearly all have agreed either explicitly or implicitly, that the environment has some influence (though not control) over human behavior in some very general sense. It then becomes a question of which

elements in the built environment contribute to this influence.

In an effort to narrow the field of investigation, a number of studies have focused not only on particular rooms within buildings, but on several essential attributes of rooms which might be seen to effect changes in human behavior. Two basic aspects of rooms which have been examined are window patterns or fenestration, and room size. The subject of windows has received probably more attention than any other aspect of rooms reported in the literature.

In summary, building design has relied in the past on the assumption that what the architect provided was what the client needed. Surveys which tap user satisfaction tend to crystallize existing architectural solutions. A theory would help to clarify some of the underlying factors in man/environment relationships and provide consistent explanations of present facts and a guide as to what to look

for in the future. It would assist in developing a predictive relationship which could be used in defining the aims of a building and in evaluation of its performance.

### Windows

Assumptions. In reading the literature on windows, one finds a frequently expressed assumption that windows are extremely important to the satisfaction and overall comfort of building occupants (Wells, 1965). Some would even attribute better health and work performance to the presence of windows (Collins, 1975). Wells reported that 69% of office workers, questioned about the relative effects on eyesight of working by daylight or artificial light, felt strongly or moderately that daylight was better (p. 57). Collins held that "vehement assertions have been made about man's basic need for windows" yet there was little objective evidence to justify these assumptions (p. 3). Canter and Wools (1970) suggested that the clichés which exist in

design may exist because the architect is forced to accept untested assumptions which tend to bind him to known and accepted solutions. It would seem that one of the tasks of architectural psychology is to set up testable hypotheses and develop some theoretical structure which might explain the underlying causes why some buildings "work" better than others.

Functions of windows. Manning (1967) listed the functions of windows as: (1) the provision of daylight, (2) provision of a view, and (3) a visual rest center. But he described as "uniquely important" the fact that "people within buildings seem to have a deep psychological need for some contact with the outside world" (p. 23). Markus (1967) added the criteria of sunlight, ventilation, privacy, and "contribution to general visual character" (p. 97). Collins (1975) expressed more explicitly the addition of "a dynamic, changing character to a room . . . enhancement of the basic character . . . more spacious" (p. 1). She also included benefits of information about the weather and the outside world, avoidance of claustrophobia and boredom in the environment (p. 2).

On the other hand, the disadvantages of windows--overheating and glare and inflexibility of furniture arrangement for the best use of light (Collins, 1975, p. 6), as well as heat loss from buildings in winter, distraction from

outside noise, difficulty in controlling illumination levels (Manning, 1967) have led, in recent years, to the introduction of windowless buildings, such as factories and schools.

From the point of view of economics, factory production, environmental and atmospheric control, and classroom discipline, these windowless buildings have much in their favor. However, there is a dearth of objective factory studies and those that we have may suffer from the influence of job security and rates of pay on subjects' reports. Collins (1975) pointed out that the disadvantages of the windowless school are seen mainly as psychological (p. 7).

There appears to be general agreement in the literature that today the use of central heating, air conditioning, and permanent supplementary artificial lighting reduces or even eliminates the importance of windows as a source of illumination and ventilation (Collins, 1975; Markus 1967; Ne'eman & Hopkinson, 1970). In spite of this statement, daylight would seem to be a most important consideration as a psychological factor. Wells (1965) showed that in an office building, people working within sight of a window tended to overestimate the amount of daylight falling on their desks, compared with the amount of artificial light. The error increased with the distance of the subject's work area from the nearest window. Up to a distance of 19 ft. the

error was almost negligible and, in fact, a slight underestimate occurred up to 12 ft. from the daylight source.

There have been suggestions that certain qualities of daylight which cannot be truly replicated are of importance to the human development. Manning (1967) made brief reference to studies by the Pilkington Research Unit (PRU) of the value of constantly changing stimuli to which the eyes are subjected in daylight conditions (p. 21). Jackson and Holmes (1973b) suggested that "the short term variations add an extra dimension to the daylit interior and undoubtedly contribute to the avoidance of monotony" (p. 80). Collins dwelt on the modeling effect achieved by daylight entering a room horizontally and the continual transformation due to changing sky and outdoor conditions. She mentioned a number of authors who have described these apparently pleasing characteristics of daylight. Presumably they were describing one's perception of a daylit room.

Some researchers made a clear distinction between daylight and sunlight when analyzing personal preferences regarding windows. Collins (1975) seemed to feel that a strong desire for sunlight was evident but that this varied with the type of building and with the type of activity occurring within the building. She also pointed out that the desire for sunshine was related to the geographical latitude, being greater where hours of sunshine were more limited (p. 61).

In a study of 400 office workers in a new building in Bristol, England, Markus (1967) found that 86% preferred to have some sunshine in their offices all year round. He also made the remark that, like daylight preferences, expressed desire for sunlight is proportional to the subject's current distance from the window (p. 100). Markus (1965) noted that where codes for sunshine requirements in winter did exist, they usually specified a minimum number of hours of sun penetration into a room. He has plotted the sunlit surfaces of a room throughout the day for certain dates of the year and, relating this to unit area of window, he has found that certain shapes of windows yield greater surface coverage of sunshine than others, even though the glass area may be less in total (p. 74). How this relates to subjective sunshine satisfaction is not known.

Apart from the question of illumination, windows seem to have another value for people who spend time in buildings. In Wells' (1965) study, a total of 89% of the office workers surveyed felt that it was important to be able to see out of the office, even if there was plenty of artificial light to work by. Only 1% felt positively that it was not important. However, studies relating to views from office windows have not provided any clear guidelines as to the necessary qualities of a "good" view. Nor do we yet understand the expressed need for a view. Jackson and

Holmes (1973b) referred to it as a "release" from the constant environment inside and a reassurance "that life is still going on in the 'real' world outside" (p. 80).

Markus (1967) emphasized the importance of dynamic change in a view relative to small movements by the observer from inside a room (p. 103). He remarked that, since nearly all views are stratified (foreground, landscape, sky), if window area is limited, then windows should be so designed that at least some of each layer is visible so as to provide the most generous amount of information. Later he suggested that maximum visual stimulation from the least amount of movement might be obtained from a large number of small apertures rather than one large window. In the Ne'eman and Hopkinson (1970) study where subjects set the window width to the lowest limit of satisfaction, it seemed apparent that at the ground floor level facing a busy street, a greater width of window was required to give minimum satisfaction than was selected by subjects on the second floor where more distant objects composed the view (p. 22, Table 2). This seems to suggest that a "good" view should be meaningful since one has to have a wider view of close figures on the ground to provide a meaningful context. In high-rise buildings the ground information is lost above the first few storeys unless the windows extend to the floor level.

Sizes of windows. Ne'eman and Hopkinson (1970)

used a scale model of a room (1 in. equals 1 ft.) with sliding panels, to have subjects set the minimum satisfactory window width, below which they would feel like complaining even if there were good artificial lighting "if you were moving into the room as your office or workroom" (p. 27). The room was furnished with model chairs and tables and had scale sized recessed fluorescent lighting fixtures in the ceiling. Two different window heights were tested--5 ft. and 7 ft.--but the 3 ft. high sill was constant. Various views were obtained by placing the model against a window in different buildings and on different floors (storeys). Comparing windows of equal height (7 ft.), the mean width selected yielded a window covering more than 30% of the exterior wall area on the ground floor and almost 25% on the second floor. As a percentage of the floor area of the room, this would constitute approximately 17% at the ground floor level and 13% at the second floor. The subjects in this experiment were of both sexes and included members of the public at large as well as architectural students and teachers, lighting experts and research staff and visitors to the Building Research Station. Since the word "view" is mentioned twice in the instructions to the subject, one might conjecture that the choice of window size was based mainly on that criterion rather than considerations of illumination, physical comfort, sunlight or any other.

Collins (1975) posed the question of what shape and size of window would give adequate view satisfaction and yet be small enough to afford negligible consumption of energy (p. 46). According to Canter and Wools (1970), a room with a floor-to-ceiling window was seen as more friendly than one with a high clerestory<sup>2</sup> window of the same width but about one-fifth of the depth. These judgments were made from line drawings of rooms, in which one had to assume that some view would be seen out the large window although it was not indicated. Using scale models of rooms, Keighley (1973a) observed that:

view requirements appear to be best satisfied by horizontal apertures the dimensions of which are determined primarily by the elevation of the skyline. . . . sill heights from 0.7 to 1.1m [2.31 to 3.63 ft.] and window head heights from 1.8 to 2.4m [5.94 to 7.92 ft.] are indicated as optimum values according to the kind of outside view (p. 319).

Keighley (1973b) also remarked that his subjects were not satisfied with a large number of apertures or with very narrow apertures and that they found increased mullion width most dissatisfying where there was a distant view (pp. 325, 326).

Ne'eman and Hopkinson found that acceptable window size judged by subjects related to a number of factors including the size of the room, number of apertures, outside

---

<sup>2</sup>A high window or opening above eye level as in the nave of a church above the aisle roofs.

view, the viewing angle, and such inconsistent variables as the weather, level of external illumination, and the subject's distance from the window.

Psychological responses to windows or their absence.

Although schools have been studied more than other types of windowless buildings, results for both teachers and pupils have been inconclusive (Collins, 1975). There have not been enough studies of windowless factories to support an argument for or against windows but, from the few published papers that we have, Collins reached the conclusion "that employees do not particularly like them" (p. 23). Manning (1967) has pointed out that buildings without windows often are endowed with much higher standards of amenity to compensate for this particular lack and, as a result, comparable studies of buildings with and without windows are difficult to find. However, an interesting observation made by Ruys (1970) was that, where subjects described the physical environment of their offices as satisfactory, and the lighting adequate in a windowless building, "about 90 percent expressed dissatisfaction with the lack of windows" (cited in Collins, p. 24).

Wilson (1972) made a study involving post-operative delirium which "can develop in almost any patient placed in an intensive care unit following serious illness or surgery" (Collins, p. 29). A comparison was made of two intensive

care units in two general hospitals serving the same community and having the same physicians on their medical staff. Wilson selected 50 major surgical patients in each unit, similar in age and general physical condition both before and after surgery. Other controls were treatment, medication, and patient-to-nurse ratio. One unit had windows, the other did not. Wilson reports that over twice as many patients in the windowless intensive care unit developed post-operative delirium as in the unit with windows visible to the patients (40% versus 18%). He also found that, of those who did not develop post-operative delirium, the incidence of post-surgical depression was greater amongst the patients in the windowless unit.

It has been observed that the symptoms of post-operative delirium are not unlike those of persons suffering from sensory deprivation, including impairment of orientation, memory, intellectual function, and judgment, all of which were included in Wilson's definition of the syndrome of delirium. Wilson seemed to accept the possibility that to be able to see a window provides some orienting or stabilizing factor assisting recovery in many patients following surgery. He also considered the possibility that post-operative delirium could be related in some way to sensory deprivation.

Mercer (1971) found that the presence of a window affected a person's perception of his own size. His subjects judged themselves to be larger in a room with a window than in one without, and Mercer inferred that a window makes a subject "'feel' bigger, as manifest in his increased [estimated] body boundary" (p. 54). Tognoli (1973) reported that subjects in a room with a window rated the room as more pleasant than those in a windowless room. Canter and Wools (1970) found the type of window to be an important factor in the judgment of room friendliness, in line drawings, but this was not the only variable manipulated.

Some authors have felt that dissatisfaction with windowless offices may be related to office size. Manning (1967) commented that, where alternative clerical employment is available, small windowless offices accommodating up to 20 people in one room would probably not be tolerated, while offices holding 200 or more might be acceptable because they are large enough to provide "internal views" (p. 23). Collins (1975) reported that:

Ruys [an architect] decided that the desire for windows is so strong for subjects in small, windowless offices that he could not make any architectural recommendations to increase satisfaction with them (p. 24).

Collins further summarized that "the small, restricted environments with little activity or personal interaction appear to be the ones in which the absence is most noticeable" (p. 35). She cited the intensive care unit as an

example of a relatively small area where the patient's movements and activities are severely limited. She also noted Hollister's remark about department stores and small shops "that tolerance of windowless interiors may be greater for large spaces than for small" (Collins, p. 31).

To summarize, the literature reveals an undocumented assumption that windows are important to satisfaction and comfort, and that daylight is better for the eyesight than artificial light. The positive functions of windows have been seen as: the provision of daylight and a view, a visual rest center, sunlight, ventilation, privacy, contact with the outside world, and the addition of a dynamic, changing character to a room. There are also disadvantages such as overheating, glare, distraction and noise, and inflexibility in room arrangement. Generally, preferred window sizes are as yet undetermined and the relevant variables which contribute to a preference are many and varied.

Satisfaction with windowless buildings has been inadequately tested and, so far, disadvantages have appeared to be mainly psychological. In intensive care units, Wilson (1972) found a significantly lower incidence of post-operative delirium amongst patients in units with windows than in those without. Some authors have felt that dissatisfaction with windowless offices may be related to room size.

### Studies of Room Size

Actual studies of the effects of room size alone on behavior are scarce. Canter (1968) studied reactions to office size, recording on-the-job performance. His measure of room size was the number of persons who normally occupy the same room. Results showed that clerical performance decreased as room size increased. After a supplementary test using various distractions, Canter concluded that these results were not due to distractions in the office setting, but "perhaps it is due to attitudes towards large offices and the nature of the social groupings within them" (p. 887). Lipman (1968) made some observations about hostility and room size in old people's homes:

The field logs show that hostility in the larger rooms occurred between the status groups--that is, between individuals as group members--but conflict in the smaller rooms took place between individuals as such (p. 27).

Both of these cases directly involved interactions between people, and only indirectly related to the physical size of the room. Samuelson and Lindauer (1976) commented on impressions of room size where subjects were tested alone in a neat or a messy room. "The neat room was described as larger and emptier than the messy room. Although both types of rooms contained the same objects, and in fact were the same room" (p. 298).

In summary, two studies relating to room size measured behavior in a social setting and may involve connotations of density, that is, the number of persons per square foot. Samuelson and Lindauer (1976) found that the apparent size of a room was influenced by its neatness or messiness.

#### Personality Variables

Samuelson and Lindauer (1976) used the Experience-Seeking Subscale of the Sensation Seeking Scale (Zuckerman, 1971) to classify subjects in a test evaluating a neat and a messy room. They found that low scorers on the Experience-Seeking Subscale gave the neat room a more positive evaluation and the messy room a more negative evaluation, than the high scoring subjects ( $p < .05$ ), though this interaction was not found on the basis of the general sensation-seeking scores (p. 297).

Craik (1970a) pointed out the need to investigate characteristic ways in which people differ in their response to certain classes of environmental settings. He cited the tentative scales of George McKechnie's Environmental Response Inventory as assessing "such dispositions as pastoralism, urbanism, stimulus-seeking, environmental adaptation, environmental well-being, abstract conservatism, environmental security, and modernism" (p. 91, 92).

As part of an experiment using soldiers in army barracks, Brauer (1974) correlated use of facilities on the

station with 20 personality trait scores from the Personality Research Form by Jackson (1967). Significant correlations at  $p \leq .01$  were evaluated by Wiggins (1973) and yielded suggestions for design implications which are listed in a table (Brauer, 1974). Some examples are:

<u>Trait</u>	<u>Defining Adjectives</u>	<u>Design Implications</u>
Cognitive structure	Precise, meticulous, perfectionist, rigid	Generally satisfied with appearance and physical aspects of the environment. Spaces and spatial arrangements must be clearly defined.
Order	Neat, organized, disciplined, clean	Places importance on cleanliness, noise, odor, colorfulness, and pleasant appearance (p. 108).

Canter and Wools (1970) measured the "satisfaction" of a group of schoolteachers with their classrooms, and found that agreement among respondents increased with the degree to which their environment was important to them. "In other words the variations in satisfaction responses of the group decreases as the 'sensitivity' of the individual increases" (p. 197). The authors suggested that more sensitive individuals should be selected for tests evaluating the built environment. Canter (1970c) correlated first-year architectural students' ratings of their own study-bedrooms with ratings of their "ideal" and he found that

"as . . . ability to discriminate increases, so the variance between the students decreases" (p. 18).

In 1970, Wools tested a group of Scottish housewives judging line drawings of rooms showing different furniture, seating arrangements, window types, and flat or sloped ceiling, using the bipolar Friendliness scale. He administered the Eysenck Personality Inventory to each subject as well, predicting different responses for extraverts and introverts on the room evaluation, but found no significant differences. Canter and his associates obtained no significant correlation between judgments of room friendliness in line drawings and neuroticism and extraversion (Higginbottom, 1974, p. 6). In Canter's (1968) study of office size, he found no relation between degree of extraversion and room size or performance, where room size was defined by the number of people working in it.

In summary, the relationship between personality characteristics and assessment of the environment has been examined and Brauer (1974) tentatively constructed a table matching personality traits with some preferred environmental characteristics. Craik (1970a) felt it important to investigate typical ways in which people differ in their response to the environment. He pointed out that personality traits of planners are operative in the development of the built environment and, as a group, may differ from those of other social and professional groups. Canter and Wools (1970) found that the more "sensitive" the subjects, the greater the uniformity between their evaluations of the built environment.

### Mood Studies

#### Mood as a Concept

Mood has been described by Wessman and Ricks (1966) as "extraordinarily complex" and amongst its shifting and transient features one finds

states of emotional or affective arousal of varying, but not permanent, duration. . . . emotions in a state of subexcitation or decay'. . . predispositions to respond in certain emotional ways and experience certain feelings . . . rather transient and indefinite and generally matters of no particular importance (p. 9).

McNair and Lorr (1964) saw mood as having the status of an intervening variable or an organismic state which might be defined in terms of its antecedent inducing operations and its correlated behavioral consequences. They listed as some of the antecedent conditions, "withholding reinforcement, environmental deprivation, emotional stimulation and intraorganic events such as illness" (p. 620).

Jacobson (1957) held that moods "must be regarded as a primitive economic modality of the ego" and emphasized the great significance of their function in allowing a repetitive affective discharge on a variety of objects in small quantities, which "tends to protect the ego from the dangers of too explosive, overwhelming discharge" (p. 81). She felt that this avoided fixation of psychic energy and allowed continual reinvestment in new objects.

Nowlis and Nowlis (1956) also looked upon mood as an interesting variable which might have a direct, though unconscious, effect upon the "occurrence of certain responses in certain situations, as in expressive behavior and action" (p. 352). In searching for a general definition of mood, Nowlis (1965) observed that "mood terms are often used when the determinants of the specified temporary state of the person are obscure, remote, or relatively inaccessible to manipulative control" (p. 353).

In summing up the behavioristic, phenomenological, and psychodynamic approaches to mood, Wessman and Ricks

(1966) noted that they were in general agreement as to the nature and the significance of moods:

They maintain that moods are basic psychological dispositions of subjective and objective importance. . . . They are not inconsequential. . . . Moods are basic expressions of the individual's continuing total life condition and also reflect and influence changes in his ongoing involvements (pp. 21, 22).

Mood and emotions. Mood has usually been seen as somehow related to emotion, having the same general affective tones and some of the bodily symptoms of emotions. Wessman and Ricks suggested that moods were "milder than full-blown emotions, which are more intense and of shorter duration" (p. 9). Nowlis noted that the latter may signify the onset of a mood, which is the subsequent steady state (Wessman & Ricks, p. 9). Jacobson (1957) posited that emotional reactions did not represent moods, but they induced "a series of mood conditions" (p. 75).

Areas of general agreement. Mood involves a predisposition to respond to certain stimuli in certain ways (Nowlis & Nowlis, 1956, p. 352; Wessman & Ricks, 1966, pp. 9, 13). It carries some implicit projected attitude towards the future (Wessman & Ricks, p. 15; Oxford English Dictionary, 1971). It is influenced by knowledge of events, stories, ideas, routine affairs, and interests of the day (Dysinger, 1937, p. 155; Nowlis & Green, 1957; Tesser, Rosen & Waranch, 1973), but is thought to stem from

physiological conditions as well as from environmental causes (Clyde, 1960; Dysinger, 1937, p. 154; Nowlis, 1970; Nowlis & Green, 1957, p. 4; Nowlis & Nowlis, 1956). Mood is pervasive and usually involves very broad repertoires of behavior and experience (Jacobson, 1957, p. 75; Nowlis & Green, 1965, p. 1; Weinshel, 1970, p. 315; Wessman & Ricks, 1966, p. 22). One is aware of one's moods (Wessman & Ricks, pp. 9 to 13), although one does not usually know their source or their objectives (Dysinger, p. 154; Weinshel, p. 315). Moods monopolize available psychic energy and, with the exception of certain complex feeling states, when a person is in one mood, he is not in any other (Jacobson, p. 75; Ryle, 1950, pp. 97 to 99, cited in Wessman & Ricks, p. 13; Weinshel, p. 316). They can be quite changeable and unpredictable, lasting sometimes for only a moment, or for days (Jacobson, pp. 75 to 77; Nowlis, 1970, p. 264). Moods are often difficult to describe (Weinshel, p. 313). Some individuals experience greater mood fluctuations

than others (Dysinger, pp. 153, 155; Nowlis & Cohen, 1968, pp. 559 to 562).

In summary, Wessman and Ricks (1966) described mood as a basic psychological disposition which was complex, shifting, and transient. McNair and Lorr (1964) felt that it was defined by antecedent conditions, and Jacobson (1957) saw it as a primitive economic modality of the ego. Mood has been found to be somehow related to emotion, although milder and of longer duration. Jacobson felt that emotions could induce a series of mood conditions.

There has been general agreement on a number of aspects of mood. For example, it is thought to be a predisposition to respond in certain ways and to carry an implicit projected attitude towards the future. It stems from psychological and environmental conditions and is influenced by knowledge of events. It is pervasive, and monopolizes psychic energy. One is aware of one's moods. They can be changeable and unpredictable, are difficult to describe, and can last for days or months. Some people have greater mood fluctuations than others.

Mood and personality. Nowlis (1965) has discussed the concept of mood in terms of recurrent first- and second-order dispositions, and the concept of temperament as a more

or less permanent disposition. Temperament, he said, was traditionally considered to be the bridge between mood and personality (p. 380). The actual relationship between these variables probably hangs on the relative duration of a mood--but on this matter there is no basic agreement. In some cases, moods of very long duration over days have been described as pathological (Nowlis, 1965, p. 385). Besides, mood states may contain characteristics of both long and short duration at the same time in a constant state of flux (Nowlis, 1970, p. 266).

Ryle (1950) observed:

We say . . . that a person is depressed, happy, uncommunicative or restless, and has been so for minutes or days. Only when a mood is chronic do we use such mood words as descriptions of character (p. 98).

Weinshef (1970) felt that mood should be distinguished from enduring affective states such as chronic anxiety, and also from certain character traits. He said:

Not infrequently, descriptions of character or of specific character traits depend on or are--at least--closely related to the mood of the individual concerned (p. 313).

Wessman and Ricks (1966) were of the opinion that "mood characteristics should prove to be highly revealing features of personality" (p. 22).

These authors made studies of two college student populations (Radcliffe & Harvard) over a 6-week period with daily mood measures. The results of the Harvard study

were later correlated with a variety of personality assessments and other clinical tests taken over a 3-year period (Wessman & Ricks, 1966). They analyzed their results on the basis of average hedonic level (elation-depression) and also on variability or range of mood variation. Significant findings showed consistent patterns of happy and unhappy men emerging from these correlations.

The happy men were optimistic and possessed of self-esteem and confidence. They were successful and satisfied in interpersonal relations. They showed ego-strength and a gratifying sense of identity. There was excellent organization and purpose in their lives, together with the necessary mastery of themselves and interpersonal situations to attain their goals (p. 247).

The unhappy men were, on the other hand, more pessimistic, dissatisfied with their interpersonal relationships, with feelings of anxiety, guilt, and lack of confidence.

With regard to stability and variability in their mood reports, the "steady" men were more inclined to conceal their feelings or to repress or deny them, while the "moody" men would readily admit their feelings. The former, in moods of both elation and depression, described themselves as "independent, serious, quiet, and reserved, with pride in their own standards and character" (p. 249). The self-descriptions of the moody men varied more with their mood but were generally "open, outgoing, and productive" and seemed to place more value on "originality and inventiveness"

(p. 249). Regarding the generalizability of these findings, however, the authors noted that the personality correlates of variability found to be significant in certain cultures could not necessarily be assumed to be found in others. They reminded the reader that the population under study was superior in intelligence and academic performance.

In 1961, Borgatta found significant correlations between the Guilford-Zimmerman Temperament Survey (GZ) scale of General Activity and the mood "lonely," and also with the GZ Objectivity scale. These were negative correlations which held for male and female subjects and for the total sample. When classified by sex, the rest of the significant Personality-Mood or Mood Change correlations in Borgatt's study applied to one sex only, with three exceptions --Cattell's (16PF) Bohemian scale which produced a positive correlation with the mood "defiant" for both males and females, Ascendance (GZ) a negative correlation with "tired," and Endurance (Edwards Personal Preference Schedule), positive for males, negative for females, with "tired."

In a study of mood ratings of office workers at the beginning and end of a Friday and Monday, combined with measures on the Eysenck Personality Inventory (EPI), Christie and Venables (1973) demonstrated a relationship between Neuroticism, Introversion, and lower Efficiency. They found that their highest Euphoria scores correlated

positively with low Neuroticism and high Extraversion, as well as with one particular time variable, Friday evenings. (Efficiency was the label given to the summed total of Activation, Deactivation, and Concentration scores.) Nowlis and Green (1965) Short Form Mood Adjective Check List (MACL) was used.

Nowlis and his associates found significant relationships between "sadness" scores on the MACL and Guilford-Martin Depression, as well as between "surgency" and Rhathmia, "pleasantness" vs. Rhathmia, and "anxiety" vs. Nervousness (Green, 1965). The results of these many correlations are more complex than can be discussed here, but they bring out several valuable implications about mood testing in general. The relative ranks of the factor scores remained quite stable over days. Possibilities of stereotyped responses were observed after a week of testing, but an alternate explanation suggests that perhaps the response behavior became more accurate with practice. The greatest consistency of report occurred on negative factors, or "negative, undesirable states" (p. 21), but the explanation for this was not apparent at the time. There is, indeed, no consistent history of large-scale testing of mood against personality, and much work remains to be done in this area.

Literature on the relationship between mood change and personality is too scarce to show any overall pattern. Borgatta's (1961) findings may support a common sense approach in hypothesizing the directions that these might take. For example, he found that a decrease in the "tired" mood is associated, for males, with Autonomy on the Edwards Personal Preference Schedule (E) and with Achievement (E), and, for females, with measures of Ascendance (GZ) and Dominance (16PF). A decrease in the "thoughtful" mood with a significant relationship to General Intelligence (16PF) led the author to suggest that those "who apply themselves to the task, rather than those who fall into a pensive mood, may be those generally able to give the best performance to the intelligence type problems" (p. 132). High male scorers on Reflective (Thurstone Temperament Schedule) and Thoughtfulness (GZ) showed an increase in the "thoughtful" mood. An increase in "defiant" mood showed a significant correlation with General Intelligence (16PF) both for males and the combined sample (p. 133). Decrease in "startled" mood was associated with high scores on Tense (16PF) for males, and an increase in "startled," with Self-sufficiency (16PF) for females (p. 134).

Mood and the environment. In speaking of the cues for verbal responses on self-report mood scales, Nowlis and Green (1957) mentioned, first, those cues which arise

from the conscious experience of mood and, as secondary sources "other internal cues and the external environmental context in which the verbal responses are elicited" (p. 2). Also listed as one of the determinants of the mood itself is "persistent environmental stimulation or deprivation" (Nowlis & Nowlis, 1956, p. 353).

Response has been measured to "embellished" and "beautiful" or "ugly" rooms, and rooms deprived of windows and a view. Many of the data consist of subjective evaluations of a room, but one experiment measured attitudes and retention (Tognoli, 1973), and two studies used behavior on a test of judgment (Maslow & Mintz, 1956; Mintz, 1956). School studies over the years have looked at grades, attention, and absenteeism, as well as subjective measures.

Kasmar, Griffin, and Mauritzen (1968) investigated the effect of two contrasting environments--a "beautiful" and an "ugly" room--measuring self-rated mood of psychiatric outpatients, their perception of the room, and their perception of the psychiatrist. Both rooms were windowless offices. The experimental room variable consisted of the decor only--such items as a carpet, wall picture, plant, lighting, and general neatness in the beautiful room, all of which were lacking in the other. The Psychiatric Outpatient Mood Scale (developed by McNair & Lorr, 1964) was used to measure patients mood while in the room. "No significant differences

in rated mood were found for the main variables of the room, psychiatrist, S age, or S sex" (Kasmar et al., 1968, p. 225). The two rooms were of identical size and the main furnishings were the same.

The weather might also be considered an important environmental variable where mood and mood change are being examined. Goldstein (1972) found a positive evaluation of mood on a self-rating basis, significantly related to low humidity, high barometric pressure, and the day being cooler than normal.

Time of day has been shown to affect mood, either directly through the position of sun and shadows, the degree of light and shade, feelings of energy or fatigue, or indirectly through general orientation and expectancies towards daily routine or one's social milieu. Cason (1931) reported that the average level of feeling is lowest during the first and last half hours of the day, and that the lowest average level of feeling of the week is to be found on Monday (p. 147).

In summary, Nowlis (1965) felt that temperament was the bridge between mood and personality. There is general agreement that the duration of a mood can vary considerably and, if very long, can be considered pathological. A study by Wessman and Ricks (1966) found men with "steady" personality characteristics inclined to conceal their feelings, while "moody" men would readily admit them. Self-descriptions of moody men varied more with their mood. This study was restricted to a rather specific population grouping.

Borgatta (1961) found a number of significant correlations between characteristics and specific subscales of various personality inventories by sex. Christie and Venables (1973) showed a relationship in office workers between euphoria, neuroticism and extraversion and the time factor of Friday evenings.

Nowlis' group (Green, 1965) also found several complex correlations between mood and personality variables.

Literature on the relationship between mood change and personality is too scarce to show any overall pattern.

No studies have yet measured the effects of specific environments on mood without a subjective description of the environment as a part of the experiment. One study which reported the subjects' perception of the test room amongst other variables, found no significant differences in mood response related to the room or other variables. The rooms differed in decor only. Self-rated mood has been found, in one case, to be significantly related to temperature, humidity, and barometric pressure. Cason (1931) reported time of day to be effective in self-report studies of level of feeling.

#### The Measurement of Mood

A cross-section through the mood literature of the past 30 years reveals a diversity of adjective check lists of varying length and composition which have been used in drug research and other fields; for example, the Feeling

and Attitude scales (Hildreth, 1946), the Mood Adjective Check List (MACL: Nowlis & Nowlis, 1956), the Clyde Mood Scale (Clyde, 1958), the Activation-Deactivation Adjective Check List (Thayer, 1967), and others. Since the 1950s, factor analyses of the results of many of these tests have produced almost as many sets of mood factors as there are rating scales. That is, no two rating scales contain all of the same adjectives in any one factor.

In relatively large-scale studies, Nowlis' group at Rochester University (1965) gave close scrutiny to the stability of their factor structure. In a test of more than 400 college men, both before and after a mood-significant experience, they used the MACL to measure initial mood and mood change. The experiment was repeated on successive Monday evenings over a total 6-week period. The mood changing experience was contrastively different for each test. Eight mood dimensions were extracted from factor analysis of all the pretest results. Later, four of the posttest results were factor analyzed and 10 mood factors were constructed from a careful comparison of the factor matrices arising out of these five analyses. Difference scores were compared for individual variables in each of the 10 factors from six different experimental sessions. Green (1965) commented: "It is immediately apparent that there is a great deal of consistency of performance from

one situation to another" (p. 7). Two replications of this experiment were carried out at about the same time at Rochester, using new samples of the eight most clearly defined factors, and 40 selected adjectives most consistently loaded on these factors. One test sampled 163 navy men and the other 165 female students just after a final examination. In 1961, Borgatta tested 180 male college students before and after 2-1/2 hours of responding to a battery of questionnaires. He also used a 40-adjective list, choosing the five top variables in each of the eight best factors extracted by the Nowlis group. Factor analyses of the results of these four MACL administrations were compared with Nowlis' results and strong support was indicated for at least six of the evolving factor structures (Nowlis & Green, 1965, pp. 76 to 83).

Green (1965) cited other occasions where the MACL was used by different investigators in the 1950s and 1960s, and he asserted:

Many more such illustrations of successful and meaningful uses of the factors could be presented. Enough such instances have occurred to warrant the conclusion that some degree of construct validity has been achieved (p. 9).

The long form of the MACL contains 140 variables, which include 10 repetitions in the latter half of the list. From Nowlis' original test results in the six weekly sessions, reliability estimates were computed on 6 of the

12 sets of repeated adjectives--1 from pretreatment and 5 from posttreatment data. Each estimate was computed twice, once using the contingency coefficient ( $C$ ), where the values ranged from .57 to .80, and once using Pearson's  $r$  which ranged from .53 to .89. These were considered high enough to ensure good test-retest reliability, and "the reliability of any particular adjective scale is surprisingly constant from one estimate to another" (Nowlis & Green, 1965, p. 21).

In addition, under the various contrasting mood-inducing conditions, "adjectives with high loadings on any one factor usually produce difference scores with the same sign" (Nowlis & Green, 1957, p. 7) and the direction of expressed mood change has been, on the whole, compatible with expectations.

The use of a single-adjective list has been found to produce monopolar factors, and not bipolar as originally expected. This finding has been replicated a number of times, e.g., Clyde, 1960; McNair and Lorr, 1964, and others. Meddis (1972) attributed this to the provision of unequal affirmative-negative opportunities to respond. Meddis constructed a scale with equal positive-negative response possibilities and obtained bipolarity on two factors. He observed that larger samples would be required to investigate this tendency more thoroughly and noted an

important semantic difficulty: "It is possible that some factors such as aggressiveness could be either monopolar (aggressive v. not aggressive) or bipolar (aggressive v. friendly)" (p. 184).

Zuckerman (1960) demonstrated the versatility of the self-report adjective check list in reporting mood by varying the instructions to the subject--to mark "how you generally feel" or "how you feel today." A high measure on internal and test-retest reliability was found in the "General" form of the test, while the "Today" form showed high internal reliability on a single test but low reliability on a retest. This tends to support the validity of the adjective check list as a measure of short-term mood and mood change.

In a test of 51 fraternity men recording daily mood over a period of 25 to 60 days, the Nowlis group reported a tendency for higher correlations between ranks of group factor means to occur after a week of testing. They questioned whether this could indicate a tendency to give stereotyped responses with repeated use of the MACL, or possibly a tendency towards more accurate responses (Green, 1965). There is no way of resolving this question yet, but it should be of concern to anyone giving repeated administrations of the check list.

Another experiment was performed to investigate the social desirability aspects of the check list. A 39-adjective MACL was used, covering 10 factors. In one session, 51 college men and 87 college women completed the test four times under different instructions each time. The instructions were, for the first, "right now I feel," for the second, "I typically feel," the third, to make the best impression possible and, the fourth, to an imagined situation in which they would normally be expected to be quite depressed. This was followed by an evaluation of the social desirability of each variable on a 7-point rating scale. In general, males and females tended to report different levels of anxiety--the females usually higher. However, both sexes rated its social desirability similarly. Females tended to rate social affection higher in terms of social desirability. Agreement between the marking of individual adjectives and social desirability ratings was not strong except when the subject was instructed to make the best possible impression (Green, 1965, pp. 21, 22).

#### Statement of the Problem

The literature shows that the investigation of the interface between human beings and their environment has been approached from many different points of view, ranging from descriptions of the natural landscape

to the evaluation of one room in a building. The general aim of these approaches has developed over the past 10 years from the formulation of new methods of measurement to the search for a basis on which to build theory. In studies of a single room, attention has been directed to specific aspects of the built environment--among them, window patterns and room size, two of the variables examined in the present study.

Most of the studies of fenestration or of room size have been subjective in nature. However, those that were not, such as school studies comparing students' performance, and Wilson's (1972) study of post-operative delirium, were performed in fully furnished rooms of varying size and layout. They, of necessity, contained a large number of uncontrollable variables in terms of their structural dimensions as well as materials, colors, textures, orientation, and their interior atmospheric conditions.

Because of the practical and financial difficulties of manipulating rooms, a number of different simulation techniques have been used in testing, such as models, photographs, drawings, and holography (Canter et al., 1973). Inevitably, the simulation removed the subject one step at least from spontaneous reaction to a real room (Lau, 1970). More objective studies are needed, and the choice of possible factors of influence needs to be greatly narrowed to focus

upon basic elements or interactions upon which a theory might be based. Even to test and thus eliminate some basic room elements is important.

Some of the research on windows has consisted of measurements alone, of sunshine penetration, for example, while in Canter's 1968 study of office size, the number of people working rather than a square or cubic measure was used as the criterion of room size. Reactions were, in part, a social measure. In all of the studies cited here, a second person has been present with the subject during testing. This social relationship has been carefully controlled (e.g., Maslow & Mintz, 1956; Wools & Canter, 1970) by using different experimenters, but inevitably the results included the effects of the test room on the relationship rather than on the subject's behavior alone. Somewhere, the subject had to be tested alone with the environment, even if only to lay the ghost of architectural determinism.

In the matter of what behavior was to be measured, the literature supports the assumption that mood is a reliable indicator of a person's predisposition to respond in certain ways. Mood has been shown to be altered by environmental situations external to the subject (Cason, 1931; Christie & Venables, 1973; Goldstein, 1972; Nowlis & Green, 1957; Wessman & Ricks, 1966) and thus was considered to be a valid measure for reporting the effects of the environment in the present study.

It was mentioned above that little is known about the relationship between mood and personality. Many more investigations would be required to increase our knowledge in this area. This study used two personality inventories previously untested in this field (GPP & GPI) and examined the relationship in a new setting.

The manner in which the present study endeavored to fill certain of the gaps in the literature of architectural psychology and of mood, might be summarized as follows:

1. Probing the effects, if any, of windows and room size on subjects' behavior.
2. Use of an objective measure--mood change.
3. Use of a real room (instead of simulation techniques).
4. Minimal use of furnishings, restricted to one chair for the subject, a small, plain table to work on, and a similar chair against the wall for later use of the experimenter in debriefing.
5. Establishment of a meaningful relationship between levels of the independent variables, the length of the larger room being twice that of the smaller, and the windows consisting of 100%, 50%, or 0% of the exterior wall bays of each room.
6. Consistency among different room conditions in all variables other than size and windows, for example, condition of the carpet, view from the window, achieved by constructing the test rooms out of one original room.
7. Elimination of social interaction. The subject went to the room alone and saw no one until the experiment was over.

In order to study the effects of the room for a longer time without irrelevant distractions, the subject was given a task to perform, after completing the MACL, which consisted of evaluating black-and-white photographs of the six room conditions for their appearance of "friendliness." This subjective evaluation of the subject's own test room could later be compared with his/her mood change in it, thus contributing to a comparison of subjective versus objective methods, and simulation versus the real room.

In this study, the effects of different sizes of room upon mood change were examined, first, shortly after entering the test room and, later, after working on the evaluation test. It was expected that, regardless of window pattern, the smaller room would induce more change in mood than the larger room.

The study also looked at the effects of different window patterns upon mood change, initially, and after evaluation of the photographs. Considering the subjective expressions of preference for windows in the literature, it was expected that in the 100% window condition the subject would feel more at ease than in the windowless condition, and would experience less drastic mood change as a result.

In view of the comments by Manning, Collins, and Hollister reported above on pp.23, 24 regarding small

windowless areas as opposed to large ones, one would expect, on the average, a greater change in mood to be associated with the smaller windowless room than with the larger.

Since no such effect has been found in rooms with windows, another purpose of this study was to look for an interaction between room size and windows in relation to mood change.

In both initial and delayed conditions of mood change, as well as in the total (the sum of these two), a relationship was anticipated with certain of the personality traits, although the relationship might differ in each mood change condition. This was also examined.

A comparison was made between the Friendliness evaluation of the different rooms in the photographs. It was expected that the photograph of the small room with no windows would be rated as the least friendly, and the large room with all windows as the most.

As a measure of behavior change, the average Friendliness rating over all photographs by subjects in the small windowless room was expected to be lower than that given by subjects in the large room with 100% windows.

## CHAPTER II

### METHOD

#### The Setting

The study was conducted at York University, Downsview, Ontario, during the summer of 1976. A large conference room was made available on the 9th floor of the Ross Building (Administration) for a period of six weeks from the middle of July to the end of August.

The room measured 29 ft. 8 in. (9.042m) in length by 11 ft. 4 in. (3.454 m) wide by 8 ft. 6 in. (2.591 m) high. It faced west, with six windows along the west wall. The walls were covered with vinyl fabric of light grey or off-white hue. The interior partitions consisted of vinyl-covered panels, approximately 4 ft. (1.219 m) wide, set into a small channel at floor and ceiling. There was a 4 in. (.102 m) baseboard of black vinyl and a 1-1/2 in. (.039 m) moulding at the ceiling. The joints between were concealed by a 1 in. (.025 m) aluminum and black vinyl "feature strip."

The windows measured approximately 4 ft. (1.219 m) in width by 5 ft. 9 in. (1.753 m) high, and were in pairs which were divided by a 4 in. (.102 m) post, the pairs being separated from each other by either an unfinished concrete column, 1 ft. 10 in. (.559 m) wide or a "false" column or

divider of the same width. The posts and dividers were covered in vinyl fabric like the walls.

The windows themselves were of double glass, with miniature venetian blinds in the space between the panes. The blinds could not be raised but were barely noticeable when adjusted to an exactly horizontal position, which was easily done by turning a small knob on the frame.

The room was lighted from above by recessed fluorescent fixtures covered with opaque plastic panels set flush with the ceiling. Each fixture held two 4 ft. (1.219 m) white tubes. The fixtures were set in six 8 ft. (2.438 m) strips across the room, centered on the windows and surrounded by panels of acoustic tile.

For the purposes of the experiment, a vinyl-covered partition was erected across the width of this room, dividing it into two smaller rooms--one with two windows (Room A) and one with four (Room B). Room A was to the south of Room B and was just half its length. Room A measured 9 ft. 9-1/2 in. (2.981 m) in length, and Room B, 19 ft. 7-1/2 in. (5.983 m).

Six solid screens were built to cover the windows when needed. These were constructed on frames of 3/4 in. by 1-1/2 in. cedar (.019 m X .038 m), covered with Ten-Test and with the same vinyl fabric as the walls. After the first screen was built, there were found to be difficulties in installing and replacing it quickly because of its size and

weight, so the rest of the screens were built in two pieces. The joint between was covered with a specially constructed T-shaped feature strip matching that of the wall panels. The strip also helped to ensure a snug fit. Every precaution was taken to prevent any light showing at the joints as it was important that the screens should look like solid walls. The venetian blinds were closed before putting up the screens but were kept in the horizontal position when the screens were not in use. A matching feature strip was added to the one-piece screen.

The original conference room had two doors opening off the corridor so that in Room A the door opening was about .4 ft. (1.216 m) from the north wall, while in Room B the door was about 2 ft. (.608 m) from the north wall. The table and chair which the subject was to use were positioned similarly in each room, about 1 ft. (.304 m) from the north wall, the chair behind the table and facing the diagonally opposite corner of the room. This meant that in Room B the subject entered the room almost directly behind the table, while in Room A the subject entered to the left of it. The table was 32 in. by 24 in. and 24 in. high (.811 m X .608 m X .608 m) with finished plywood top and brown metal legs. The chair was a black metal frame armchair with black upholstery on the seat and back. The only other furniture in the room was a similar chair (for the experimenter

to use later) which was placed against the north wall just a little in front of the table, and a wastebasket to the right of the table. The wastebasket was office-type of black plastic. The floor was covered with wall-to-wall carpeting of a pale lime green. Each room was equipped with a hygrometer behind where the subject sat, and a buzzer in the corner behind the door.

The view from the windows looked over the central quadrangle towards the Scott Library, Business Administration Building, and the man-made lake beyond. For some miles the view was relatively unobstructed and in the foreground, as always during the summer months, people were walking between buildings, talking, or sitting reading. A little farther away, beyond the Library, people would stroll by the lake, eat their lunch sitting on the grass, walk their dogs, or play with frisbees. If the subject followed the instructions precisely, the foreground would not be visible to him/her during the experiment.

When a test room was prepared for testing, it was in one of three conditions: (1) all windows uncovered (100%), (2) half the windows uncovered (50%), or (3) no windows, i.e., all windows covered with the vinyl screens (0%). With the two sizes of room, there were, in all six test room conditions--R400, R450, R40, R200, R250, R20.

The subject sat at the north end of the room just inside the door, facing southwest, thus having a full view of the room. In the 50% window condition, the windows that were screened to look like walls were always at the south end of the room so that the view directly opposite the subject and the light falling on the table were not essentially altered from the 100% condition. In the smaller room, the southernmost window was screened and, in the larger room, the two southernmost windows.

The electric lights were left on all the time, in all of the six conditions. The tests for the subject to do were laid on the table in open, self-sealing envelopes, and the door of the room was ajar.

The subjects arrived on the 8th floor in the Personnel Department where there was a general waiting room (Appendix 1). The Reception Area for this project occupied a small alcove off the corridor, about 6 ft. by 11 ft. (1.824 m X 3.344 m) which formed part of an anteroom to a lounge and to an office (Appendix 2). This space was furnished with a round, white table, 38 in. in diameter (.963 m), two chairs similar to those in the test rooms, and a standing tri-lite for indirect illumination in addition to the three small recessed tungsten lights in the ceiling. The door to the lounge was kept closed and the table was screened from the office door and the corridor by a standing wooden shutter-type

screen of natural pine, 5 ft. 6 in. in height (1.672 m). Wall-to-wall carpeting of deep crimson covered the floor.

This Reception Area was roughly 20 ft. (6.080 m) from the main reception desk of the department, with the result that most of the time there was a medium level of ambient noise from the telephones ringing and people arriving for interviews. It provided a natural excuse, after the subject had done the first few tests, to offer a more secluded room in which he/she could do the rest of the tests on his/her own.

### The Instruments

#### The Mood Adjective Check List (MACL) Short Form

Vincent Nowlis' Mood Adjective Check List (MACL) Short Form, as used in this study (Nowlis & Green, 1965, p. 111) is a 24-adjective check list to describe feelings or mood. Each of the adjectives can be marked on a 4-point rating scale: vv = definitely, v = slightly, ? = cannot decide, no = definitely not (having score values of 4, 3, 2, and 1) (see Appendix 3).

The test is self-administering. All adjectives are on one page and instructions are printed at the top. The subject is asked to work rapidly and to mark the first reaction, to describe feelings at the moment of reading each word.

The adjectives represent eight dimensions of mood-- Aggression, Anxiety, Concentration, Egotism, Fatigue, Sadness, Social Affection, and Surgency--with three adjectives characteristic of each.

In the present study, the MACL was administered three times. The first time it was given to the subject in the Reception Area immediately following completion of the personality inventories and before entering the test room. This might be referred to as Initial Mood. It was an opportunity also for the experimenter to check whether the subject understood the instructions and followed them. The second and third MACLs were placed in self-sealing envelopes in the test room, MACL II to be taken out and answered when a buzzer sounded (after 5 minutes in the room), and MACL III immediately following the task of six Architectural Evaluation tests of photographs. These two MACLs measured "Mood upon Impact with the Test Room" and "Mood after Delay in the Test Room." All test forms were identical, following Nowlis' format, and the order of the words was not varied. The subject was asked to replace each test in its envelope and seal it, before opening the envelope for the next test.

In the scoring, Initial Mood Change was calculated by subtracting the score for each adjective in MACL I from its score in MACL II. Final Mood Change was calculated by

subtracting MACL II scores from those of MACL III. Thus, a minus score in Mood Change meant a decrease in the intensity of any particular feeling, and a positive score meant an increase, while a zero score indicated no change.

Development of the scale. Nowlis and Green, in 1965, set themselves the task of formulating an adjective check list to measure mood and mood change. They hypothesized four bipolar dimensions of mood, defining the poles of each dimension in "terms of the kinds of behavior and experience toward which the person in that mood would be more strongly or selectively disposed" (Nowlis & Green, 1965, p. 3). They looked for adjectives describing several dispositions connected with each mood to avoid, if possible, "merely a cluster of close synonyms" (p. 3). Words of medium intensity were chosen rather than words expressing high or low extremes of each mood dimension.

One hundred and thirty adjectives were finally selected from many different sources, including Cattell (1950), Murray (1938), and the resources of Nowlis' own research group. These were printed in five columns on one sheet, with a scale of four rating levels above each word. Ten of the adjectives were repeated in the last column, to test reliability. In addition to adjectives belonging to the four bipolar dimensions, four words were included relating to need states or organic conditions (hungry, in

pain, intoxicated, thirsty). A second form was printed with the words in the first four columns reversed in order. The total test contained 140 words to be checked.

Subjects were undergraduate fraternity men at the University of Rochester. Approximately 450 men gathered in an auditorium on six successive Monday evenings. The purpose was to test the adjective check list by inducing a definitely different complex mood state in each subject in each of the six sessions.

A pretreatment MACL was passed out as soon as all subjects were seated. Monitors collected the test sheets as soon as they were finished. Following this, an experimental mood-inducing treatment lasted from 40 to 60 minutes, after which the second MACL was distributed and filled. Then the subjects left. The treatments consisted of the following:

1. a documentary film, The Face of Lincoln
2. an aggressive hoax
3. film comedy, The Freshman
4. English-language film version of The Nuremberg Trials
5. unedited color film of a major surgical operation
6. contest for cash prizes for immediate recall task based on travelogue film.

Results from the two administrations (pretest and posttest) of the MACL in these sessions were factor analyzed. Eleven factors were extracted and rotated. In a detailed

interpretation of the factors, Nowlis and Green listed a few negative adjectives in some of the factors, but they were not found to be bipolar. A suggested label was given for each factor, although they were described rather by letters (A, B, C, etc.). Five large-scale analyses were made, and factors were compiled which appeared to have some consistency throughout the five analyses. These were Aggression, Surgency, Concentration, Fatigue, Social Affection, and Sadness. Three other factors were consistently found, though the investigators were not entirely satisfied with their defining variables. These they called Anxiety, Skepticism, and Egotism.

In 1965, Nowlis and Green constructed a short form of the MACL from three of the words having highest loadings on each of the best eight factors, which has since been used extensively in mood testing. This is the form used in the present study.

Reliability and validity. Reliability estimates were calculated on the 10 repeated adjectives. Statistical association between the two presentations of these 10 adjectives was shown by two statistics, the contingency coefficient (C) and Pearson's r. Thus, the type of reliability reported was a "test-retest" with negligible time interval between the first and second administrations. Values of C ranged from .57 to .80, and r values from .45 to .89.

"The reliability of any particular adjective scale is surprisingly constant from one estimate to another" (Nowlis & Green, 1965, p. 21).

Four replications, using shortened versions of the MACL and testing only eight or nine of the factors, gave strong support to the results of the Nowlis and Green study. Two of these were carried out at Rochester University and two were by Borgatta (1961) at New York University. The resulting factors are described in Nowlis and Green (1965, pp. 64 to 75). To a certain extent, factorial validity might be assumed for the Short Form of the MACL on the basis of its selection of adjectives with the highest loadings on the best factors and from these later tests.

The Gordon Personal Profile (GPP) and  
Inventory (GPI)

The Gordon Personal Profile and Inventory were chosen as the instruments for mood measurement for several reasons:

(1) because of their generality of application, (2) they have a known relationship with a major (16PF) personality test (Gillis & Lee, 1979), and (3) have all acceptable characteristics including a wide range of personality traits.

These two tests can be completed in succession, the Inventory following immediately after completion of the Profile. If the subject is informed at the beginning that the instructions are identical for both tests, then there is no need for a break between the two. Both are self-administered, with the experimenter only going through the written instructions

of the Profile with the subject and making certain that they are understood.

Each test provides measures of four aspects of personality which are significant in the everyday adjustment of normal individuals to social, educational, and industrial situations. In the Gordon Personal Profile (GPP), these traits are Ascendency (A), Responsibility (R), Emotional Stability (E), and Sociability (S). In the Gordon Personal Inventory (GPI) they are Cautiousness (C), Original Thinking (O), Personal Relations (P), and Vigor (V). Both tests may be used with high school, college, industrial, or general adult groups.

The tests consist of a number of sets of four descriptive phrases, known as "tetrads"--one phrase representing each personality trait, in every tetrad. The GPP contains 18 such sets, and the GPI, 20. Of the four phrases in a tetrad, two "are considered by typical individuals to be equally complimentary" (Gordon, 1956, 1963, p. 3) and two the opposite. In each tetrad, the subject is asked to mark one item as being most like him/herself and one item least like him/herself. A favorable response thus cannot be given to all items in a set and, even if none of the four is like the individual, an answer of relatively most or relatively least like, of the four, must be marked. Each of the tests takes an average of 7 to 15 minutes to complete, thus the administration of the two together can occupy up to half an hour. The tests were given this way in the present study.

Development of the GPP. From other factorial studies of personality, six factors were hypothesized and 300 items written describing behaviors related to these factors. The 300 items were divided into two equivalent forms of 150 items each, and administered to one or other of two groups of students in a midwestern college. The individual items were then subjected to factor analysis independently for each form of the test. Four factors were extracted, which are those listed above.

The preference value of each item was determined separately for the male and for the female subjects. Items showing generally equal preference were paired. Two pairs were combined in such a way that the resulting tetrad contained two of high preference value and two of low value and each item represented a different personality trait.

With 24 tetrads, the Profile and another independent personality questionnaire (not employing the forced-choice technique, but covering the same factors) were administered to two groups of 104 college women. Peer ratings were taken on the four traits and compared with results from each of the tests. At another college, the two types of test were administered to 63 female students and 55 male students. Peer ratings were obtained again. As with the earlier study, the forced-choice technique was found to have higher validity than the questionnaire form, but in this case significantly

higher--on two scales for the male group and on three scales for the female group.

Five revisions of the scale were made before the final form was reached. Item analyses were made on high school, college, clinical, and industrial populations. Differences amongst the samples from different populations occurred, but within populations preference values appeared to be highly stable. (Correlations between two midwestern and western college samples were .97 for men and .98 for women.) To avoid the necessity of printing a number of different forms, item preference values were balanced as well as possible for composite groups or for the general population.

In the development of the Profile, more than 5000 subjects were tested, and the data contributed to the final form of the test.

Development of the GPI. After development of the GPP, four different personality factors were selected from factor analytic studies in the literature, and 210 items chosen to represent them. These items were tested on a group of 200 college students. After factor analysis, four factors were identified which were those used in the final form of the Inventory, listed above. Only 120 of the 210 items were chosen for the first Inventory--making a total of 30 tetrads, which were constructed in the same manner as

for the Profile. Item preference values were tested as before and three revisions were made before the final form of the Inventory was reached, with its 20 tetrads. The data from 1786 subjects were analyzed and used in the development of this test.

Validity of the GPP. In the use of the scale for testing college men (55) and women (63), mentioned above, product-moment correlations between peer ratings and scores on the GPP ranged from .47 to .73, and were significant at the .01 level on each of the four traits and for both men and women.

In its second experimental form, the Profile was administered to 27 clients prior to counseling (John Gawne, Boston University Counseling Center). Without knowledge of obtained scores, the counselors rated their clients after the final interview on a 9-point scale for each of the traits in the Profile. Product-moment correlation coefficients between initial scores and counselor ratings were significant at the .05 level for two of the traits (R and S), and at the .01 level for the other two (A and E). These studies seem to indicate a good level of descriptive validity.

The GPP Manual (Gordon, 1954, 1963) presents brief summaries of 20 research studies with the Profile in different operational settings. A comparison of the predictive validity reported in these 20 cases suggests a relatively high

correlation between responses on the A scale and success as sales people, management and executive personnel. This scale does not correlate significantly, on the other hand, with scores on the GPP of people deemed reliable for "hazardous duty," or for scuba divers or frogmen. The last three groups, however, showed high correlations with the R and E scales, significant at the .01 level.

In a list of factor loadings of individual items on the factors which they purport to represent, positive loadings range from .56 to .82 and negative loadings from -.45 to -.89.

A summary of internal consistency and stability estimates is given in the GPP Manual on page 21. According to Table 21 (Gordon, 1956, 1963, p. 21), for 140 college students, reliability coefficients for the four personality traits are all .84 or above. In addition, the Kuder-Richardson (Case III formula) shows .74 as the lowest coefficient for 200 college freshmen. Other split-half reliability coefficients (Manual, p. 21, Table 22) for two high school groups show the lowest as .70 for 235 boys and girls in grades 9 - 12 in the first group and .68 in the second for 159 boys and girls in the same grades.

Test-retest reliabilities, after one week, ranged from .84 to .87 on the four traits, for 84 college students and the range was from .80 to .87 for 88 high school students.

after a period of three months. The author expresses the opinion "that stability over even longer intervals would be reasonably satisfactory" (p. 21).

Patterns of intercorrelations between the four traits, as measured from obtained scores on the GPP and from peer ratings made on the GPP, are reported in Tables 23 and 24 (Manual, p. 22). These patterns have a certain similarity which the author feels may "reflect the existence of real relationships among the traits for the populations sampled, rather than relationships imposed by the forced-choice format of the Profile" (Manual, p. 22).

The GPP shows only a slight relationship to intelligence and aptitude scores as measured by a variety of instruments, of which results are reported in Table 28 (Manual, p. 23).

Correlations between the scales of the GPP and those of the GPI are generally positive and are not great, the highest being .47 and the majority below .20.

Correlations of the GPP with other personality measures show varying degrees of congruence between individual scales. For example, comparing the Guilford-Zimmerman Temperament Survey (GZTS) and the GPP, the highest correlations are .61 and .58, respectively, between the GPP Ascendency and GZTS Sociability and between GPP Ascendency and GZTS Ascendence. The same GPP scale (A) has shown a

significant relationship to the Leadership value in the Survey of Interpersonal Values (SIV) with  $r = .39$ , Dominance on the Edwards Personal Preference Schedule (EPPS),  $r = .55$ , and the Poise, Ascendancy, and Self-assurance cluster on the California Psychological Inventory (CPI). The Responsibility scale on the GPP has been found to be significantly related to six conceptually similar scales on the SIV, EPPS, and the CPI. The same scale (R) shows a negative relationship to one conceptually unlike scale of the CPI, Flexibility. The GPP Sociability scale has been negatively related to EPPS Need for Autonomy (-.23) and to SIV Valuing Independence (-.30).

Validity of the GPI. Factorial validity is demonstrated in a listing on page 11 of the GPI Manual (Gordon, 1956, 1963) of factor loadings of certain typical items on the factor or personality dimension that they help to measure. Both positive and negative factor loadings are included under each trait. The positive loadings shown range from .70 to .94 except for one, Cautiousness, at .48. The negative loadings listed range from -.55 to -.85.

The Manual summarizes 16 research studies in several different operational settings in order to study the predictive validity of the GPI. Product-moment correlations were shown between the GPP and various other measures of success such as supervisor ratings or performance on other tests.

Studies involving salesmanship report values significant at the .01 level on the Original Thinking and Personal Relations scales, and at the .05 level on the Vigor and Cautiousness scales.

In the lower levels of supervisory personnel, a correlation significant at the .01 level was reported in Original Thinking between the GPI and advancement, and between GPI and supervisor ratings. Correlations with the C and V scales were also significant, but at the .05 level.

First and second level executives were significantly differentiated on the P scale at  $p = .01$ , and junior officers and enlisted men in two studies (scuba divers and frogmen) on the O scale at  $p = .01$ . The P scale showed the highest correlation with success in "hazardous duty training" in the navy.

Three studies were performed to determine split-half reliability values, corrected by Spearman-Brown for first-half versus second-half correlations. For 168 college students, reliability coefficients were all above .80. For 103 high school seniors the range was from .77 to .83, and for 124 college students, on the Kuder-Richardson, from .78 to .84. Intercorrelations between the scales, calculated for male and female college students, tended to be slightly higher for males than for females. In both cases, the highest correlation occurred between Cautiousness and Personal Relations (.37 for women and .42 for men). Intercorrelations were also

found for two groups of salesmen who, unlike college men and women, tended to show negative correlations between scales. Correlations between the GPI and various measures of aptitude and intelligence showed a significant relationship between the Original Thinking scale and intelligence in all groups of subjects at the .01 level, but not on all subtests. Correlation of the GPI with the GZTS for 160 navy enlisted men showed a relationship of interest between the V scale (GPI) and General Activity (GZTS), .66, and the C scale and Restraint of .63.

In summary, both tests have demonstrated a high degree of predictive and split-half reliability, and separately have shown satisfactory factorial and descriptive validity and internal consistency.

#### The Architectural Evaluation (AE) Friendliness Scale

The Architectural Evaluation (AE) scale is modeled on Osgood's semantic differential (Osgood, 1957), and consists of 10 bipolar adjective pairs to be rated on a 7-point scale (Appendix 4). The instrument was designed to measure a person's subjective evaluation of one aspect of the built environment--its friendly, sympathetic, or welcoming qualities.

For this study, the scale was reproduced on a single sheet of paper. On the left side of the sheet, following Canter and Wools' (1970) format, were the adjectives that appeared to be more "favorable" (although this is a

subjective value judgment) and the less favorable were on the right. The ratings, from 1 to 7, read from left to right so that, on the whole, a low score tended to be more favorable, and a high score more unfavorable to the rated environment. More specifically, a low score denoted a more "friendly" rating of the environment.

At the top of the sheet were full instructions for the use of the scale. In this study, the stimuli to be rated were six photographic enlargements (approximately 7.0 in. by 9.5 in., or 17.5 cm by 24.5 cm) in black and white of the six test room conditions, mounted on grey boards. Each photograph was taken from the corner of the room where the subject sat, looking towards the diagonally opposite corner (i.e., looking to the southwest). See Appendix 5.

Development of the scale. In 1970, Wools and Canter constructed a 7-point rating scale after study of the adjectives employed by Osgood et al. (1957), Vielhauer (1965), and Canter (1969). Forty-nine adjective pairs were selected for their possibility of representing the quality of the physical environment and its reactions upon people. Twenty-four monochromatic drawings were made of different room interiors, and 67 non-architectural students judged the drawings on the rating scale, producing 26 replications of the scale for each drawing. The results were factor analyzed by principal component analysis with varimax rotations and eight significant factors were extracted.

The first three of these factors were Activity (e.g., fast/slow), Harmony (e.g., clear/obscure), and Friendliness (e.g., welcoming/unwelcoming). Each of these was further subjected to scalogram analysis (Stouffer et al., 1966). This analysis converted the adjective list from a subjective description of the environment to a relative or scaleable measure which could be reliably used for the comparison of different environments. It also had a tendency to render the list of adjectives under one factor more homogeneous by the selection of only those pairs which contributed to a scale or measuring instrument. In addition, the scalogram analysis made it possible, within reasonable limits of confidence (.10), to reproduce a subject's behavior on the entire test from a single score. It was felt that, by doing this, what was sacrificed in precision was gained in reliability (Canter & Wools, 1970, p. 191). Thus, three instruments were created for measuring people's reaction to room interiors as judged from drawings. The Friendliness scale, in its final form, contained 10 adjective pairs, rated on a 7-point scale, with the adjective considered the more "favorable" of each pair on the left side of the sheet associated with a lower score.

In the present study, Canter and Wools' method of scoring was not used. This was because the scalogram analysis was based on a U.K.—or, even more specifically,

Scottish--population. Housing details, offices, university buildings and university attitudes tend to differ in different geographical locations, and it was felt necessary to make use of the greater detail which the full 7-point scale allowed.

Validity and reliability. This scale was tested in real rooms with 32 Scottish housewives, aged 21 to 32 years, judging a secretary's office and a storeroom for office supplies. Results distinguished significantly between the two rooms, at the .005 level of significance (Canter & Wools, 1970; Wools, 1970; Wools & Canter, 1970). The experiment was set up in such a way that subjects judged the room first, shortly after entering it with the experimenter, and again after about 25 minutes spent on another environmental test. Repeat judgments were significantly consistent at the  $p < .001$  level. Two experimenters were used in this study, each testing one quarter of the subjects in each of the two rooms, and no difference was found between the results with these two experimenters (architectural undergraduates), indicating, in this case, the reliability of the instrument between experimenters.

In an effort to learn more about the physical correlates of these judgments, a new set of 16 drawings was made, showing rooms of approximately equal size but demonstrating four different types of windows, two types

of bookcases, two chair types (but arrangement of chairs identical), and two types of ceilings (flat and sloped). Again, the subjects were the 32 housewives, who now judged the plain rectangular window as significantly more friendly than the clerestory, and the sloped ceiling as significantly more friendly than the flat ( $p = .005$ ). Seating and bookcases produced no differential effect. The Eysenck Personality Inventory, administered along with this study for effects of extraversion/introversion, did not show significant results.

Twelve new drawings were made (omitting the bookcases), with flat or sloped ceilings, rectangular or clerestory windows, and three seating arrangements. With 41 first-year architectural students in their first week of term acting as subjects, the seating arrangements produced a significant effect with  $p < .005$ . Easy chairs (2) at an angle to each other were seen as more friendly than office chairs (also 2) facing each other across a desk (Wools, 1970).

Different groups were tested using these and other similar drawings--another group of first-year students (in psychology) and a group of professional architects attending a conference. Only the two student groups' results were truly comparable, being based on the same drawings.

Spearman's rank coefficient between these two was .84 (significant at  $p < .01$ ). Analysis of variance showed that

both groups of students, and the architects, found the seating the most influential feature contributing to room friendliness, followed by the windows as a close second for the conference architects. The easy chairs at an angle were seen as more friendly, as was the rectangular large window (Wools, 1970). The housewives were influenced mainly by the ceiling or roof differences. In overall importance, the ceiling was second to the seating (with the exception of the conference architects) with  $p < .01$ , and the window (except for the architects) was third at  $p < .05$  (Wools & Canter, 1970).

These studies tend, in general, to show a consistency across groups, in distinguishing between different features of the built environment. The fact that the professional architects were more influenced by the windows may be attributed to their training, but it is an important point, since architects are expected to interpret the layman's needs with regard to architectural spaces. The overall consistency found between different drawings and different modes of stimulus presentation also begins to lay a groundwork for construct validity.

Canter and Wools (1970) performed another study in which third and fourth year architectural students were compared with third and fourth year students from other faculties and disciplines. The 30 architectural students

judged 20 photographs of plans and elevations of houses, while the 52 non-architectural students rated 24 drawings of room interiors. In this way, two modes of presentation were compared, each one being the most familiar mode of observation for those using it. Each group had a slightly different set of adjectives on which to rate the buildings, but 31 of the adjectives were common to both scales.

In the analysis, the adjectives fell into three similar clusters for each group as were found in the factor analysis mentioned above--Character, Harmony, and Friendliness. For the non-architects, the first and third clusters overlapped, and five of the adjectives in the Harmony cluster occurred in the Character cluster for the architects. But, on the whole, as the authors pointed out, "it is apparent that there is a great deal of similarity between the dimensions employed by the architects and those used by non-architects" (p. 189). Hershberger (1970) found similar results where the architects, as a group, tended only to be more homogeneous in their judgments. These results might be interpreted as contributing to the factorial validity of these adjective rating scales.

Finally, Canter and Wools (1970) used the Friendliness scale to test two different types of space, in addition to the secretarial office and the store room.

Six music practice rooms were evaluated by 64 music students. Significant differences were found between the room ratings "at the extremes of the scale range" (p. 192). A relationship was found between the reverberation time of the room and the instrument played by the subject--stringed instrument players favoring longer reverberation times.

Three house types were evaluated by 43 housewives in a Scottish new town, each rating her own house. The houses were also assessed on a Ministry of Housing check list and a sociological questionnaire. There was substantial agreement between the three sets of evaluations.

These, and other similar studies by the same group in Glasgow, have made important contributions to the evidence for the reliability of this scale's performance in judging different types of architectural environment.

#### The Questionnaire

The Personal Questionnaire was given at the very end, after testing was finished. The questions were printed on the bottom half of the Subject Sheet (Appendix 6). At the top was the name, telephone number, subject number, date, sex, age, and occupation, along with time of arrival and testing time for the GPP and GPI. Also recorded when the subject arrived was the illumination level, temperature and humidity in the test room, the temperature outside,

humidity (obtained from the Weather Office), and the barometric pressure. Some of these could be useful later in the interpretation of results.

The form of the Questionnaire may be seen in Appendix 5 (Subject Sheet). It was administered verbally by the experimenter to every subject, with the suggestion that he/she could relax for a few minutes while answering four or five questions which would be helpful in interpreting the results.

The questions were self-explanatory. There were four for male subjects regarding hours of sleep the night before, state of health, medication or alcohol taken since the previous midnight, and any unusual happening during the previous week which could affect mood. For female subjects, there was an additional question regarding the menstrual cycle and whether it usually had an effect on mood. A further question was asked of all subjects if the answer was not already known; that is, whether or not the subject worked in the building, in which case a familiarity with the wall finish, partitioning, ceiling, and lighting system would be expected, even with interior offices having no windows. This could be treated as a separate variable in the results.

The responses to the Questionnaire were only intended as an additional resource in the interpretation of data that might otherwise be difficult to explain.

### Subjects

One hundred and six persons volunteered to participate in the experiment. They consisted of students and staff at all levels, from many departments and faculties of the University. The sample consisted of 105 staff and students, of whom 24 were male and 81 female. The male group comprised 27% of the 20-29 year age group, 24% of the 30-49 year age group, and 2 out of 12 in the 50-59 year age group.

Recruitment. The recruitment of subjects began a month before testing started, with a notice in the York University Bulletin (Fisher, 1968) (Appendix 7), which has wide circulation throughout all departments and offices, and student distribution in general. Notices were posted on boards in all university buildings, including cafeterias, residences, lounges, and laboratories (Appendix 8). A letter (Appendix 9) was sent to the head of every faculty, college, and department, which was later followed up by a telephone call. Some faculties submitted lists of their teaching staff, who were subsequently sent copies of the letter and were asked to mention the project to their classes. Great difficulty was experienced in obtaining subjects, even with the utmost cooperation of the Personnel Department who volunteered to speak to a number of department heads, and the assistance of members of certain faculties and offices who encouraged members of their staff to participate. Undoubtedly, part of the difficulty in recruiting subjects

stemmed from the experimenter's reluctance to disclose in any way the nature of the tests or to assign a false purpose to the research. This meant that prospective subjects had to be somewhat trusting, risk-taking, or curious, or motivated by a desire to get away from their work for half an hour. Until the last day of the experiment, the time between tests was filled with efforts to obtain more subjects. A new set of notices with color and eye-catching patterns was posted on all boards after three weeks of testing, and the notice in the Bulletin was altered in wording and repeated for each week that the experiment was in progress.

Assignment to test room conditions. Subjects were randomly assigned to the six test room conditions and two control conditions. The plan called for 10 subjects in each experimental condition and 10 in each control group. Two different test room conditions were picked at random for the control groups. These turned out to be R200 and R20. Two experimental manipulations were controlled in each of these room conditions: (a) eliminating the effects of the initial personality tests and the first MACL, and (b) eliminating the effects of MACL II in the test room. As a consequence there were four control groups planned with 10 subjects each. Flow diagrams for experimental and control subjects are shown in Figure 1.

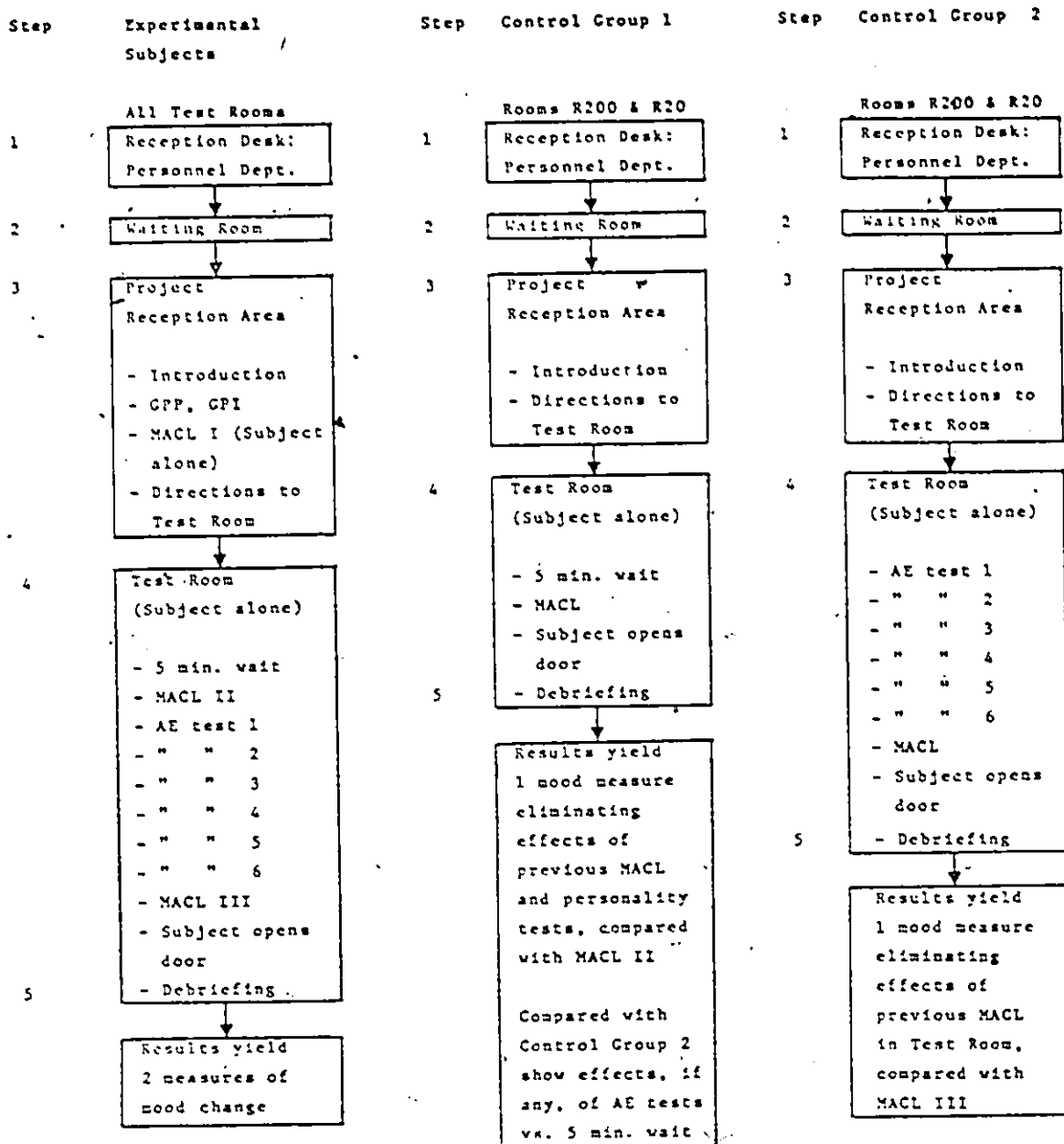


Figure 1. Flow Diagrams for Experimental and Control Subjects and results expected from each.

Note: Subjects are with experimenter in Steps 3 and 5.

Of the experimental subjects, more than the required number volunteered before the date set to finish testing; and two additional subjects were assigned to test room conditions on the basis of a supplementary random order list. One subject did not complete MACL III, and an extra subject was assigned to that room condition. In the control groups, two results were invalid and one partially invalid, and other subjects were assigned to replace these but, accidentally, one of them, although given the right test room condition, was given the wrong control condition. The net result, then, was that one of the control groups had 11 sets of valid data, two had 10, and one had 10 valid MACLs but only 9 valid sets of AEs. In the experimental groups, one had 12 valid sets of data, four had 10, and one had 11 subjects, of whom one did not answer MACL III (although the data from all other tests were valid).

Random order of test room conditions. Ten slips of paper inscribed with the room condition (R400, etc.) were prepared for each of the six experimental conditions, folded individually, and placed in a covered box. To these were added 10 slips of paper for each of the control conditions, making a total of 60 experimental and 40 control slips of paper. After shaking up the box, the knobs of paper were withdrawn one by one and the order recorded. Thus, the various control conditions were interspersed at

random amongst the 60 randomly ordered experimental conditions. As subjects volunteered for the experiment, they were assigned to the first available time that was suitable to them. A supplementary set of 24 random order test room conditions was made up in the same way to accommodate extra subjects if more than 100 persons should apply, but the supplementary list contained no controls.

#### Procedure

Testing took place between July 22 and August 30, 1976. Only one subject was tested at a time and the one experimenter tested all subjects. On some days, only one or two subjects were tested while, on other days, there were as many as seven or eight. A rough approximation of the complete testing time per subject was 40 minutes for experimental subjects.

When the subject arrived, he/she went to the reception desk in the personnel department and was asked to take a seat in the waiting room. The experimenter greeted him/her there and took him/her to the experimental reception area, which occupied a corner of the corridor in an alcove. The subject was told that he/she would be given a series of simple paper-and-pencil tests to do, as was noted in the advertisement, that there were no right or wrong answers to the tests, only choices or preferences, and that the

results would be held in strict confidence (Appendix 10). The subject was given the Gordon Personal Profile to do right away. The experimenter went over the instructions with the subject in detail. As instructions were the same for both Profile and Inventory, the subject was asked to continue on to the Gordon Personal Inventory as soon as he/she had completed the Profile.

When the subject had finished both of these, the experimenter took them and handed him/her a copy of the first Mood Adjective Check List (MACL I), and asked the subject to read the directions and begin it right away. This was formally the beginning of the experiment. The experimenter noted the time and left the subject alone while he/she filled out the MACL. Upon completion, the experimenter again noted the time, took the test sheet, and told the subject that he/she would complete the rest of the tests on his/her own, following written instructions, which was what had been done up to that point anyway. The subject was asked to follow the instructions carefully.

Handing the subject a sheet of instructions (Appendix 11) for getting to the test room (which was upstairs on the next floor), the experimenter accompanied the subject to the foot of the stairs and left him/her there saying, "I'll join you in the room as soon as you have finished."

At the top of the stair, the door to the corridor was open and on the wall opposite was a large notice facing the subject, which pointed to Room "A" on the left side and Room "B" on the right (2 windows and 4 windows, respectively).

Following instructions, the subject entered whichever test room had been designated (the door was slightly ajar, while the other test room door was closed), closed the door, and sat down at the table. The subject waited until he/she heard the buzzer before opening the first of the envelopes on the table. This gave the subject time to absorb the surroundings. The experimenter waited a few minutes downstairs, then went upstairs and, exactly five minutes after leaving the subject, pressed the buzzer.

Inside the room, the tests were lying on the table in a pile of numbered self-sealing envelopes. Instructions were to seal each test in its envelope after completion, and before taking out the next test. The order of the eight tests was: number 1, MACL II (measure of mood upon impact with the room); numbers 2 to 7, Architectural Evaluation tests of photographs of the six test room conditions, presented in random order; number 8, MACL III (measure of mood after delay in the room). At the end of the final test (MACL III), the subject was instructed to open the door when finished and wait until the experimenter joined him/her.

The experimenter was waiting outside the room and entered immediately after noting the time that the door was opened.

The experimenter administered the short Questionnaire outlined above and afterwards told the subject that that was all that was required, explaining the purpose of the study and thanking him/her for participating. If the subject had questions, then a short discussion might take place at this point. All subjects were requested not to discuss the project with others who might be volunteering for it later. A brief summary of results was promised to everyone who participated. Ideally, it would have been desirable to check on all of the above manipulations. However, because of practical limitations, these checks were not possible.

During the testing, a male assistant was employed to change the screens on the windows between tests, following the pre-established random order. Where a number of subjects were closely scheduled for testing in one day, this was very important to the smooth operation of the proceedings. Although changing the screens took only a couple of minutes, it was a strenuous job, the half-screens weighing about 14 lbs. (6.35 kg) each, and for one of the windows in the smaller room, a full screen weighing 28 lbs. (12.70 kg) and measuring 4 ft. (1.219 m) in width. In addition, with the test rooms on the floor above the reception area, this could have involved a good deal more running up and down stairs if performed by the experimenter, who was testing. The assistant also looked after minor repairs if any of the

screens became damaged, and notified the experimenter if adjustments were needed due to the effects of temperature (prolonged exposure to the sun through glass) or the processes of wear-and-tear.

## Hypotheses

### Rationale for Hypotheses

It is apparent from the literature on environmental and architectural psychology that writings to the present time in these fields cover a wide span of subjects and approaches. A number of authors have expressed the need for a narrower focus on particular aspects of the environment and for the need for actual data on different components of the architectural environment in relation to human behavior, on which a theory may be based (Canter & Wools, 1970; Canter, 1970d; Canter & Lee, 1974). It is felt that theory will give a basis for uniformity of evaluation of existing buildings and a foundation for prediction in the future for buildings of various uses.

Here, an attempt is made to define environmental variables in the simplest possible terms in order to reduce the complexity of the relationship under study, that is, between man and environment.

Hypothesis 1. In Canter's 1968 study of office size, clerical performance decreased as room size increased. Canter felt that attitudes to large offices and the social groupings in them were important. Lipman (1968) noted that people experienced a different kind of hostility in a large and a small room. There, feelings of hostility were related to people in the room. Thus, Canter and Lipman both found that room size was in some way related to human behavior. Since both of these studies took place in a social setting, it was questioned whether the room size itself could contribute to the behavior change or whether it was entirely a social phenomenon. To learn more of the underlying causes of behavior change, it seemed necessary to test the subject alone in the room.

The first hypothesis posits that mood will change differentially in the large and small rooms when the subject is alone in it, regardless of the fenestration of the room.

As a further means of tracing the components of mood change due to room size, if they exist, two separate measures of mood change will be taken--upon first impact with the room and later, after delay in the room. These two measurements form parts a and b of the first hypothesis.

Hypothesis 2. According to Wells (1965), 69% of office workers in one office building felt that daylight was better for the eyesight than artificial light. Markus (1967)

found that 86% of subjects surveyed preferred to have some sunshine in their offices all the year round. In his study, expressed desire for sunlight was proportional to the subject's current distance from a window.

In Wells' (1965) study, 89% of office workers surveyed felt it important to be able to see out of the office. Manning (1967) spoke of people having a psychological need for contact with the outside world. He also noted the value of constantly changing stimuli in a daylit room. Collins referred to the avoidance of claustrophobia where there were windows and she, as well as Jackson and Holmes (1973b), pointed to the avoidance of boredom or monotony.

Jackson and Holmes (1973b) suggested that a view from a window constituted a release from the constant interior environment and a reassurance of the presence of the outside world.

The literature abounds with subjective statements such as these expressing the feelings that people have about windows. An objective measure is required which will define the differences in these feelings between people using rooms with and without windows. It is felt that this may be expressed in change in mood between doing tests in a common reception room and then performing tests in another room which, for some subjects, has windows, and for others has none.

It is suggested that the greater contentment associated with windows that is expressed in the literature will produce less violent mood change and, in fact, less mood change in general in rooms which have windows the length of the exterior wall when compared with windowless rooms. In order to measure the difference, the hypothesis will be tested that mood change will be greater in rooms with wall-to-wall windows than in the windowless rooms. This will be the second hypothesis tested in this study, and mood change will again be measured (a) upon impact with the room and (b) after delay in the room.

Hypothesis 3. Collins (1975) suggested that small windowless environments seem to be where lack of windows is most noticeable. Hollister supported this in his statement that there is greater tolerance for large windowless areas than for small (Collins, p. 31). According to Manning (1969), one would expect an interaction effect on subjects' behavior associated with windows and room size, the subjects in a small windowless room being more dissatisfied than those in a large one. The choice of two variables--windows and room size--may provide the possibility of measuring interaction between room variables in their effect on human behavior, rather than single variables alone. Hypothesis 3 expects that mood change will depend upon both room size and number of windows, and this, too, will be measured upon impact and after delay.

Hypothesis 4. A number of writers have endeavored to find a relationship between mood and personality variables. These attempts have so far resulted in rather scattered and specific correlations between the two. It was felt, in this study, that effects of personality on mood change should be monitored, and the Gordon Personality Profile and Inventory were administered to all subjects before they undertook the mood tests. It was hypothesized that mood change would, to some extent, be related to these personality characteristics.

Hypothesis 5. Because of the difficulty of creating different room sizes and other features for the purposes of testing, simulation techniques have been used extensively in architectural psychology tests. In a series of drawings of rooms with different window shapes, Canter and Wools (1970) found that the room with the larger window seemed more friendly than the one with a small one. In this experiment it was hypothesized that rooms in photographs having more windows would be rated as more friendly than those with fewer windows, and large rooms more friendly than small (Hypothesis 5a). Frequent criticisms have been made of the use of drawings and photographs for subjective judgments of different rooms. Attempts to relate feelings towards simulated rooms to feelings towards real rooms led to the hypothesis that subjects completing the tests in a small room without windows would give a lower friendliness rating to all room photographs than subjects in a large room with 100% windows (Hypothesis 5b).

These hypotheses may be stated in the following manner:

Hypothesis 1a. Regardless of the number of windows, the amount of mood change upon entry into the room--Impact--will differ between the large and the small room.

Hypothesis 1b. Regardless of the number of windows, the amount of mood change after being in the room working on a test--Delay--will differ between the large and the small room.

In particular, it was expected that the amount of mood change would have an inverse relationship with the room size variable, such that subjects in the large room with all windows (R400) would show less mood change than those in the small room with all windows (R200); in the 50% window condition, mood change in room R450 would be less than in room R250, and in the 0% window condition, the large room with no windows (R40) would have less than the small room with no windows (R20).

Hypothesis 2a. Regardless of the room size, the amount of mood change upon Impact will differ between the 100% window condition and the 0% window condition.

Hypothesis 2b. Regardless of the room size, the amount of mood change after Delay will differ between the 100% window condition and the 0% window condition.

In particular, it was expected that the amount of mood change would have an inverse relationship with the fenestration variable, such that both large and small rooms in the 100% window condition (R400 and R200) would show the least mood change and both rooms in the 0% window condition (R40) and (R20) would show the most mood change.

Hypothesis 3a. Mood change upon Impact will depend upon both room size and number of windows.

Hypothesis 3b. Mood change after Delay will depend upon both room size and number of windows.

This hypothesis was concerned with the interaction effects of room size and number of windows on mood change.

Hypothesis 4 . Mood change--Impact, Delay, and Total--will be related to certain personality characteristics as measured by the Gordon Personal Profile and the Gordon Personal Inventory.

Hypothesis 5a. In the Architectural Evaluation Friendliness rating of room photographs, there will be a direct relationship between the rating of "Friendliness" and the independent variable; that is, the room size/fenestration of the rooms in the photographs.

On the Friendliness scale, a low score means a positive rating. The higher the score, the more negative the Friendliness rating. Therefore, it was expected that the graph of rated Friendliness of photographs of the six test room conditions would show the scale rating as a decreasing function of room size and fenestration; that is, the rating would be highest for the small room with no windows (R20) and lowest for the large room with all windows (R400).

Hypothesis 5b. The mean ratings of Friendliness given to photographs of rooms will depend upon which test room the subject occupies while doing the rating. That is, there will be an inverse relationship between the scale rating given to all room photographs and the independent variable or size/fenestration conditions of the test room.

In particular, it was expected that, as the room size and window proportion of the test room increased, the mean rating over all photographs would decrease. Since the higher the rating, the more unfriendly the room appears to

be, this would mean that subjects in the larger room with all windows (R400) would rate all photographs as more Friendly than would subjects in the smaller room with no windows (R20).

### Experimental Design

This is a completely randomized 2 X 3 factorial design. It contains two levels of room size (large, small) and three window conditions in each (100%, 50%, 0%). Ten subjects were assigned initially to each of the six test room conditions (R400, R450, R40, R200, R250, R20), accounting for 60 subjects. Six additional persons applied. Three of these served as replacements for invalid tests which had to be repeated. (Subjects had gone into the wrong room or had not filled out the tests.) The other three were assigned to test room conditions following the supplementary random order list. This resulted in 12 subjects being tested in the R40 condition and 11 in the R200 condition. In the latter (R200) condition, one subject did not fill out MACL III, thus rendering these results partially invalid, although the mood change upon the Impact measure (MCI) remained valid in relation to all other MCI results where mood change after Delay (MCD) was not involved. Finally, five test room conditions had 10 valid responses each on all tests, and condition R40 had 12.

The principal dependent variable was mood, as measured by Nowlis' Mood Adjective Check List. Mood Change upon Impact with the test room (MCI) was calculated by subtracting the results of the subject's first mood test (MACL I) from the results of his second (MACL II) so that an increase in intensity of mood on one variable would yield a positive value and a decrease would yield a negative. This may be expressed as  $MCI = MACL II - MACL I$ .

Mood Change after Delay in the test room (MCD) was calculated by subtracting the results of the second mood test (MACL II) from the third (MACL III), and again an increase in intensity yielded a positive value.  $MCD = MACL III - MACL II$ . Total Mood Change was the sum of both these measures,  $MCT = MCI + MCD$ .

A supplementary dependent variable was the measure of architectural evaluation of photographs of the six test room conditions on Canter and Wools' Friendliness scale. Concomitant variables included personality traits, as reported in the Gordon Personal Profile and Inventory, and also, sex, age, occupation, amount of sleep the previous night, state of health, menstrual cycle, and whether or not the subject worked in the same building. Other possible relevant concomitant variables were barometric pressure, temperature and humidity outdoors and in the test room, and the amount of illumination in the room. Total time

spent in the test room was recorded, and speed of work on the first three tests.

#### The Measurement of Mood and Mood Change

Since mood lability is dependent upon the personality characteristics of the individual, in a general sense it was not expected that mood would be greatly altered by the test room except in relation to the personality traits as measured on the GPP and GPI for experimental subjects.

By the same token, whether mood changes are characteristically sudden and reactive to the environment, or whether an individual is more resistant to mood change, which develops slowly over a period of time in one environment, may also be related to personality traits. Thus, mood change upon Impact and mood change after Delay may be expected to be correlated differentially with personality traits on GPP and GPI.

It was understood that any emotional change that one underwent in a particular room would be related to many personal factors and conditions including previous experience, associations, physical and psychological conditions, as well as personality traits.

Absolute values in measuring mood change. The first concern of this study was whether or not the test room was able to influence or change mood. As noted above,

mood change would be related to personality. When we differentiate between personalities in this respect, we say that one person is more moody, more changeable, more temperamental, than another. We are thinking of the amount of mood change. For this reason, in looking for a correlation between personality traits and mood change, an absolute measure of mood change was employed, which included all of a subject's change in mood, both upwards and downwards, and yielded a measure of the amount of mood change experienced by the subject in the room. It might be referred to as gross mood change and was the subject of the first two hypotheses.

Net mood change. When measuring the way in which a room might alter one's mood, the basic concern was directional. The investigator wanted to know whether positive emotions were increased or decreased, and whether negative emotions were increased or decreased, and whether the differences were significantly greater in one room than in another. Since the extracted factors from factor analysis were used to represent a qualitative description of different mood elements, positive and negative signs had to be taken into account in examining the differences in mood change between rooms by factors.

For example, if one wished to know if a particular room contributed towards making people feel happier or

sadder, one would measure whether mood change in relation to the factor of "Positive Emotion" was a positive or a negative value, and the same with the variables in the factor of "Negative Emotion." An analysis which examines a qualitative difference in mood change between rooms would take account of both direction and amount of mood change. Analysis of covariance, with personality traits on the GPP and GPI as covariates, was considered appropriate.

Mood change upon Impact and mood change after Delay were considered to be two separate entities, for the reasons given above. In all calculations they have been computed and reported separately. Nevertheless, since the net result of mood change in the room was of interest, as was the total amount associated with each test room condition, a Mood Change Total (MCT) which was the sum of these two was also calculated. It was either the algebraic sum or the sum of the absolute values according to whether it was a measure of net (NMCT) or gross (GMCT) mood change.

The importance of the difference between using relative and absolute values in measuring mood change might be expressed in the following way. The individual who was emotionally labile and subject to quick mood changes of short duration might undergo an instantaneous mood change upon entering the test room (Impact), and might as quickly change back to his/her former mood upon adjusting to the

room (Delay). This would create the condition  $MCD - MCI = 0$  where mood might actually have changed considerably and differentially between rooms. The use of absolute values prevented the loss of this measure of change. A person who was very sensitive to environmental influences might be rapidly or deeply affected by a particular style of room, and this effect might increase with the length of stay in the room ( $MCD > MCI$ ), a fact that was of some importance in the qualitative study of the test rooms and was brought out by the use of relative measures.

In summary, absolute values were used to measure the amount of gross mood change which occurred (GMC) and relative values to indicate in what direction mood change took place and to measure the net result (NMC). In most cases, mood change was reported by mood factors--the result of factor analysis of each subject's first MACL scores. Thus, net mood change by factors might include both increases and decreases in one factor, on different mood adjectives.

#### Statistical Analysis

The scores on the first mood test of every subject, including controls, were subjected to a principal components factor analysis with varimax rotation. This involved the 24 mood adjectives of the MACL. The factor

analysis was used to determine whether the eight mood factors, on which Nowlis' Short Form MACL was based, would be extracted.

The second step was to compute a Pearson correlation matrix on values of mood change in experimental subjects and the eight personality traits from the GPP and GPI. Gross and net mood change by factors (5) were summed separately for Impact (MCI), Delay (MCD), and Total (MCI + MCD). The result was two 15 X 15 correlation matrices. This provided an answer to hypothesis 4, regarding a relationship between mood change and certain personality characteristics.

Fifteen two-way analyses of variance were computed for the absolute (gross) values of mood change by factors for conditions of Impact, Delay, and the Total (GMCI, GMCD, and GMCT). This was to answer hypotheses 1a and 1b, comparing room sizes.

The same analyses of variance provided an answer to hypotheses 2a and 2b, regarding window conditions. This was followed by trend analyses of Gross Mood Change by windows.

In the third hypothesis, it was not stated whether amount or direction of mood change was involved and, as both are of interest, this hypothesis was tested, first, by using the above-mentioned two-way analyses of variance

and later computing 15 similar analyses of variance of Net Mood Change.

Analysis of covariance was not used, although it had originally been intended, because correlational values between mood change and personality variables were not considered to be sufficiently high.

Hypotheses 5a and 5b were tested by analysis of variance using a split-plot factorial design, with repeated measures for each subject and with test room conditions as randomized blocks. Afterwards, a trend analysis was made of the AE Friendliness ratings of the room photographs.

The testing of control group ( $C1_1$ ,  $C2_1$ ,  $C1_2$ ,  $C2_2$ ) results against matching experimental conditions was accomplished by the use of  $t$  tests between means, covering a comparison of MACL raw scores in four comparable test room and mood test conditions (R20-MACL II, R20-MACL III, R200-MACL II, R200-MACL III). Control group 2 completed the Architectural Evaluation Test before filling out the MACL. Results of the AE ratings of room photographs were also compared by  $t$  tests between the mean AE ratings of the second control groups ( $C2_1$ ,  $C2_2$ ) and experimental subjects in the same test room conditions (R20, R200).

Further analyses were made as required in answer to questions raised in the discussion of results.

### CHAPTER III

#### PRESENTATION OF RESULTS

Results will be presented in the order in which the statistical analysis has been outlined above.

##### Factor Analysis of Mood Adjective Ratings

A principal components factor analysis was performed with varimax rotation on the raw scores of the first MACL of every subject tested (Table 1). In the case of the experimental subjects this was MACL I. For control subjects, it was the only MACL that they filled--either after a 5-minute delay in the test room (Group C1) or after completing the Architectural Evaluation (AE) task (Group C2). The analysis was based on 105 cases.

Five factors were extracted, comprising 65.6% of the total variance. The first factor, Negative Mood, accounted for almost exactly one quarter of the variance, and the next two factors about 15% and 10%, respectively. All of the highest loadings on the extracted factors were positive and, with one exception, greater than .5 (see Table 2).

This accounted for 23 of the 24 variables. The remaining adjective--Carefree--had a negative loading on a sixth factor (-.66) combined with positive loadings of

Table 1  
Number of Valid Tests in Each Room Condition

Room	No. of windows	Proportion of windows	No. of subjects with		
			Valid MACLS		Valid AE tests
R400	4	100%	10	(E)	10
R450	2	50%	10	(E)	10
R40	0	0%	12	(E)	12
R200	2	100%	10	(E)	11
			10	(C1 <sub>2</sub> )	--
			10	(C2 <sub>2</sub> )	10
R250	1	50%	10	(E)	10
R20	0	0%	10	(E)	10
			11	(C1 <sub>1</sub> )	--
			10	(C2 <sub>1</sub> )	9

Note: E = Experimental subjects  
C1 = Control group 1  
C2 = Control group 2

Table 2

## Variables with Highest Loadings on the First Five Mood Factors

Factor	Label	Variables	Loading	% of total variance	Cumulative %
1	Negative mood	regretful	.88	24.3	24.3
		sad	.83		
		sorry	.79		
		fearful	.77		
		jittery	.54		
		angry	.52		
		clutched up	.41		
2	Positive mood	warmhearted	.87	15.0	39.2
		kindly	.76		
		affectionate	.72		
		witty	.66		
		playful	.61		
3	Egotistic defiance	egotistic	.75	9.5	48.7
		boastful	.75		
		self-centered	.69		
		rebellious	.69		
		defiant	.60		
4	Fatigue	drowsy	.83	6.5	55.2
		tired	.78		
		sluggish	.71		
5	Concentration	concentrating	.83	5.6	65.6
		serious	.73		
		engaged in thought	.68		

.62 on Clutched Up, and .46 on Angry, and contributed only 4.7% of the total variance. Because of its structure and duplication of variables, this factor was dropped, which meant that the adjective, Carefree, was eliminated from the analysis wherever this was based on factors.

#### Tests of Hypotheses

Because of the assumption that mood change would be related to personality characteristics, and the decision to use analysis of covariance in analyzing mood change, it was necessary as the second step in the analysis to examine the actual degree of correlation found between mood change and reported personality traits. This correlational analysis was the subject of the fourth hypothesis and, therefore, hypothesis 4 was the first one to be dealt with. Later, the remaining hypotheses were examined in their natural order, that is, numbers 1, 2, 3, and 5.

#### Hypothesis 4

The total amount of mood change (Impact plus Delay) will be related to certain personality characteristics as measured by the Gordon Personal Profile and the Gordon Personal Inventory (p. 86)

It was decided that the necessary criteria of significance would be a correlation of .4 or greater and with  $p \leq .01$ . In the Pearson correlation matrices of

total mood change (Impact plus Delay) and scores on the eight personality traits of the GPP and GPI, in both gross and net (total) mood change measures, no correlation reached the  $\pm .4$  level. Thus this hypothesis was rejected. That is, it was concluded that, in this experiment, the total amount of mood change (Impact plus Delay) was not significantly related to personality characteristics as measured by the GPP and the GPI.

#### Hypotheses 1a and 1b

1a. Regardless of the number of windows, the amount of mood change upon entry into the room--Impact--will differ between the large and small room.

1b. Regardless of the number of windows, the amount of mood change after being in the room working on a test--Delay--will differ between the large and the small room (p. 84).

These two hypotheses state that mood change would have an inverse relationship with the room size variable and, specifically, that mood change associated with test room R400 would be less than with R200, with R450 less than with R250, and R40 less than R20.

As mentioned above, the variable of Gross Mood Change was considered to be the appropriate measure of amount of mood change referred to in the first and second hypotheses. Five two-way analyses of variance (size X windows) were calculated for Gross Mood Change upon Impact

for the five mood factors. No significant main effects were observed due to room size alone, as shown in Tables 3 to 7. Thus, hypothesis 1a was rejected. That is, it was concluded that Gross Mood Change upon Impact with the room did not differ significantly between the large and the small room.

When all the adjectives were included (including Carefree) and summed over factors, the mean Gross Mood Change upon Impact was seen to be in line with this hypothesis, as shown in Figure 2, but the differences between room sizes did not reach statistical significance.

Five two-way analyses of variance of Gross Mood Change after Delay (by mood factors) also uncovered no significant main effects due to size at the .01 level, as seen in Tables 8 to 12 and, as a result, hypothesis 1b was rejected. That is, it was concluded that Gross Mood Change after Delay in the room did not differ significantly between the large and the small room.

The actual relationship found between Gross Mood Change after Delay and the size of the test room is shown in Figure 2.

Table 3

Analysis of Variance Summary Table for Gross Mood Change upon  
Impact for Factor 1

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	15.73	1	15.73	3.21	0.08
Windows	0.68	2	0.34	0.07	0.93
2-way Interactions					
Size X Windows	0.12	2	0.06	0.01	0.99
Residual	274.62	56	4.90		
Total	291.10	61	4.77		

Table 4

Analysis of Variance Summary Table for Gross Mood Change upon  
Impact for Factor 2

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	3.13	1	3.13	0.92	0.34
Windows	0.59	2	0.30	0.09	0.92
2-way Interactions					
Size X Windows	12.71	2	6.35	1.87	0.16
Residual	190.07	56	3.39		
Total	206.39	61	3.38		

Table 5

Analysis of Variance Summary Table for Gross Mood Change upon  
Impact for Factor 3

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	5.24	1	5.24	1.71	0.20
Windows	12.18	2	6.09	1.98	0.15
2-way Interactions					
Size X Windows	0.19	2	0.10	0.03	0.97
Residual	171.97	56	3.07		
Total	188.98	61	3.10		

Table 6

Analysis of Variance Summary Table for Gross Mood Change upon  
Impact for Factor 4

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	5.03	1	5.03	3.01	0.09
Windows	0.29	2	0.15	0.09	0.92
2-way Interactions					
Size X Windows	1.04	2	0.52	0.31	0.73
Residual	93.60	56	1.67		
Total	99.87	61	1.64		

Table 7

Analysis of Variance Summary Table for Gross Mood Change upon  
Impact for Factor 5

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	0.35	1	0.35	0.17	0.69
Windows	0.54	2	0.27	0.13	0.88
2-Way Interactions					
Size X Windows	4.58	2	2.29	1.09	0.34
Residual	117.60	56	2.10		
Total	123.10	61	2.02		

Table 8  
 Analysis of Variance Summary Table for Gross Mood Change after  
 Delay for Factor 1

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	11.71	1	11.71	2.15	0.15
Windows	8.08	2	4.04	0.74	0.48
2-way Interactions					
Size X Windows	18.38	2	9.19	1.68	0.20
Residual	305.57	56	5.46		
Total	343.37	61	5.63		

Table 9

Analysis of Variance Summary Table for Gross Mood Change after Delay for Factor 2

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	2.16	1	2.16	0.36	0.55
Windows	17.22	2	8.61	1.45	0.24
2-way Interactions					
Size X Windows	0.39	2	0.20	0.03	0.97
Residual	333.56	56	5.96		
Total	353.50	61	5.80		

Table 10

Analysis of Variance Summary Table for Gross Mood Change after  
Delay for Factor 3

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	3.09	1	3.09	1.95	0.17
Windows	0.34	2	0.17	0.11	0.90
2-way Interactions					
Size X Windows	0.16	2	0.08	0.05	0.95
Residual	88.87	56	1.59		
Total	92.39	61	1.52		

Table 11

Analysis of Variance Summary Table for Gross Mood Change after  
Delay for Factor 4

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	4.24	1	4.24	3.79	0.06
Windows	6.66	2	3.33	3.98	0.06
2-way Interactions					
Size X Windows	0.42	2	0.21	0.19	0.83
Residual	62.67	56	1.12		
Total	73.55	61	1.21		

Table 12

Analysis of Variance Summary Table for Gross Mood Change after  
Delay for Factor 5

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	3.30	1	3.30	1.10	0.30
Windows	1.32	1	0.66	0.22	0.80
2-way Interactions					
Size X Windows	6.58	2	3.29	1.10	0.34
Residual	168.27	56	3.01		
Total	179.42	61	2.94		

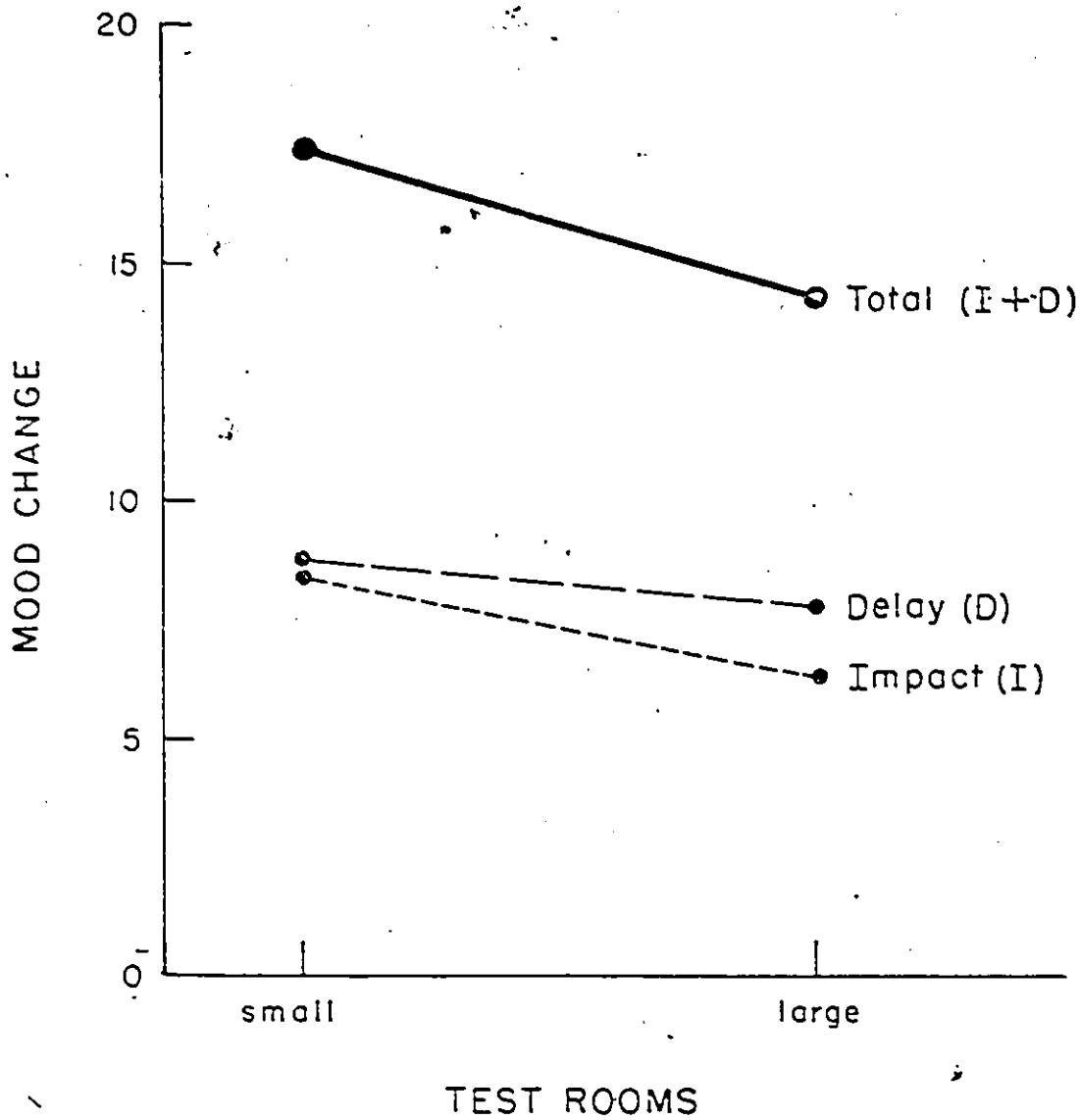


Figure 2. Mean Gross Mood Change\* Summed over Factors, by Room Size.

\*Including "Carefree".

Hypotheses 2a and 2b

2a. Regardless of the room size, the amount of mood change upon Impact will differ between the 100% window condition and the 0% window condition.

2b. Regardless of the room size, the amount of mood change after Delay will differ between the 100% window condition and the 0% window condition (p. 85).

These hypotheses contend that both large and small rooms in the 100% window condition (R400 and R200) will show the least mood change, and both rooms in the 0% condition will show the most.

The two-way analyses of variance of Gross Mood Change upon Impact did not show any significant main effects due to windows on any mood factor, as shown in Tables 3 to 7, and hypothesis 2a was rejected. That is, it was concluded that Gross Mood Change upon Impact did not differ significantly between the 100% window condition and the 0% window condition.

Table 13 shows Gross Mood Change summed over factors in conditions of Impact, Delay, and Total, by Test Rooms.

A similar situation was found in relation to hypotheses 2b (Tables 8 to 12) and this hypothesis was also rejected. That is, it was concluded that there was no significant difference in Gross Mood Change after Delay between the 100% and the 0% window conditions.

Table 13

Gross Mood Change Summed over Factors in Conditions of Impact, Delay and Total by Test Rooms

	100% Windows		50% Windows		0% Windows		Large Room Total (n=32)	Small Room Total (n=30)
	Large (n=10)	Small (n=10)	Large (n=10)	Small (n=10)	Large (n=12)	Small (n=10)		
Impact	52.0	75.0	67.0	69.0	75.0	87.0	194.0	231.0
Delay	47.0	69.0	95.0	76.0	88.0	100.0	230.0	245.0
I + D	99.0	144.0	162.0	145.0	163.0	187.0	424.0	476.0
Impact	127.0		136.0		162.0			
Delay	116.0		171.0		188.0			
I + D	243.0		307.0		350.0			
Mean Impact	6.35		6.80		7.36		6.06	7.70
Mean Delay	5.80		8.55		8.55		7.19	8.17
Mean Total	12.15		15.35		15.91		13.25	15.87

The observed Gross Mood Change totals after Delay by window conditions, summed over factors, are shown in Table 13. The mean Gross Mood Change by rooms is shown in Tables 26 to 30 (Appendix 13).

Trend analyses of Gross Mood Change by windows revealed a tendency toward a linear trend in the hypothesized direction when the dependent variable was Factor 3 in the Impact condition ( $p = .055$ ), and when Factor 4 was the dependent variable in the Delay condition ( $p = .029$ ), neither one reaching the .01 level of significance. These trends will be discussed in the following chapter.

#### Hypotheses 3a and 3b

3a. Mood change upon Impact will depend upon both room size and number of windows.

3b. Mood change after Delay will depend upon both room size and number of windows (p. 86).

Both Gross and Net Mood Change measures were examined and no significant interaction was found at the .01 level in any mood factor in either the Impact or

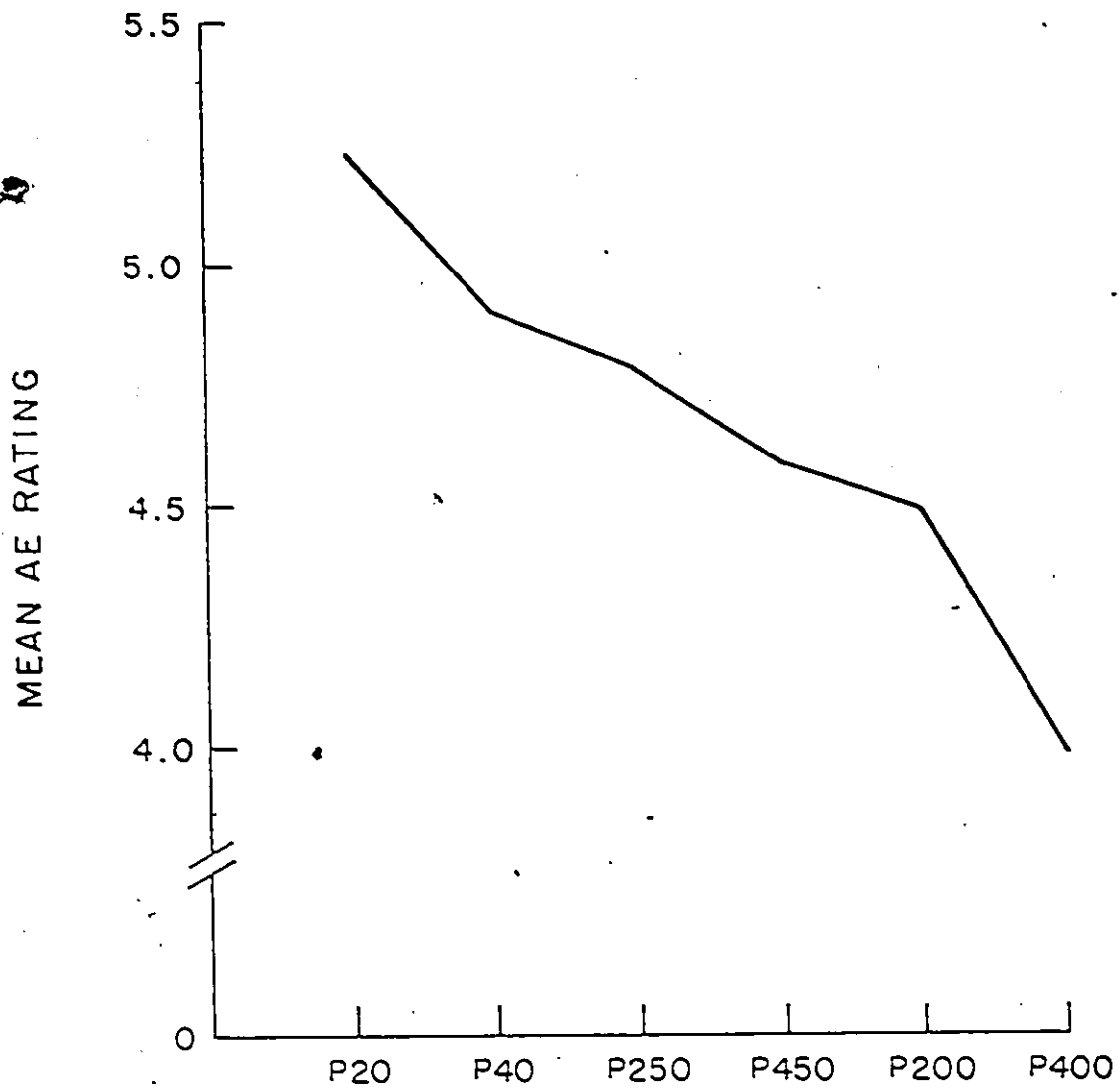
Delay condition. Thus, both hypotheses 3a and 3b were rejected. That is, with regard to both Gross and Net Mood change, there were no interaction effects of room size by number of windows in either the Impact or Delay condition. Summary tables of the analyses of variance for the five mood factors of Gross Mood Change in both Impact and Delay situations are shown in Tables 3 to 12. Summary tables of the analyses of variance for the five mood factors of Net Mood Change (both Impact and Delay) are shown in Appendix 12.

#### Hypothesis 5a

In the Architectural Evaluation Friendliness rating of room photographs, there will be a direct relationship between the rating of Friendliness and the independent variable, that is, the room size/fenestration of the rooms in the photographs (p. 86).

Specifically, this hypothesis predicted that the rated Friendliness of photographs of the six test room conditions would be a decreasing function of room size and fenestration. The rating would be highest for the small room with no windows (R20) and lowest for the large room with all windows (R400).

Figure 3 shows that this was indeed the case. A split-plot analysis of variance with photo ratings as repeated measures and subject's test room as blocks, produced an  $F$  value of 15.97, significant at less than the



TEST ROOM PHOTOGRAPHS  
BY WINDOW CONDITION AND SIZE

(Ranging from small room with no windows  
to large room with 100% windows)

Note: Higher rating signifies less friendly.

Figure 3. Mean AE Rating by Room Photographs.

.01 level ( $F_{\text{signif.01/5, infin.}} = 3.02$ ). A trend test was run on these ratings, finding a linear trend with  $F = 49.5$  ( $p < .01$ ). This hypothesis was retained. That is, a direct relationship was found between the AE rating of Friendliness and the room size/fenestration variable of the rooms in the photographs.

#### Hypothesis 5b

The mean ratings of Friendliness given to photographs of rooms will depend upon which test room the subject occupies while doing the rating. That is, there will be an inverse relationship between the scale rating given to all room photographs and the independent variable, i.e., the size, fenestration conditions of the test room.

From analysis of variance between subjects' test rooms, a relationship was not found, as may be seen in Figure 4; therefore, hypothesis 5b was rejected. That is, it was concluded that there was no relationship between the average Friendliness rating over all six room photographs and the size/fenestration conditions of the subject's test room.

#### Control Groups

Subjects in control group  $Cl_1$  were tested in room R20. They had no preliminary MACL or personality tests. They were directed to the test room after a brief introduction, given written directions like all other

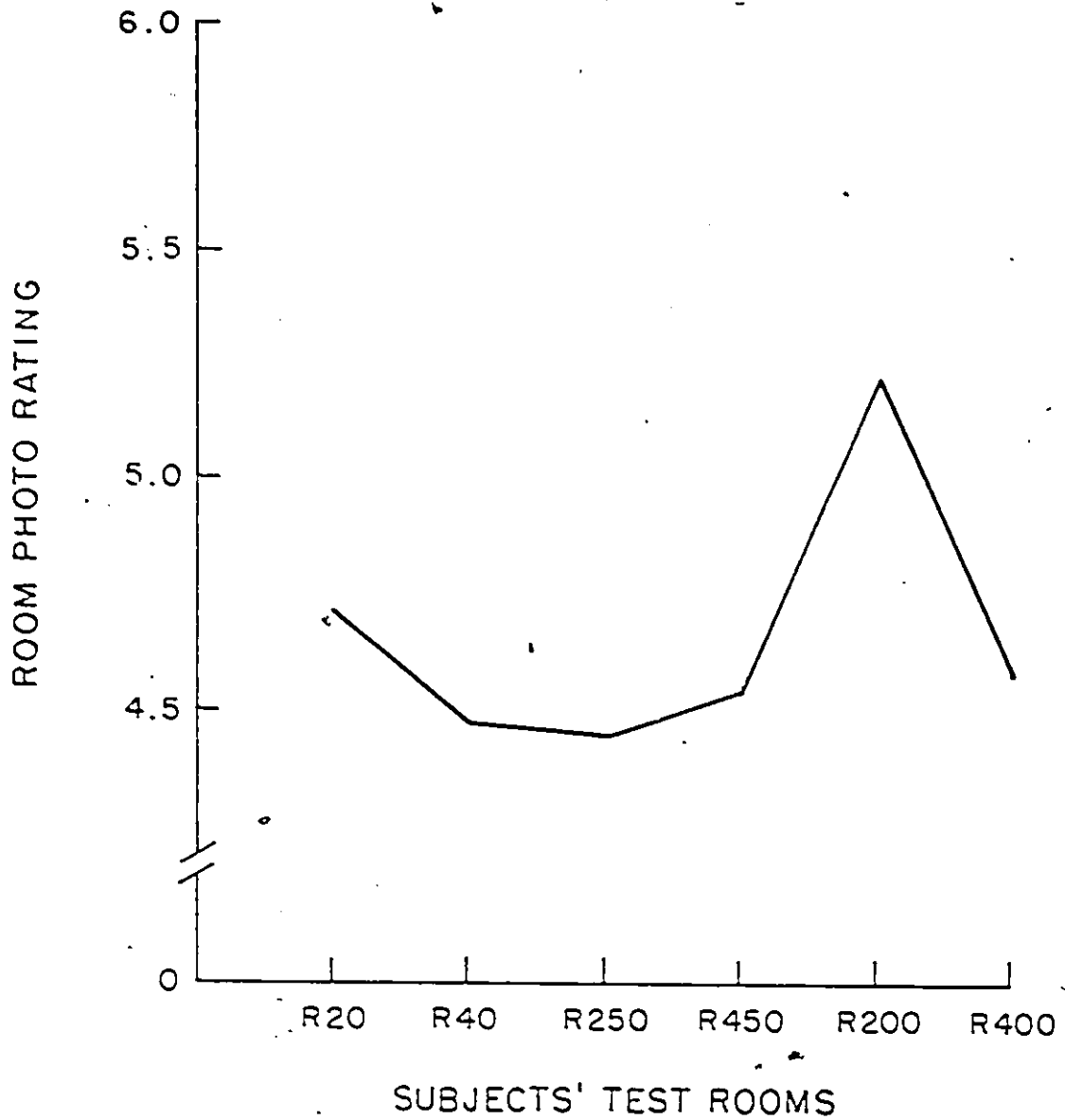


Figure 4. Rating of Room Photographs by Subjects in the Six Test Rooms.

subjects (Appendix 11, p. 194), and had a 5-minute delay in the room before opening the envelope with the MACL and filling out the form.

These subjects' results (raw scores) were compared on each of the 24 mood adjectives by  $t$  tests, with the raw scores of experimental subjects' MACL II in the same test room. No significant differences were found at the .01 level.

Similar results obtained in the  $t$  test comparisons of control group C1<sub>2</sub> and experimental subjects' MACL II raw scores in room R200, and it was concluded that prior administration of the MACL upon the subject's arrival, and the presentation of the two personality tests, did not affect performance on MACL II.

MACL raw scores of control groups C2<sub>1</sub> and C2<sub>2</sub> were compared with experimental subjects' MACL III in rooms R20 and R200, respectively, by  $t$  tests, and no significant differences were found in either comparison (Appendix 11, p. 195).

It was concluded that the administration of the previous MACLs upon arrival and in the test room did not significantly affect subjects' responses on MACL III, nor did the prior administration of the GPP and the GPI affect the performance of experimental subjects on the responses to MACL III.

Ratings of photographs from the Architectural Evaluation test were compared between control groups

$C2_1$  and  $C2_2$  and the corresponding experimental subjects. In  $C2_1$  and R20 comparisons, no  $t$  value was found with a significance of .01. In the  $C2_2$  comparisons, six  $t$  values out of 60 tests showed a significant difference at the .01 level. Characteristics of these differences between experimental and control groups will be discussed in the next chapter.

Although there were 24 male subjects in the experiment, 10 of them (by random choice) became control subjects, leaving only 14 who participated in the three mood tests. Therefore, meaningful mood change comparisons could not be calculated. However, when age by sex comparisons were made of Total Gross Mood Change for experimental subjects, those below 30 years of age were: male (6 subjects) mean = 15,  $SD = 17.13$ ; female (21 subjects) mean = 20,  $SD = 10.86$ ; 30 years and older: male (8 subjects) mean = 13.75,  $SD = 7.38$ ; female (26 subjects) mean = 13.04,  $SD = 7.14$ . This gives an overall mean by sex of 14.29 for males ( $SD = 7.02$ ) and for females 16.15 ( $SD = 9.55$ ).

#### Summary of Results

Of the five two-part hypotheses, only one part of one hypothesis (5a) was retained, and the rest were rejected.

In the rejection of hypothesis 1, it was concluded that the gross amount of mood change upon entering the room, or after delay in the room, did not differ between

the large and the small room. The rejection of hypothesis 2 confirmed the finding that the gross amount of mood change upon impact with the room or after delay did not differ between the 100% and the 0% window conditions.

In analyses of variance of both Gross and Net Mood Change upon Impact with the room and after Delay, no significant interaction was found between size of room and number of windows. (Hypothesis 3 was rejected.)

No significant correlation was observed at the criterion level of .4 and a significance of .01 or less between either Gross or Net Mood Change and personality variables, as measured on the GPP and the GPI. (Hypothesis 4 was rejected.)

It was concluded that there was a direct relationship between the rating of Friendliness of the rooms in the photographs and their size/fenestration condition. Acceptance of hypothesis 5a was based on the fact that the rated Friendliness was a decreasing function of room size and fenestration; that is, the rating was highest (least friendly) for the small room with no windows (R20) and was lowest (most friendly) for the large room with 100% windows (R400).

No relationship was found between the average rating of Friendliness over all six photographs and the subject's test room, and hypothesis 5b was rejected.

In t test comparisons between control groups' MACL raw scores and the corresponding raw scores of experimental subjects, no significant differences were found, leading to the conclusion that performance on the MACL was not affected by previous practice or by the experience of completing the GPP and the GPI.

No significant difference was found between performance on the AE test between experimental and control (group C2) subjects. It was therefore concluded that the preliminary tests (including two MACLs and two personality tests) which were completed by experimental subjects did not significantly alter their performance on the AE test.

There were not enough male subjects to permit meaningful calculations of results by sex.

## CHAPTER IV

### DISCUSSION OF RESULTS

In this chapter, topics will be treated in the same order as in the Statistical Analysis and in the Presentation of Results. The factor analysis of the 24 mood adjectives will be examined first, followed by a discussion of the results pertaining to Hypothesis 4, and later Hypotheses 1, 2, 3, and 5.

#### Factor Analysis of Mood Adjective Raw Scores

In Nowlis' Short Form MACL, he included the three adjectives with the highest loadings on his eight strongest factors (Nowlis & Green, 1965, p. 111). On the whole, Nowlis' adjective groupings remained together in the present study but were represented by fewer factors. The two exceptions were Nowlis' factors of Aggression and Surgency. The adjectives which Nowlis found to load on these two factors had loadings on different factors in this study.

In the present factor analysis of the raw mood data, Factor 1 included the six adjectives representing Nowlis' factors of Sadness (Regretful, Sad, Sorry) and Anxiety (Fearful, Jittery, Clutched Up) and, in addition, the adjective, Angry (Table 2). Factor 2 included Nowlis' Social Affection (Warm-hearted, Kindly, Affectionate) and two of his

Surgency adjectives, Witty and Playful. Factor 3 contained, primarily, Nowlis' Egotism factor (Egotistic, Boastful, Self-centered) and also the adjectives Rebellious and Defiant which belonged to Nowlis' Aggression factor. Factors 4 and 5 had identical adjective loadings with Nowlis' Fatigue and Concentration factors, respectively.

It is interesting to note that, in this study, anger was associated with moods of regret and anxiety rather than aggression, as was the case in a number of studies in the past (Nowlis, 1965, p. 361).

#### Discussion of Hypotheses

Hypothesis 4: Patterns of correlations between GPP and GPI, and mood change. As mentioned above, no significant correlation was found between personality traits and gross mood change Total (I plus D), or net mood change Total (I plus D). The stated criteria were  $r = .40$  and  $p = .01$ .

Significant correlations found in the past between mood and aspects of personality related to other personality inventories than were used here. Wessman and Ricks' admonition regarding the generalizability of mood/personality correlates, which may vary in different cultures, may also be applicable here.

It may be of interest to look at the pattern of correlational values found at the .05 level or less, as this could have value in later tests involving mood and personality.

Table 14 shows these correlations for gross mood change in the conditions of Impact (I) and Delay (D) as well as for the Total (I plus D). Table 15 shows the same for net mood change.



Table 14 (Cont'd.)

Gross Mood Change	Ascendency	Responsibility	Emotionality	Sociality	Cautiousness	Original Thinking	Personal Relations	Vigor
Total (I + D)	-	-	-	-	-	-	-	-
Factor 1	-	-.336 (.004)	-.364 (.002)	-	-	-	-	-
Factor 2	-	-	-	-	-	-	-	-
Factor 3	-	-.270 (.017)	-.201 (.059)	-	-.206 (.054)	-	-	-
Factor 4	-	-	-.203 (.057)	-	.205 (.055)	-	-	-
Factor 5	-	-	-	-	-	-	-	-

<sup>a</sup>p value indicated in brackets

\*p ≤ .05

Table 15

Significant Correlations\* between Net Mood Change and Personality Traits on the GPP and GPI (n=62)

Net Mood Change	Ascendency	Responsibility	Emotionality	Sociality	Cautiousness	Original Thinking	Personal Relations	Vigor
Impact								
Factor 1	-	-	-	-	-	-	-	-
Factor 2	-	-	-	-	-	-	-	-
Factor 3	-	-	-	-	-	-	-	-
Factor 4	-	-.474 (.001) a	-.232 (.035)	-	-	-	-	-
Factor 5	-	-	-	.246 (.027)	-	-	-	-
Delay								
Factor 1	-	-	-	-	-	.273 (.016)	-	-
Factor 2	-	-.203 (.057)	-.246 (.027)	-	-	-.217 (.045)	-	-
Factor 3	-.220 (.043)	-	-	-	-	-	-	-
Factor 4	-	-	-	-	-	-	-.300 (.009)	-
Factor 5	-	-.306 (.008)	-	-	-	-	-	-

Table 15 (Cont'd.)

Net Mood Change	Ascendency	Responsibility	Emotionality	Sociality	Cautiousness	Original Thinking	Personal Relations	Vigor
Total (I + D)	-	-	-	-	-	-	-	-
Factor 1	-	-	-	-	-	-	-	-
Factor 2	-	-	-	-	-	-	-	-
Factor 3	-	-	-	-	-	-.215 (.047)	-	-
Factor 4	-	-.322 (.005)	-	-	-	-	-	-
Factor 5	-	-.249 (.026)	-	-	-	-	-	.241 (.029)

<sup>a</sup> p value indicated in brackets

\*p ≤ .05

Comparing the two tables, it is immediately seen that there was a difference between the correlation of personality traits with amount of mood change (gross), as indicated in Table 14, and with the result of the mood change (net), as indicated in Table 15. An example is Emotionality and the mood change Totals.

It is also apparent that some personality traits were correlated with different mood factors in the different time conditions of Impact and Delay--for example, Responsibility (Table 15). In the Impact condition this correlation (with Factor 4) is seen to have met the stated criteria for significance, yet it disappeared altogether in the Delay condition and was replaced by less significant correlations with two other factors (2 and 5). This may mean that the personality trait which can be found to correlate with one factor of mood change upon Impact may correlate with totally different factors of mood change after Delay.

The trait of Emotionality seemed to have a stronger association with gross mood change upon Impact (with Factors 1, 3, and 4) than after Delay (with Factor 1 only), supporting the view that if the room had any effect upon the emotions, it was immediate, and tended to level out over time.

The foregoing suggests that in looking for correlations between mood change and personality characteristics, one must take into account the time factor involved in the

mood change measure (upon Impact or after Delay) as well as the type of measure that is being used; that is, whether one is interested in the total amount of mood change which occurs (gross) or in the final result of the mood change (net).

In summary, in this study, personality traits on the GPP and the GPI were not found to have a significant correlation with mood change, meeting the required criteria of significance. However, tendencies toward correlation at a lower level were seen to differ according to the mood change measure (gross or net) and the length of delay.

Theoretical implications. The conclusions for Hypothesis 4 seem to underline the intricacy of personality measurement, and to emphasize the care needed in making assumptions regarding the relationship between personality characteristics and mood change. Personality traits, if they correlate at all, are associated differently with gross mood change and with net mood change, and in both of these cases the correlations differ, depending on when mood change is measured. Therefore, global assumptions regarding the relationship between personality and mood change would be likely to prove invalid.

Practical implications. The area of mood change study involving relationships with personality variables needs further and more detailed study. If the nature of the

correlation depends upon the time factor and the type of mood change measurement, then Impact and time spent in the designed environment may also be a basis for design criteria. An entrance foyer or dentist's waiting room might present unique problems of particular mood change requirements when compared with a hospital ward or a private bathroom. It seems that further testing, focusing on particular mood factors, and perhaps using mood induction, might be indicated by the results of this study.

Hypothesis 1: Trends in mood change by room size.

Architecturally, when one is studying the effects of certain characteristics of a room upon mood, the net effects of the room upon the majority of its users constitute the principal concern--although it is first of all important to know whether the room has any effect at all upon mood. This last question was answered by the measure of gross mood change, and it was apparent that there was no major significant effect upon mood attributable to the size of the test room.

At a lesser level of significance than the established criterion, however, certain effects were observed due to room size, and a study of net mood change revealed the direction of these changes. It may be useful to examine these results in the gross and net measures of mood change.

When analyzed separately by mood factors, the gross mood change total showed a difference in Factor 1 (Negative Mood) between the large and the small room, significant

at the .05 level ( $F = 3.93$ ,  $n = 62$ ), with a mean of 4.30 units of mood change in the smaller room against 2.44 in the larger (Figure 5a). Figure 5b shows that this change consisted of a net decrease in Negative Mood of -0.56 in the large room and a very slight net increase (0.10) in the small room.

Looking back to the literature, Lipman (1968) found a difference in the type of hostility expressed in large and small rooms. Since the relationship between negative mood and hostility is not known, the present study cannot contribute to knowledge regarding the effects of room size upon social behavior.

Mean Net Mood Change by rooms is shown in Tables 31 to 35 (Appendix 13).

Theoretical implications. It is obvious that mood change cannot be looked upon as a unidimensional variable. The altering of different mood factors could have an important bearing on the design criteria for different types of buildings, according to their uses. For example, one might wish to encourage positive emotion in a mental hospital ward,

while methods of decreasing negative emotion might be of central interest in prison design.

Practical implications. Room size by itself did not appear to have any significant effect on mood change. A trend, which was found in relation to one of the factors, suggests that further detailed studies with emphasis on individual factors could be rewarding both to research on mood and to the emerging field of psychological design criteria.

Hypothesis 2: Trends in mood change by windows. As an objective measure of feelings in rooms with windows and without, the measure of mood change in this experiment did not contribute to the support of the opinion that windows make a difference in feelings, which has been expressed in the literature. It was expected that differences in gross mood change would be found between the 0% and the 100% window conditions. However, it was felt that differences between the 0% and 50%,

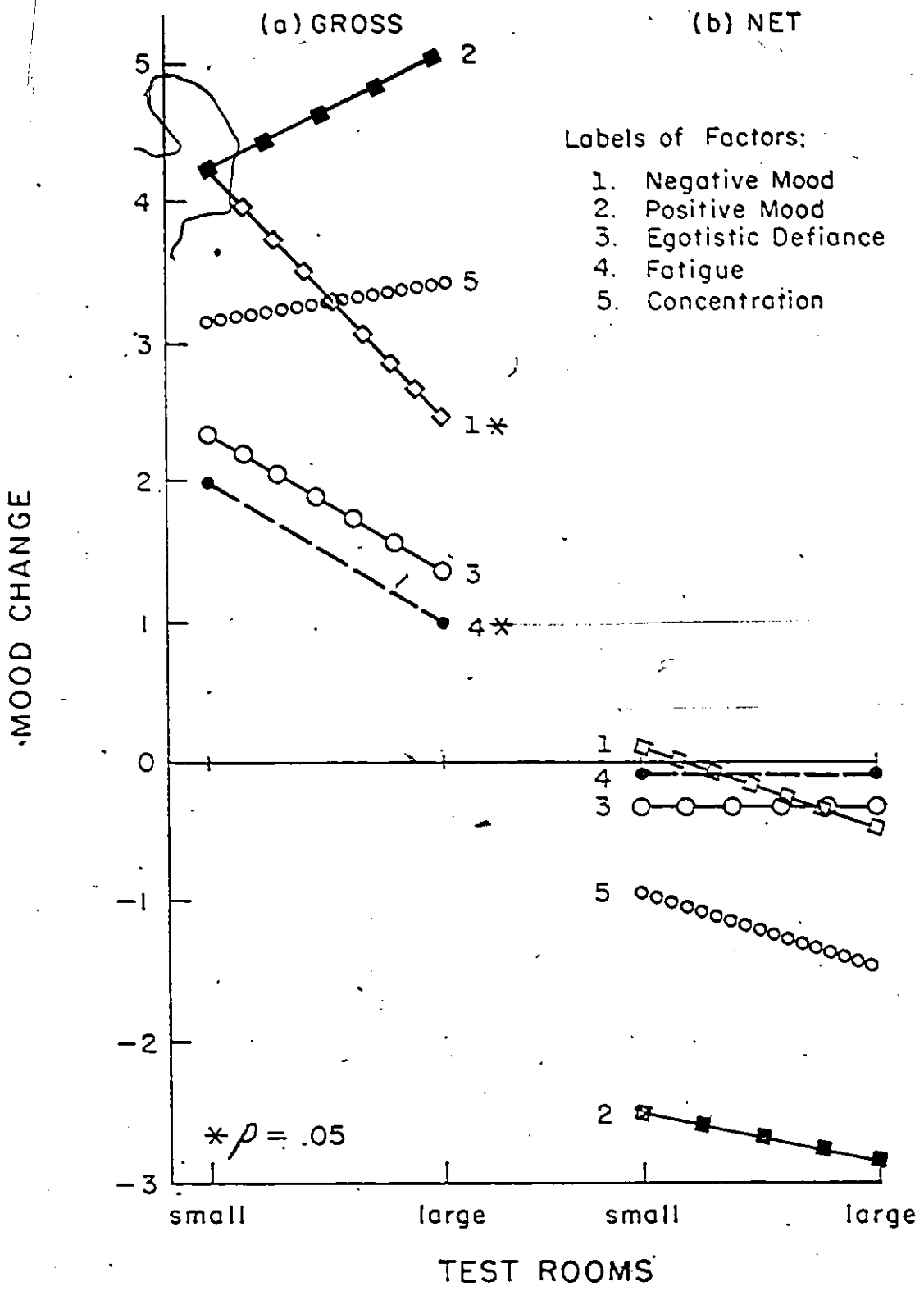


Figure 5. Total Gross and Net Mood Change (Impact plus Delay) by Factors by Room Size.

or between 100% and 50% would be too subtle to show significance. Thus, the 50% condition was not included in the hypothesis. Nevertheless, in general, it was anticipated that the 50% condition would fall between the two extremes producing, perhaps, a significant trend.

Figures 6 and 7, which illustrate the results of gross and net mood change totals, respectively, by factors, show that this was seldom the case. In Figure 6, gross mood change is seen to have been greatest in the 50% condition in three of the factors, while in net mood change (Figure 7) the relationship between the three window conditions was different in every case. Here it is shown (Figure 7) that in Factor 4 (Negative Physical State), the 50% condition did fall between the other two ( $F = 3.51$ ,  $p = .025$ ,  $n = 62$ ) and showed a significant linear trend ( $F = 7.66$ ,  $p = .008$ ).

Theoretical implications. As with Hypothesis 1, these results show that mood change cannot be treated as a unidimensional variable, and that meaningful results can be found only in studying the separate mood factors. The initial assumption that a 50% window condition would produce mood change results halfway between the 0% and 100% conditions proved to be incorrect in this study, except in the case of one mood factor.

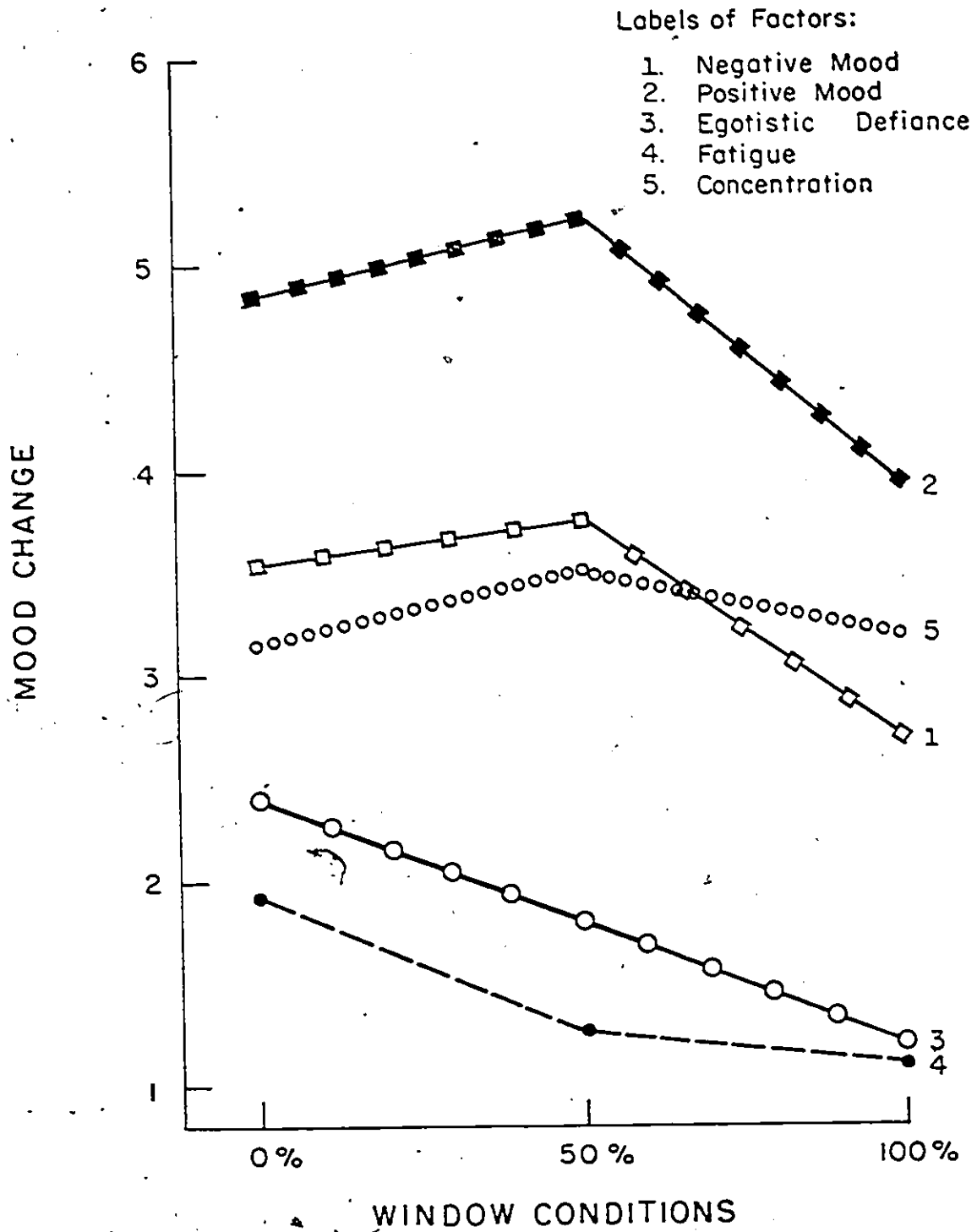


Figure 6. Total gross Mood Change (Impact plus Delay) by Factors by Windows.

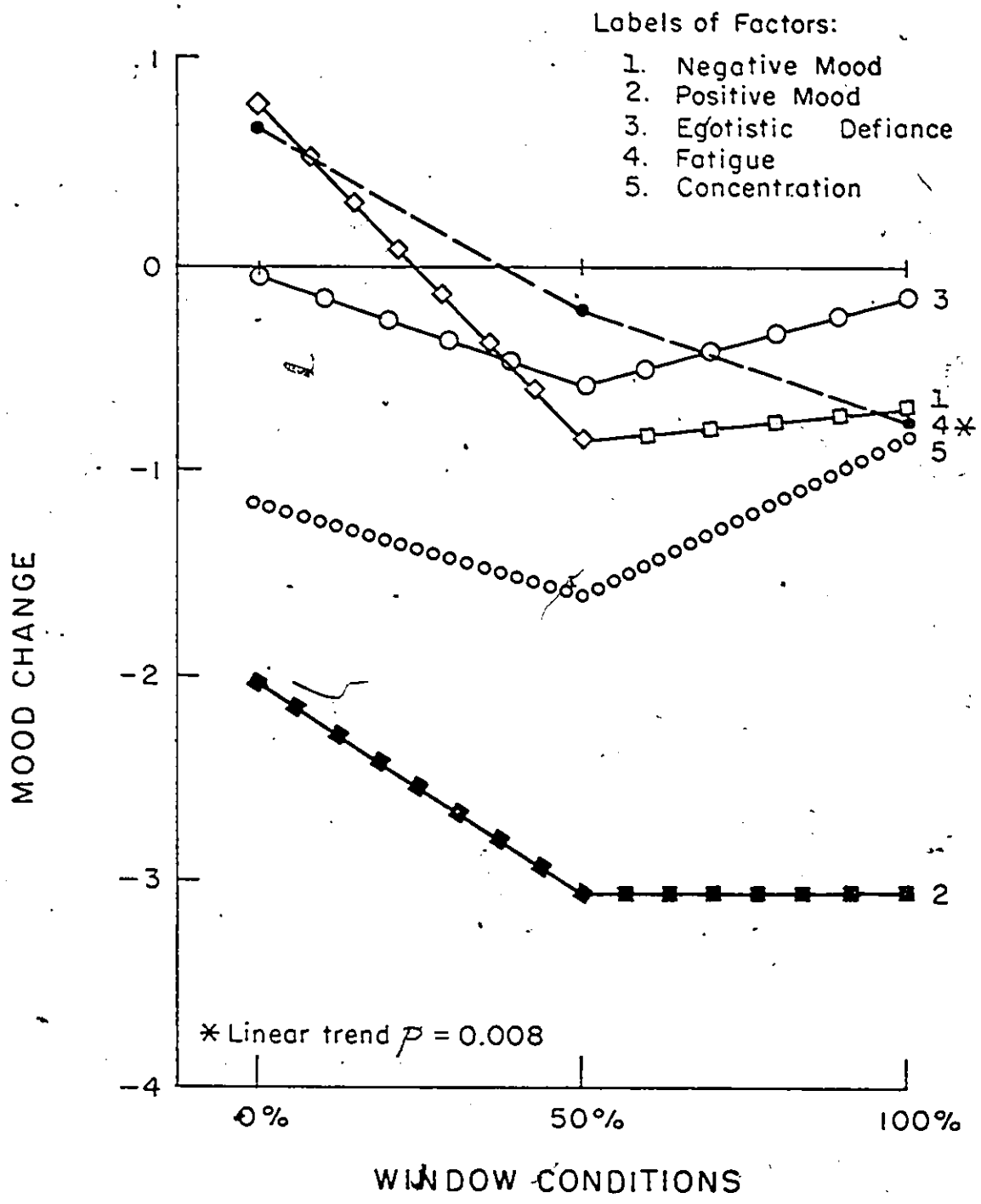


Figure 7. Total Net Mood Change (Impact plus Delay) by Factors by Windows.

Practical implications. It seems that further studies may be indicated in relation to Factor 4, which is the factor with the adjectives Drowsy, Sluggish, Tired. From the point of view of design criteria, these feelings could be an important consideration in rooms used for study or work, particularly. This factor, which showed a slightly significant difference (.025) between window patterns in net mood change, also showed a difference, though less significant (.05) between room sizes, in gross mood change (Tables 26-30, Appendix 13).

Further studies concerning the meaning of window patterns would be helpful. Keighley (1973b) examined "satisfaction" with various symmetrical window patterns, but did not test asymmetrical patterns as used in this study.

Hypothesis 3: Interaction effects of room size and number of windows. It was expected that there would be a strong interaction between the room size and the pattern of fenestration. However, no support was found for Collins' (1975), Hollister's (Collins, 1975), or Manning's (1969) supposition of an interaction between windows and room size in their effects upon human feelings. That there was no indication of interaction in any mood factor in either Impact or Delay seems to carry important implications regarding further testing of these variables, and also concerning design criteria.

In the test of Hypothesis 2, the finding that the 50% condition was not in a straight line relation between 0% and 100% led to a separate examination of the three

window conditions in each room size, which is shown in Figure 8 for gross and net mood change. It was obvious that in both measures of mood change the 50% condition had a different relationship between room sizes than the 100% or 0% conditions. Figure 9 shows that, when gross mood change was summed over factors, the 50% condition did not differ from the 100% in the small room, while it differed from both other conditions in the large room.

Theoretical implications. It may be that the underlying factors in the effects of room size and windows on mood are not closely related. For example, one might assume that space is a factor relating both to windows and to size, whereas the key factor in human reactions to windows may be light (as conjectured by Wells, 1965) and in the case of size it may be airiness.

Practical implications. In the interests of design criteria, further close attention could be given to the elements affecting human reactions, such as mood change, in rooms of different window patterns without regard to size. This would allow for more detailed study of many different window proportions between 0% and 100%. A concurrent description of each room elicited from different subjects than those tested for objective reaction might contribute to new methods of identification of some of the underlying factors associated with human reaction to windows. A

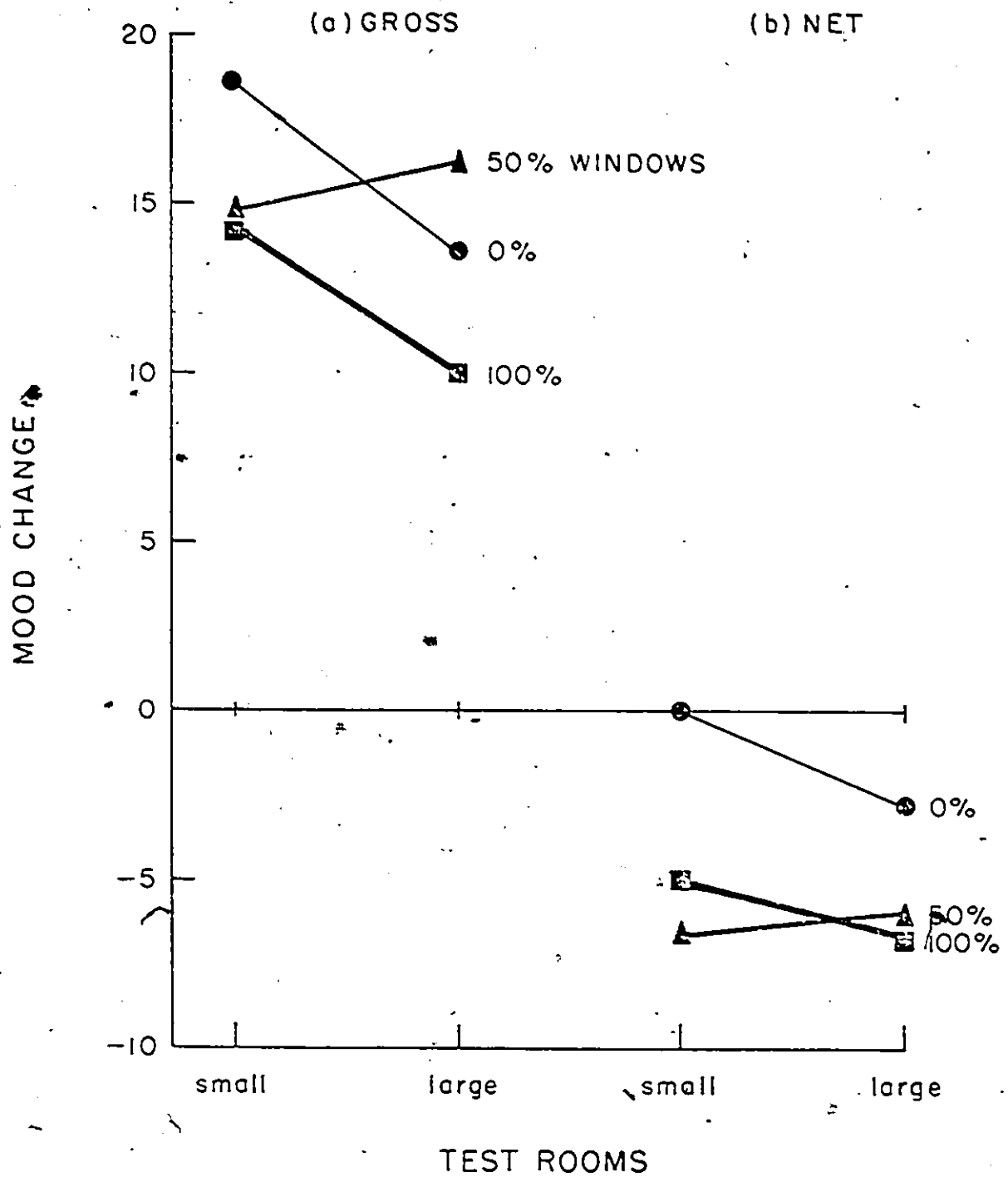


Figure 8. Total Mean Gross and Net Mood Change (Impact plus Delay) Summed over Factors for Window Conditions by Room Size.

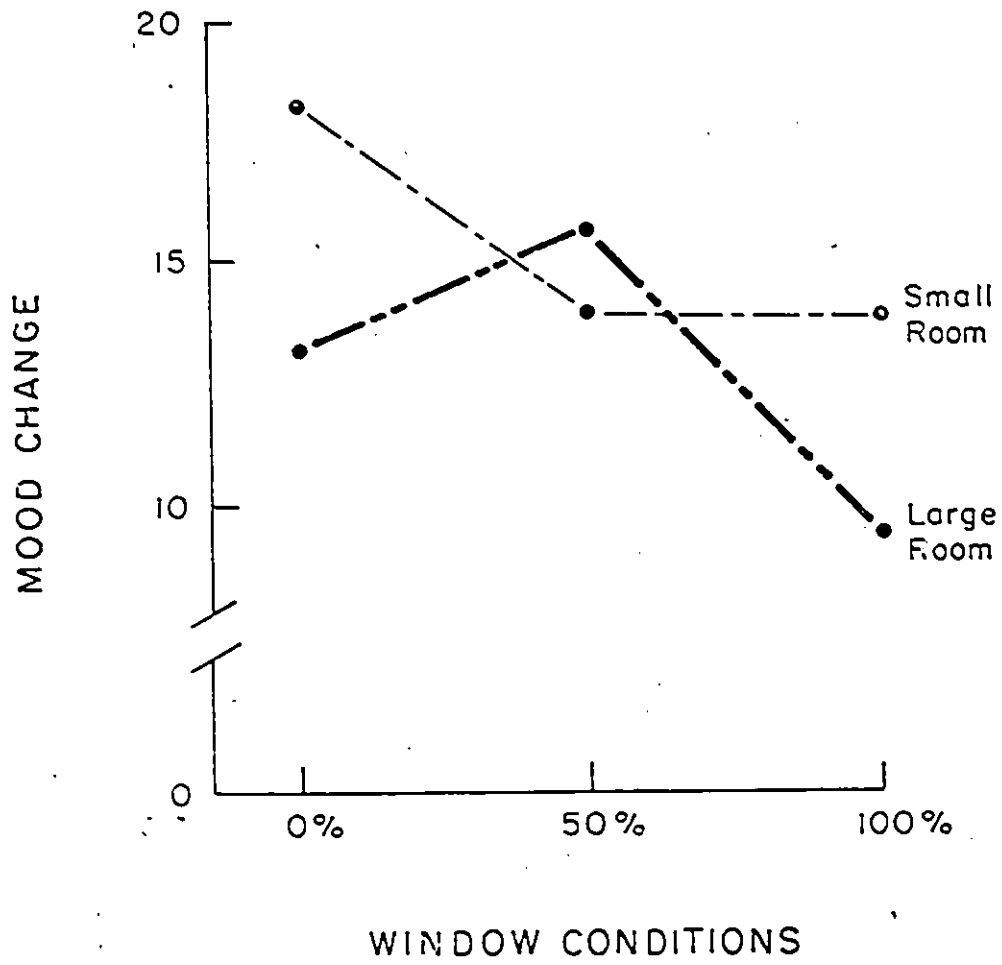


Figure 9. Mean Gross Mood Change (Impact plus Delay)  
For the Two Room Sizes by Window Conditions.

similar description might be effected relating to room sizes, without regard to fenestration.

Hypothesis 5: AE test - Comparison of friendliness rating of the six room photographs and evaluation of behavior on a test in the six test rooms. In the friendliness rating of photographs of the six test rooms, a significant difference was found between the small room with no windows, which was seen as least friendly, and the large room with all windows which was rated the most friendly ( $p < .001$ ). The strong effect between rooms found in the AE test provides confirmation of the reliability of Canter and Wools' Friendliness Scale in subjective evaluation of rooms which differ in certain architectural details. However, when performance on the test was itself compared in the different test rooms, no difference was found between the performance of the different subjects, associated with the rooms that they occupied. Therefore, the total lack of effect of the real rooms on test behavior should provide a warning regarding the generalization from subjective evaluations of rooms in photographs to behavioral reactions in real rooms.

Theoretical implications. These data add further confirmation to the implication of Canter and Wools (1970) that windows affect people's subjective impressions of the friendliness of a room. The subjective evaluation of a

room from photographs does not necessarily bear any relationship to the subjects' behavior in the same room. There could be many reasons for this, including the natural limitations of a photograph compared with a real room, and also that one's evaluation of the friendliness of a real room might not in any way influence one's judgment of the apparent friendliness of rooms in photographs--even though they might be similar to that real room. However, in this study, the room size variable contributes a new dimension to the area of friendliness evaluation of rooms.

Practical implications. Until controlled comparisons have been made between subjective judgments of room photographs, subjective judgments of real rooms, and behavioral reactions in rooms under the same conditions, generalizations would be inappropriate regarding the formulation of design criteria on the basis of evaluations of photographs alone.

#### Limitations of the Study

1. At the beginning of this study, the statement was made that possibly no very great effect could be expected in the measurement of mood change, other than that which might be related to the personality characteristics of the subjects.

There were a number of reasons for this; for example, that the subjective measure of mood--and thus of mood change--is a very subtle measure. Also, demands were made of the subject to perform "tests," and thus situational factors may have competed with the characteristics of the test room to affect the mood of the subjects. In addition to this, mood was measured on a scale of four, which limited the scope for change from one test to the next.

As a test of the a priori probability of rejecting the null hypothesis, power tests were calculated for the 2 X 3 analysis of variance which was used on both gross and net mood change data for each of the five mood factors in the conditions of Impact, Delay and the Total (Impact plus Delay). (A total of 30 analyses of variance were computed, each with 62 subjects.)

The power tests showed that with  $\alpha = .01$ , estimating the expected effect size to be small ( $f = .10$ ), degrees of freedom for room size ( $n - 1 = 2 - 1$ ) equal to 1 and  $n'_s = 29$  (Cohen, 1977, p. 365), then the probability of rejecting the null hypothesis was .03. In other words, the probability of detecting a difference in mood change by room size in these circumstances was approximately 3 in 100. Even if the expected effect size were estimated at a medium value ( $f = .25$ ), the power of the test would be raised to only .23.

To detect a difference in mood change by window patterns with  $\alpha = .01$ ,  $df = 2$  ( $n - 1 = 3 - 1$ ), expected effect size small ( $f = .10$ ) and  $n'_w = 20$ , the power of the analysis of variance was .02. Raising the expected effect size to a medium value ( $f = .25$ ) would raise the power to .17, or 17 chances in 100 that if an effect did actually exist, it would be detected by this test.

When a power test was calculated for the interaction effects of size by windows, with  $\alpha = .01$ ,  $df = (2 - 1)(3 - 1) = 2$ ,  $f = .10$  and  $n'_x = 20$ , the power of the two-way analysis of variance to detect an interaction effect was again .02 or, if a medium effect were postulated, .17.

Therefore, one might regard the negative results of hypotheses 1 - 4 as, at best, tentative. The power tests indicate that failure to reject the null hypothesis, even if an effect were present, could have been expected in more than 75% of all cases, and in more than 80% where differences in window conditions or interaction effects between room size and windows were concerned.

When sample size was calculated for a power of .80, with small effect size as before ( $f = .10$ ), and  $n'_s = 29$ , the required sample would have to contain 586 subjects to obtain this power to detect a significant difference between room sizes. In the same circumstances to detect a

significant difference between window patterns, if a difference did exist, would require a sample of 464 subjects. Thus, for the six rooms, a total of more than 3500 subjects would have been required. Obviously, to perform the experiment under these conditions would have been impossible, as the large committee room which became the two test rooms was available for only a two-month period in the summertime, when students were not available in such numbers, and even staff members were taking vacations and therefore difficult to recruit.

As a result of these power tests, and the fact that several of the nonsignificant results were in the hypothesized direction, it seems reasonable to suggest that further research along the same lines would be justified, using much larger samples and tight controls over concomitant variables. It might also be useful to develop a modified mood scale employing five to nine measurement intervals. Various other suggestions for controls are included below.

Nevertheless, in spite of the shortcomings mentioned above, it is felt that this study introduced a new focus of attention on an area of measurement of behavior in rooms which vary in size and fenestration. The study avoided the pitfalls of influence due to geographic location and orientation within the building. The experiences

of this study provide a useful key to some of the controls which may be needed in studies of human reactions to rooms.

2. It was concluded that an unnecessarily high level of anxiety was engendered by the mystery surrounding the purpose of the tests. To give it a contrived, but logical, purpose would have eliminated many of the feelings of curiosity and suspicion that must have affected mood. In addition, including this purpose in the publicity to recruit subjects would surely have attracted many more volunteers.

3. The silence of the ninth floor (test rooms) compared with the noise and bustle of the eighth (reception area) probably contributed considerably to the subjects' uneasiness.

4. The 5-minute wait in the room might have occasioned less anxiety if the subject could have been given something to do which would not distract his attention from the room but would have been easier than simply waiting for a buzzer to sound.

5. Considering the decrease in positive mood in all rooms, which was greater than the decrease in any negative mood, the rooms, or the tasks done in them, were not well liked. The range of the friendliness ratings of room photographs indicated that the rooms in the photographs were all considered relatively unfriendly (lowest mean

rating = 3.98 out of 7 for the most friendly room, where a lower rating signified more friendly, a higher rating less friendly). For a test of ordinary work or study rooms, perhaps a more neutral experience would have been more appropriate.

6. Adding to the negative experience in the test room was the contrast with the appearance of the reception area, which was rather pleasant and welcoming with a red carpet and indirect lighting, although it was only a corner of the corridor.

7. Because of the difficulty of obtaining subjects, and the means used to recruit them--mainly through heads of departments--one would expect that a bias may have been created in the motivation of subjects since the principal reasons for volunteering became (1) to return a favor to the Personnel Department, (2) to get away from work for half an hour, or (3) to show their bosses a cooperative spirit.

8. Publicizing the experiment without giving details might also be expected to produce a bias in the range of personality characteristics of subjects. Risk-taking persons would be attracted by the unknown aspects of the proposed tests, while timid or self-conscious people would be excluded.

9. The time of year (summer), although the only time that the large Committee Room could be borrowed and converted

into two test rooms, was not ideal from the point of view of recruitment of subjects. Many of the staff were away on holiday and there were few students, compared with the winter months. Continuous efforts to obtain the minimum number of subjects required undoubtedly had its effects on the experimenter, which might be felt by the subjects.

10. The use of only one experimenter throughout, while ensuring one kind of consistency, introduced the possibility of a bias for or against certain types of subjects whose approach might be more aggressive or in some way antagonistic to the experimenter.

11. Greater value could have been obtained from the use of Canter and Wools' Friendliness scale with the room photographs if it had been arranged to have one or several of the actual rooms evaluated on this scale by an independent group of subjects. In this early stage of research in the field, this could have made a very meaningful contribution with very little extra cost, except in time.

12. If the Personal Questionnaire had included a question to all subjects regarding their opinion of the room, or even a description of it, a greater depth of understanding might have been found in the relationship between the judgments of real rooms and of photographs.

## SUMMARY AND CONCLUSIONS

The purpose of this study was (1) to investigate the possibility of differential mood change in rooms of different size and different window conditions, (2) to look at two measures of mood change, measured upon impact with the test room, and again after delay in the room working on a test, (3) to determine whether rooms of different size and different window conditions have a consistent effect on judgments of rooms from photographs, and (4) to investigate the possibility of a correlation between mood change and personality variables.

Two adjacent rooms were used in the testing, one twice the length of the other, but both equal in height and width. The larger room was four window bays in length and the smaller one two. Different window conditions were produced by (a) leaving the rooms as they were, which gave a 100% window condition, (b) covering one window in the small room with a solid screen which matched the other walls, and two windows in the large room, yielding a 50% condition, and (c) similarly covering all windows for 0% condition in both rooms.

The Gordon Personal Profile and the Gordon Personal Inventory were administered in a separate reception area when the subject arrived and these were followed by the administration of the 24-adjective short form of Nowlis' Mood Adjective Check List (MACL). The MACL was filled

twice more, once after a 5-minute wait in the test room and again after completing Canter and Wools' Friendliness Scale in judgments of six room photographs. The first MACL results were subtracted from the second to obtain Mood Change upon Impact, and the second from the third for Mood Change after Delay.

A principal components factor analysis with varimax rotation was made on the first set of mood adjective ratings, and five factors were extracted. Most of the mood change results were analyzed by these factors except the total Gross Mood Change, which was also summed over conditions of Impact and Delay. Two-way analyses of variance examined mood change by size and window conditions for each factor, under the conditions of Impact, Delay, and the total for both gross and net mood measures. Trend analyses were made of gross mood change by windows.

The Pearson correlation was used to investigate the relationship between personality traits and mood change, by factors. The "Friendliness" ratings of the six room photographs were analyzed by split-plot analysis of variance and a trend analysis was performed later. Comparisons were made between the four control groups and matching experimental conditions by  $t$  tests between means, and the same was used to compare the control groups' "friendliness" ratings of photos for each adjective.

These analyses led to the following conclusions, with regard to the various questions investigated in this study. For this particular sample, an overall significant effect on gross mood change was not found to be associated with room size or with window conditions, either upon impact or after delay in the Test Room. Nor was a significant interaction observed between the effects of room size and windows.

The judgments of "Friendliness" in room photographs revealed a highly significant trend in judgments, varying from the photo of the large room with all windows to the small room with no windows. However, the judgments on the "Friendliness" Scale were not seen to be affected by the Test Room which the subject occupied while doing the test.

A few notable relationships which were observed between certain personality variables and mood change were associated only with particular mood factors and did not reach both an acceptable degree of correlation and an acceptable level of significance.

#### Suggestions for Further Research

Some of the implications for further research arising out of this study are:

1. less complex studies, involving only the independent variable of room size (floor area);

2. less complex studies involving only the independent variable of percentage (of exterior wall area) of windows;
3. further explorations of mood change reactions to various patterns of windows constituting a 50% (of exterior wall area) condition;
4. further investigation of reaction to room size in rooms furnished simply but appropriately with the basic needs for one-person activities, e.g., sleeping, studying, bachelor apartment, etc.;
5. investigation of the validity of generalizing from judging photographs and drawings of rooms to judging the same rooms in reality, using the same scales;
6. studies relating to a comparison of behavior in a room (e.g., mood change) and subjective evaluation of the same room in photographs or drawings;
7. further detailed studies focusing on one mood factor such as fatigue;
8. investigation of the possibility of producing a modified mood scale for more accurate measurement of subtle changes in mood.

## REFERENCES

- Borgatta, E. F. Mood, personality and interaction. Journal of General Psychology, 1961, 64, 105-137.
- Brauer, R. L. Survey of soldiers' attitudes toward troop housing. U.S. Army Construction Engineering Research Laboratory. Champaign, Ill., 1973. In D. Canter and T. Lee (Eds.), Psychology and the built environment. Tonbridge, Kent: Whitefriars Press, 1974.
- Canter, D. Office size: An example of psychological research in architecture. The Architects' Journal Information Library, 24 April 1968, 881-888.
- Canter, D. The measurement of appropriateness in buildings. Transactions of the Bartlett Society, 1969, 6, 40-60.
- Canter, D. An introduction. In D. Canter (Ed.), Architectural psychology. London: RIBA, 1970. (a)
- Canter, D. Need for a theory of function in architecture. The Architects' Journal Information Library, 4 February 1970. (b)
- Canter, D. Should we treat building users as subjects or objects? In D. Canter (Ed.), Architectural psychology. London: RIBA, 1970. (c)
- Canter, D. The place of architectural psychology: A consideration of some findings. In B. Honikman (Ed.), Architectural psychology. Proceedings of the Architectural Psychology Conference at Kingston Polytechnic, September 1-14, 1970. London: RIBA, 1971; Kingston Polytechnic, 1970.. (d)
- Canter, D. (Ed.). Architectural psychology. Proceedings of the Architectural Psychology Conference held at Dalarnhui, University of Strathclyde, March 1969. London: RIBA, 1970..(e)
- Canter, D., Beynon, M., & West, S. Comparisons of an hologram and a slide of a room interior. Perceptual and Motor Skills, 1973, 37, 635-638.
- Canter, D., & Lee, T. (Eds.). General introduction. In Psychology and the built environment. Tonbridge, Kent: Whitefriars Press, 1974.

- Canter, D., & Wools, R. A technique for the subjective appraisal of buildings. Building Science, 1970, 5, 187-198.
- Cason, H. General curves and conditions of feeling. Journal of Applied Psychology, 1931, 15, 126-148.
- Cattell, R. B. Personality: A systematic theoretical and factual study. New York: McGraw-Hill, 1950.
- Cattell, R. B. 16 Personality factor questionnaire. Champaign, Ill.: Institute for Personnel Ability Testing, 1973.
- Christie, M. J., & Venables, P. H. Mood changes in relation to age, EPI scores, time and day. Journal of Social and Clinical Psychology, 1973, 12, 61-71.
- Clyde, D. J. Self-ratings. In L. Uhr and J. G. Miller (Eds.), Drugs and behavior. New York: Wiley, 1960.
- Clyde, D. J. Clyde mood scale manual. Coral Gables, Fla: University of Miami, Biometrics Laboratory, 1963.
- Cohen; J. Statistical power analysis for the behavioral sciences: Revised edition. New York: Academic Press, 1977.
- Collins, B. L. Windows and people: A literature survey. Psychological reaction to environments with and without windows. Washington, D.C.: Institute for Applied Technology, National Bureau of Standards, June 1975.
- Craik, K. H. The environmental dispositions of environmental decision-makers. In S. Klausner (Ed.), Society and its physical environment. Annals of American Academy of Political and Social Sciences, 1970, 389, 87-94. (a)
- Craik, K. H. Human behavior in the built environment. In T. M. Newcomb (Ed.), New directions in psychology (Vol. 4). New York: Holt, Rinehart & Winston, 1970. (b)
- Craik, K. H. Environmental psychology. Annual Review of Psychology, 1973, 24, 403-422.

- Craik, K. H. Human responsiveness to landscape: An environmental psychological perspective. In G. J. Coates and K. M. Moffett (Eds.), Response to environment. Raleigh, N.C.: North Carolina State University, Student Publications of the School of Design (Vol. 18), 1969.
- Dysinger, D. W. A study of mood. Psychological Record, 1937, 1, 147-156.
- Edwards, A. L. Edwards personal preference schedule. New York: Psychological Corp., 1959.
- Eysenck, H. J. Eysenck personal inventory. San Diego: Educational and Industrial Testing Services, 1963.
- Fisher, S. York University Bulletin. Communications Dept., 1968-.
- Goldstein, K. M. Weather, mood, and internal-external control. Perceptual and Motor Skills, 1972, 35, 786.
- Gordon, L. V. Gordon personal profile and Manual. New York: Harcourt, Brace & World, 1954, 1963.
- Gordon, L. V. Gordon personal inventory and Manual. New York: Harcourt, Brace & World, 1956, 1963.
- Gordon, L. V. Survey of interpersonal values and Manual. Chicago: Science Research Associates, 1960.
- Green, R. F. On the measurement of mood (Technical Report No. 10, Research Project No. NR 171-342, Contract No. Nonr 668(12), 1965). Paper presented at the Conference on Emotions and Feelings, October 5-6, 1962.
- Guilford, J. P., & Martin, H. G. Guilford-Martin personnel inventory. Beverly Hills, Calif.: Sheridan Psychological Services, 1946.
- Guilford, J. P., & Zimmerman, W. S. Guilford-Zimmerman temperament survey. Beverly Hills, Calif.: Sheridan Psychological Services, 1955.
- Hammersley, D. W. (Ed.). Hospital and community psychiatry. Washington, D.C.: American Psychiatric Association, November, 1976.
- Hershberger, R. G. A study of meaning and architecture. In M. Sanoff and S. Cohen (Eds.), EDRA 1. Raleigh, N.C.: North Carolina State University, 1970.

- Higginbottom, N. David Canter's research in architectural psychology. Unpublished Master's thesis, University of Surrey, 1974.
- Hildreth, H. M. A battery of feeling and attitude scales for clinical use. Journal of Clinical Psychology, 1946, 2, 214-221.
- Hollister, F. D. Greater London Council: A report on the problems of windowless environments. London: Hobbs, 1968.
- Honikman, B. An investigation of a method for studying personal evaluation and requirement of the built environment. In B. Honikman (Ed.), Architectural psychology: Proceedings of the architectural psychology conference at Kingston Polytechnic, September 1-14, 1970. London: RIBA, 1971.
- Honikman, B. (Ed.). Architectural psychology: Proceedings of the architectural psychology conference at Kingston Polytechnic, September 1-14, 1970. London: RIBA, 1971.
- Jackson, D. N. Personality research form manual. Goshen, N.Y.: Research Psychologists Press, 1967.
- Jackson, G. K., & Holmes, J. G. Let's keep it simple (11). Daylight design. Light and Lighting, February 1973, 59-60. (a)
- Jackson, G. K.; & Holmes, J. G. Let's keep it simple (12). What we want from daylight. Light and Lighting, March 1973, 80-82. (b)
- Jacobson, E. Normal and pathological moods: Their nature and function. In A. Freud et al. (Eds.), Psychoanalytic study of the child (Vol. 12). New York: International Universities Press, 1957.
- Kasmar, J. V., Griffin, W. V., & Mauritzen, J. H. Effect of environmental surroundings on outpatients' mood and perception of psychiatrists. Journal of Consulting and Clinical Psychology, 1968, 32, 223-226.
- Kaye, S. M. Psychology in relation to design. Canadian Psychological Review, 1975, 16(2), 104-110. -

- Keighley, E. G. Visual requirements and reduced fenestration in office buildings: A study of window shape. Journal of Building Science, 1973, 8, 311-320. (a)
- Keighley, E. G. Visual requirements and reduced fenestration in offices: A study of multiple apertures and window area. Journal of Building Science, 1973, 8, 321-331. (b)
- Lau, J. J. H. Use of scale models as a stimulus mode. In J. Archa and C. Eastman (Eds.), EDRA 2. Proceedings of the 2nd Annual Environmental Design Research Association Conference, Pittsburgh, October 1970.
- Lee, T. Psychology and architectural determinism. The Architects' Journal Information Library, 4 August 1971, 253-262.
- Lipman, A. Building design and social interaction: A preliminary study in three old people's homes. The Architects' Journal Information Library, 3 January 1968, 23-30.
- Manning, P. Windows, environment and people. Interbuild, January 1967, 20-25.
- Markus, T. A. The significance of sunshine and view for office workers: Sunlight in buildings. Proceedings of Commission Internationale de l'Eclairage (CIE) Conference. Rotterdam: Bouwcentrum, 1965.
- Markus, T. A. The function of windows: A reappraisal. Building Science, 1967, 2, 97-121.
- Markus, T. A., Whyman, P., Morgan, J., Whitton, D. Maver, T., Canter, D., & Fleming, J. Building performance. New York: Wiley, 1972.
- Maslow, A. H., & Mintz, N. L. Effects of esthetic surroundings: Initial effects of three esthetic conditions upon perceiving "energy" and "well-being" in faces. The Journal of Psychology, 1956, 41, 247-254.
- McNair, D. M., & Lorr, M. An analysis of mood in neurotics. Journal of Abnormal and Social Psychology, 1964, 69(6), 620-627.
- Meddis, R. Bipolar factors in mood adjective checklists. British Journal of Social and Clinical Psychology, 1972, 11, 178-184.

- Mercer, J. C. On measuring the effect of a window. Architectural Research and Teaching, 1911, 2, 53-55.
- Mintz, N. L. Effects of esthetic surroundings: Prolonged and repeated experience in a "beautiful" and an "ugly" room. The Journal of Psychology, 1956, 41, 459-466.
- Murray, H. A. Explorations in personality. New York: Oxford University Press, 1938.
- Ne'eman, E., & Hopkinson, R. G. Critical minimum acceptable window size: A study of window design and provision of a view. Lighting Research and Technology, 1970, 2, 17-27.
- Nowlis, D. P., & Cohen, A. Y. Mood reports and the college natural setting: A day in the lives of three room-mates under academic pressure. Psychological Reports, 1968, 23, 551-566.
- Nowlis, V. Research with the mood adjective check list. In S. S. Tomkins and C. E. Izard, Affect, cognition and personality: Empirical studies. New York: Springer, 1965.
- Nowlis, V. Mood: Behavior and experience. In Magda B. Arnold (Ed.), Feelings and emotions. New York: Academic, 1970.
- Nowlis, V., & Green, R. F. The experimental analysis of mood (Research Project No. NR 171-342, Contract No. Nonr-668(12), Technical Report No. 3). Department of Psychology, University of Rochester, 1957.
- Nowlis, V., & Green, R. F. Factor analytic studies of the mood adjective check list (Research Project No. NR 171-342, Contract No. Nonr 668(12), Technical Report No. 11). Department of Psychology, University of Rochester, 1965.
- Nowlis, V., & Nowlis, H. H. The description and analysis of mood. In O. V. St. Whitelock (Ed.), Techniques for the study of behavioral effects of drugs. Annals of the New York Academy of Sciences, 1956, 65(Art. 4), 247-356.

- Osgood, C. E. The nature and measurement of meaning. Psychological Bulletin, 1952, 49, 97-237.
- Oxford English Dictionary. Compact Edition. New York: Oxford University Press, 1971.
- Proshansky, H. M. Environmental psychology and the real world. American Psychologist, 1976, 31(4), 303-310.
- Proshansky, H. M., Ittelson, W. H., & Rivlin, L. G. Environmental psychology. Man and his physical setting. New York: Holt, Rinehart & Winston, 1970.
- Ruys. Windowless offices. Unpublished Master's thesis, University of Washington, Seattle, 1970.
- Ryle, G. The concept of mind. London: Hutchinson, 1950.
- Samuelson, D. J., & Lindauer, M. S. Perception, evaluation and performance in a neat and messy room by high and low sensation seekers. Environment and Behavior, 1976, 8(2), 291-306.
- Stouffer, S. A., Guttman, L., Suchman, E. A., Lazarfeld, P. F., Star, J. A., & Causen, J. A. Measurement and prediction. New York: Wiley, 1966.
- Studer, R. G. The dynamics of behavior-contingent physical systems. In H. M. Proshansky et al. (Eds.), Environmental psychology. Man and his physical setting. New York: Holt, Rinehart & Winston, 1970.
- Taylor, C. W. Architectural psychology. Production of a new type of manpower. Paper presented at the Proceedings of the International Congress of Applied Psychology, Liege, Belgium, July 25-30, 1971.
- Tesser, A., Rosen, S., & Waranch, E. Communicator mood and the reluctance to transmit undesirable messages (the Mum Effect). The Journal of Communication, 1973, 23, 266-283.
- Thayer, R. E. Measurement of activation through self-report. Psychological Reports, 1967, 20, 663-678.
- Thurstone, L. L. Thurstone temperament schedule. Chicago: Science Research Associates, 1953.

- Tognoli, J. Effects of windowless rooms and unembellished surroundings on attitudes and retention. Environment and Behaviour, 1973, 5, 191-201.
- Vielhauer, J. A. The development of a semantic differential scale for the description of the physical environment (Doctoral dissertation, Louisiana State University, 1965). Dissertation Abstracts, 1966, 26(8), 4831.
- Weinshal, E. M. Some psychoanalytic considerations on moods. International Journal of Psychoanalysis, 1970, 51, 313-320.
- Wells, W. P. Subjective responses to the lighting installation in a modern office building and their design implications. Building Science, 1965, 1, 57-68.
- Wessman, A. E., & Ricks, D. F. Mood and personality. New York: Holt, Rinehart & Winston, 1966.
- Wiggins, J. S. The relationship between personality characteristics and attitudes toward housing and related facilities in six army posts. In R. L. Brauer, Survey of soldiers' attitudes toward troop housing. Champaign, Ill.: U.S. Army Construction Engineering Research Laboratory, 1973.
- Wilson, L. M. Intensive care delirium: The effect of outside deprivation in a windowless unit. Archives of Internal Medicine, 1972, 130, 225-226.
- Winkel, G. H. (Ed.). Environment and behavior. Beverley Hills, Calif.: Sage Publications, 1969-.
- Wohlwill, J. F. The emerging discipline of environmental psychology. American Psychologist, 1970, 25, 303-312.
- Wools, R. The assessment of room friendliness. In D. Canter (Ed.), Architectural psychology. London: RIBA, 1970.
- Wools, R., & Canter, D. The effect of the meaning of buildings on behaviour. Applied Ergonomics, 1970, 1, 144-150.
- Zuckerman, M. The development of an affect adjective check list for the measurement of anxiety. Journal of Consulting Psychology, 1960, 24, 457-462.

APPENDIX 1

PHOTOGRAPHS OF PERSONNEL DEPARTMENT  
RECEPTION AREA



(a)



(b)

Figure 10.. Personnel Department:  
    (a) Reception Desk  
    (b) Waiting Room

APPENDIX 2

PHOTOGRAPHS OF THE PROJECT  
RECEPTION AREA

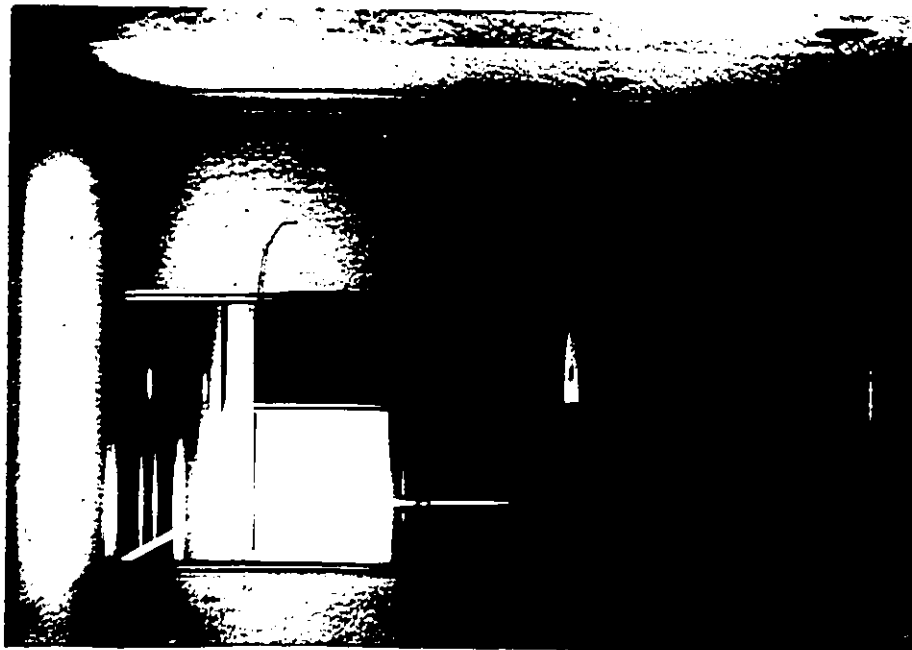
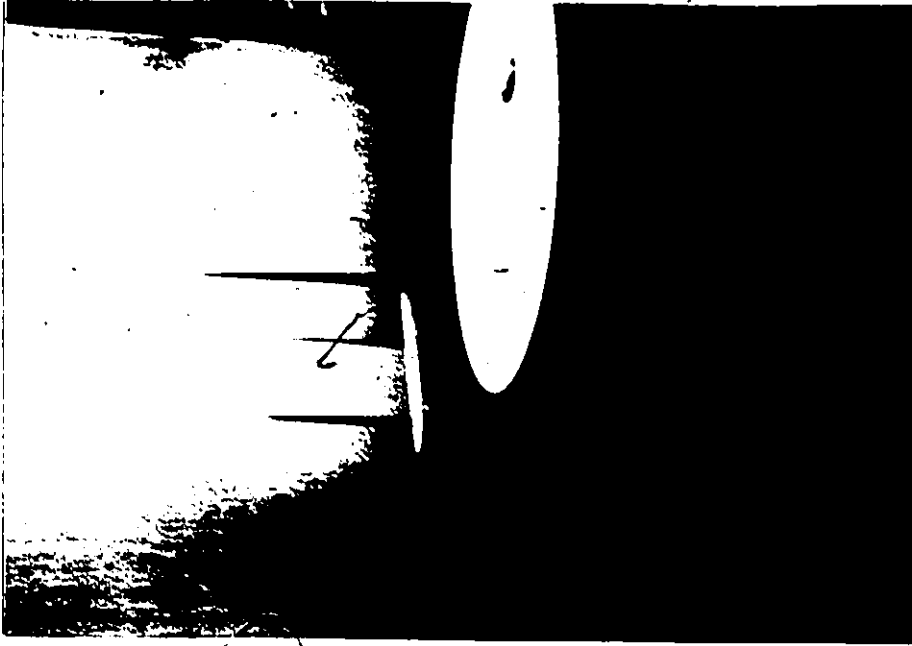


Figure 11. Project Reception Area. In background is door to Lounge, which was locked.

APPENDIX 3

A SHORT FORM OF THE MOOD ADJECTIVE  
CHECK LIST (MACL)

A Short Form of the MACL

Each of the following words describes feelings or mood. Please use the list to describe your feelings at the moment you read each word. If the word definitely describes how you feel at the moment you read it, circle the double check (vv) to the right of the word. For example, if the word is relaxed and you are definitely feeling relaxed at the moment, circle the vv as follows:

relaxed v  ? no. (This means you definitely feel relaxed at the moment.)

If the word only slightly applies to your feelings at the moment, circle the single check v as follows:

relaxed vv v  ? no. (This means you feel slightly relaxed at the moment.)

If the word is not clear to you, or you cannot decide whether or not it applies to your feelings at the moment, circle the question mark as follows:

relaxed vv v  ? no. (This means you cannot decide whether you are relaxed or not.)

If you definitely decide the word does not apply to your feelings at the moment, circle the "no" as follows:

relaxed vv v ? no (This means you are definitely not relaxed at the moment.)

Work rapidly. Your first reaction is best. Work down the first column, then go to the next. Please mark all words. This should take only a few minutes. Please begin.

affectionate vv v ? no

fearful vv v ? no

angry vv v ? no

engaged in thought vv v ? no

boastful vv v ? no

sluggish vv v ? no

carefree vv v ? no

sad vv v ? no

clutched up vv v ? no

warmhearted vv v ? no

concentrating vv v ? no

rebellious vv v ? no

drowsy v v ? no

self-centered vv v ? no

regretful vv v ? no

witty vv v ? no

kindly vv v ? no

jittery vv v ? no

defiant vv v ? no

serious vv v ? no

egotistic vv v ? no

tired vv v ? no

playful vv v ? no

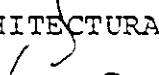
sorry vv v ? no

---

Please replace this test in its envelope when you have finished, and seal it.

APPENDIX 4

THE ARCHITECTURAL EVALUATION (AE) FRIENDLINESS  
SCALE

A handwritten scribble in black ink is located below the text, consisting of several overlapping, irregular lines.

FORM AEL

The following words can be used to describe the room in the photograph as you see it.

Every word on the left side of the page is paired with one on the right side. Each pair of words has a scale numbered from 1 to 7 between the two words, e.g. ordinary 1 2 3 4 5 6 7 unusual.

EXAMPLE: If the room in the photograph seems to you to be ordinary, you will encircle one of the numbers on the left side of the sheet, close to the word "ordinary" (if very ordinary, circle No. 1 or 2, if ~~less~~ so, circle No. 3). On the other hand, if the room in the photo seems to you to be unusual, you will encircle a number on the right side closer to the word "unusual" (No. 5 or, if very unusual, perhaps No. 6 or 7).

Please encircle one of the seven numbers for each pair of words, choosing the number that seems best to describe your feelings about the room in the photograph.

Work as quickly as you can. Your first feeling is best.

Please begin right away.

HAPPY	1	2	3	4	5	6	7	SAD
HOT	1	2	3	4	5	6	7	COLD
WELCOMING	1	2	3	4	5	6	7	UNWELCOMING
SOFT	1	2	3	4	5	6	7	HARD
RELAXED	1	2	3	4	5	6	7	TENSE
KIND	1	2	3	4	5	6	7	CRUEL
SYMPATHETIC	1	2	3	4	5	6	7	UNSYMPATHETIC
SOFT	1	2	3	4	5	6	7	LOUD
FRIENDLY	1	2	3	4	5	6	7	UNFRIENDLY
INTERESTING	1	2	3	4	5	6	7	UNINTERESTING

AS SOON AS YOU HAVE FINISHED, PLEASE RETURN THIS SHEET AND THE PHOTOGRAPH TO THE ENVELOPE AND SEAL IT.

THEN PLEASE TAKE THE NEXT ENVELOPE AND OPEN IT.

The following words can be used to describe the room in the photograph as you see it.

Every word on the left side of the page is paired with one on the right side. Each pair of words has a scale numbered from 1 to 7 between the two words, e.g. ordinary 1 2 3 4 5 6 7 unusual.

EXAMPLE: If the room in the photograph seems to you to be ordinary, you will encircle one of the numbers on the left side of the sheet, close to the word "ordinary" (if very ordinary, circle No. 1 or 2, if less so, circle No. 3). On the other hand, if the room in the photo seems to you to be unusual, you will encircle a number on the right side closer to the word "unusual" (No. 5 or, if very unusual, perhaps No. 6 or 7).

Please encircle one of the seven numbers for each pair of words, choosing the number that seems best to describe your feelings about the room in the photograph.

Work as quickly as you can. Your first feeling is best.

Please begin right away.

SYMPATHETIC	1	2	3	4	5	6	7	UNSYMPATHETIC
HOT	1	2	3	4	5	6	7	COLD
SOFT	1	2	3	4	5	6	7	LOUD
KIND	1	2	3	4	5	6	7	CRUEL
FRIENDLY	1	2	3	4	5	6	7	UNFRIENDLY
WELCOMING	1	2	3	4	5	6	7	UNWELCOMING
INTERESTING	1	2	3	4	5	6	7	UNINTERESTING
RELAXED	1	2	3	4	5	6	7	TENSE
HAPPY	1	2	3	4	5	6	7	SAD
SOFT	1	2	3	4	5	6	7	HARD

AS SOON AS YOU HAVE FINISHED, PLEASE RETURN THIS SHEET AND THE PHOTOGRAPH TO THE ENVELOPE AND SEAL IT.

THEN PLEASE TAKE THE NEXT ENVELOPE AND OPEN IT.

The following words can be used to describe the room in the photograph as you see it.

Every word on the left side of the page is paired with one on the right side. Each pair of words has a scale numbered from 1 to 7 between the two words, e.g. ordinary 1 2 3 4 5 6 7 unusual.

EXAMPLE: If the room in the photograph seems to you to be ordinary, you will encircle one of the numbers on the left side of the sheet, close to the word "ordinary" (if very ordinary, circle No. 1 or 2, if less so, circle No. 3). On the other hand, if the room in the photo seems to you to be unusual, you will encircle a number on the right side closer to the word "unusual" (No. 5 or, if very unusual, perhaps No. 6 or 7).

Please encircle one of the seven numbers for each pair of words, choosing the number that seems best to describe your feelings about the room in the photograph.

Work as quickly as you can. Your first feeling is best.

Please begin right away.

SOFT	1	2	3	4	5	6	7	HARD
SYMPATHETIC	1	2	3	4	5	6	7	UNSYMPATHETIC
INTERESTING	1	2	3	4	5	6	7	UNINTERESTING
FRIENDLY	1	2	3	4	5	6	7	UNFRIENDLY
HAPPY	1	2	3	4	5	6	7	SAD
WELCOMING	1	2	3	4	5	6	7	UNWELCOMING
HOT	1	2	3	4	5	6	7	COLD
KIND	1	2	3	4	5	6	7	CRUEL
SOFT	1	2	3	4	5	6	7	LOUD
RELAXED	1	2	3	4	5	6	7	TENSE

AS SOON AS YOU HAVE FINISHED, PLEASE RETURN THIS SHEET AND THE PHOTOGRAPH TO THE ENVELOPE AND SEAL IT.

THEN PLEASE TAKE THE NEXT ENVELOPE AND OPEN IT.

The following words can be used to describe the room in the photograph as you see it.

Every word on the left side of the page is paired with one on the right side. Each pair of words has a scale numbered from 1 to 7 between the two words, e.g. ordinary 1 2 3 4 5 6 7 unusual.

EXAMPLE: If the room in the photograph seems to you to be ordinary, you will encircle one of the numbers on the left side of the sheet, close to the word "ordinary" (if very ordinary, circle No. 1 or 2, if less so, circle No. 3). On the other hand, if the room in the photo seems to you to be unusual, you will encircle a number on the right side closer to the word "unusual" (No. 5 or, if very unusual, perhaps No. 6 or 7).

Please encircle one of the seven numbers for each pair of words, choosing the number that seems best to describe your feelings about the room in the photograph.

Work as quickly as you can. Your first feeling is best.

Please begin right away.

WELCOMING	1	2	3	4	5	6	7	UNWELCOMING
SOFT	1	2	3	4	5	6	7	HARD
KIND	1	2	3	4	5	6	7	CRUEL
HAPPY	1	2	3	4	5	6	7	SAD
SYMPATHETIC	1	2	3	4	5	6	7	UNSYMPATHETIC
SOFT	1	2	3	4	5	6	7	LOUD
INTERESTING	1	2	3	4	5	6	7	UNINTERESTING
HOT	1	2	3	4	5	6	7	COLD
FRIENDLY	1	2	3	4	5	6	7	UNFRIENDLY
RELAXED	1	2	3	4	5	6	7	TENSE

AS SOON AS YOU HAVE FINISHED, PLEASE RETURN THIS SHEET AND THE PHOTOGRAPH TO THE ENVELOPE AND SEAL IT.

THEN PLEASE TAKE THE NEXT ENVELOPE AND OPEN IT.

The following words can be used to describe the room in the photograph as you see it.

Every word on the left side of the page is paired with one on the right side. Each pair of words has a scale numbered from 1 to 7 between the two words, e.g. ordinary 1 2 3 4 5 6 7 unusual.

EXAMPLE: If the room in the photograph seems to you to be ordinary, you will encircle one of the numbers on the left side of the sheet, close to the word "ordinary" (if very ordinary, circle No. 1 or 2, if less so, circle No. 3). On the other hand, if the room in the photo seems to you to be unusual, you will encircle a number on the right side closer to the word "unusual" (No. 5 or, if very unusual, perhaps No. 6 or 7).

Please encircle one of the seven numbers for each pair of words, choosing the number that seems best to describe your feelings about the room in the photograph.

Work as quickly as you can. Your first feeling is best.

Please begin right away.

KIND	1	2	3	4	5	6	7	CRUEL
HOT	1	2	3	4	5	6	7	COLD
FRIENDLY	1	2	3	4	5	6	7	UNFRIENDLY
HAPPY	1	2	3	4	5	6	7	SAD
RELAXED	1	2	3	4	5	6	7	TENSE
SYMPATHETIC	1	2	3	4	5	6	7	UNSYMPATHETIC
SOFT	1	2	3	4	5	6	7	HARD
INTERESTING	1	2	3	4	5	6	7	UNINTERESTING
WELCOMING	1	2	3	4	5	6	7	UNWELCOMING
SOFT	1	2	3	4	5	6	7	LOUD

---

AS SOON AS YOU HAVE FINISHED, PLEASE RETURN THIS SHEET AND THE PHOTOGRAPH TO THE ENVELOPE AND SEAL IT.

THEN PLEASE TAKE THE NEXT ENVELOPE AND OPEN IT.

The following words can be used to describe the room in the photograph as you see it.

Every word on the left side of the page is paired with one on the right side. Each pair of words has a scale numbered from 1 to 7 between the two words, e.g. ordinary 1 2 3 4 5 6 7 unusual.

EXAMPLE: If the room in the photograph seems to you to be ordinary, you will encircle one of the numbers on the left side of the sheet, close to the word "ordinary" (if very ordinary, circle No. 1 or 2, if less so, circle No. 3). On the other hand, if the room in the photo seems to you to be unusual, you will encircle a number on the right side closer to the word "unusual" (No. 5 or, if very unusual, perhaps No. 6 or 7).

Please encircle one of the seven numbers for each pair of words, choosing the number that seems best to describe your feelings about the room in the photograph.

Work as quickly as you can. Your first feeling is best.

Please begin right away.

INTERESTING	1	2	3	4	5	6	7	UNINTERESTING
HAPPY	1	2	3	4	5	6	7	SAD
SOFT	1	2	3	4	5	6	7	HARD
FRIENDLY	1	2	3	4	5	6	7	UNFRIENDLY
RELAXED	1	2	3	4	5	6	7	TENSE
HOT	1	2	3	4	5	6	7	COLD
WELCOMING	1	2	3	4	5	6	7	UNWELCOMING
SYMPATHETIC	1	2	3	4	5	6	7	UNSYMPATHETIC
SOFT	1	2	3	4	5	6	7	LOUD
KIND	1	2	3	4	5	6	7	CRUEL

AS SOON AS YOU HAVE FINISHED, PLEASE RETURN THIS SHEET AND THE PHOTOGRAPH TO THE ENVELOPE AND SEAL IT.

THEN PLEASE TAKE THE NEXT ENVELOPE AND OPEN IT.

APPENDIX 5

PHOTOGRAPHS OF THE SIX TEST ROOMS, USED IN THE  
ARCHITECTURAL EVALUATION (AE) FRIENDLINESS  
TEST



Figure 12. . Photograph of Large Room with 100% windows used in the Architectural Evaluation Test. The size of photographs used in the test was approximately 7.0 inches by 9.5 inches or 17.5 cm by 24.5 cm. (This note applies also to Figures 13, 14, 15, 16, and 17).

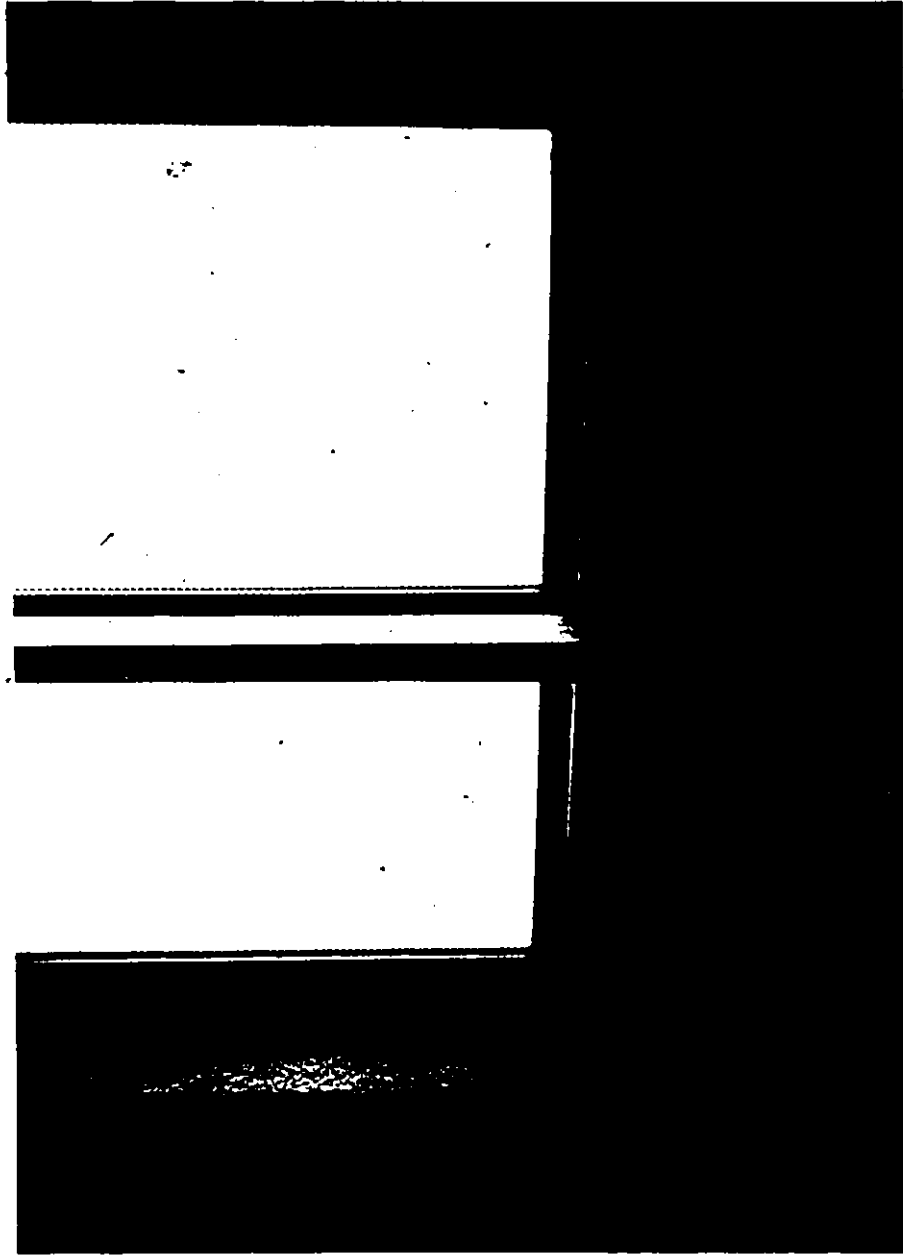


Figure 13. Photograph of Small Room with .100Z Windows.

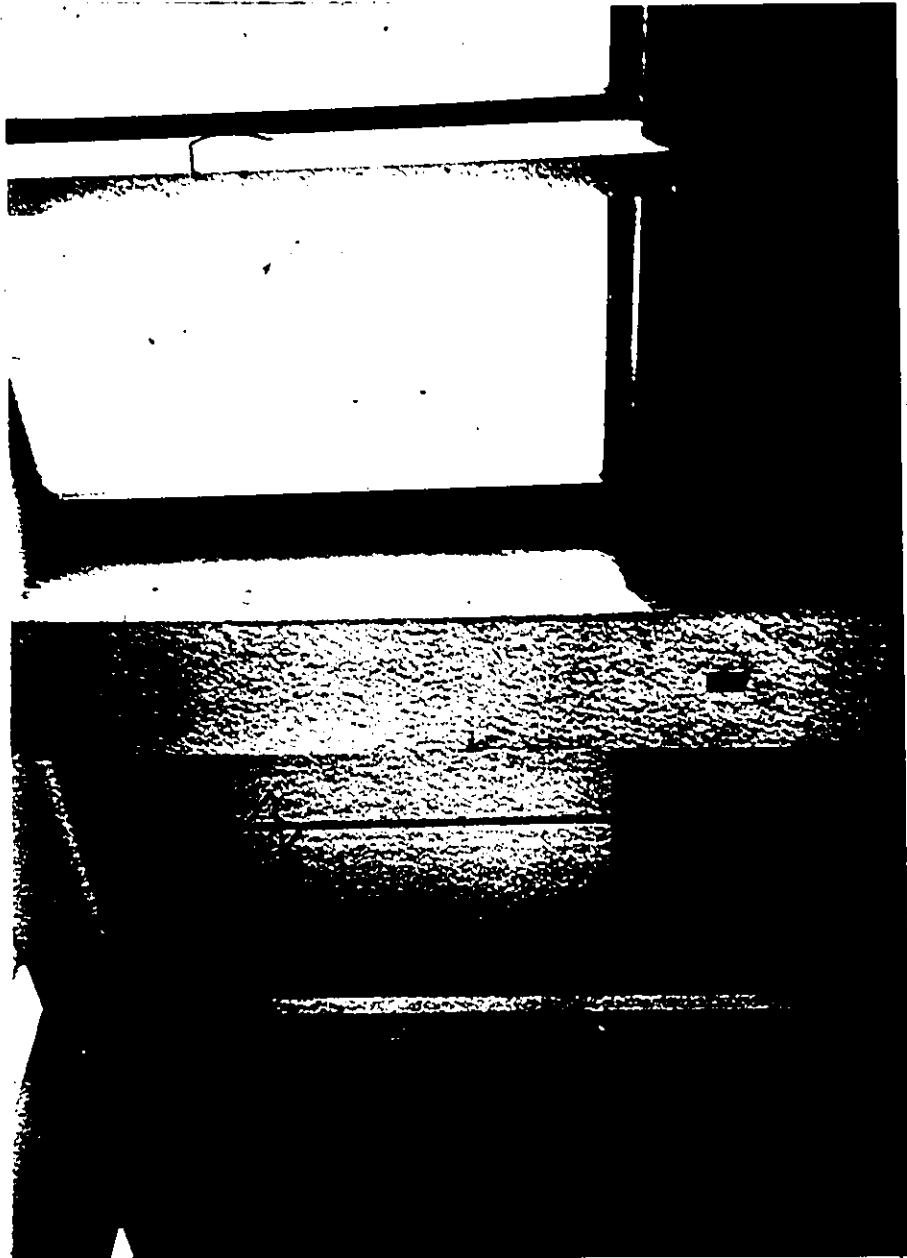


Figure 14. Photograph of Large Room with 50% Windows.

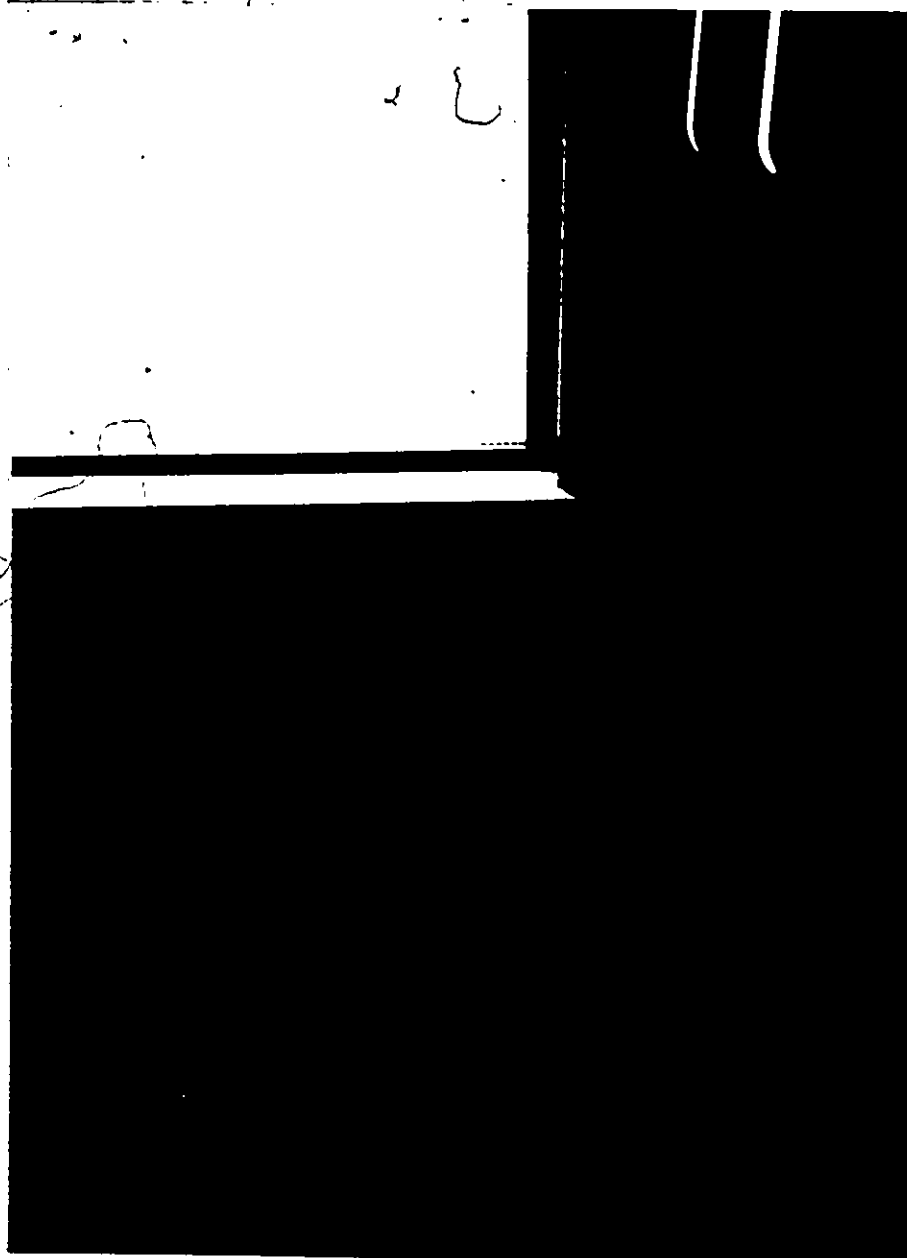


Figure 15. Photograph of Small Room with 50% Windows.



Figure 16. Photograph of Large Room with 0% Windows.

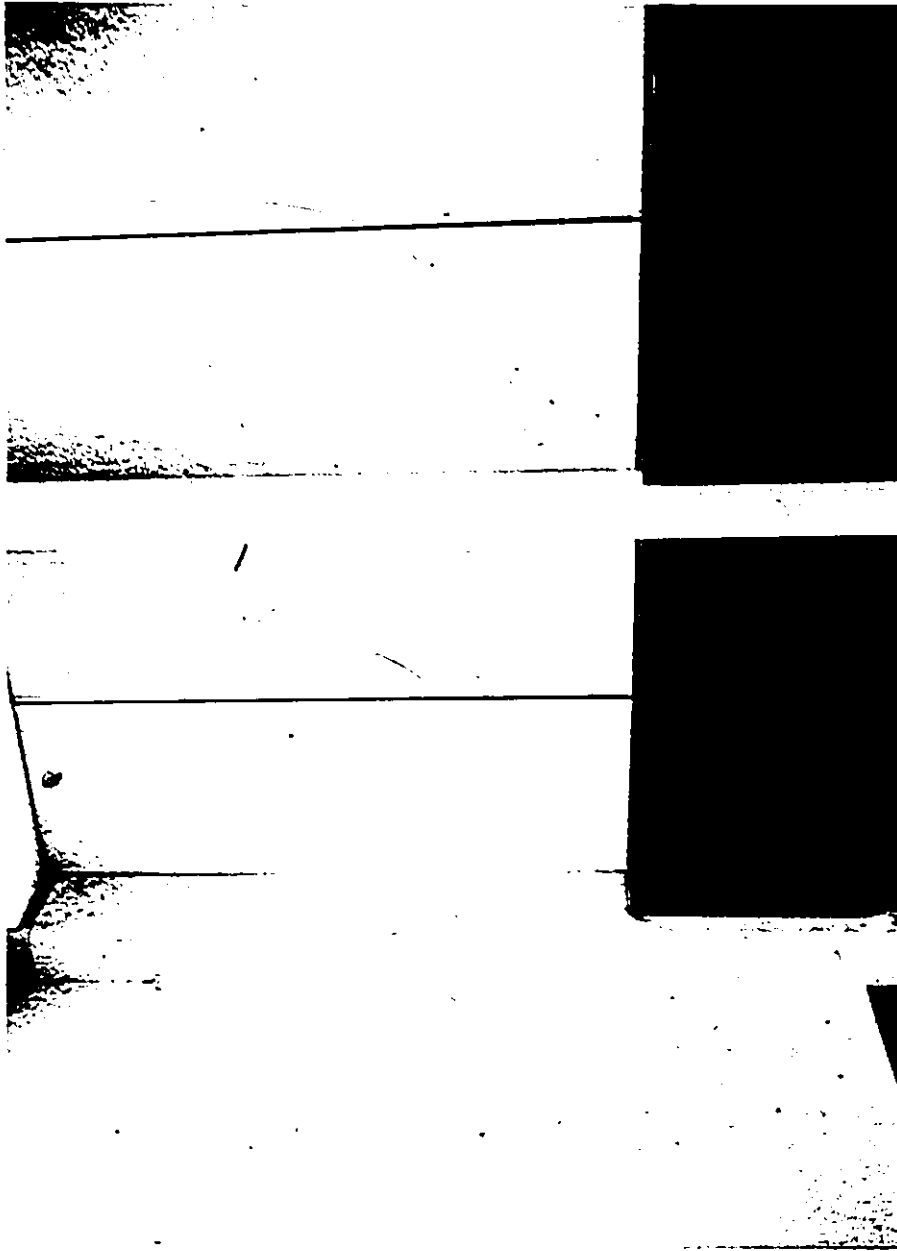


Figure 17. Photograph of Small Room with 02 Windows.

APPENDIX 6

SUBJECT SHEET (PERSONAL QUESTIONNAIRE)

SUBJECT SHEET

182

Name \_\_\_\_\_ Subject No. \_\_\_\_\_

Tel. No. \_\_\_\_\_ Date \_\_\_\_\_

Sex \_\_\_\_\_

Age \_\_\_\_\_

Occupation \_\_\_\_\_

Times arrival \_\_\_\_\_

begin GPP \_\_\_\_\_ finish \_\_\_\_\_

begin MACLI \_\_\_\_\_ finish \_\_\_\_\_

Total finish \_\_\_\_\_

LT \_\_\_\_\_

TEMP \_\_\_\_\_

H.INT \_\_\_\_\_

H.EXT \_\_\_\_\_

B.P. \_\_\_\_\_

1. How much sleep did you have last night? \_\_\_\_\_ hours.

2. Are you in good health today? Yes \_\_\_\_\_ No \_\_\_\_\_

If other than 'yes', explain briefly \_\_\_\_\_

How bad? \_\_\_\_\_

3. Have you taken any medication or alcohol since midnight last night?

Yes \_\_\_\_\_ No \_\_\_\_\_

If 'yes', when \_\_\_\_\_ what \_\_\_\_\_ how much \_\_\_\_\_

4. Has anything unusual happened today or during the past week which might tend to affect your mood? Yes \_\_\_\_\_ No \_\_\_\_\_

If 'yes', what was it and how did it make you feel? \_\_\_\_\_

5. WOMEN - re menstrual cycle Yes \_\_\_\_\_ n.a. \_\_\_\_\_

Does today fall within a menstrual period from five days before menstruation to five days after it? \_\_\_\_\_

Does your mood change very much during and before menstruation? Explain \_\_\_\_\_

6. OFFICE STAFF - Do you work in this building? Yes \_\_\_\_\_ No \_\_\_\_\_

Room No. \_\_\_\_\_ Comments \_\_\_\_\_

7. Comments on Test \_\_\_\_\_

APPENDIX 7

SAMPLE ISSUE OF YORK UNIVERSITY BULLETIN



**YORK**  
UNIVERSITY

# BULLETIN

Published five days a week during term by Communications Department.  
Deadline 12:00 noon on the day preceding publication. Room S802, Ross (667-3441).  
Items submitted will be edited as required

Tuesday July 6 - Wednesday July 7, 1976

EMERGENCY SERVICES CENTRE - 3333

## GENERAL

- \* The Orange Snail Coffee Shop (Room 107, Stong College) opened July 5 and will be open from 8:00 a.m. - 11:00 p.m. (licenced from 12:00 noon-1:30 p.m. and 3:00 p.m.-11:00 p.m.) Monday through Friday until further notice.
- \* Food & Plenty Enterprises offer noon-hour lunch service (effective July 5) for faculty and senior administrative staff in the Osgoode Hall Senior Common Room from 12:00 noon - 2:00 p.m. The SCR will be licenced under the canteen licence in approximately three weeks; cash or Chargex accepted.
- \* The York University Track Club invites all members of the community to participate in a Superstars Competition, which is being held on Sunday, July 11 at the Tait McKenzie Building. Registration commences at 8:00 a.m. with events starting at 9:00 a.m. Events will include a two mile run, 50 metre swim, two mile bicycle ride (bring own bicycles), and an obstacle course. Prizes will be given for men and women in the following categories: 12-15 years; 16-19 years; 20-29 years; 30-39 years; and 40 and over. A \$2.00 entry fee will be charged; for further information call 667-2347 (Room 303, Tait McKenzie Building).
- \* The students of Atkinson Visual Arts 200 (Matrix Studio) are presenting an exhibition of their art work from July 29-August 9, 9:30 a.m.-4:00 p.m., in the Calumet College Common Room at Atkinson College.
- \* Volunteers are requested for participation in a research project from July 22 to August 27 (weekdays only); individual times will be arranged by appointment. Interested persons may call Barbara Znaniecki at local 2279/2511 between 8:30 a.m. and 4:30 p.m. or 822-3888 in the evenings.
- \* Cheques Requisitioned from the Accounting Office: The Office of the Chief Accountant requests the cooperation of the community in adhering to the practice of allowing 5 days for the preparation of cheques, including travel advances, petty cash reimbursements, expense reimbursements, etc. Please do not request to arrange special pickup unless absolutely necessary.
- \* Members of the community are asked to note that in order to facilitate the bicycle races being held on Sunday, June 11, Thompson Boulevard and Fraser Drive from Athabasca Road to the T.O.B. exit road will be closed from 9:00 a.m. to approximately 2:00 p.m.
- \* The Stan Kenton Band will hold a concert at Burton Auditorium on Friday, July 16 at 8:00 p.m. General admission is \$5.00 and tickets are available from the Conference Office (Room 139, Winters College) or the Conference Desk in Winters Residence.

## EVENTS

### Tuesday

12:00 noon - Y.U.S.A. General Meeting - new members may join at door - Room D, Stedman Lecture Halls

### Wednesday

12:00 noon & 1:00 p.m. - Summer Film Series - [Film Library] a cartoon festival featuring Donald Duck, Elmer Fudd, Felix the Cat and more - Room 114, Scott Library

12:00 noon - 1:00 p.m. - Yoga Classes - Common Room, Atkinson College

9:30 p.m. - Stargazing - Twin Astronomical Observatories, Petrie Science Building

APPENDIX 8

SAMPLE OF BILLBOARD NOTICES

# VOLUNTEERS

## VOLUNTEERS REQUESTED FOR PARTICIPATION IN A RESEARCH PROJECT

### WHERE ?

Ross Building, 8th floor SCUTH

### WHEN ?

From July 22nd to August 27th - WEEKDAYS ONLY - Individual times will be arranged by appointment.

### HOW ?

Phone Barbara Znaniecki (pronounced Z-NAN-YETSKI)  
667-2279 or 667-2511 between 8.30 a.m. and 4.30 p.m.  
or 822-3888 (in Mississauga) evenings.

### WHY ?

- To take part in an interesting project and share in a new experience.

5  
APPENDIX '7

LETTER TO DEPARTMENT HEADS

**CONFIDENTIAL**

188

Memo to:

From: Barbara Znaniecki

Subject: Research Project for Ph.D. in Psychology

Date: June 24, 1976

The following are a few notes on the research project that I have discussed with you within the last few days. It is in the area of Architectural Psychology and is a study of people's reactions to rooms of different sizes and different window conditions.

The rooms to be tested are in the Ross Building. The measure of response will be Mood Change. Six different room conditions will be studied.

Subjects will be seen individually. Basically what the Subject will be doing will be simple paper-and-pencil tests to which there are no right or wrong answers - just choices or preferences. Several of these will be Mood tests, one will be a Personality measure, the results to be correlated later with Mood Change, and one of the tests will be a task relating to the Test Room conditions.

The total time required will be approximately one hour. An opportunity will be provided at the end of the Subject's interview to comment on the experience and the Project. I am hoping for a total of at least 100 Subjects.

Naturally I would not want prospective Subjects to see the contents of this memo as I am looking for a spontaneous mood response, so I am attaching another sheet with a few points that I hope might interest people enough to apply. You can assure any prospective Subjects that all individual results will be held in strict confidence, and only totals and averages will be used in the analysis. No one except myself will see any of the individual papers.

I shall be glad to send you an outline of the results after the analysis has been completed if you would be interested.

VOLUNTEERS REQUESTED FOR PARTICIPATION IN A RESEARCH PROJECT

## WHERE ?

Ross Building, 8th floor SOUTH

## WHEN ?

From July 22nd to August 27th - WEEKDAYS ONLY - Individual times will be arranged by appointment.

## HOW ?

Phone Barbara Znaniecki (pronounced Z-NAN-YETSKI)  
667-2279 or 667-2511 between 9.30 a.m. and 4.30 p.m.  
or 822-3888 (in Mississauga) evenings.

## WHY ?

To take part in an interesting project and share in a new experience.

Participation is simple. It will take about one hour of your time. Your part will consist merely of filling in some paper-and-pencil forms. There are no right or wrong ways to do this - all are just choices or preferences. The project will be explained after you have finished the forms and you will have an opportunity to comment.

APPENDIX 10

INTRODUCTION FOR SUBJECTS

## APPENDIX 10

## INTRODUCTION FOR SUBJECTS

We are conducting some experiments, as you know, in mood studies. I'll ask you to fill in some paper-and-pencil tests. They are very easy to do. There are no right or wrong answers, so anyone can do them. They are just choices or preferences.

We're a little crowded for space as you can see, so I'll just start you off here so that you can see what kind of tests they are, and the rest of them you'll be able to do on your own in another room, following written instructions.

Do you have any questions before we begin?

Are you ready to begin now?

This is followed by going through the instructions for the Gordon Personal Profile and Inventory. When these are completed, the subject is given the instructions for the first MACL, to read to himself. The subject is asked if he/she understands them, and if there are any questions.

After the first MACL, the subject is given the appropriate sheet of directions to get to the Test Room.

APPENDIX 11

WRITTEN INSTRUCTIONS TO SUBJECTS (INCLUDING SEPARATE  
INSTRUCTIONS FOR TWO TYPES OF CONTROL GROUPS) "

## WRITTEN INSTRUCTIONS FOR EXPERIMENTAL SUBJECTS

WHAT TO DO NEXT

Please walk along the corridor to the "Exit" sign, turn left and go up the stairs to Room 942 **A**.

When you get to the room, go in and close the door behind you.

You will find a table with envelopes on it which contain the rest of your forms.

Please sit down and wait until you hear a buzzer sound before you open the first envelope (about 5 minutes).

When you hear the buzzer, open the first envelope, take out the test and begin it right away.

After you have finished and sealed the first test, continue with the others in numerical order without delay.

## WRITTEN INSTRUCTIONS FOR CONTROL GROUP 1

INSTRUCTIONS

Please walk along the corridor to the "Exit" sign, turn left and go up the stairs to Room S942 A.

When you get to the room, go in and close the door behind you.

You will find a table with a large brown envelope on it which contains your test form.

Please sit down at the table and wait until you hear a buzzer sound before you open the envelope (about 5 minutes).

When you hear the buzzer, open the envelope and take out the test. Read the instructions carefully and then do the test right away.

## WRITTEN INSTRUCTIONS FOR CONTROL GROUP 2

INSTRUCTIONS

Please walk along the corridor to the "Exit" sign, turn left and go up the stairs to Room S942 A.

When you get to the room, go in and close the door behind you.

You will find a table with envelopes on it which contain your test forms.

Please sit down at the table.

Open the first envelope right away and take out the test. Read the instructions carefully and then begin the test.

After you have finished and sealed the first test, continue with the others in numerical order without delay.

APPENDIX 12

SUMMARY TABLES OF THE ANALYSES OF VARIANCE FOR THE  
FIVE MOOD FACTORS OF NET MOOD CHANGE FOR IMPACT  
AND DELAY

Table 16

Analysis of Variance Summary Table for Net Mood Change upon  
Impact for Factor 1

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	3.05	1	3.05	0.67	0.42
Windows	5.88	2	2.94	0.65	0.53
2-way Interactions					
Size X Windows	13.88	2	6.94	1.52	0.23
Residual	255.02	56	4.55		
Total	277.48	61	4.55		

Table 17

Analysis of Variance Summary Table for Net Mood Change upon  
Impact for Factor 2

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	0.88	1	0.88	0.21	0.65
Windows	9.70	2	4.85	1.18	0.32
2-way Interactions					
Size X Windows	16.45	2	8.22	2.00	0.15
Residual	230.40	56	4.11		
Total	257.35	61	4.22		

Table 18

Analysis of Variance Summary Table for Net Mood Change upon  
Impact for Factor 3

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	4.14	1	4.14	1.35	0.25
Windows	6.78	2	3.39	1.10	0.34
2-way Interactions					
Size X Windows	23.96	2	11.98	3.90	0.03
Residual	172.20	56	3.08		
Total	206.77	61	3.39		

Table 19

Analysis of Variance Summary Table for Net Mood Change upon  
Impact for Factor 4

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	0.36	1	0.36	0.21	0.65
Windows	9.86	2	4.93	2.89	0.06
2-way Interactions					
Size X Windows	3.93	2	1.97	1.15	0.32
Residual	95.40	56	1.70		
Total	109.42	61	1.79		

Table 20

Analysis of Variance Summary Table for Net Mood Change upon  
Impact for Factor 5

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	0.02	1	0.02	0.01	0.94
Windows	1.69	2	0.84	0.34	0.71
2-way Interactions					
Size X Windows	0.97	2	0.48	0.20	0.82
Residual	138.87	56	2.48		
Total	141.55	61	2.32		

Table 21

Analysis of Variance Summary Table for Net Mood Change after  
Delay for Factor 1

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	1.23	1	1.23	0.26	0.61
Windows	13.76	2	6.88	1.46	0.24
2-way Interactions					
Size X Windows	7.49	2	3.75	0.79	0.46
Residual	264.17	56	4.72		
Total	286.34	61	4.69		

Table 22

Analysis of Variance Summary Table for Net Mood Change after  
Delay for Factor 2

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	0.04	1	0.04	0.00	0.95
Windows	18.09	2	9.05	1.00	0.38
2-way Interactions					
Size X Windows	11.58	2	5.79	0.64	0.53
Residual	507.70	56	9.07		
Total	537.37	61	8.81		

Table 23

Analysis of Variance Summary Table for Net Mood Change after  
Delay for Factor 3

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	7.26	1	7.26	4.70	0.04
Windows	0.78	2	0.39	0.25	0.78
2-way Interactions					
Size X Windows	0.54	2	0.27	0.18	0.84
Residual	86.57	56	1.55		
Total	94.98	61	1.56		

Table 24

Analysis of Variance Summary Table for Net Mood Change after  
Delay for Factor 4

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	0.19	1	0.19	0.14	0.71
Windows	2.47	2	1.24	0.92	0.40
2-way Interactions					
Size X Windows	0.40	2	0.20	0.15	0.86
Residual	74.87	56	1.34		
Total	78.00	61	1.28		

Table 25

Analysis of Variance Summary Table for Net Mood Change after  
Delay for Factor 5

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>p</u>
Main effects					
Room size	2.89	1	2.89	0.64	0.43
Windows	15.11	2	7.55	1.68	0.20
2-way Interactions					
Size X Windows	23.17	2	11.58	2.57	0.09
Residual	252.27	56	4.51		
Total	292.97	61	4.80		

APPENDIX 13

TABLES OF MEAN MOOD CHANGE, GROSS AND NET, BY  
ROOMS, FOR THE FIVE MOOD FACTORS

Table 26

Mean Gross Mood Change by Rooms for Factor 1:  
Negative Mood

Rooms	Impact	Delay	Total
R400	1.000	0.500	1.500
R200	1.900	2.00	3.900
R450	1.200	2.400	3.600
R250	2.200	1.700	3.900
R40	1.083	1.167	2.250
R20	2.200	2.900	5.100

Table 27

Mean Gross Mood Change by Rooms for Factor 2:  
Positive Mood

Rooms	Impact	Delay	Total
R400	2.300	1.900	4.200
R200	2.100	1.600	3.700
R450	3.100	3.300	6.400
R250	1.400	2.700	4.100
R40	2.00	2.833	4.833
R20	2.300	2.600	4.900

Table 28

Mean Gross Mood Change by Rooms for Factor 3:  
Egotistic Defiance

Rooms	Impact	Delay	Total
R400	0.200	0.600	0.800
R200	0.700	0.900	1.600
R450	0.700	0.600	1.300
R250	1.200	1.100	2.300
R40	1.167	0.667	1.833
R20	1.900	1.200	3.100

Table 29

Mean Gross Mood Change by Rooms for Factor 4:  
Fatigue

Rooms	Impact	Delay	Total
R400	0.600	0.200	0.800
R200	0.800	0.700	1.500
R450	0.300	0.400	0.700
R250	1.100	0.700	1.800
R40	0.500	0.833	1.333
R20	1.200	1.400	2.600

Table 30 \*  
Mean Gross Mood Change by Rooms for Factor 5:  
Concentration

Rooms	Impact	Delay	Total
R400	1.100	1.800	2.700
R200	2.00	1.700	3.700
R450	1.400	2.800	4.200
R250	1.400	1.400	2.800
R40	1.500	1.833	3.333
R20	1.100	1.900	3.000

Table 31

Mean Net Mood Change by Rooms for Factor 1:  
Negative Mood

Rooms	Impact	Delay	Total
R400	-0.800	+0.100	-0.700
R200	-0.900	+0.200	-0.700
R450	-0.400	0.000	-0.400
R250	-0.800	-0.500	-1.300
R40	-0.917	+0.333	-0.583
R20	+0.800	+1.500	+2.333

Table 32

Mean Net Mood Change by Rooms for Factor 2:  
Positive Mood

Rooms	Impact	Delay	Total
R400	-1.900	-1.700	-3.600
R200	-2.100	-0.400	-2.500
R450	-1.900	-1.700	-3.600
R250	-0.200	-2.300	-2.500
R40	-1.000	-0.500	-1.500
R20	-1.700	-1.000	-2.700

Table 33

Mean Net Mood Change by Rooms for Factor 3:  
Egotistic Defiance

Rooms	Impact	Delay	Total
R400	0.000	+0.300	+0.300
R200	-0.300	-0.300	-0.600
R450	-0.500	+0.400	-0.100
R250	-1.000	-0.100	-1.100
R40	-1.000	+0.333	-0.667
R20	+1.200	-0.600	+0.600

Table 34

Mean Net Mood Change by Rooms for Factor 4:  
Fatigue

Rooms	Impact	Delay	Total
R400	-0.600	0.000	-0.600
R200	-0.600	-0.300	-0.900
R450	+0.100	-0.200	-0.100
R250	-0.300	-0.100	-0.400
R40	0.000	+0.333	+0.333
R20	+0.800	+0.200	+1.000

Table 35

Mean Net Mood Change by Rooms for Factor 5:  
Concentration

Rooms	Impact	Delay	Total
R400	-0.300	-1.800	-2.100
R200	-0.400	+0.100	-0.300
R450	0.000	-1.800	-1.800
R250	-0.200	-1.200	-1.400
R40	-0.667	+0.167	-0.500
R20	-0.300	-0.900	-1.200