This thesis addresses the research question: How do different physical layouts of high-rise college dormitories affect residents' perceptions of satisfaction and crowding? The purpose of the research was to outline some design strategies that could be used to provide designers with information which can help them to design better high density dormitories.

Design variables which impact human spatial behavior were reviewed. Four hypotheses regarding the effects of space layout on crowding and satisfaction were tested.

Using analysis of variance for hypothesis testing, the study found that: (1) crowding, and satisfaction with rooms were not significantly affected by variations of space layout inside the rooms, and (2) residents of long-corridor dormitories felt more crowded about their dormitory than residents of short-corridor dormitories, but there was no difference in satisfaction with the dormitories, between long-corridor and short-corridor residents. Additional correlational analysis revealed that personal characteristics had different linkages
to satisfaction, crowding, and interpersonal behaviors. Limitations of this research and some suggestions for future dormitory design and research were consequently presented.
The Relationship Between Physical Layout and Satisfaction in High-Rise Student Housing

by

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>OBJECTIVES</td>
<td>6</td>
</tr>
<tr>
<td>LITERATURE REVIEW</td>
<td>10</td>
</tr>
<tr>
<td>Definitions</td>
<td>10</td>
</tr>
<tr>
<td>Effects of Density and Design</td>
<td>13</td>
</tr>
<tr>
<td>The Effects of Density</td>
<td>13</td>
</tr>
<tr>
<td>The Effects of Design</td>
<td>17</td>
</tr>
<tr>
<td>MATERIALS AND METHODS</td>
<td>25</td>
</tr>
<tr>
<td>Study Setting</td>
<td>25</td>
</tr>
<tr>
<td>Conceptual Assumption</td>
<td>31</td>
</tr>
<tr>
<td>Statement of Hypotheses</td>
<td>36</td>
</tr>
<tr>
<td>Variables</td>
<td>37</td>
</tr>
<tr>
<td>Dependent Variables</td>
<td>38</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>38</td>
</tr>
<tr>
<td>Other Variables</td>
<td>38</td>
</tr>
<tr>
<td>Data Collection</td>
<td>40</td>
</tr>
<tr>
<td>Limitations</td>
<td>42</td>
</tr>
<tr>
<td>Statistical Analysis</td>
<td>43</td>
</tr>
<tr>
<td>RESULTS AND DISCUSSION</td>
<td>45</td>
</tr>
<tr>
<td>Results</td>
<td>45</td>
</tr>
<tr>
<td>Frequency Analysis</td>
<td>45</td>
</tr>
<tr>
<td>Analysis of Variance</td>
<td>48</td>
</tr>
<tr>
<td>Correlation Analysis</td>
<td>51</td>
</tr>
<tr>
<td>Summary of Findings</td>
<td>58</td>
</tr>
<tr>
<td>Discussion</td>
<td>58</td>
</tr>
<tr>
<td>Effects of Space Layout on Crowding, Satisfaction, and Interpersonal Variables</td>
<td>61</td>
</tr>
<tr>
<td>Relationships Between Demographic Variables and Crowding, Satisfaction and Interpersonal Variables</td>
<td>63</td>
</tr>
<tr>
<td>CONCLUSIONS AND RECOMMENDATIONS</td>
<td>68</td>
</tr>
<tr>
<td>Conclusions</td>
<td>68</td>
</tr>
<tr>
<td>Recommendations</td>
<td>69</td>
</tr>
<tr>
<td>Design Practice</td>
<td>69</td>
</tr>
<tr>
<td>Future Research</td>
<td>70</td>
</tr>
<tr>
<td>LITERATURE CITED</td>
<td>72</td>
</tr>
<tr>
<td>APPENDICES</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>A. Letter to Student Participants</td>
<td>79</td>
</tr>
<tr>
<td>B. Self-Administered Questionnaire</td>
<td>80</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Floor plan of McNary Hall.</td>
<td>26</td>
</tr>
<tr>
<td>2. Floor plan of Finley Hall.</td>
<td>28</td>
</tr>
<tr>
<td>3. Locations of selected dormitories on Oregon State University campus.</td>
<td>29</td>
</tr>
<tr>
<td>4. Typical room plans.</td>
<td>30</td>
</tr>
<tr>
<td>5. The research model.</td>
<td>35</td>
</tr>
</tbody>
</table>
**LIST OF TABLES**

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Comparative statistics of McNary Hall and Finley Hall.</td>
<td>32</td>
</tr>
<tr>
<td>2. Frequency distributions of personal variables.</td>
<td>46</td>
</tr>
<tr>
<td>3. Comparative statistics of participants.</td>
<td>47</td>
</tr>
<tr>
<td>4. Analysis of variance: dormitory by room satisfaction, room crowding, dormitory satisfaction and dormitory crowding.</td>
<td>49</td>
</tr>
<tr>
<td>5. Correlations between dormitory and personal variables with interpersonal variables, crowding, and satisfaction.</td>
<td>53</td>
</tr>
</tbody>
</table>
The Relationship Between Physical Layout and Satisfaction in High-Rise Student Housing

INTRODUCTION

One of the major issues that society faces today is the ever growing population. It has been estimated that the world population is increasing by more than 200,000 persons a day. Meanwhile a substantial percentage of the population has settled in densely populated areas. In the United States approximately 70 percent of the populace now lives in metropolitan areas under high density conditions and the density is predicted to become considerably higher in the future (Freedman, 1975).

Population growth and concentration presents many difficulties for society and even threatens the quality of our living environment. Many cities are currently experiencing the strains of overcrowding on streets and freeways and in employment and housing opportunities (Schmid, 1970; Schmitt, 1966).

As a result of these problems, various approaches to reducing the effects of dense living have been recommended. Birth control and density control are two widely used mechanisms. Although the utilization of birth control methods and the liberalization of abortion laws in many places may reduce the number of children born, the techniques do not itself presage a decline in the number of births (Ehrlich and Erhlich, 1970).

Density control refers to imposing aggregate density standards in community planning and zoning as to the number of persons who may occupy a given amount of space in order to ensure a healthy living
environment. One such standard for developing new communities is 400 persons per acre. This standard was established by the American Public Health Association in 1946, and originated from observations in deteriorated urban ghettos, where high levels of physical and social illness were associated with the overcrowded living situation. However, this standard was developed without taking into consideration the effects of such confounding variables as poverty, poor nutrition, and poor conditions of sanitation and ventilation. The density standards recommended by American planners are thus considered unrealistic as requirements for public health and social welfare (Schmitt, 1963). Hall (1966) also argued that the application of a rigid density figure to a community or housing project may hardly be useful without the reference of an analysis of social interaction, group life, and cultural difference.

Since we are likely to have high concentrations of people in the foreseeable future, many people have asked "can we still have dense living and not the negative consequences attributed to it?" The problem then becomes how to accommodate large concentrations of people rather than just reduce their numbers.

Many architects and city planners have suggested that a sensible alternative for dense living is possible with the control of human use of space through physical design. For example, Le Corbusier (1933) claimed that high density made civilization possible because innovation depends on intense communication within close proximity. He also proposed utilizing high-rise buildings to achieve the density in order to facilitate the beneficial effects of intense human interactions.
Human responses to dense living in high-rise structures have received growing attention in the past decade. A body of socio-psychological research has reported that multi-unit housing is associated with various adverse outcomes such as negative attitudes toward the environment, perceived crowdedness, social withdrawal, and even delinquency among residents of low-income public housing (McCarthy and Saegert, 1979; Mitchell, 1971; Newman, 1973; Yancey, 1973), social isolation and dissatisfaction among the elderly (Cranz and Schumacher, 1977) and among young mothers with small children (Fanning, 1967). Other researchers reported that some dormitory residents experienced dissatisfaction and were unwilling to help other dormitory residents (Bickman et al., 1973; Holahan and Wilcox, 1979).

Architects of mass housing, especially the high rise flat, have been criticized as being mostly concerned with the aesthetics and economics of their designs and paying scant attention to the needs of residents. Alexander (1969) suggested two reasons for the apparent lack of concern by architects for the social and psychological consequences of their designs. First, many architects strongly believe that people are so adaptive and malleable that they can accommodate themselves to almost any kind of physical situation with no significant alteration in either their social and behavioral patterns or their physical condition. Thus, architects feel justified in creating designs without concerning themselves about any psychological consequences their designs might have on the future inhabitants. Secondly, many designers claim that so little is presently known about environmental effects on behavior and psychosocial phenomena that attempts to design structures on such a basis is senseless.
While the former reason may sometimes be true, researchers have demonstrated that the latter is clearly not the case (Proshansky et al., 1970). The systematic study of human responses to the day-to-day physical environment is a domain of research activity with a limited history. However, the architectural space and physical attributes of a building have been determined by behavioral scientists to have an impact on the behavior of people occupying the building.

Until recently the traditional design professions were accused of ignoring people and their needs. On the other hand, social scientists were accused of ignoring the means to facilitate the application of empirical findings to environmental design. Realization consequently grew that there is a mutual impact between man and his environment. Since then the environment has been studied in a dependent sense, as a manifestation and extension of human responses (Heimsath, 1977).

While the issue of high-rise living is gaining public prominence, the residents' responses to their physical environment and density has captured the attention of many design-oriented researchers. Researchers frequently want to evaluate the performance of existing buildings by determining how satisfied the residents feel about living in the building. In light of recent and predicted increasing demand for mass housing, the effects of high-rise living on its residents are of particular interest.

Although there is much literature deploring the consequence of living in densely populated low-income public housing, few researchers have investigated the effects of multi-unit dwellings on other types of special populations such as college students, the elderly, and hospitalized patients. This study is concerned with the application
of research data to the creation of a high-rise living environment for college students that can economize on space and yet still be a satisfactory place to live. Specifically, this research is concerned with the question of how architectural design can mediate students' space perception and residential satisfaction.
OBJECTIVES

It is important to clarify the reasons why the college dormitory was chosen as the study setting. Several researchers (Ricker and Lopez, 1963; Educational Facilities Laboratories, 1972) claim that the university is the place where the young go to pursue knowledge, to meet people, to experiment in personal development, and to seek an identity, and that the student dormitory can provide a place for these experiences. Students' needs for living space are physical, social, and personal. They need a place for fun, for stimulation, and also a place that provides for quiet, independence, privacy, and intimate socialization.

Dormitories function as a place for these various needs. Yet some are met by the design and equipment of the building, others by social organization. Specifically, the residence environment consists of two major parts, physical and social (Chickering, 1972). The physical environment functions as a material, structural envelope encasing the student. It channels the movement of the student and controls the amount of personal space he/she may use and it affects the psychological processes of the human organism.

The social environment of the dormitory, according to Chickering (1972), functions to provide a place for students to experiment with social skills and personal growth. It provides a place for sharing ideas and creating new worlds of experience and understanding. By informal contacts, students have been successful in educating each other in areas beyond the classroom. Also, the experience of dormitory living teaches individuals how to live comfortably in groups.
By observing the impact of one's behaviors on others and feeling the force of the groups' behavioral norms, students can develop personal systems of social values, and an awareness of similarities between people, the intimacy of a small group, and their own sense of identity.

Accordingly, a student dormitory is a great deal more than brick and concrete. It is people and their activities, thus these various needs and functions should be recognized and met. A dormitory should be constructed as an environment with living quarters scaled to people, providing privacy without isolation, and facilitating relationships with a small group of intimates. It should be organized and operated as a laboratory for practical training in the human relations of group living (E.F.L., 1972). Researchers have indicated that the residential environment has a significant impact on students in many aspects, such as satisfaction with college life, intellectual and academic productivity, and personal growth, as well as turnover rate. Feldman and Newcomb (1969) found that colleges and universities contain many different subenvironments and that students' perceptions of the overall college environment are affected in part by their residence hall. This is where the students spend much of their non-class time and where a large proportion of interpersonal interactions occur. The notion that residential living may be used to reduce the turnover rate has been further supported by the study of Alfert (1966) who reported that dropping out of a university was related to the living situation. In recent years the traditional college dormitory has been under attack. Critics argue that residents lose their identity due to
the impersonal scale of the structures and the numerous identical units double-loaded along long, narrow corridors.

Formerly, student housing administrators and designers responsible for dormitory programs were caught in a three-way squeeze: an ever-increasing student enrollment needed a place to stay, students were limited financially, and dormitory construction costs were rising faster day after day. Administrators and designers were so preoccupied with problems of growth, costs, and budgets that providing additional quantities of units became the dominant issue and the basic needs of dormitory residents were seldom questioned (E.F.L., 1972).

The typical dormitory building under these circumstances was derived from the housing program for low income people, i.e., identical rooms lined along both sides of a central corridor that leads only to a stairway or elevator shaft, compounded by "inhuman size". However, the student room is not a hotel room for a transient, it is the students' home for a while. As a result, the traditional dormitory design has been declared uninviting, crowded, and institutional in atmosphere. Too many students live anonymously in rows of identical boxes (Van der Ryn and Silverstein, 1967).

On most campuses, while the number of student housing units have been projected to increase, the quality in terms of performance of existing dormitories has not been systematically evaluated to determine whether they are effectively providing the kind of housing students need. In fact, there is no feedback channel between users' needs and building performances in our housing market, because few architects have attempted to understand and interpret the physical implications of the changing patterns of student living. Few studies
are available which analyze how student perceptions and behaviors may be influenced by the internal architecture. Since the building will last at least 50 years, far longer than any administrator's tenure, dormitory design needs to be thoroughly studied.

This study examined the influence of dormitory corridor length on students' perceptions of crowding, satisfaction and privacy. A paradigm for minimizing the design consequences of dense living in high-rise dormitories was determined in order to improve the quality of future campus housing.

In summary, the objectives of this research are:

1. To conduct a field study to determine relationships between dormitory corridor and room design and students' perceptions of crowding and satisfaction.

2. To provide architects with data which could help answer the question about how to design better housing for college students.

3. To provide housing administrators with ways to improve the student housing by making it more receptive to the "users".
LITERATURE REVIEW

With the observable growth of human population and the recognized trend toward dense living, the issue of the effects of multi-unit dwelling on human responses has captured the attention of many researchers. The number of studies in this area has mushroomed during the past 20 years. In some of the studies, the parameters of dense living were only vaguely defined; and there appears to be a certain confusion regarding the meaning of the terms crowding and high density. Therefore, the definition of these terms needs additional clarification.

Definitions

Density: Density refers to the number of objects per spatial unit. Residential density has at times been expressed in terms of persons per acre, persons per room, dwelling units per acre, etc. However, early sociological and planning studies did not give systematic attention to the implications of these different measures. One might, for instance, live in a dense household but in a low density neighborhood. The differences were well illustrated by Zlutnick and Altman (1972) who distinguished between inside housing-unit density, referring to the number of people per unit of space within a residence, and outside housing-unit density, referring to the number of people per unit of space in a larger spatial unit such as an acre. From this two-level framework, four situations were generated:
1. High inside and high outside density (e.g., many people living in a dwelling that is in a highly populated neighborhood such as an urban ghetto).

2. Low inside and high outside density (e.g., a luxury apartment in an urban setting).

3. High inside and low outside density (e.g., a rural situation with many people living in a dwelling).

4. Low inside and low outside density (e.g., a suburban setting).

This type of analysis implies that the unit of measurement of persons or dwellings per acre does not reveal the number of persons per dwelling or per room and that it, taken alone, can be misleading. Moreover, the analysis implies that although a high-rise building is more or less coincident with one definition of high density-dwelling units per building, there is not necessarily a relationship between actual inside living conditions and residence in a high-rise. A high-rise may be surrounded by considerable open space or designed with ample space in individual units or rooms. Since this study is interested in examining residents' responses to the dormitory architecture itself, density is defined as persons per spatial unit inside the dwelling, i.e., persons per room and persons per building.

**Crowding:** Crowding and density have been used interchangeably, but in fact, there appears to be ample justification for distinguishing between these terms. While Morris and Winter (1978) defined crowding as a condition of space deficits that can be physically measured, e.g., square feet per person and persons per
room, Stokols (1972) sharply distinguished between density and crowding on a physical-psychological basis. Density was regarded as a physical condition of limited space; crowding, on the other hand, referred to a condition in which restriction and inconveniences of limited space were perceived and experienced. For example, one can be with a group of strangers and feel quite crowded, but can be with the same-size group of friends and not feel crowded even when sharing a restricted amount of space.

Stokols stated that high density was a necessary, though not sufficient, condition for the feeling of being crowded. That is, increased numbers of people per unit of space was an important prior condition for a feeling of crowding, but it was not always wholly sufficient to create that feeling. Somewhat similar ideas based on the psychological concept have been offered by others. For example, Altman (1975) claimed that the experience of crowding resulted when one is unable to achieve desired levels of privacy, i.e., when one is exposed to more social interactions than he can control. Proshansky et al. (1970) postulated that crowding situationally occurred when the number of people present is great enough to reduce an individual's behavioral freedom and choice. There is agreement, then, that high density may not always lead to the perception of crowding, thus is in no way equal to crowding. Since this study is interested in examining students' spatial perception, crowding is defined as a subjective perception of a space, while density is an objective descriptor to be measured in terms of persons per spatial unit.
**Effects of Density and Design**

The study of dense living as it relates to human response is a complex topic of research. In order to assess how experiences and perceptions of dense condition can be altered, a review of past literature about the effects of living in dense settings is necessary as an aid to the understanding of the issue. In this section, previous research which is relevant to this study, but may not have been directly conducted in a dormitory setting, is examined.

**The Effects of Density**

There are three basic approaches to examining human reactions to density: analyses of correlates of residential density in large social units such as census tracts; laboratory experiments where intense high density can be achieved with experimental control; and field research in specific settings reflecting various ranges of density. This review of literature examined all three approaches to the research of density.

**Correlation Studies**

The correlation approach, originated by sociologists, has as its basic strategy being able to relate various measures of residential density, such as persons per acre and per room to various indices of social pathology, such as disease, mental illness, crime, and mortality rate. A study of 75 communities in Chicago (Galle et al. 1972; Galle and Gove, 1979) which used census and local community data examined the differential effects of persons per room, rooms per housing
unit, housing units per structure, and structures per acre on pathological indicators. Galle and Gove (1979) reported that persons per room was the significant pathological indicator for mortality, fertility, public assistance, and juvenile delinquency once the effects of socioeconomic status and ethnicity were taken into account. However, similar studies utilizing various areas of New York (Freedman et al., 1975) and of Honolulu (Schmitt, 1966), found no significant relationship between measures of density and pathology. Studying 243 central cities across the nation, Dye (1975) reported that pathology was in fact more closely related to demographical characteristics of the cities such as age, race, ethnicity, and socioeconomic status than density measures. Dye also found that the most significant pathological measure of density was persons per room, when the effects of demographic variables were controlled.

In general, results from these correlational studies indicate that there is little relationship between various measures of pathology and outside density such as persons per acre, and that there are some relationships between pathologies and inside density such as persons per room. Thus, a need was indicated for the present study, which investigated the effects of density within dwellings.

**Laboratory Experiments**

The laboratory approach typically involves subjects who are brought into a laboratory setting and exposed to no more than several hours of various density conditions. Experiments usually examine the effects of different room densities on subjects' physiological reactions, task performances, and verbal and nonverbal behaviors.
Studying the effects of varied room density on task performance, Freedman et al. (1972) placed subjects in same-number groups (4 and 7 persons) in either a large or small room, where they worked on tasks requiring cooperation and coordination over a several-hour period. From questionnaire results Freedman indicated that interpersonal behaviors such as aggressiveness, competitiveness, liking for others, and cohesiveness of the group were weakly affected when the size of space was changed.

However, a number of researchers examining the effects of room size found that groups in smaller rooms reported greater crowdedness, confinement, discomfort, and/or less friendliness than did similar groups in larger rooms (Baum and Koman, 1976; Epstein and Karlin, 1975; Evans, 1975; Saegert, 1975). On the other hand, Sundstrom (1975) found positive effects of high density on task performance, pleasantness, liking for others, and friendliness among male students. Although inconsistent effects of room density have been found by laboratory studies, most researchers using this approach suggested that high density had detrimental effects on human behaviors.

Field Survey

The other basic approach to the study of density is the use of data collected from field surveys of residents of general housing projects (Booth, 1976; Mitchell, 1971) or specific residential settings such as naval vessels (Dean et al., 1975), prisons (Paulus et al., 1975) and dormitories (Aiello et al., 1976; Baron et al., 1976; Eoyang, 1974).
In a summary of 3966 public housing residents in Hong Kong, Mitchell (1971) collected data on marital interaction and contacts with neighbors along with traditional measures of social pathology. He reported that the dwellers complained about the densities in their home and neighborhood, however, density did not appear to affect their levels of emotional strain, hostility, and husband-wife relations when poverty was controlled. It was some of the household features, e.g., distance of dwelling units from ground level, which affected their emotional strain and behavior.

Baron et al. (1976) compared the responses on evaluation of living space, self-perceptions of privacy and control, and interpersonal relationships between male dormitory residents in two-person rooms and three students who shared these same-sized two-person rooms. Residents of triples expressed greater feelings of crowding, were uncomfortable in their room, had less control over privacy and room activities, and were less satisfied with their room and roommates.

Examining the responses of male and female freshmen who lived in dormitories at Rutgers University, Aiello et al. (1975) discovered that subjects living in triple rooms reported feeling more crowded, less satisfied with living conditions, more physical and psychological problems, and more likely to break up with roommates than did subjects living in double rooms. They also found the effect of density on these variables was greater for women than for men. Similar results were also reported by Eoyang (1974). In general, field surveys have yielded results indicating that density can have negative socio-psychological effects on the population subgroups low in control of their residential environment, such as the low income and students.
The Effects of Design

A number of housing researchers have provided evidence that the physical design of housing has had serious adverse effects on residents' behaviors. Studies involving the effects of design with a focus on building size and space layout were examined in this section.

Effects of Building Size

There are two basic ways to examine human reactions to building size: examining the experience or perceptions of living in tall buildings and comparing the living experience between high-rise and non-high-rise groups.

As far as the former goes, some observers cite the considerable social distance among the co-tenants in high-rise apartments, leading to a situation of anonymity. Fanning (1967) studied the living experience in high-rise flats in Germany and found that young mothers (aged 20-29) of small children experienced a feeling of social isolation. However, Zito (1974) in a study of middle class residents of a high-rise in New York found that residents were mobile in socialization, enjoyed anonymity and the privacy of high-rise living, and moved to a high-rise precisely in order to divorce themselves from the pressure of social contact. A nationwide survey of elderly people in tall buildings (Nahemow et al. 1977) reported that building size was not found to affect the extent of individual social contacts and participation in activities in or out of the building. Instead, elderly residents were more concerned with fire and safety of the building.
Another group of studies compared living experiences of high-rise and non-high-rise residents. Using telephone interviews, Williamson (1981) investigated complaints and satisfactions of high-rise and non-high-rise residents in the area of Dusseldorf-Cologne, Germany. He found that high-rise residents registered more complaints about their buildings, yet when asked the degree of satisfaction about their quarters, there was no significant difference between the two groups.

McCarthy and Saegert (1979) compared living experiences of 2000 families who were residents of otherwise similar, high- and low-rise, low-income public housing projects in New York City. They found that high-rise tenants felt more crowded, experienced greater anonymity, had less privacy, and felt less safe in interior building spaces, and had less involvement and satisfaction with their buildings than low-rise tenants. They explained that high-rise residents experienced more crowding and dissatisfaction because of the absolute number of people and interactions inherent in the building. They also found that residents of higher floors felt more crowded. Another comparison of New York public housing (Newman, 1973) also revealed that building bulk correlated positively with anti-social behaviors and crime rates. However, Newman observed that one of the key problems was that the layout of certain spaces was not easily personalized or under the resident's control.

Examining the effect of building size on residential satisfaction and friendship formation, Holahan and Wilcox (1979) compared the responses of 129 freshmen living in a megadormitory and four low-rise dormitories at Texas State University. They found that the low-rise residents scored significantly higher on the measure of
satisfaction than did megadormitory residents and that female residents scored significantly higher on the friendship measure than did males.

Bickman et al. (1973) used both a drop-letter technique and a questionnaire survey to examine residents' responses in high-, medium- and low-rise dormitories at the University of Massachusetts. The return rate of letters which were stamped, addressed, and then dropped in the hallways of dormitories indicated that residents of high-rise dormitories were less willing to help. They also found that less mutual trust, cooperativeness, and friendliness was reported by these residents.

**Effects of Space Layout**

Human reactions to building spaces have been normally examined by comparing residents living in dwellings or rooms with different layouts. A series of studies under the Stony Brook Research Program by Baum and colleagues (Baum et al., 1975; Baum et al., 1979; Baum and Valins, 1977; Valins and Baum, 1973) used field and laboratory methods to compare college freshmen living in a traditional corridor dormitory with those living in a suite type dormitory. The interior architecture of a corridor-design dormitory, housing 34 students in 17 double-occupancy rooms arranged along a double-loaded corridor, required residents to share a common lounge and bathroom with 33 others. The other design, housed residents in four- or six-person suites, accommodated comparable numbers of residents in equivalent amounts of space on each floor, but required residents to share common areas with only three or five others.
From this research Valins and Baum (1973) and Baum et al. (1975) examined many facets of student life such as feelings of crowding, group cohesion and social involvement, responses in waiting room, verbal and nonverbal behaviors, performance on simulated personal space tasks, and group problem solving. Questionnaire data indicated that corridor residents felt more crowded and perceived themselves as having too much undesired contact with others. When asked to work on problem-solving tasks, corridor residents performed better under a competitive versus cooperative setting and, in the presence of others, suite residents worked in a more cooperative fashion with their roommates on a group problem-solving task. Also, unobtrusive observation in a waiting room indicated that corridor residents chose seats more distant from a confederate, looked less often at him, and interacted less frequently with the confederate, suggesting avoidance of interactions. In addition, corridor residents avoided strangers and experienced greater discomfort in the presence of strangers in laboratory settings.

Baum and Valins (1977) conceptualized the architectural difference in terms of the absolute number of interactions which an individual resident could have in these environments; because of the larger number of corridor residents sharing living space, the probability that they would encounter others and experience unwanted social encounters was greater than suite-residents. On the other hand, a suite arrangement created conditions of propinquity for a small number of people, thereby creating the basic conditions for moderately intimate, regular contacts.
At Trinity College, Baum and Valins (1977) also compared the effects of two other arrangements of dormitory space, i.e., long-corridor dormitory versus short-corridor dormitory. Each floor of the long-corridor dormitory housed 36-40 students living along an undifferentiated central hallway linked to two stairways and two community bathrooms. The short-corridor dormitory housed about 60 students on a floor but subdivided residents into three groups of 20-22 students each. Each subsection of a floor was supplied with a lounge and a bath on the central hallway. Interview data showed that long-corridor residents reported more crowdedness, greater unwanted social interactions with neighbors, and greater difficulty making friends on their floor than did short-corridor ones.

Similarly, Baum et al. (1978) used experimental and survey methods to investigate the responses of 120 freshmen living in long and short-corridor dormitories. Experimental data showed that long-corridor residents were more competitive and reactive, after one and three weeks of residence. However, by the end of seven weeks they became more withdrawn than short-corridor residents. Baum showed that long-corridor residents reported more crowding, frequent unwanted interaction, less satisfaction, and more problems in their dormitories than did short-corridor residents. The long-corridor group also reported greater difficulty regulating social contacts, lower expectations for such control, and a desire to avoid neighbors. These control-relevant problems became more salient as length of residence increased.

In a later report, Baum et al. (1979) suggested that architectural space arrangement was an important mediator of the size of local
residential groupings. The size of the residential grouping mediated group interaction, friendship formation, and the experience of crowding and social life.

As far as the effects of variation of room layout was concerned, a person's perception of a room could be affected by many conditions associated with the enclosure. Kriebel (1980), used students' evaluations of five dormitories at an urban university, and stated that door location, window location, and shape of room were factors influencing how occupants responded to dormitory living. Van der Ryn and Silverstein (1967) observed that visual privacy was not provided in rooms if the room door had to be left open for better ventilation, especially if the door faced another door across the hall.

In an experimental role-playing research procedure, Desor (1972) asked subjects to place miniature figurines into a model room until the room was just short of being crowded. Desor indicated that with the area held constant more figurines were placed in a room if screening partitions were present, if there were fewer external entrances into the room, and if the room was rectangular rather than square in shape. Desor suggested that the presence of partitions might increase privacy since partitions would help cut down on visual exposure and noise.

Another experiment examining the effects of furniture density on perceived room size and spaciousness (Imamoglu, 1973) indicated that there was an inverse relationship between perceived room size and furniture density, i.e., the empty room was assessed as the largest and the overfurnished as the smallest. It also found that both the empty
and overfurnished rooms were perceived as less spacious than a moderately furnished room.

Based on the review of previous research, it appears that the human responses to dense living are very complex. Research on the question of the relationship between density, design, and human behaviors has so far produced findings of associations which are, for the most part, inconsistent or weak, or severely qualified by control variables. It is difficult to tell whether any findings, positive or negative, are due to real differences in densities, in building size, or in non-density variables such as floor layout, or even non-physical variables.

As was noted, building height is only a rough indicator of density. Population densities may vary with increased building height, depending on the type and scope of density measures used and depending on floor layouts of building and unit. Where such measures as density within a dwelling vary directly with height and design, controls should be introduced to distinguish potential effects of each on the dependent variable.

While the primary interest of this research was the effects of physical design on dense living, it was also noted in the review that morbidity effects and behavior measures vary by socioeconomic status, sex, age, ethnic group status, etc. For example, people appear to live satisfactorily at high densities in Japan, Hong Kong, and Singapore. Schmitt (1963) compared aggregate statistics on Hong Kong with aggregate statistics on American cities. The population in very densely settled Hong Kong exhibited fewer signs of most pathologies than did more sparsely settled urban Americans. Schmitt suggested
that the effects of density can be strongly mediated by local culture, evolving in adaptation to and in support of changing, local density conditions. In other words, the same dense setting may be more or less conducive to pathology depending on the presence or absence of a suitable adaptive culture. Rapoport (1975) also pointed out that high-rise apartments appear to be more successful in continental Europe than in England due to the different life styles.

Some people in the U.S. also choose to live in high density areas and sometimes pay a premium to do so. For example, no one has to be forced to live in a high-rise apartment on New York's Park Avenue; and Chicago's near North Side is considered exciting and attractive because of its high density. Empirical studies published on middle class inhabitants' reactions to tall buildings are different from those of lower status groups. For example, Zito (1974) studying a high-rise building occupied by middle class persons found that residents enjoyed the anonymity and privacy of the high-rise.

The effects of non-physical factors were only briefly discussed here because the researcher's major focus is on the manipulation of physical parameters. In order to prevent ambiguity or error the following potential confounding variables were controlled for in the current study: population characteristics, building size, and building density.
MATERIALS AND METHODS

Designers are interested in predicting the effects of architectural features in order to create optimal housing. The ability to draw conclusions about relationships is important if data are to be used in the design or alteration of physical settings. This study was based on the comparison of homogeneous student samples living in similar buildings. The buildings are similar in terms of size and density but have different floor layouts. In an experimental sense, treatments are the direct result of design variations. In this study the assessment of these design variation treatments was conducted in a field setting which allowed the researchers to look at the effects of floor and room layouts on students perception of space and general residential satisfaction.

Study Setting

Two high-rise dormitories, Finley and McNary Halls, at Oregon State University were the setting for this research. The main floor of both dormitories contains a lounge, the Head Resident's office and apartment, and various service and recreational facilities. The rest of the floors in each building are living quarters. McNary Hall was built in 1963, and the floors of the living quarters were designed in a long corridor format with double-loaded wings. The wings are served by a central core which includes a lounge, laundry room, stairway, elevator shaft, community bathroom, and storage area (Figure 1). Finley Hall was built in 1968 in a short corridor arrangement. A service core and two common bathrooms serve the two shorter wings of
Figure 1. Floor plan of McNary Hall (conventional-corridor dormitory).
the double-loaded corridor as well as the living units lined to the south and north of the core (Figure 2).

Finley Hall, the dormitory with the shorter corridors, is a seven-story structure located in the south section of campus. The six-story McNary Hall, the dormitory with the long corridor design, is located at the east end of campus. Both buildings are approximately an equal distance from the student union and main library and have similar surroundings. For example, each has a dining hall next to it and has easy access to open spaces (Figure 3).

Both dormitories are open to all students who must apply for the limited number of rooms available. The dormitories accommodate students of various school levels and are coed with men and women separated by floor. McNary Hall houses men on 2nd, 4th, and 6th floors and women on 3rd and 5th; Finley Hall houses men on 2nd, 4th, and 6th, while 3rd, 5th, and 7th house women. The typical floor of McNary dormitory contains 36 double rooms and three single rooms, and total capacity of the dormitory is 373 persons; Finley has 30 doubles and 3 singles on a typical floor, and the total capacity of the dormitory is 378 persons.

As far as the living units are concerned, room furnishings are similar for both dormitories, and each resident has a bed, desk, chair, and wardrobe. In a typical double room of both dormitories the desk and wardrobes are built-in (Figure 4a & b); bunk beds are available upon request in both dormitories. The typical room density is about 88 square feet per person in McNary, and 89 in Finley. For the purpose of this study it was considered that residents in both
Figure 2. Floor plan of Finley Hall (modified-corridor dormitory).
Figure 3. Locations of selected dormitories on Oregon State University campus.

Numerical listing:

6 - McNary Hall and its Dining Hall
14 - Administrative Services Building
26 - Arnold Dining Hall
27 - Finley Hall
31 - Kerr (main) Library
50 - Memorial (student) Union Building
A. McNary Hall.  

B. Finley Hall.

Figure 4. Typical room plans (not to scale).
dormitories were furnished with a comparable amount of space. Table 1 summarizes the statistics of the two buildings.

**Conceptual Assumption**

The general intent of this post occupancy evaluation is to provide programmatic information to dormitory designers and administrators. This form of evaluation research involves an examination of a design once it has been completed, occupied, and used for a reasonable length of time. Designers and administrators of student housing can use the results of post occupancy evaluations as programmatic inputs which enable them to systematically improve the design of new dormitories.

The basic purpose of this research is to identify the design features which either do work or do not work for particular client groups in particular situations. The primary function of this practical-oriented research as a source of programmatic information is its basis in assessing the performance of real settings as opposed to predictions merely derived from general theory. In other words, to provide a nonarbitrary basis for generating design guidelines. This non-theoretical stance is the major strength of the current research.

Recent studies have made it clear that the way the physical environment is structured and organized is related to individual perceptions of the environment. An awareness that students sense a difference between dormitories and in some cases, between room types within a dormitory, was brought out in the literature review. In the selected research setting, the densities of the two dormitories as well as the density and furnishing of the living units of the two
Table 1. Comparative statistics of McNary Hall and Finley Hall.

<table>
<thead>
<tr>
<th></th>
<th>McNary Hall</th>
<th>Finley Hall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of dormitory building</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Persons per dormitory</td>
<td>373</td>
<td>378</td>
</tr>
<tr>
<td>Floors</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Rooms per floor</td>
<td>39</td>
<td>33</td>
</tr>
<tr>
<td>Percent double rooms</td>
<td>92</td>
<td>91</td>
</tr>
<tr>
<td>Square feet per person in room</td>
<td>88</td>
<td>89</td>
</tr>
<tr>
<td>Corridor type</td>
<td>long</td>
<td>short</td>
</tr>
</tbody>
</table>
dormitories were considered comparable. However, the arrangement of floor spaces within the living quarters and spaces within the individual living unit between the two dormitories were considered different. The different layouts of space which are compatible in density led the researcher to question how these two dormitories affect students' perceptions of space and general residential satisfaction.

In the long corridor dormitory (McNary Hall) residents live on floors designed with long wings. Floors in the short corridor dormitory (Finley Hall) are broken into several small sections. Several studies such as Baum and Valins (1977) and Baum et al. (1975) compared the residents of a traditional corridor-style dormitory with those who lived in four-to-six person suite-style dormitories. These researchers found that corridor residents felt less satisfied and more crowded in their dormitory. Different building configurations have been found to affect residents' perception of their environment. In the research setting of the current study, the difference of corridor length between the two dormitories was expected to have different effects on satisfaction and crowdedness of living in the dormitory.

Between the two dormitories, there are also two design attitudes visible in the configuration of the student rooms. In the rooms of the long corridor dormitory, an individual's furniture is arranged in a linear pattern, i.e., one's desk, wardrobe, and bed are placed against one wall, the other person's are placed against the wall on the opposite side of the room (Figure 4a). In the short corridor dormitory, the two desks and two wardrobes are placed along one wall, and the two beds are placed along the wall on the opposite side of the room (Figure 4b).
The former arrangement is an attempt to create two identical areas for the occupant. Usually this attempt takes the form of symmetry. The nominally symmetrical plan does have the advantage of clearly defining territory for each occupant. The short corridor dormitory room arrangement at first appears to be symmetrical, but the door and window locations preclude any symmetry. While in theory the students may have the same amount of space and type of furnishings, the clearly equal, symmetrical space is not possible. There will be a difference in each person's space within the room and one student may feel that the other one has the "better deal" due to the window location. The different space arrangements between the two types of dormitory rooms, may have an effect on the resident's satisfaction and feeling of crowdedness.

The post-occupancy study of the effects of the design variations at both dormitory and room levels was assumed to be able to lead dormitory designers and administrators to a systematic understanding of the performance of the existing dormitories, and to determine which kinds of physical design promote a better living environment. It could also provide data which can be used by them as they discuss with students, parents, legislators, and taxpayers the better type of housing available. It may also help to establish design guidelines of progressive improvements to modify existing dormitories.

The model in Figure 5 outlines a network of events associated with the research. The chain of events begins on the left side of the figure, with established design guidelines that manipulate the configurations of dormitories and rooms to be built. A post-occupancy survey was introduced to compare residents' responses to the buildings
Figure 5. The research model.
after they are built and used; subjective responses, i.e., the degree of perceived satisfaction and crowdedness at both dormitory and room levels. As a result of these responses, analytical evaluation was made to modify the existing design guidelines for high-rise dormitories. Thus a feedback loop was introduced.

Statement of Hypotheses

This study was designed to determine whether the residents of the long corridor dormitory differ from the residents of the short corridor dormitory in their perceived levels of crowding and satisfaction with their individual rooms and the dormitory as a whole. Thus, the following four hypotheses guided this study:

1. Residents living in the long-corridor dormitory do not significantly differ in room satisfaction from residents living in the short-corridor dormitory.

2. Residents living in the long-corridor dormitory do not significantly differ in their perceptions of room crowding from residents living in the short-corridor dormitory.

3. Residents living in the long-corridor dormitory do not significantly differ in dormitory satisfaction from residents living in the short-corridor dormitory.

4. Residents living in the long-corridor dormitory do not significantly differ in their perceptions of dormitory crowding from residents living in the short-corridor dormitory.

5. There is no significant relationship between the variables Dormitory type, Age, Sex, SES, Residency length, and Academic achievement and the interpersonal variables.
In addition to these four specific hypotheses, this study assessed how residents perceived the interpersonal relationships of living in the dormitory.

**Variables**

The definitions of the variables used in this study are:

**High-Rise Dwelling:** A high-rise dwelling, commonly refers to a multi-story building of six or more floors, thus requiring elevators. Housing units are arranged along one or two sides of a corridor (single- or double-loaded corridor design) (Jones, 1980; Morris and Winter, 1978).

**Dormitory Satisfaction:** the level of contentment/discontentment with current conditions within dormitory building.

**Room Satisfaction:** the level of contentment/discontentment with current conditions within individual dwelling units.

**Dormitory Crowding:** the level of contentment/discontentment with current amount of space within dormitory building.

**Room Crowding:** the level of contentment/discontentment with current amount of space within the individual dwelling unit.

**Density:** An objective descriptor to be measured in person per spatial unit inside the dwelling; persons per room and persons per building.

**Crowding:** A subjective perception of a space.
Dependent Variables

The hypothesis testing of this study involved four dependent variables—Dormitory Satisfaction, Room Satisfaction, Room Crowding, and Dormitory Crowding. In the questionnaire (Appendix B) these four items were all measured on five-point bipolar scales, and the operationalization was as follows:

**Dormitory Satisfaction:**
How satisfied are you with living in this dorm?
Very satisfied --- 1 2 3 4 5 --- Not at all

**Room Satisfaction:**
How satisfied are you with living in your present room?
Very satisfied --- 1 2 3 4 5 --- Not at all

**Dormitory Crowding:**
How crowded do you feel living in this dorm?
Very crowded ----- 1 2 3 4 5 --- Not crowded at all

**Room Crowding:**
How adequate do you feel the space in your room?
Crowded ----------- 1 2 3 4 5 --- Uncrowded

Independent Variable

The independent variable for hypothesis testing was the dormitories with different floor and room layouts in a dichotomous scale of long-corridor dorm versus short-corridor dorm.

Other Variables

In addition to hypothesis testing, several questions relevant to this study were used. These items include:
Personal Variables. A section of questions to obtain factual information about demographic and schooling data were used. These items dealt with the categorial determination of sex, ethnicity, academic achievement, and socioeconomic status of the family (SES). Information such as age and length of residency were collected on interval scales.

Interpersonal Variables. A section including 10 questions rated on five point bipolar scales to investigate students' interpersonal attitudes and perceptions of their living environment was used. The questions used were as follows.

Density Tolerableness:
I don't mind living in a dormitory holding hundreds of people.
   Strongly agree --- 1 2 3 4 5 --- Strongly disagree

Anonymity:
People on this floor don't know about me and my actions.
   Strongly agree --- 1 2 3 4 5 --- Strongly disagree

Participation:
Very few people participate in social activities of this floor.
   Strongly agree --- 1 2 3 4 5 --- Strongly disagree

Neighboring:
Although I occasionally enjoy talking to my neighbors, I don't like to get involved with them.
   Strongly agree --- 1 2 3 4 5 --- Strongly disagree

Helpfulness:
People on this floor are concerned with helping and supporting one another.
   Strongly agree --- 1 2 3 4 5 --- Strongly disagree

Self-reliance:
People on the floor tend to rely on themselves when a problem comes up.
   Strongly agree --- 1 2 3 4 5 --- Strongly disagree

Cohesiveness:
There is a feeling of unity and cohesion among floor-mates.
   Strongly agree --- 1 2 3 4 5 --- Strongly disagree
Friendliness:
I would say this floor is a friendly place to live.
Strongly agree --- 1 2 3 4 5 --- Strongly disagree

Privacy from Roommate:
How much privacy would you say that you have from your roommate?
Very much ------- 1 2 3 4 5 --- None

Privacy from Neighbors:
How much privacy would you say that you have from your neighbors?
Very much ------- 1 2 3 4 5 --- None

Data Collection

The data source for this study was student responses to a self-administered questionnaire (Appendix B) developed by Huang (1982) at Portland State University. The 54-item questionnaire developed by Huang (1982) covered information about residents' personal backgrounds and their perceptual and behavioral responses to physical and social environments in the dormitory.

The development of the questionnaire was based on the questionnaires of previous studies (i.e., Marshall, 1972, Gerst and Moos, 1972). The questions investigating satisfaction and social climate of dormitory living have been repeatedly used in several studies (Gerst and Moos, 1972; Gerst and Sweetwood, 1973; Moos, 1978; Moos and Gerst, 1974), and questions investigating privacy and crowding were also previously used (Marshall, 1970; Marshall, 1972). Prior to the formal survey, a pre-test using a random sampling to draw two typical double rooms per floor was carried out, so that some feedback on the questionnaire design was obtained and necessary modifications of questions were made. These pre-tested rooms were not used in the final sample (Huang, 1982).
To ensure the accuracy of data, frequency distribution tables were made for all questions to check that they were coded, and punched correctly (Huang, 1982). Typical double rooms in both dormitories were employed as the subject pool because they were comparable in terms of the size and shape of furnished space between the two dormitories. In each dormitory the same numbering system was used for rooms on all typical floors. A random sampling was performed to draw 15 typical double rooms from the numbers in the room numbering system. In other words, 15 typical double rooms in the same locations of all residential floors of each dormitory were drawn as the sample rooms to insure a representative proportion of subjects from all floors.

Prior to the survey, permission was granted to the researcher to conduct the survey by Oregon State University. Two copies of the questionnaire were slipped under the doors of all 165 sample rooms on the same evening in the middle of Spring Term, 1980. Since most tenants were likely to move into the dormitories before or at the beginning of the term, it was considered that the novel effects of a new residence would have worn off after having lived there for at least two months. Accompanying the questionnaire was a cover letter explaining the purpose of the survey and instruction to return the completed form. Tenants were given ten days to return the questionnaire. A reminder was sent to them a week after the questionnaire was distributed.

In order to rule out the possible effects of density and cultural differences, responses from double rooms with only a single resident and rooms occupied by foreign students were screened out. As a result, a random sample of 123 residents was used in this study with
61 residents of McNary and 62 residents of Finley included. The usable return rate was 37.3%. The raw data in the form of a computer card deck was used in this study.

Limitations

There were several limitations of the data for this research. The population surveyed in this study was university students living in multi-story dormitories. This special subject pool places limits on the ability to generalize the findings to other populations. The inferences made from this data are limited to college students living in similar dormitories and they do not necessarily hold for other living groups in other types of dwellings, because the selected dormitories are different from, for example, general apartments in many ways. The dormitories are short-term residences for at most a couple of years, and their residents are students in a specific life cycle stage. Thus, the first limitation of the research arises in the attempt to generalize the findings to general multistory apartments and condominiums.

The second limitation was inherent in the nature of this one-shot study. Time complicates the interactions between physical structures and users. Buildings may wear and deteriorate, and spaces may be improved. User characteristics may change, either the same users grow older or new users from a different subculture may replace older tenants. The general social rate of change appears fast; it is even more rapid within the college environment, where four years is a full generation. To account for historical changes in the environment and to recognize changes within the college, theoretically a longitudinal
research design appears more appropriate than the current cross-sectional study. However, due to constraints of time and money, the cross-sectional research design was necessary and could be replicated in the future to get longitudinal results.

**Statistical Analysis**

Three types of statistical analyses were used in this study. The first task of data analysis is to understand the basic characteristics of the sample. Frequency analyses were performed on all selected demographic variables with frequency distributions and central tendencies of the variables examined.

To test the four hypotheses, analysis of variance was performed to determine the significant difference between means of the two groups on all four dependent variables. The difference was considered significant if the significance level (p) was equal to or less than 0.05.

Correlation analysis was used to examine the strength and direction of the relationships between selected independent and personal variables with crowding, satisfaction, and interpersonal variables. In analyzing the correlation, a coefficient (r) with an absolute value above 0.20 was considered to indicate a relationship worthy of further exploration. In addition, a significance test, derived from the use of Student's t statistic, was reported for each coefficient. In this study, in order to consider the correlation significant and be able to reject the null hypotheses that the correlation between two variables in the population is zero, a probability equal to or less than 0.05 was required. Computer analysis was
carried out through the Portland State University computer by using the *Statistical Package for the Social Sciences* (SPSS) (Nie et al., 1975).
RESULTS AND DISCUSSION

Results

Frequency Analysis

The subprogram "FREQUENCIES" in SPSS was used to examine the distribution and means of the personal variables, i.e., Age, Sex, Ethnicity, SES, Residency Length, and Academic Achievement. In order to understand the similarities and differences of the personal characteristics between the subject groups in the two dormitories, a separate frequency distribution was made for each dormitory. Table 2 shows the frequency distributions of these variables.

Based on the preceding analysis, a summarized comparison of subjects' characteristics between the two dormitories is shown in Table 3. Subjects' age and length of residency of both dormitories were almost identical. Both dormitories contained predominantly white residents (93.1% in McNary, 95.1% in Finley), and a slightly higher percentage of males than females (41.0% in McNary, 45.2% in Finley). It was also found that both dormitories contained a higher proportion of students with a grade above average (76.7% in McNary, 72.1% in Finley) and most students were from middle class families (71.1% in McNary, 85.2% in Finley). From the frequency distributions the two groups appeared quite comparable demographically.
Table 2. Frequency distributions of personal variables.

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<th></th>
<th>Finley Hall</th>
<th></th>
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<td></td>
<td></td>
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<td>Adjusted frequency (%)</td>
<td>Absolute frequency (n)</td>
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<td>1</td>
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</tr>
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<td>62</td>
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<td>6.6</td>
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<td>14</td>
<td>22.9</td>
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<td>3</td>
<td>31</td>
<td>50.8</td>
<td>37</td>
<td>60.7</td>
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<td>--</td>
<td>1</td>
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</tr>
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<td>Total</td>
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<td>62</td>
<td>100.0</td>
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<td>performance</td>
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<td>(grade)</td>
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<td>14</td>
<td>23.3</td>
<td>17</td>
<td>27.9</td>
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<td>--</td>
<td>--</td>
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</tr>
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<td></td>
<td>M*</td>
<td>1</td>
<td>--</td>
<td>1</td>
<td>--</td>
</tr>
<tr>
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<td>Total</td>
<td>61</td>
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<td>62</td>
<td>100.0</td>
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</table>

*M = missing cases.
Table 3. Comparative statistics of participants.

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<tr>
<th></th>
<th>McNary Hall</th>
<th>Finley Hall</th>
</tr>
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<tr>
<td>Sample size</td>
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<td>62</td>
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<tr>
<td>Mean age</td>
<td>19.2</td>
<td>19.9</td>
</tr>
<tr>
<td>Sex (percent female)</td>
<td>41.0</td>
<td>45.2</td>
</tr>
<tr>
<td>Ethnicity (percent Caucasian)</td>
<td>93.1</td>
<td>95.1</td>
</tr>
<tr>
<td>SES (percent middle class)</td>
<td>71.1</td>
<td>85.2</td>
</tr>
<tr>
<td>Mean length of residency (terms)</td>
<td>2.8</td>
<td>2.9</td>
</tr>
<tr>
<td>Academic achievement (percent A &amp; B)</td>
<td>76.7</td>
<td>72.1</td>
</tr>
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</table>
Analysis of Variance

SPSS subprogram "BREAKDOWN" with a one-way analysis of variance (ANOVA) was used for hypothesis testing. The first hypothesis to be tested was:

Residents living in the long-corridor dormitory do not significantly differ in room satisfaction from residents living in the short-corridor dormitory.

An ANOVA was performed to compare the scores of Room Satisfaction of long-corridor residents to those of short-corridor residents. As illustrated in Table 4, the mean Room Satisfaction scores of both groups were as follows:

The long-corridor group: \( (n=47) = 2.49 \)

The short-corridor group: \( (n=53) = 2.30 \)

(Measuring scale: Very satisfied = 1, not at all = 5)

Although the long-corridor residents reported a lower degree of satisfaction with their rooms (indicated by higher mean scores) than the short-corridor residents, the result of ANOVA \( (F = 0.85, p = 0.36) \) showed that the difference was not statistically significant because the significance level \( (p) \) was larger than 0.05. In other words, the null hypothesis that there was no significant difference in Room Satisfaction between the two groups was not rejected.

The second hypothesis tested was:

Residents living in the long-corridor dormitory do not significantly differ in their perceptions of room crowding from residents living in the short-corridor dormitory.
Table 4. Analysis of variance: dormitory by room satisfaction, room crowding, dormitory satisfaction and dormitory crowding.

<table>
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<tr>
<th>Source of variation</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Number of cases</th>
<th>Degrees of freedom</th>
<th>F statistic</th>
<th>Significance level (p)</th>
</tr>
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<td></td>
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<tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Short-corridor</td>
<td>2.30</td>
<td>1.05</td>
<td>53</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Long-corridor</td>
<td>2.49</td>
<td>0.96</td>
<td>47</td>
<td>100</td>
<td>1.98</td>
<td>0.85</td>
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<tr>
<td>Dormitory Satisfaction</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-corridor</td>
<td>2.32</td>
<td>1.16</td>
<td>53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-corridor</td>
<td>2.47</td>
<td>0.93</td>
<td>47</td>
<td>100</td>
<td>1.98</td>
<td>0.49</td>
</tr>
<tr>
<td>Room Crowding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-corridor</td>
<td>2.67</td>
<td>1.04</td>
<td>61</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Long-corridor</td>
<td>2.47</td>
<td>1.05</td>
<td>58</td>
<td>119</td>
<td>1.17</td>
<td>1.16</td>
</tr>
<tr>
<td>Dormitory Crowding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-corridor</td>
<td>3.47</td>
<td>1.31</td>
<td>62</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-corridor</td>
<td>2.93</td>
<td>1.12</td>
<td>60</td>
<td>122</td>
<td>1.20</td>
<td>5.83</td>
</tr>
</tbody>
</table>

\(^a\) Very satisfied = 1, not at all = 5.

\(^b\) Crowded = 1, uncrowded = 5.

\(^*\) Significant (p \(<\) 0.05).
An ANOVA was also done to compare the scores of Room Crowding of long-corridor residents to short-corridor ones. As shown in Table 4, the mean score of Room Crowding of both groups were as follows:

The long-corridor group: \( (n=58) = 2.47 \)
The short-corridor group: \( (n=61) = 2.67 \)
(Measuring scale: Very crowded = 1, not at all = 5)

Although the long-corridor residents reported a higher degree of crowding in their rooms (indicated by lower mean scores) than the short-corridor residents, the result of ANOVA \( (F = 1.16, p = 0.28) \) showed that the difference was not statistically significant \( (p < 0.05) \). In other words, the null hypothesis that there was no significant difference in perception of Room Crowding between the two groups was not rejected. The third hypothesis to be tested was:

Residents living in the long-corridor dormitory do not significantly differ in dormitory satisfaction than residents living in the short-corridor dormitory.

The third ANOVA was done to compare the scores of Dormitory Satisfaction between the two groups. As illustrated in Table 4, the mean scores of Dormitory Satisfaction of both groups were as follows:

The long-corridor group: \( (n=47) = 2.47 \)
The short-corridor group: \( (n=53) = 2.32 \)
(Measuring scale: Very satisfied = 1, not at all = 5)

Although the long-corridor residents did report a lower degree of satisfaction with their dormitory (indicated by higher mean scores) than the short-corridor ones, the result of ANOVA \( (F = 0.49, p = 0.49) \) showed that the difference was not statistically significant. The
null hypothesis that there was no significant difference in Dormitory Satisfaction between the two groups was not rejected.

The fourth hypothesis to be tested was:

Residents living in the long-corridor dormitory do not significantly differ in their perceptions of dormitory crowding from residents living in the short-corridor dormitory.

The fourth ANOVA was done to compare the scores of Dormitory Crowding between the two groups. As shown in Table 4, the mean scores of Dormitory Crowding of both groups were as follows:

The long-corridor group = (n=60) = 2.93
The short-corridor group = (n=62) = 3.47
(Measuring scale: Very crowded = 1, not at all = 5)

The comparison of mean scores showed that long-corridor residents perceived more crowded conditions in their dormitory (indicated by lower mean scores) than short-corridor residents. The ANOVA (F = 5.83, p = 0.02) indicated that the difference was statistically significant because the significance level (p) was smaller than 0.05. The null hypothesis that there was no significant difference in perception of Dormitory Crowding between the two groups was rejected.

Correlation Analysis

To examine how dormitory type and personal background relate to crowding, satisfaction, and interpersonal perceptions and attitudes, SPSS subprogram "PEARSON CORR" was used to assess the strength and direction of correlations between dormitory type and personal variables (Age, Sex, Resident Length, Academic Achievement, Ethnicity,
and SES) with all interpersonal variables (Density, Tolerableness, Anonymity, Participation, Neighboring, Helpfulness, Self-reliance, Cohesiveness, Friendliness, Privacy from Roommate, and Privacy from Neighbors) and, Room Crowding, Dormitory Crowding, Room Satisfaction, and Dormitory Satisfaction.

In analyzing the correlation, as noted earlier, a coefficient (r) with an absolute value of 0.20 was considered to indicate a relationship worthy of further exploration. In addition a significance level of 0.05 had to be obtained on the correlation coefficient in order to consider the relationship significant. The significance test was used to indicate whether or not the null hypothesis, that the correlation between the two variables in the population was zero, should be rejected.

One of the personal variables, Ethnicity, was dropped from the correlation analysis. This variable did not have a large enough sample size in each of the variable categories to consider the Pearson r accurate.

Dormitory

As shown in Table 5, the variable dormitory, indicating short-corridor and long-corridor dormitories, was not correlated with the variables Dormitory Satisfaction, Room Satisfaction, and Room Crowding. But it was slightly related to Dormitory Crowding in the direction that long-corridor residents felt more crowded than short-corridor residents (r = -0.21). This relationship was significant and the null hypothesis, which was that the correlation between Dormitory and Dormitory Crowding in the population was zero, was rejected. This
Table 5. Correlations between dormitory and personal variables with interpersonal variables, crowding, and satisfaction.

<table>
<thead>
<tr>
<th></th>
<th>Dormitory</th>
<th>Age</th>
<th>Sex</th>
<th>SES</th>
<th>Residency length (term)</th>
<th>Academic achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dormitory</td>
<td>-0.21</td>
<td>0.13</td>
<td>0.01</td>
<td>0.08</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>Crowding&lt;sup&gt;e&lt;/sup&gt;</td>
<td>122</td>
<td>121</td>
<td>122</td>
<td>120</td>
<td>122</td>
<td>120</td>
</tr>
<tr>
<td>p</td>
<td>0.01*</td>
<td>0.08</td>
<td>0.45</td>
<td>0.19</td>
<td>0.23</td>
<td>0.21</td>
</tr>
<tr>
<td>Room</td>
<td>-0.08</td>
<td>0.17</td>
<td>0.21</td>
<td>-0.02</td>
<td>-0.13</td>
<td>-0.04</td>
</tr>
<tr>
<td>Crowding&lt;sup&gt;e&lt;/sup&gt;</td>
<td>119</td>
<td>118</td>
<td>119</td>
<td>117</td>
<td>119</td>
<td>118</td>
</tr>
<tr>
<td>p</td>
<td>0.19</td>
<td>0.03*</td>
<td>0.01*</td>
<td>0.41</td>
<td>0.09</td>
<td>0.31</td>
</tr>
<tr>
<td>Dormitory&lt;sup&gt;f&lt;/sup&gt;</td>
<td>0.10</td>
<td>0.05</td>
<td>-0.03</td>
<td>-0.08</td>
<td>-0.13</td>
<td>-0.13</td>
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<tr>
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<td>99</td>
<td>100</td>
<td>98</td>
<td>100</td>
<td>98</td>
</tr>
<tr>
<td>p</td>
<td>0.17</td>
<td>0.32</td>
<td>0.38</td>
<td>0.21</td>
<td>0.09</td>
<td>0.10</td>
</tr>
<tr>
<td>Room</td>
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<td>0.16</td>
<td>0.01</td>
<td>0.05</td>
<td>-0.08</td>
<td>-0.14</td>
</tr>
<tr>
<td>Satisfaction&lt;sup&gt;f&lt;/sup&gt;</td>
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<td>99</td>
<td>100</td>
<td>98</td>
<td>100</td>
<td>98</td>
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<tr>
<td>p</td>
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<td>0.48</td>
<td>0.30</td>
<td>0.23</td>
<td>0.09</td>
</tr>
<tr>
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<td>0.03</td>
<td>-0.10</td>
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<td>122</td>
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<td>p</td>
<td>0.49</td>
<td>0.01*</td>
<td>0.05*</td>
<td>0.38</td>
<td>0.13</td>
<td>0.09</td>
</tr>
<tr>
<td>Anonymity&lt;sup&gt;g&lt;/sup&gt;</td>
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<td>-0.01</td>
<td>-0.14</td>
<td>-0.21</td>
</tr>
<tr>
<td>p</td>
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<td>0.12</td>
<td>0.34</td>
<td>0.47</td>
<td>0.06</td>
<td>0.01*</td>
</tr>
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<td>Participation</td>
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<td>0.02</td>
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<td>-0.14</td>
</tr>
<tr>
<td>p</td>
<td>0.12</td>
<td>0.21</td>
<td>0.41</td>
<td>0.41</td>
<td>0.05*</td>
<td>0.06</td>
</tr>
<tr>
<td>Neighboring&lt;sup&gt;g&lt;/sup&gt;</td>
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<td>-0.11</td>
<td>-0.05</td>
<td>-0.03</td>
<td>-0.09</td>
<td>-0.23</td>
</tr>
<tr>
<td>p</td>
<td>0.12</td>
<td>0.11</td>
<td>0.29</td>
<td>0.36</td>
<td>0.16</td>
<td>0.01*</td>
</tr>
<tr>
<td>Helpfulness&lt;sup&gt;g&lt;/sup&gt;</td>
<td>-0.02</td>
<td>0.13</td>
<td>-0.09</td>
<td>0.11</td>
<td>0.00</td>
<td>0.04</td>
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</tr>
<tr>
<td>Self-Reliance&lt;sup&gt;g&lt;/sup&gt;</td>
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<td>-0.04</td>
<td>0.01</td>
<td>-0.22</td>
</tr>
<tr>
<td>p</td>
<td>0.31</td>
<td>0.04*</td>
<td>0.06</td>
<td>0.32</td>
<td>0.47</td>
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<tr>
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<td>-0.24</td>
<td>0.11</td>
<td>0.07</td>
<td>0.05</td>
</tr>
<tr>
<td>p</td>
<td>0.05*</td>
<td>0.04*</td>
<td>0.00*</td>
<td>0.12</td>
<td>0.24</td>
<td>0.29</td>
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Table 5 (continued)

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<th>Dormitory&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Age</th>
<th>Sex&lt;sup&gt;b&lt;/sup&gt;</th>
<th>SES&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Residency length (term)</th>
<th>Academic achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friendliness&lt;sup&gt;g&lt;/sup&gt;</td>
<td>r= -0.07</td>
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<td>-0.18</td>
<td>0.11</td>
<td>-0.03</td>
<td>-0.01</td>
</tr>
<tr>
<td></td>
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<td>122</td>
<td>120</td>
<td>122</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>p= 0.22</td>
<td>0.01*</td>
<td>0.02*</td>
<td>0.13</td>
<td>0.39</td>
<td>0.45</td>
</tr>
<tr>
<td>Privacy from Roommate&lt;sup&gt;h&lt;/sup&gt;</td>
<td>r= 0.13</td>
<td>0.13</td>
<td>-0.15</td>
<td>0.08</td>
<td>-0.00</td>
<td>-0.05</td>
</tr>
<tr>
<td></td>
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<td>123</td>
<td>121</td>
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<td>121</td>
</tr>
<tr>
<td></td>
<td>p= 0.08</td>
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<td>0.19</td>
<td>0.48</td>
<td>0.28</td>
</tr>
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<td>Privacy from Neighbors&lt;sup&gt;f&lt;/sup&gt;</td>
<td>r= 0.11</td>
<td>0.10</td>
<td>-0.03</td>
<td>0.01</td>
<td>-0.11</td>
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</tr>
<tr>
<td></td>
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<td>123</td>
<td>121</td>
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<tr>
<td></td>
<td>p= 0.12</td>
<td>0.14</td>
<td>0.36</td>
<td>0.45</td>
<td>0.11</td>
<td>0.12</td>
</tr>
</tbody>
</table>

<sup>a</sup>Short corridor = 0, long corridor = 1.

<sup>b</sup>Female = 0, male = 1.

<sup>c</sup>Upper class = 1, lower class = 4.

<sup>d</sup>A = 1, F = 5.

<sup>e</sup>Crowded = 1, uncrowded = 5.

<sup>f</sup>Very satisfied = 1, not at all = 5.

<sup>g</sup>Strongly agree = 1, strongly disagree = 5.

<sup>h</sup>Very much = 1, none = 5.

* Significant (p ≤ 0.05).
confirmed the result of the ANOVA. The variable dormitory was not significantly correlated with any interpersonal variables (Density Tolerableness, Participation, Neighboring, Helpfulness, Self-Reliance, Friendliness, Privacy from Roommate, and Privacy from Neighbors) except Anonymity and Cohesiveness at the .05 level. The null hypotheses for these two correlations (Dormitories and Anonymity, Dormitory and Cohesiveness) were rejected. In the population a relationship other than zero exists for these variables. The positive r between Dormitory and Anonymity indicated that short-corridor residents were more likely to agree that people did not know about them and their actions than were the long-corridor residents. The r value is relatively small (r = 0.17) indicating that the relationship between the two variables is weak. The negative r between Dormitory and Cohesiveness indicated that short-corridor residents were less likely to agree that there was a feeling of unity and cohesion on the dormitory floor. The r value is small (r = -0.15) again indicating that the relationship is weak.

Age

Table 5 illustrated that Age was significantly correlated with Room Crowding (r = 0.17, p = 0.03) and Room Satisfaction (r = 0.16, p = 0.05) at 0.05 level, thus the null hypothesis for these variables was rejected. The positive r indicated that older residents felt less crowded yet were less satisfied with their room than did younger residents. The r value is relatively small indicating that the correlations were weak. Moreover, age was found to be significantly correlated with Density Tolerableness, Anonymity, Self-Reliance,
Cohesiveness, and Friendliness at 0.05 level. Null hypotheses were rejected indicating a correlation other than zero exists in the population for these variables. Compared with younger residents, older ones were less likely to agree that they did not mind living in a dormitory which accommodated hundreds of people \((r = 0.23, p = 0.01)\), and more likely to agree that their neighbors did not know about them and their actions \((r = -0.22, p = 0.01)\).

Older dormitory residents were less likely than younger residents to agree that students in their dormitory were self-reliant \((r = 0.16)\). They also were less likely to feel that there was unity or cohesiveness on their dormitory floor \((r = 0.16)\) and less likely to perceive the floor a friendly place to live \((r = 0.20, p = 0.01)\). All the correlations between age and the interpersonal variables were weak.

**Sex**

As far as the relationships between crowding, satisfaction, and sex are concerned, sex was significantly correlated with Room Crowding at 0.01 level \((r = 0.21, p = 0.01)\). Thus the null hypothesis that the correlation between sex and Room Crowding was zero, was rejected. The \(r\) value indicated that males felt less crowded in their rooms than females. In addition, sex was found to be significantly correlated with Density Tolerableness, Cohesiveness, Friendliness and Privacy from Roommate. Compared with females, males were more likely to agree that they did not mind living in a dormitory holding hundreds of people \((r = -0.15, p = 0.05)\); male students agreed more often than female students that there was a feeling of unity and cohesion on the floor \((r = -0.24, p = 0.00)\).
Male students were also more likely than female students to agree that their dormitory was a friendly place to live ($r = -0.18$, $p = 0.02$) and males also perceived more privacy from their roommates than did females ($r = -0.15$, $p = 0.05$). None of these correlation coefficients were very high, indicating only weak relationships exist.

**SES and Residency Length**

As far as the relationships between crowding, satisfaction, and socioeconomic status were concerned, the data indicated that SES was not significantly correlated with any of the satisfaction and crowding measures. Table 5 illustrated that SES was not significantly correlated with any of the interpersonal variables. The variable Residency Length was also not significantly correlated with the crowding and satisfaction variables, and was correlated with only one of the interpersonal variables. Residency Length and participation are significantly correlated, although the relationship is weak ($r = -0.15$, $p = 0.05$). The direction indicates that as residency length increases students are more likely to agree that very few people on the floor participate in the social activities of the dormitory.

**Academic Achievement**

In examining the relationships between crowding, satisfaction and academic achievement, from Table 5 it can be concluded that Academic Achievement did not significantly correlate with any of the satisfaction and crowding measures. However, Academic Achievement did correlate significantly with Anonymity, Neighboring, and Self Reliance. This indicated that students with better academic achievement were
less likely to agree that their neighbors did not know about them and their actions \( r = -0.21, p = 0.01 \), that they did not like to get involved with their neighbors \( r = -0.23, p = 0.01 \), and that dormitory residents relied on themselves to solve problems \( r = -0.22, p = 0.01 \).

**Summary of Findings**

Three types of statistical analyses were performed in this research. A separate frequency analysis of all selected demographics was made for each dormitory. A comparison of the results from the analyses indicated that the two groups were quite comparable on those demographic aspects.

Of the four null hypotheses tested by ANOVA, only the one assuming no significant difference of dormitory crowding between the long-corridor and the short-corridor residents was rejected. The other three regarding the Room Crowding, Room Satisfaction and Dormitory Satisfaction were retained because no significant differences were found between the two dormitory groups.

Correlation analysis were performed among dormitory type, personal background, crowding, satisfaction and interpersonal perceptions and attitudes. Only weak relationships were found among the variables although some of these relationships were statistically significant. A further discussion of the relationships is presented in the next section.

**Discussion**

The purpose of this research was to determine how the space layout of high rise college dormitories affected residents'
perceptions of crowding and satisfaction with their dormitories and
individual rooms. The central assumptions underlying the research
were that the space arrangement was a vital determinant of crowding
and satisfaction; and the examination of different space layouts could
provide a basis for developing design guidelines.

The following four hypotheses were tested by analysis of
variance:

1. Residents living in the long-corridor dormitory do not
significantly differ in room satisfaction from residents
living in the short-corridor dormitory.

2. Residents living in the long-corridor dormitory do not
significantly differ in their perceptions of room crowding
from residents living in the short-corridor dormitory.

3. Residents living in the long-corridor dormitory do not
significantly differ in dormitory satisfaction from residents
living in the short-corridor dormitory.

4. Residents living in the long-corridor dormitory do not
significantly differ in their perceptions of dormitory
crowding from residents living in the short-corridor
dormitory.

Despite some indications that, as we predicted, the long-corridor
residents felt less satisfied both in their dormitory and room and
more crowded in their room than short-corridor residents, none of the
differences were found to be statistically significant. That is, the
null hypotheses about the effects of different physical layouts on
perceived room crowding, room satisfaction, and dormitory satisfaction
residents felt more crowded in their dormitory than short-corridor ones.

The following is a summary of the results from the correlation analysis which examined how dormitory type and personal variables related to crowding, satisfaction, and interpersonal perceptions and attitudes indicated:

1. Dormitory was significantly correlated with Dormitory Crowding which confirms the results from the ANOVA that long-corridor residents felt more crowded in their dormitory than did short-corridor residents. Dormitory was also significantly correlated with anonymity and cohesiveness although the relationship was weak.

2. Older residents agreed less often to the idea that the floor is a friendly place to live and that they do not mind living in a dormitory holding hundreds of people, and agreed more often that their neighbors do not know about them and their actions.

3. Compared with female students, male students felt less crowded in their room and more frequently agreed that there is a feeling of unity and cohesion on the floor.

4. Socioeconomic status was not significantly correlated with any of the interpersonal, crowding and satisfaction measures.

5. Length of Residence was significantly correlated with participation. The students who had lived in the dormitory longer felt that fewer people participated in the social activities of the floor.
felt that fewer people participated in the social activities of the floor.

6. Students with better academic achievement agreed less often that their neighbors did not know about them and their actions, that they did not like to get involved with their neighbors, and that dormitory residents rely on themselves to solve problems.

The Pearson correlation coefficients were low for all the relationships, even ones that were significant. This would indicate that relationships between the variables were weak.

Effects of Space Layout on Crowding, Satisfaction, and Interpersonal Variables

Room

From the results of the analysis of variance comparing the two groups' mean scores of Room Crowding and Room Satisfaction, it was determined that long-corridor residents did not feel more crowded and less satisfied with their rooms than short-corridor residents. It is possible that the two types of room layout were too similar to have any different effects for the residents. Because no similar studies were available for comparison, the effects of room layout on crowding and satisfaction will have to be determined by future research.

Dormitory

The expectation that long-corridor residents would feel significantly more crowded in their dormitories than short-corridor ones was
confirmed by the analysis of variance comparing the two groups' mean scores for Dormitory Crowding. These results are similar to the findings of Baum and Valins (1977) and Baum et al. (1978) who found that long-corridor residents reported more crowding in their dormitory than did short-corridor groups. Baum and colleagues conducted research in Stony Brook (Baum et al., 1975; Baum et al., 1979; Valins and Baum, 1973) from which they concluded that corridor residents felt more crowded in their dormitory than did suite group.

As for the students' responses to Dormitory Satisfaction, from the result of the ANOVA it was concluded that long-corridor residents felt less satisfied with their dormitories than short-corridor ones. However, the differences were too small to be statistically significant. This result was not in keeping with the findings of Baum et al. (1978) that residents of long-corridor dormitories felt less satisfied with their dormitory life than short-corridor residents. Conceptualizing the long-corridor residents as a large living group and the short-corridor residents as a small living group, the result was also not in keeping with the findings of Stony Brook Research Program (Baum et al. 1975; Baum et al., 1979; Valins and Baum, 1973). These researchers found that residents of corridor dormitories (large living group) felt less satisfied with their social life in the dormitories than suite residents (small living group).

From the results of the correlation analysis it was concluded that there were no significant differences between the two dormitory groups' responses on those interpersonal variables such as Density Tolerableness, Participation, Neighboring, Helpfulness, Self-Reliance, Friendliness, and Privacy from Roommates and Privacy from Neighbors.
These results were not in keeping with the findings of Baum and Valins (1977). From their research which compared short- and long-corridor residents, they concluded that long-corridor residents had greater unwanted social interactions with neighbors, and had difficulty making friends on their floor. In another study Baum et al. (1978) concluded that long-corridor residents had difficulty regulating social contacts. One possible explanation for this study's results of no relationships between the dormitory type and the interpersonal variables may be that the dormitory layouts were too similar. Also the difference in corridor length between the two dormitories may have been too small to have any different effects on the residents.

The variables that Dormitory did have a significant relationship with were Dormitory Crowding, Anonymity and Cohesiveness. Even though there are significant differences between the two dormitory corridor types and these variables the Pearson Correlation Coefficients indicate only weak relationships exist.

Relationships Between Demographic Variables and Crowding, Satisfaction and Interpersonal Variables

In this section, correlations between the demographic variables and crowding, satisfaction and interpersonal variables were compared to the findings of previous studies. Possible reasons to explain differences in findings between this study and previous ones were explained at the end of each subsection.
Age

Correlations between the variables Age and the crowding, satisfaction and interpersonal variables were all weak. However, the following variables did have a significant relationship with Age: Room Crowding, Room Satisfaction, Density Tolerableness, Anonymity, Self-Reliance, Cohesiveness, and Friendliness. These relationships could be interpreted to indicate that compared to younger students, older students felt their dormitory rooms were more crowded; they were less satisfied with their rooms; and they were more opposed to living in dormitories holding hundreds of people. These older students were also more likely to agree that their neighbors did not know about them and their actions; they perceived that students on their floor did not rely on themselves to solve problems; and they were less likely to agree that their dormitory floor was cohesive and a friendly place to live. The weak correlations for these relationships may have been due to the only slight differences of ages in the sample. Future research needs to focus on dormitories where there is more variation in class level in order to confirm these results.

Sex

Correlational analysis of this study can be interpreted that male students felt less crowded in their rooms and more of them agreed that there is a feeling of cohesion and friendliness on the floor than did female students. The males also indicated they were more tolerable of high densities and they felt more privacy from their roommates than did females. The findings are not in keeping with the findings of Walden,
Nelson, and Smith (1982). These researchers found that female students were less disturbed by the crowded conditions of their rooms. Baum et al. (1975) and Valins and Baum (1973) found that there was no sex difference in residents' crowding perception of college dormitories.

**Ethnicity**

As noted in Chapter II, Schmitt (1963) indicated that the effects of density could be mediated by local culture or long-established traditions of tolerance of dense living. Ethnic and cultural comparisons have further illustrated that culture provides the referents necessary for an individual to assign meaning to any level of density or to determine how he/she perceives space (Rapoport, 1977). In this study, the frequency data showed that white students perceived more privacy from their roommate and were more willing to get involved with their neighbors. However, due to small numbers of non-white students, these relationships could not be examined with correlation analysis.

**Socioeconomic Status**

While middle-class high-rise residents enjoyed anonymity and privacy in the dormitory buildings (Zito, 1974), other studies found that low income high-rise residents complained about crowding, lack of privacy and safety in their buildings (McCarthy and Saegert, 1979; Newman, 1973). In this study, socioeconomic status was not found to correlate significantly with any of the crowding, satisfaction, and interpersonal variables such as Anonymity and Privacy from Neighbors. Perhaps this study did not find significant relationships because over 71 percent of the students in McNary and 85 percent of the students in
Finley were classified as middle class. In the future studies need to be completed in dormitories with more variation in the socioeconomic status of the residents.

Length of Residence

As noted in Chapter II, Baum et al. (1978) found that residents of long-corridor dormitories reported difficulty in regulating social contacts, they desired to avoid neighbors and exhibited symptoms of helpfulness. These problems became more salient as length of residence increased. In this study, residency length was not found to correlate significantly with any of the crowding, satisfaction, and interpersonal variables except Participation. A significant but weak relationship was found between the length of Residence and Participation, with students who had lived in the residence hall longer feeling that fewer people participated in the social activities of the floor.

Academic Achievement

Academic Achievement did not significantly relate to any of the crowding and satisfaction variables. However, significant but weak correlations were found between Academic Achievement and some of the interpersonal variables. From the analysis it was concluded that students with higher grades felt that their neighbors knew about them and their actions although they did not want to get involved with their neighbors.

Among the demographic variables studied in this research, relationships between Dormitory Crowding and Satisfaction and the
interpersonal variables, Ethnicity, Sex, and Length of Residence were not found to confirm the findings of previous studies. These studies found significant relationships between some of the crowding, satisfaction and interpersonal variables. It is possible that the relationships are moderated or complicated by confounding factors such as self-selection of residence. The fact that students could request placement in a particular residence in the university might have a confounding influence on the research results. For example, the preferences for certain aspects of the chosen residence may result in a positive attitude toward all aspects of the dormitory environment. It is suggested that future research should look into the social, physical and economic reasons why particular residences are selected so as to have a better control of possible confounding influence.
CONCLUSIONS AND RECOMMENDATIONS

Conclusions

From this research two important conclusions can be drawn:

1. This study served an evaluation function; it provided a basis for assessing the performance of existing high-rise dormitories and for programming the planning of future student housing. Knowledge gained from this study will help to improve the housing policy and design to make them more receptive to residents. Even though the data alone can not generate a design, they can lead to a more informed design by keeping architects constantly aware of the fact that people will be inhabiting their buildings—residents' experience must be evaluated.

2. This research had an information function; investigating the linkages between design features and crowding/satisfaction, this research served to advance the understanding of human responses to dense living. It contributed a piece of information to the growing body of knowledge in the field of environmental psychology, and helped enlarge the scope of links between field research and design practice.

Hopefully the findings of this study will encourage others to engage in related research on dense residences on college and university campuses throughout the country. The influence of dense living on student behavior is an important part of the educational process and further study is needed.
Recommendations

Some recommendations were made based upon this study.

Design Practice

Room Layout

In addition to the basic functions such as sleeping, study, and storage, dormitory living units should provide for students' needs of relaxation, privacy, and intimate socialization. The spaces for these functions can be combined or some can be separated from the others. If a school had generous funding, one potentially optional solution would be a suite design, i.e., to provide each person with private bedroom space, which could open onto a common study-lounge space that two or more students would share. Previous dormitory studies have illustrated that a suite design would normally provide for high personal control and maximum privacy. At the same time, this design also provides a shared social space where interactions take place.

Typically, a suite design solution is unlikely because of budget constraints and one is left with the difficult situation of one room to be shared by two persons. A frequent problem with this arrangement is the lack of privacy it affords roommates.

Dormitory Layout

In this study, consistent with the hypotheses, long-corridor residents reported that their dormitory was more crowded than short-corridor ones, even though both student groups were exposed to comparable physical densities. Previous researchers (Baum et al., 1978)
also found that varying the number of configurations of dormitory rooms (suite, corridor length, etc.) influenced the residents' responses to crowding and satisfaction measures. This remained true even when actual physical densities were held constant.

Accordingly, satisfactory high-density conditions could be created through decreasing the number of people served by a given environment. For example, we can build smaller apartments or break up long corridors into smaller subunits. Furthermore, clear boundaries marked with doors, signs, obvious transition zones, different colors, textures, motifs, etc. designed for different areas could also facilitate or reinforce distinct subsections in the dormitory.

Some of the examples of design discussed for dormitory and room layouts are obviously suggestions which are speculative. Nevertheless, they illustrate options that are sensitive to the various emerging perspectives for dense living.

**Future Research**

The experience from this research suggests the need for additional empirical research to study the living experience in high-rise dormitories. This research only addressed the effects of space layout on crowding and satisfaction, future research could test the effects of other physical elements such as color and room location. It would be useful to replicate the study to discover, for example, whether there are differences between residents living at the end of hallways and those living by the central common area, or between those living on higher floors and those on lower floors.
Moreover, non-design oriented researchers need to test the effects other than design variables. For example, since this study found sex was significantly correlated with crowding in the dormitories, one can examine whether sex has an effect on crowding and satisfaction.
LITERATURE CITED


APPENDICES
LETTER TO STUDENT PARTICIPANTS

Hello,

The following questionnaire survey aims to understand how the building design of this dormitory services your needs. Primarily, your feelings concerning the adequacy of spaces in your room and the floor where you live are investigated. The result from your inputs and opinions on this study should help improve the quality of student housing for you and other students.

Your response to questionnaire will be scored by a computer, and will be held strictly confidential. Printing your name at the top page of questionnaire is optional.

I am interested in the total response of men and women in the various dormitories sampled, and am not analyzing individual scores. You will notice that I have pre-marked your room number at the top page of the questionnaire. The purpose of coding the number is to identify the location of your room within the floor plan of the building.

When you have completed the questionnaire, please drop it in the box placed on the reception counter at the Head Resident Office. I will pick it up at 7:00 PM on the 17th of April. Your immediate response shall be fully appreciated.

You will determine the success of this study, and I want to thank you in advance for taking time from your busy schedule to participate in this project. If you have any questions regarding the study, please contact me at 1-225-0642.

Sincerely,

Ed Tieh-Yeu Huang
Graduate Program in Urban Studies and Planning
Portland State University
APPENDIX B

SELF-ADMINISTERED QUESTIONNAIRE
(Data codes reported in parenthesis)

Building name: __________________
Room number: __________________

Please fill in an answer or check one from given answers on following questions:

1. How old are you? _____ (Number)

2. Are you ... _____ Female (0) _____ Male (1)

3. How many quarters have you lived in your present room? _____ (Number)

4. Did you live in this dormitory before you moved to your present room?
   _____ No
   _____ Yes (How many terms? _____ Room number _____)

5. What is your class level in Spring, 1980?
   _____ Freshman (1) _____ Post-baccalaureate (5)
   _____ Sophomore (2) _____ Graduate student (6)
   _____ Junior (3) _____ Other (9)
   _____ Senior (4)

6. How many credit hours are your carrying? _____ (Number)

7. How would you rate your academic achievement as measured by grades in college?
   _____ Mostly A's (1) _____ Mostly D's (4)
   _____ Mostly B's (2) _____ Mostly ungraded (5)
   _____ Mostly C's (3) _____ No college grades yet (6)

8. Which of the following describes the type of dwelling in which you lived most of the time while you were growing up?
   _____ Single-family (1) _____ Small apartment building (4)
   _____ Duplex (2) _____ Large apartment building (5)
   _____ Town house (3) _____ Other (Specify ______ ) (9)
9. Which of the following describes your room most of the time while you were growing up?

- Private room (1)
- Room shared with one person (2)
- Room shared with two persons (3)
- Room shared with three persons or more (4)
- Other (please specify) (9)

10. Would you say that the environment in which you lived most of the time while you were growing up was ...

- Very crowded (1)
- Somewhat crowded (3)
- Moderately crowded (2)
- Not crowded (4)

11. Approximately how much of your waking time (between the time you get up and go to bed) do you usually spend in your room?

- None (1)
- Less than 2 hours (2)
- 2 to 4 hours (3)
- 4 to 8 hours (4)
- 8 to 12 hours (5)
- More than 12 hours (6)

12. One of the following figures has been the typical plan of your present room (if the furniture is arranged differently, please indicate in the plan where they are placed), please shade the area that you consider as your own territory, where you feel most comfortable.

(Figure 4: Typical room plans on page 30 is used here.)

13. In the preceding plan of your room, please indicate which desk, bed, and wardrobe you use most of the time.

14. How many times do you use the lounge of this floor in a typical week?

- (Number)

15. How many times do you walk through the hallway of this floor on a typical day?

- (Number)

16. How many people on this floor could you count on for a small favor?

- (Number)

17. How many people on the floor could you count on in an emergency?

- (Number)
18. The following figure is the plan of the floor where you live, please shade the rooms and areas that you consider as places part of your territory, where you feel comfortable.

(Figures 1, 2, on pages 26, 28, were used here.)

19. How would you describe your roommate?

- American Indian/Alaskan native (1)
- Black/Afro-American (2)
- Caucasian/White (3)
- Chicano/Mexican American (4)
- Pacific Islander/Asian American (5)
- Resident with visa/International student (6)

20. How would you describe yourself?

- American Indian/Alaskan native (1)
- Black/Afro-American (2)
- Caucasian/White (3)
- Chicano/Mexican American (4)
- Pacific Islander/Asian American (5)
- Resident with visa/International student (6)

21. Which of the following describes the type of socioeconomic class in which you grew up?

- Upper class (1)
- Middle class (2)
- Middle-lower class (3)
- Lower class (4)
- Don't know (9)

Here are some sentences used to describe your feeling of your current living environment, as it seems to you. The description of your feeling is furnished with a 5-point scale, ranging from "strongly agree" to "strongly disagree." Please circle the number on the scale that comes closest to your feeling about each following statement.

22. I don't mind living in a dormitory holding hundreds of people.
   Strongly agree ----- 1 2 3 4 5 ----- Strongly disagree

23. People on this floor don't know about me and my actions.
   Strongly agree ----- 1 2 3 4 5 ----- Strongly disagree

24. Very few people participate in social activities of this floor.
   Strongly agree ----- 1 2 3 4 5 ----- Strongly disagree

25. Although I occasionally enjoy talking to my neighbors, I don't like to get involved with them.
   Strongly agree ----- 1 2 3 4 5 ----- Strongly disagree

26. People on this floor are concerned with helping and supporting one another.
   Strongly agree ----- 1 2 3 4 5 ----- Strongly disagree
27. People on the floor tend to rely on themselves when a problem comes up.
    Strongly agree ——— 1 2 3 4 5 ——— Strongly disagree

28. It is easy to meet people on the floor and to build friendship.
    Strongly agree ——— 1 2 3 4 5 ——— Strongly disagree

29. There is a feeling of unity and cohesion among floormates.
    Strongly agree ——— 1 2 3 4 5 ——— Strongly disagree

30. I would say this floor is a friendly place to live.
    Strongly agree ——— 1 2 3 4 5 ——— Strongly disagree

Please circle the number on the scale that comes the closest to your feeling about each following question.

31. How often do you say "hello" or "good morning" to people on this floor?
    Very often ———— 1 2 3 4 5 ———— Never

32. How well do you think people on the floor know each other?
    Very well ———— 1 2 3 4 5 ———— Not at all

33. About how many of them would you say that you know by name?
    Almost everyone ——— 1 2 3 4 5 ——— None

34. How often do you go to eat, to moves, to picnics, or other things like that with others on the floor?
    Very often ———— 1 2 3 4 5 ———— Never

35. How often do you and your neighbors exchange or borrow things such as books, tools, and food from one another?
    Very often ———— 1 2 3 4 5 ———— Never

36. How extensively have you been involved in social, athletic, or governmental activities of this floor?
    Very involved ———— 1 2 3 4 5 ———— Never

37. How extensively have you been involved in social, athletic, or governmental activities of this dormitory?
    Very involved ———— 1 2 3 4 5 ———— Never

38. How often do you hear noise through the walls of your room?
    Very often ———— 1 2 3 4 5 ———— Almost never

39. How often does the noise bother your sleeping or studying?
    Very often ———— 1 2 3 4 5 ———— Almost never

40. How much privacy would you say that you have from your roommate?
    Very much ———— 1 2 3 4 5 ———— None

41. How much privacy would you say that you have from your neighbors?
    Very much ———— 1 2 3 4 5 ———— None
42. How often do you have to wait to use the facilities in the suite or floor bathroom?
   Most of the time --- 1 2 3 4 5 --- Never

43. How many people do you usually see in the lounge on the floor when you are there?
   Quite a few -------- 1 2 3 4 5 -------- None

44. How often do you see others in the lounge on the floor whom you don't know?
   Very often -------- 1 2 3 4 5 -------- Never

45. How many people do you usually see in the hallway on the floor when you walk through it?
   Quite a few -------- 1 2 3 4 5 -------- None

46. How often do you see others in the hallway on the floor whom you don't know?
   Very often -------- 1 2 3 4 5 -------- Never

47. How crowded do you feel in this dormitory?
   Very crowded -------- 1 2 3 4 5 -------- Not crowded at all

48. How adequate do you feel the space on this floor?
   Full ------------------ 1 2 3 4 5 -------- Empty
   Cramped ------------------ 1 2 3 4 5 -------- Spacious
   Crowded ------------------ 1 2 3 4 5 -------- Uncrowded

49. How adequate do you feel the space in your room?
   Small ------------------ 1 2 3 4 5 -------- Large
   Cramped ------------------ 1 2 3 4 5 -------- Spacious
   Crowded ------------------ 1 2 3 4 5 -------- Uncrowded

50. How well do you get along with your roommate?
   Very well ------------------ 1 2 3 4 5 -------- Not at all

51. How satisfied are you with living in your present room?
   Very satisfied ------ 1 2 3 4 5 ------ Not at all

52. How satisfied are you with living in this dormitory?
   Very satisfied ------ 1 2 3 4 5 ------ Not at all

Please add any additional comments you would like to make on the following blank area. Thanks again for your valuable time!