THERAPEUTIC AND DEVELOPMENTAL DESIGN:

THE RELATIONSHIP BETWEEN SPATIAL ENCLOSURE AND IMPAIRED ELDER-CHILD SOCIAL INTERACTION

A Dissertation

by

MIN-YOUNG SEO

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2006

Major Subject: Architecture

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Approved by:

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ABSTRACT

Therapeutic and Developmental Design:
The Relationship between Spatial Enclosure and Impaired Elder-Child Social Interaction.
(August 2006)

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Social interaction and the availability of meaningful activities promote the physical and psychological well-being of children and older adults. The development of social interaction is closely related to physical and social environments that complement the therapeutic needs of cognitively impaired elders and the developmental needs of young children. This study examined the effects of the degree of spatial enclosure on social interaction between these two groups during physical exercise in an assisted living facility co-located with a childcare center. The multi-methodological approach allowed for triangulation and employed the following techniques: naturalistic observation, a Web-based and mail out survey, an experiment, semi-structured interviews, sequential analysis, nonparametric analysis, and content analysis.

The findings of this study demonstrated that a semi-enclosed spatial plan most influenced the prosocial behavior of older adults and young children. These elder-child prosocial behaviors were likely facilitated by a perception of adequate personal space, openness, and possible spaces for prospect and refuge within the semi-enclosed spatial plan. Elder-child social interaction was positively influenced by several programmatic factors which gave participants some sense of control. These findings led to design recommendations for creating appropriate developmental and therapeutic environments for children and older adults in intergenerational care settings. Recommendations were that a satisfactory balance be maintained between openness and enclosure as these stimulate elder-child social interaction.

DEDICATION

To my parents,
for the endless caring, love,
hard work, and dedication they have invested in my life.

To my sister,
for the sweet care, encouragement,
and dedication she has given and continues to give.

To my fiancé,
for the love, commitment, and deep meaning
he has brought into my life, especially at some very critical moments.

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Special appreciation is necessary for the children, residents, and staff at the Freedom House, the Sheridan of Bryan, and the Jack and Jill preschool who were involved in the study. I would like to express appreciation to the participants of the study survey. Their warm support and cooperation is what made this study possible. Particularly, Ms. Wendy Hazel should be recognized for her graciousness and generosity in allowing me to conduct this research at Freedom House. I would also like to thank Mr. Chuck Tedrick for his technical support and hard work in making the observation mock-up. Thanks also go to Dr. Matthew Kaplan for his consistent support to find intergenerational care facilities in the country. I am also grateful to my dear friend Grace Turner for her sweet care, encouragement, and support she gave me.

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CHAPTER I
INTRODUCTION AND REVIEW OF LITERATURE

For age is opportunity no less
Than youth itself, though in another dress,
And as the evening twilight fades away
The sky is filled with stars, invisible by day

- Henry W. Longfellow

1.1 THE CONTEXTS FOR INTERGENERATIONAL INTERACTION

We have gone through several demographic and social changes in the United States since World War II. These changes have included the aging of our population, isolation of the elderly, increasing divorce rates, and increasing percentages of single parents and working women. These changes have impacted the nature and quality of care for young children and older adults, leading to a shift in the fields of education and healthcare.

As a viable solution to these social problems, intergenerational programs have been implemented across the country. Intergenerational programs, as a social vehicle seek to bring generations together, promote social interaction, foster cultural continuity, and enrich individual lives (Kaplan et al., 2002). To better understand the need for potential change in child and elder care systems, the following section reviews demographic and social trends in the United States and their associated problems from an intergenerational perspective. This approach will allow us to consider younger and older generations as substantial human resources to the communities in which we live.

1.1.1 Demographic Changes in the United States

1.1.1.1 Age Distribution

The current age distribution in the United States reflects trends such as a higher

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This dissertation follows the style and format of *Environment and Behavior*.

fertility rate early in the 20th century and the post World War II Baby Boom (Ward, 1997). As shown in Figure 1.1, the proportion of children under age 18 has decreased from 36 percent in 1960 to 25 percent in 2001, and by 2020, this is projected to steadily decrease to 24 percent of the total U.S. population. In contrast, the number of older Americans age 65 and older has increased from 8 percent in 1950 to 12 percent in 2001. By 2020, the percentage in this age group is projected to make up 16 percent of the total U.S. population (The Federal Interagency Forum on Child and Family Statistics, 2002). By 2030, the percentage of younger and older populations will each make up about 22 percent of the total population. This trend toward a narrowing gap between the two populations is a clear implication for an intergenerational approach as a potential key in providing quality care for younger and older generations.

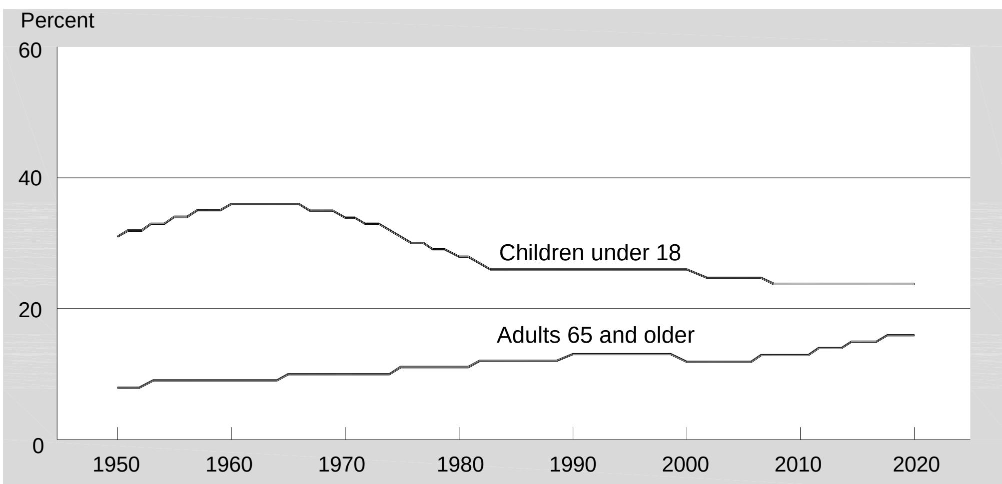


Figure 1.1: Older and Younger Populations in the United States
Source: Adapted from Federal Interagency Forum on Child and Family Statistics, 2002

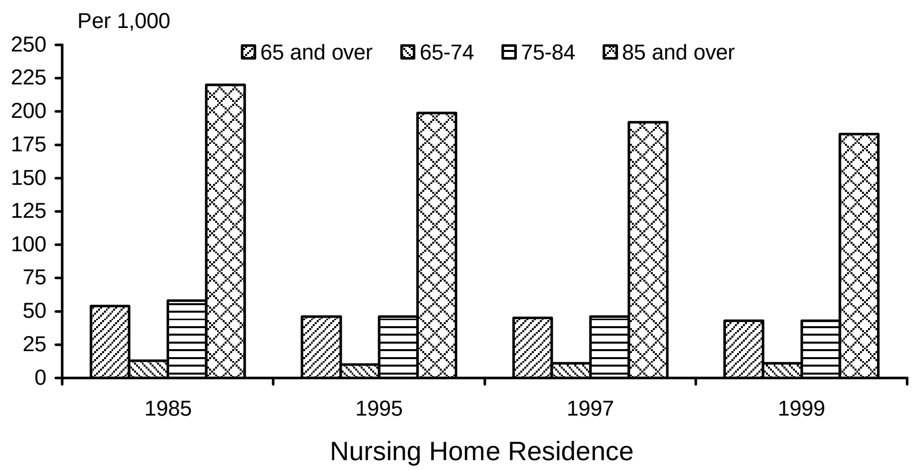
1.1.1.2 Oldest-Old Population (Age 85 and over)

In the last few decades, persons 85 years of age and over were the fastest growing group in an aging population. By 2050, the number of this age group is projected to increase to 5 percent of the U.S. population from 2 percent in 2000. This increase is attributed to an increased life expectancy, along with the fact that Baby Boomers begin to move into this age group (Federal Interagency Forum on Aging-Related Statistics, 2004). In addition to the longevity, the health and living arrangements are important factors of family ties because declining health is key to result in institutionalization which is often accompanied by decreased social contact with their family.

The physical and mental health of older adults varies greatly by age and sex. Particularly noticeable are huge differences between non-institutionalized persons and nursing home residents needing assistance for functional limitations[1]. In 1995 among non-institutionalized persons 70 years of age and over, 10 percent of women and 7 percent of men were unable to perform one or more activities of daily living (ADLs). In 1995, for older adults, the proportion of those disabled rose dramatically with age, ranging from 5 percent of women and 4 percent of men among persons 70-74 years, to 22.6 percent of women and 19.3 percent of men among persons 85 years of age and over (U. S. Department of Health and Human Services, 1999). In comparison to the relatively small proportion of non-institutionalized persons 70 years of age and over, the majority (97 percent) of nursing home residents age 65 and over received one or more ADLs in 1997. When considering the fact that 65 percent of nursing home residents in 1997 were 85 and over (see Figure 1.2), this age group is likely to include a high proportion of elderly adults with functional limitations (Federal Interagency Forum on Aging-Related Statistics, 2004). Regarding the mental health of the elderly, the total number of older adults with Alzheimer's disease (AD) in the US population was 4.5 million in 2000, with a range of 7 percent (0.3 million) for persons 65-74 years, 53 percent (2.4 million) for persons 75-84 years, to 40 percent (1.8 million) for those persons 85 years of age and over (Hebert et al., 2003). A similar trend toward an increased occurrence of Alzheimer's disease with age is expected to occur in 2050. By 2050, the older population of AD is projected to be more than 8 million for persons 85

[1] Assistance with functional limitations is indicated by six activities of daily living (ADLs), including bathing, dressing, eating, walking, using the toilet, and moving in and out of bed or chairs.

years and older; 4.8 million for persons 75-84 years, while the number for persons 65-74 years is expected to remain constant at 0.4 million (Hebert et al., 2003).



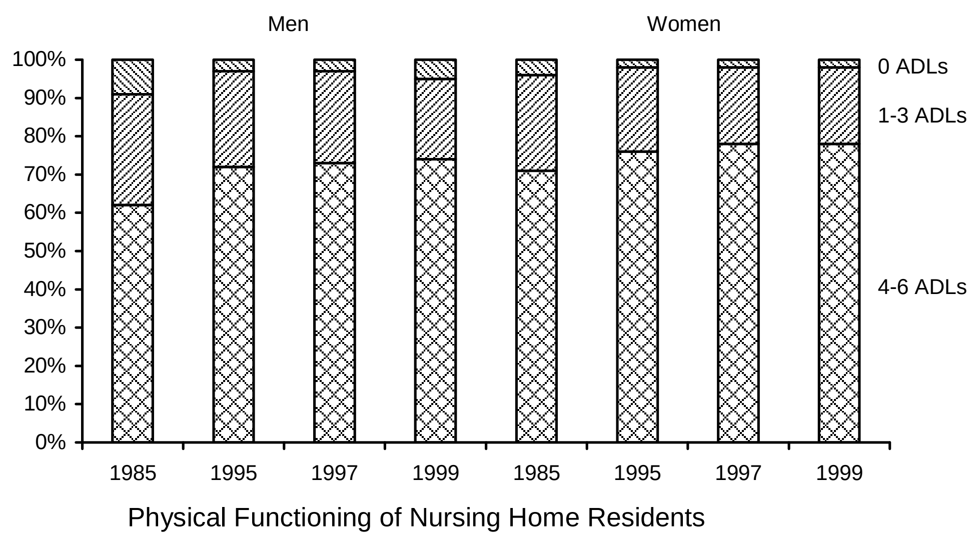


Figure 1.2: Nursing Home Residence (above) and Physical Functioning (below)
Source: Adapted from Federal Interagency Forum on Aging-Related Statistics, 2004

The prevalence of elderly adults living alone versus those residing in nursing homes is a distinctive phenomenon of the twentieth century. While the relatively small proportion (4.5 percent) of the older population lived in nursing homes in 2000, the rate of nursing home residence increases dramatically with age, ranging from 1.1 percent for persons 65-74 years, to 4.7 percent for persons 75-84 years, and 18.5 percent for persons 85 years of age and over (Federal Interagency Forum on Aging-Related Statistics, 2004). Among non-institutionalized older adults, six out of ten women 85 years of age and over lived alone. This is at least twice the number of non-institutionalized older men (U. S. Department of Health and Human Services, 1999). Given the greater likelihood of living alone, and having a diminished capacity to perform activities of daily living with increasing age, then it is likely that more older adults will have less contact and support from their families. In other words, a substantial decline in intergenerational co-residence, along with decreasing physical mobility, is likely to prevent older adults from being involved in the lives of younger generations. This would be despite greater opportunities for more years of parent-child interaction life expectancy increases.

1.1.2 Social Changes in the United States

1.1.2.1 Geographic Mobility

Geographic mobility has been the primary cause of age-segregation in terms of living arrangement and social activity. A consequence of geographic mobility is the reduced contact between parents and their adult children. This can result from the emigration of young adults to urban areas, postretirement migration to Sunbelt states, and the growth of the suburbs (Pillemer & Glasgow, 2000; Ward, 1997). For example, attractive, comfortable amenities in the suburbs such as quiet, open spaces are more likely to diminish contact between older adults and their non-co-resident children. According to reviews on geographic mobility (Pillemer & Glasgow, 2000; Ward, 1997), geographic mobility has declined in the United States since the 1960s. Although overall rates of geographic dispersion have diminished during the past few decades, there are a substantial number of older adults who do not have children, reside in long-term care facilities, or live alone. Therefore, intergenerational contact from neighbors, as a community resource, is likely to have a positive impact on the psychological well-being of older adults who lack contact with other generations in their family.

1.1.2.2 Baby Boomers

Concurrent with geographic mobility, marital status and the number of offspring are also very important contributors to the strength of parent-child relationships in old age (Pillemer & Glasgow, 2000). Spouses and children provide needed care and support for older persons. The awareness of the need to provide social support for older adults has received more attention as the Baby Boomer generation officially enters old age beginning in 2011. The Boomers, born between 1946 and 1964, are at somewhat greater risk of living alone due to several factors. These include a lower birth rate among Baby Boomer women than their mothers, higher lifetime divorce rate (over 50%), and better health at retirement (Pillemer et al., 2000). The Boomers' marital dissolution will also affect the amount of close family ties, including less contact with and less emotional support from their own children. Since a consistent fact is that lack of emotional support negatively impacts health and overall quality of life, then there needs to be more emphasis on promoting non-family social interaction, such as neighboring.

1.1.2.3 Preschool Children and Employed Mothers

The growing proportion of children under age 6 with employed mothers is an important factor in the changing nature of the quality of care for young children. They are more likely to be cared for by persons other than their parents for substantial amounts of time almost daily. By 1995, among children under six years of age, two in three were expected to have mothers working outside the home (Phillips, 1991). The trend toward greater numbers of employed mothers affects the type of childcare arrangements especially according to the age of the child. Statistical information shows that in 1997, a high proportion of children ages 3 to 6 (preschoolers) were more likely to be in a center-based childcare arrangement than children from birth through age 2 who were cared for in home-based care, by either a relative or non-relative. Nationally, the proportion of preschoolers cared for in center-based care arrangements rose from 42 percent in 1990 to 61 percent in 2000 (The Federal Interagency Forum on Child and Family Statistics, 2002). The more striking statistical information is that a significant proportion (30.2 percent) of preschoolers with employed mothers required multiple care arrangements[2] compared to those (6.5 percent) with mothers not employed outside the home(U.S. Department of Commerce, 2002).

As more women have participated in the labor force, either for reasons of personal fulfillment or economic need, the roles of women within the context of their families have expanded. Parents' roles as members of the workforce and caregivers for young children are likely to involve conflicting goals such as finding affordable childcare to facilitate both parents' employment and funding expensive services to support children's development. Surprisingly, one in three employed mothers of infants and one in four employed mothers of preschoolers experienced difficulty in finding adequate, affordable childcare (Galinsky, 1989). More working mothers, the need for quality childcare, and the increasing need for multiple care arrangements are expected to drive up the demand for accessible, affordable, and high quality childcare. These issues clearly have implications for the various intergenerational caregiving systems, which have a significant impact on children, their parents, the elderly, and society as a whole.

1.2 IMPACTS OF INTERGENERATIONAL INTERACTION ON QUALITY OF CARE

1.2.1 Impacts of Intergenerational (IG) Programs

The demographic and social trends reviewed above have affected the family system and the lives of children and the elderly. Within the last few decades, more emphasis on the nuclear family[3] and a large decline in consistent interactions between young and old have been frequently reported (Pillemer et al., 2000). This significant

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[2] Multiple care arrangements here refer to being cared for under two or more childcare arrangements. The childcare arrangements include care by a relative, daycare center, nursery or preschool, family daycare, non-relative care in child's home, but excludes self care.

[3] A nuclear family is a household consisting of two married parents and their children. Grandchildren and grandparents do not belong to the definition of a nuclear family.

trend, or age segregation, has diminished the opportunity for interaction between younger and older generations. For children, there has been a loss of cultural and historical connections and an increased fear of aging. For the elderly, there have been persistent feelings of loneliness, uselessness, and depression. Several studies have concluded that both the decline in life satisfaction among older people and the increase in myths and negative stereotypes toward the aged and aging among younger people seem to be connected to this trend of separation between the generations (Newman et al., 1997).

These social phenomena have given birth to intergenerational programs (IG) since the mid-1960s, which are alternatives for meaningful connections between children and older people through participating in activities as well as in sharing skills, knowledge, and experiences. Intergenerational programs call for using the shared and reciprocal needs of both generations (Hutchinson & Bondy, 1990; Osborne & Bullock, 2000; Stremmel, et al., 1994). Healthy active seniors, as well as more frail elderly adults, are a significant, but frequently, overlooked resource which can bring a unique quality to children's lives. At the same time, children can bring energy and enthusiasm to the lives of older adults. For children and older adults, intergenerational programs can enable the participants to develop meaningful, caring relationships with the other generation. Many empirical research studies have demonstrated that intergenerational activities and interactions have helped children to achieve an understanding and acceptance of the aging process (Kuehne, 1999; Newman et al., 1997). Children also get an appreciation of the contributions made by older people. The elderly, in turn, recover their self-esteem and self-worth by supporting children in meaningful ways (Kuehne, 1999; Newman et al., 1997).

The growth of formal and informal intergenerational programs has expanded from local to national levels over the last three decades. They originated in the 1960s and 1970s in response to a need to fill emotional and social gaps between the generations, and also to counteract negative attitudes toward both generations. In the 1980s and 1990s the focus of intergenerational programs has shifted to concentrate on specific social issues (Newman, 1997). As the public, professional, and political awareness of these social issues and problems has increased, numerous studies in this field have highlighted the positive impact of intergenerational programs for children, youth, and older adults. For elementary school-aged children, there have been many benefits of participating in intergenerational (IG) programs. These include positive changes in their perceptions/attitudes of older people and aging (Bales et al., 2000; Chowdhary et al., 2000; Pinquart et al., 2000; Schwalbach & Kiernan, 2002), an increase in prosocial behaviors toward older adults, such as, sharing and helping (Lambert et al., 1990), a decrease in negative affects, such as, anxiety (Marx et al., 2004), an increase in self-management skills at school, greater interest in school work (Newman et al., 1999), and improved peer relationships (Newman et al., 1999). Other studies also found benefits to youth from contact with older adults through IG programs. These are listed as a positive change in self-esteem for teenage mothers (Roye & Balk, 1996), reduced school dropout rates (Brabazon, 1999; Roye & Balk, 1996), improved attitudes toward older people and school (Taylor et al., 1999), reduced stress between teens and their parents (Griff, 1999), and reduced alcohol and drug use (Taylor et al., 1999). Additionally, some studies found that intergenerational activities with children had significant influence on the self-esteem of elderly persons (Taylor et al., 1999), less agitated behavior (Ward et al., 1996), and greater involvement in activities (Angersbach & Jones-Forster, 1999).

Particularly noticeable are several studies which document the impact of intergenerational programs on the attitude and behavior of preschool-aged children and older adults with dementia. The results of these studies show mixed results. Children in the Seefeldt's study (1987) showed more negative attitudes toward older people and their own aging after weekly visits to a nursing home for infirm residents than did those children who did not have such contact. It is possible, however, that the negative experiences were likely to be associated with not only the infirm physical conditions of the residents but also the poor planning of the visits. On the other hand, Dellmann-Jenkins et al. (1991) found that, with careful planning, intergenerational contact positively influenced preschoolers' prosocial behaviors such as sharing, helping, and cooperating with elderly adults, compared to those who did not have the intergenerational experience. Other studies found benefits for older adults with dementia from contact with young children. Newman and Ward (1993) found that older adults exhibited more positive behaviors such as touching and extending hands when children were present compared to when they were not. An increase in positive behavior, such as smiling and reaching out, was evident in older adults with low functioning abilities. A study by Ward, Kamp, and Newman (1996) also demonstrated that there was an increase in some positive behaviors and a decrease in the level of agitation when young children were present. Table 1.1, below, presents a summary of major findings associated with intergenerational programs.

Most of these studies, using a variety of quantitative and qualitative methods, were in the fields of psychology, sociology, and other social sciences (Ward, 1997). The main concepts of intergenerational research have focused on structural changes and the participants' program (Kuehne, 1999; Newman et al., 1997; Uhlenberg, 2000). However, these approaches may not be sufficient to thoroughly understand how intergenerational interaction affects participants' individual or group behavior in multigenerational settings. For meeting this new challenge, more empirical research using a systemic perspective is needed. Expanding on these concepts leads to a broader understanding of the architectural, social, and organizational context (Kuehne & Kaplan, 2001). As an extension of this systemic perspective, intergenerational shared-site (IGSS) programs have emerged as an extension of intergenerational programs. In the next section, a literature review of IGSS is presented.

TABLE 1.1
Summary of Research on Intergenerational Programs

Authors	Findings
Angersbach & Jones-Forster, 1999	• The type of activity (teacher-selected, older adult-selected, and child-selected), the size of activity group (small or large), and the number of children and older adults present were systematically related to patterns of intergenerational interactions.
Bales, et al. 2000	• Children's journal revealed an increase in positive perception and a decrease in negative perception of older adults.
Brabazon, 1999	• Intergenerational activities were positively related to school attendance and achievement for high school students at risk for dropping out of high school.

TABLE 1.1 (Continued)

Authors	Findings
Bruck, 1997	• Seniors in a nursing home benefited greatly from plants, animals, and children as these gave the nursing home a more warm and comfortable environment • The Eden Alternative influenced children's intimate interaction with residents and showed consistently high staff morale.
Chowdhary, et al., 2000	• The intervention of curricular materials had some effect on children's perceptions of aging and activities with older people, but these benefits were not consistent in all groups.
Dellmann-Jenkins, Lambert, Fruit, 1991	• Contact with older adults with careful planning over a nine-month period produced an increase in preschoolers' prosocial behaviors toward infirm older adults. • Preschoolers who participated in an IG program showed more willingness to share and help older adults than those who did not.
Griff, 1999	• Intergenerational family therapy with grandparents contributed to reduced amount of parents' stress from childrearing, but no significant change found in the grandparents' perceptions of their grandchildren's behavior.
Hutchinson & Bondy, 1990	• Most of the child-elder pairs engaged in mutually responsive interaction. • It is likely that children determined the nature of the child-elder interaction, that is, children's behavior encouraged the elders' to respond with similar behavior.
Lambert et al., 1990	• IG activities yielded an increase in prosocial behaviors (i.e., sharing, helping, cooperating) of preschool-aged children toward older adults.
Liebman, 1986	• Preschoolers' visits to nursing home residents had a positive influence on children's behaviors and intergenerational relationships, leading to children's informal visits to residents' rooms.
Marx et al., 2004	• Children in 3rd to 5th grade showed more interest and participated more during IG programs than in the classroom. • They were more anxious in the classroom than during IG programs.
Newman, Morris, & Streetman, 1999	• Positive interactions between elders and children (8-9 years of age) were stimulated by individualized attention and sensitive behaviors of older adults to students. This attention may positively affect the students' subsequent academic performance and peer relationships.
Newman & Ward, 1993	• Older adults with dementia displayed positive behaviors such as extending hands, touching and hold hands when young children were present.
Osborne & Bullock, 2000	• Young adults' visitation and assistance to seniors in a rural community provided intergenerational companionship for all the seniors, service-learning opportunities for young adults, and a sense of well-being for seniors' family members.
Pinquart et al., 2000	• Elementary school students' attitude toward elders improved and remained stable as a result of contact with elders.
Roye & Balk, 1996	• Co-participation of teenage mothers and grandmothers in the program was correlated to lower school dropout rates and higher self-esteem.
Schwalbach & Kiernan, 2002	• Although children's perception toward older people remained mixed, they consistently showed more positive regard toward older adults in the IG programs.
Seefeldt, 1987	• Preschoolers in IG activities with infirm nursing home residents exhibited more negative attitudes toward older people than those children without this contact.
Taylor et al., 1999	• Intergenerational mentoring program had a positive influence on middle school students' sense of well-being, attitudes and knowledge about school, elders, and their own future.
Ward, Kamp, & Newman, 1996	• Participation in activities with young children resulted in increased positive behavior and decreased agitation.

1.2.2 Impact of Intergenerational Shared-Site (IGSS) Programs

As intergenerational programs have exploded across the country, the shift in focus from quantity to the quality of intergenerational interaction has resulted in natural and consistent interaction on a daily basis (Kuehne & Kaplan, 2001). In this light, since the 1990s, more attention has been paid to "Intergenerational Shared Site (IGSS)" programs. According to a national survey by the AARP, IGSS programs are those in which "multiple generations receive ongoing services and/or programming at the same site, and generally interact through planned and/or informal intergenerational activities" (Goyer & Zuses, 1998).

Intergenerational share-site programs, to date, can be classified into four main types: (1) co-located adult and child daycare center; (2) senior center in a school facility; (3) adult care center co-located with a childcare center or a high school; and (4) long-term care facilities with on-site childcare (Goyer & Zuses, 1998). Among these, the most common IGSS programs are both nursing homes co-located with childcare centers and co-located adult and childcare centers regardless of their geographical locations. The survey indicated that occasional, informal interactions between younger and older generations frequently occurred but there is a great need for more information about IGSS programs, resource materials, and empirical research data.

An emerging body of literature examines the benefits of establishing ongoing intergenerational activities in long-term care facilities with on-site childcare (Chamberlain et al., 1994; Kocarnik & Ponzetti, 1991). For elderly residents, the benefits have included greater self-esteem, motivation for more involvement in physical activities, as well as the development of special relationships with children through daily visits from children and their parents (Vujovich, 1987). In addition, working families with children or elders in the home have reported a unique opportunity to observe their children's daily growth, less need for multiple care arrangements, and accessibility to nursing staff in case of medical emergencies (Hegeman, 1985). Such advantages were associated with more extensive publicity programs and led to greater staff morale, which was also linked to higher rates of job retention and more successful recruitment of staff

(Hegeman, 1985). In an ethnographic study, Kuehne (1988) identified eleven interactive behaviors between older adults and preschool-aged children. Among these, nine categories were rated as being positive in nature, and the positive interactions were predominant. In contrast, Middlecamp and Gross (2002) found that preschoolers in intergenerational daycare settings rated older people less positively than those without contact with older adults.

Prior research with demented older adults and preschool-aged children in an IGSS setting (Camp et al., 1997) found that older adults with mild to moderate levels of dementia were capable of serving as mentors for preschoolers in modified Montessori activities. Cognitively impaired elders displayed attentive behaviors with no instance of negative behaviors such as aggressive, disruptive, confused, or anxious behaviors during the activities with children. Another study by Jarrott and Bruno (2003) also demonstrated that cognitive impairment was not a barrier against participating in activities with preschoolers. Participation in IGSS programs enabled older adults with dementia to develop a greater sense of well-being during regular activities with preschool children. Another recent ethnographic study (Hayes, 2003) found that there were significant increases in verbal exchanges, empathy (assisting, helping), eye contact, and physical contact (hugging, holding hands) between preschoolers and cognitively impaired older adults in an IGSS setting.

These opportunities and benefits from IGSS programs also have an influence in transforming traditionally stark nursing home environments into bright and cheerful residential spaces as well. Travis, Stremmel, and Kelly-Harrison (1995) contended that older adults and preschool aged children benefited largely from "routine and family-style activities", resulting in positive interaction, positive feelings, and improved attitudes toward each other. In Kuehne's study (1999), involving interviews with the staff of 13 intergenerational shared-site childcare programs, the findings noted that physical design features and activities promoted social interaction in the natural, everyday lives of participants by providing "real" and "virtual" accessibility for both generations. In terms of the relationship between the physical environment and social programs, IGSS programs are seen as providing a "homelike" atmosphere in a long-term care facility with a childcare center (Rosenberg, 1993). Further, a "family-like" atmosphere increased positive social interaction between older adults and young children (Foster, 1997). Table 1.2 summarizes previous studies on intergenerational shared-site (IGSS) programs on elder-child interaction in long-term care settings.

With the rapid increase in studies of IGSS programs, more attention has been paid to the role of the architectural environment in promoting social interaction between children and older people in IGSS sites (Kuehne & Kaplan, 2001). Since it is recognized that changes in physical design features in association with these new types of social programs combine to influence human behavior, it is necessary to investigate the relationship between persons and their environment using empirical research. Such new types of research help make us aware of new levels of architectural implications of social interaction for both older adults and young children. In light of this, the next section reviews architectural studies of interactions between older adults and children. This information provides a background context for the study.

TABLE 1.2
Reviews of Elder-Child Interaction

Authors	Findings
Camp et al., 1997	• Older adults with dementia were able to act as mentors during a modified Montessori program with young children. • Older adults showed no instance of disengagement, aggressive, disruptive, or anxious behaviors.
Chamberlain, Fetterman, & Maher, 1994	• Preschoolers and elderly residents had positive attitudes toward ongoing intergenerational experiences in the intergenerational shared-site setting.
Foster, 1997	• IGSS programs provided a family-like atmosphere in which intergenerational interaction was promoted naturally. • It was frequently observed that residents amused themselves by watching the children’s movements.
Hayes, 2003	• Preschoolers and older adults with dementia showed prosocial behaviors toward each other, such as helping, sharing, hugging, smiling, approaching in a friendly manner, and mutual verbal communications. • Less structured activities were likely to promote spontaneous interaction between young children and older adults.
Hegeman, 1985	• All staff reported that IGSS programs had a positive effect on participating elders as well as non- participating elders simply by the mere presence of children during activities. • The most common challenge to serve the IGSS program was inadequate space.

TABLE 1.2 (Continued)

Authors	Findings
Jarrott & Bruno, 2003	• It was found that there was no association of cognitive impairment with participation in activities with young children. • Older adults with dementia exhibited higher levels of cognition during activities with young children.
Kuehne, 1988	• The prevalence of positive interactions (e.g., showing affection, complimenting others, and playing) was observed among participants in co-located adult and child daycare settings.
Middlecamp & Gross, 2002	• The experience with older people did not change preschooler's less positive attitude toward older adults as compared to younger adults.
Rosenberg, 1993	• Children showed positive attitudes toward the elderly residents in nursing homes; who, in turn, enjoyed being with the children and in the intergenerational program • The program had an influence on creating a home-like, family atmosphere at the intergenerational shared-site settings.
Vujovich, 1987	• The physical and emotional needs of residents were naturally met through intergenerational activities and daily visits from children. • Children received consistent affection from elders and so enabled them to develop closer relationships with residents due to intergenerational exposure on a daily basis. • The nursing home was able to create a bright and cheerful atmosphere because of the children's curiosity, laughter, and energy.

1.3 REVIEWS OF STUDIES ON THE BUILT ENVIRONMENT

While most of these IGSS studies have focused attention on the importance of programs and structural changes for participants, little is known about the relation between physical environment and elder-child social interaction. The extent and significance of the person-environment relationship is particularly important for both young children and older adults because both groups have limited ability to control their surroundings. In addition, both groups spend much of their time in group and institutional settings. Due to their limited and diminished abilities, young children and older adults are vulnerable to even modest changes in their environments. Such changes may unwittingly thwart the competence level of these individuals (Lawton, 1998).

Given the dearth of research in this area, the purpose of this section is to review the extant literature on the built environment for older adults with dementia as well as young children. The following involves a review of empirical studies from architectural and psychological literature in order to investigate key architectural features in designing therapeutic and developmental environments. For this review, the term 'built environment' is loosely defined to include microscale issues (i.e., lighting, color, furnishing). This review is divided into two subsections. The first subsection 1.3.1 focuses on empirical studies pertaining to long-term care settings, published 1980 or later, in English, with an emphasis on people with Alzheimer's and other related dementia. This search produced 37 studies (see Appendix E). The second subsection 1.3.2 deals with the effects of the built environment on children's development. Those studies which met the following criteria were included in this review: empirical research with an emphasis on the development of preschool-aged children, written in English, published 1980 or later. There were 38 studies found with these criteria (see Appendix F).

1.3.1 The Built Environment and Older Adults

Therapeutic design based on the special needs of people with dementia can have a significant influence on their behavior and their quality of life by facilitating appropriate, desirable behaviors. In light of this, this review discusses how the physical environment can accommodate physical and cognitive disabilities to reduce the inappropriate behaviors of older adults with dementia. Six topics are emphasized: (1) group size, (2) residential character, (3) sensory stimulation, (4) safety, (5) orientation, and (6) lighting.

1.3.1.1 Group Size[4]

Given the fact that people with dementia experience a declining ability to adapt to environmental changes, it is important to consider an appropriate group size in which they would feel comfortable. Two types of studies have predominated research on the impact of new care models on older adults with dementia. These include studies on group living[5] (GL), first conducted in Sweden, and studies on special care units[6] (SCU)

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[4] The studies reviewed did not have consistent numbers in regard to a small versus large unit. Small size units used in the studies were 8 through 12 residents per unit.
[5] The group living (GL) model is an alternative to traditional long-term care for demented elders, and has proliferated in Sweden.
[6] The special care unit (SCU) is defined as a dedicated unit that accommodates only people with cognitive impairment.

in America. Generally, these care models shared major environmental characteristics, such as smaller size units (8-10 residents in each unit), private rooms with in-suite shower and toilet, and a central lounge with a dining area and a small kitchen (Annerstedt, 1993; Day et al., 2000). Many research projects have been conducted on group living and special care units. These have demonstrated that group size is significantly related to physical and psychological consequences for people with dementia.

Residents residing in smaller units experienced less anxiety and depression, more mobility (Annerstedt, 1997; Saxton, et al., 1998; Skea & Lindesay, 1996) and positive social interaction with staff and other residents (McCracken & Fitzwater, 1989; Netten, 1993; Weisman, 1997). Smaller group living units were positively associated with greater competence and increased job satisfaction for staff and lower stress levels for relatives than was noted for staff and relatives of residents in nursing homes of traditional style (Annerstedt, 1993, 1997). Unlike smaller group sizes, larger group sizes were associated with higher agitation levels (Sloane et al., 1998), more behavior problems (Bianchetti et al., 1997), greater intellectual deterioration, and emotional disturbances (Annerstedt, 1994), frequent territorial conflicts, invasions of space, and aggressiveness (Morgan & Stewart, 1998). Even though the previous studies did not offer consistent numbers for large or small units, small and manageable groupings may consist of four to sixteen residents living in a clustering of resident room with several smaller activity areas to provide a homelike, comfortable environment for people with dementia (Annerstedt, 1997; Calkins, 1988; Cohen & Weisman, 1991). Additionally, a successful transition to these enhanced care units (i.e., group living) is accompanied by organizational and social components such as well-educated, empathic staff and a group of residents with the same type and level of dementia.

1.3.1.2 Residential Character

Like smaller group units, residential (i.e., non-institutional) design features can influence the creation of a familiar, comfortable environment designed to minimize cognitive disabilities of people with dementia (Annerstedt, 1994; Cohen-Mansfield & Werner, 1998; Sloane et al., 1998). According to these studies, residents in non-institutional settings experience less anxiety and aggressiveness, better motor functions, and less need for tranquilizing drugs. Staff and relatives also reported greater satisfaction with non-institutional facilities. On the other hand, residents in a less home-like environment were more disturbed and displayed increased disorientation (Elmståhl et al., 1997). In Kihlgren et al.'s (1992) study, resident's relatives and staff were interviewed but the results were mixed. Elders with dementia who were transferred to a collective living unit with homelike characteristics exhibited better social abilities, reduced depression but also had more disturbances over time. It is difficult to assess whether residential design features produced a negative effect on residents' behavior since the previous studies addressed environmental interventions combined with staff education as part of an overall intervention. However, the above findings imply that a very non-institutional environment can be characterized as having sensory overload, just as an institutional type environment can be considered as having no sensory stimulation. Thus, careful attention should be given to non-institutional design features intended to minimize anxious behavior resulting in over-stimulation. Cohen and Weisman (1991) recommend addressing the human scale (i.e., location surrounded by trees, building masses divided into house-like forms with shingled roofs, and wooden siding), avoiding of "hard" architecture[7], and providing variation within a theme, spaces for personal belongings from the past, and a friendly entrance with a sheltered and accessible entryway.

1.3.1.3 Sensory Stimulation

Both over-stimulation and under-stimulation are identified as potential problems in environments designed for the elderly with dementia (Cohen & Weisman 1991). Findings on the effects of sensory stimulation are mixed. A pilot study in Italy carried out by Bianchetti et al. (1997) found that a low stimulation settings characterized by

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[7] According to Cohen and Weisman (1991), hard architecture is "built from materials such as ceramic tile, plastic laminate, and stainless steel, which are meant to be indestructible." (p.52).

neutral wall color and elimination of stimulation help to reduce behavioral disturbances. Similarly, decreased stimulation, involving no television/radio, lowered voices, and staff going at a slower pace caused a significant reduction in agitated behavior (Meyer et al., 1992), wandering and the use of restraints (Cleary et al., 1988). In a study on the effects of maximized stimulation, residents with dementia spent less time in their bedrooms and were more attentive to activity after being relocated from nursing homes to small group facilities (Lawton et al., 1984). In another study, geropsychiatric patients who completed sensory treatment showed significant improvement with urinary incontinency and involvement in group activity (Paire & Karney, 1984).

Recently, there has been a growing trend toward studying multi-sensory stimulation in dementia care settings. Multi-sensory environments are concerned with a variety of sensory stimuli (i.e., lights, sounds, tactile variation) involves specially designed rooms called 'snoezelens'[8]. According to a comprehensive empirical review by Livingston et al. (2005), six research studies related to the effectiveness of snoezelens for people with dementia have shown short-term effectiveness for the duration of the treatment session only. Taken as a whole, it is clear that the degree of sensory stimulation should be carefully regulated to avoid either deprivation or overload when designing spaces of potentially high stimulation (i.e., elevators, corridors, nursing stations, bathing rooms, and residents' rooms) or spaces of low stimulation (i.e., activity and dining rooms) (Day et al., 2000).

1.3.1.4 Safety

There are two important issues related to the safety of environments for persons with dementia. These include the need for surveillance because of constant attempts to exit. For preventing exit attempts, design solutions are based on residents' cognitive limits. The environmental interventions related to manage exit attempts included the placement of a full-length mirror in front of the exit doorway, two-dimensional grids on

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[8] Developed in the Netherlands, snoezelen is a specially developed sensory room designed for people with sensory and learning disabilities. A snoezelen room has features such as special lighting (i.e., spotlights, star panels, UV lights), bubble tubes, a vibrating bean bay, aroma diffuser, and the like.

the floor, mini-blinds, camouflaged door knobs or panic doors, and attention-getting signage next to exits. The majority of the studies for these interventions reported a significant decrease in problem behavior (Bird et al., 1995; Hussian, 1988; Hussian & Brown, 1987; Mayer & Darby, 1991). In another study of 30 residents in a special dementia care unit, two-dimensional grids placed in front of glass doors failed to decrease resident's exit attempts (Chafetz, 1990). The author assumed the failure was associated with the presence of glass doors, which provided visual stimulation to the outside. When considering the therapeutic potential of a garden to provide sensory stimulation, people with dementia may benefit from free access to an outdoor area. Three studies showed that free access into secure outdoor areas through unlocked doorways resulted in less agitation and aggression (McMinn & Hinton, 2000; Namazi & Johnson, 1992; Sloane et al., 1998).

Surveillance is another key safety factor for staff in environments for people with dementia. Environmental interventions may unwittingly produce negative consequences for both residents and staff. A quasi-experimental study by Morgan and Stewart (1998) revealed that a new dementia care unit with low density, private rooms, and an enclosed charting room was more difficult for the staff to monitor, and also increased incidents of residents wandering. Similarly, staff in the Weiss institute with a large, open space reported that a high level of visibility or surveillance from a nursing station decreased levels of social interaction for residents (Lawton et al., 1984). Taken as a whole, a review of literature on such research suggests the importance of balancing the ease of surveillance and staff-resident interaction.

1.3.1.5 Orientation

Residents with reduced cognitive ability require a clearly defined physical environment in terms of overall building configuration and corridor design (Elmståhl et al., 1997; Netten, 1993). The success of spatial orientation depends primarily on overall building configuration. Clustering a number of small units of residents' rooms and associated common spaces help residents orientate themselves spatially (Cohen &

Weisman, 1991). A way-finding study by Passini et al. (1998) identified major features for successful way-finding design such as delineation of entrances to buildings, identifiable zones, and landmarks. In a survey of 104 residents in several homes, residents residing in cluster facilities experienced better orientation (Netten, 1993). The characteristics of cluster facilities such as complex decision points and longer corridors allowed residents the ability to make meaningful choices between places. This reasoning was also apparent in a study of corridor design. In a quasi-experiment with 105 residents in 18 group living units, residents experienced greater spatial orientation in facilities with L-, H-, or square-shaped designs while there was more disorientation in a design using straight corridors (Elmståhl et al., 1997). However, it is possible that the complexity of a physical configuration itself can function as a landmark, when we consider the fact that people with dementia have diminished ability to think and reason in complex ways.

Not surprisingly, spatial orientation was also associated with physical environmental features such as color, room number, and sound. Three articles described the finding that color and room number enhanced orientation. In a study of 19 Alzheimer's residents who were relocated to a new unit, these residents found it useful to note the color and structure (e.g., room number, name plate) for locating their own rooms (Gibson et al., 2004). Gross and et al. (2004) found that older adults with moderate to severe dementia could identify written names and photographs of themselves, and benefited from prosthetic signage. Similarly, another study found color and room number served as environmental cues for enhancing orientation (Lawton et al., 1984). In a way-finding study of 104 demented residents at 13 long-term care facilities, noise and low levels of lighting were found to be associated with spatial disorientation (Netten, 1989). These empirical studies were supported by neuropsychiatric studies using short-term memory tests, which found a substantial impact of color on patients with Alzheimer's disease in geriatric wards (Cernin et al., 2003; Wijk & Sivik, 1995).

1.3.1.6 Lighting

In long-term care settings for people with dementia, lighting has been associated with a variety of outcomes. The majority of empirical studies reviewed found that demented older adults who were exposed to bright artificial light exhibited a decrease in disruptive behavior (Garce, 2002; Okawas et al., 1991), a decrease in agitated behavior (Koss & Gilmore, 1998; Lovell et al., 1995;), an improvement in sleep-wake rhythm (Okawas et al., 1991; Satlin et al., 1992), and slept longer at night (Mishima et al., 1994). Similarly, increased light intensity of dining room environments during mealtime affected residents with Alzheimer's disease by encouraging them to increase their intake of food and fluids (Koss & Gilmore, 1998; McDaniel et al., 2001). In contrast, bright-light therapy was reported to have little or no positive effect on demented residents' agitated behaviors (Lyketsos et al., 1999; Thorpe et al., 2000). Interestingly these mixed results for use of bright light were consistent with two previous studies on normal elderly people. A study in Sweden found a positive correlation between the quality of light and the quality of life[9] (Sorensen & Brannstrom, 1995) using a bright light intervention (i.e., 2500 lux full-spectrum light). The adverse effects recorded for the 20 healthy older adults included irritation, anxiety, and agitation (Genhart et al., 1993).

The level of lighting was important in finding one's way around. Elderly residents with dementia living in group homes were able to find their way when there was a higher light intensity (Netten, 1989). Visual deficits experienced by people with dementia include difficulty with color discrimination, depth perception, and sensitivity to contrast (Brawley, 2006). In general, these abilities underlie basic design recommendations such as eliminating glare, increasing contrast levels, providing consistent and even light levels, increasing the level of illumination, use of indirect lighting, and greater exposure to bright natural daylight (Calkins, 1988; Cohen & Weisman, 1991; Brawley, 2006). Still, further research is necessary to determine optimal lighting levels for older people who are visually impaired.

[9] After the lighting in the home was improved, one group in the experiment reported an improvement in appetite, physical condition, self-confidence, general health as well as a decrease in feelings of loneliness, bad temper, and anxiety (Sorensen & Brannstrom, 1995)

In conclusion, architectural design features are associated with a variety of lifestyle benefits for people with dementia. It is important to remember that counter-therapeutic design features may lead to fewer opportunities for demented residents to have children visit their long-term care facility, and encourages the perception that frail seniors have little interest in interacting with children. In the light of these factors, more research is needed to understand how the built environment complements therapeutic needs for cognitively impaired elders in multigenerational settings. Appendix E summarizes the key information from the studies reviewed on architectural design and its effects on older people with dementia.

1.3.2 The Built Environment and Children

The contextually supportive design based on developmental needs of young children can encourage movement, support comfort, foster competence, and provide a sense of control (Olds, 2001). In this regard, a review of the current literature on the impact of the built environment on young children addresses developmental issues, such as motor skills, cognitive ability, and social development. Three environmental dimensions emerged as the most common foci of studies on preschool-aged children: (1) density, (2) spatial organization, and (3) furnishings.

1.3.2.1 Density

Density, along with caregiver-child ratio, has been used as a primary indicator for the quality of daycare (Dunn, 1993). The recommendation of the National Association for the Education of Young Children is to maintain an adult-child ratio of between 1:7 to 1:10 and group size from 14 to 20 for 3- and 5-year-old children (Decker & Decker, 2001). Federal guidelines for Head Start programs require 35 square feet of classroom space per child (U.S Department of Health & Human Services, 1995). Conceptually, research on density in preschool settings is most concerned with two types[10] of density manipulations in relation to development of social, cognitive, language skills (Gump, 1987). Given the available data reviewed, the findings for this area show a significant relationship between density and children's development.

Low density in daycare centers is associated with more verbal interaction with peers or adults (Field, 1980; Smith & Connolly, 1986), fewer behavior problems (Howes, 1988), and higher levels of perceived social competence (Howes et al., 1992). In contrast, children experiencing higher density engaged in unoccupied play (Field, 1980; Kantrowitz & Evans, 2004; Smith & Connolly, 1986), exhibited social maladjustment and behavioral problems (i.e., hostile, aggressive, hyperactive, anxious) (Howes, 1988; Maxwell, 1996), showed more aggression (Smith & Connolly, 1986), and gave more antisocial responses during a social problem-solving task (Holloway & Reichhart-Erikson, 1988). Density is also associated with children's cognitive development, as children tend to have lower scores on cognitive ability tests administered in high density classrooms (Maxwell, 1996).

Interestingly, a recent study of the influence of group size on the level of young children's psychological stress found a relationship between group size and the level of the hormone, cortisol[11]. Preschoolers who received a lower level of focused attention and less stimulation from care providers, along with the larger group size, showed an increase in levels of cortisol (Dettling et al., 2000). Similar results were also found for groups of toddlers aged 18 to 40 months. Legendre (2003) found that a rise in cortisol level is associated with large group size (n>15), less available physical space per child in the playrooms (<5m²), and a large number of caregivers on the team (>4 adults). Increased cortisol levels for young children in association with lower quality group care settings reflect the important role of environmental factors in coping with the demands of a group care context.

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[10] Two types of density are social and spatial density. Social density refers to the number of children present in the same space, while spatial density is related to the amount of space for the same number of children. For social density manipulation, group size is altered and space is held constant. For spatial density manipulation, the amount of space is altered and group size held constant (Gump, 1987).

[11] The hormone, cortisol is related to psychological stress. Increased stress activates cortisol secretion.

1.3.2.2 Spatial Organization

Another environmental dimension that has received much attention in studies of young children is spatial organization based on the degree of openness (i.e., closed space, open space, semi-open space). Studies on the effects of a closed spatial plan were conducted until the mid-1960s (Gump, 1987). A closed space design, defined by structures (e.g., full-height walls, a tall piece of furniture), has been attributed with having a calming effect on children (Moore, 1994). Yet a recent study on toddlers aged 21-37 months found more self-centered behavior and conflict among toddlers in a closed space (Legendre & Fontaine, 1991). Most likely the negative social behaviors were related to a higher spatial density, resulting in less active play, therefore the greater social density would contribute to peer conflict (Gump, 1987). As Moore (1986) noted, the presence of enclosure may hinder children's movement and creativity by preventing them from engaging in activities from one area to another. On the other hand, findings from Lowry (1993)[12] emphasized that children sought privacy; children often used props to cover the entrances of open play structures.

As an alternative to a closed space, the concept of using open space has emerged as a design element for daycare centers since the 1970s. Findings on the relationship between open space and children's development are mixed. Young children in open-plan classrooms exhibited more cooperation and greater sensory exploration (Prescott, 1987). In contrast, less desirable social outcomes associated with open space included a higher level of aggression, withdrawal, and wandering (Neill & Denham, 1982), as well as lower attention span (Neill, 1982a). Noise level is another potential problem related to children's use of open space. A study by Neil and Denham (1982) recorded sound levels at five daycare centers in Scotland and found that the more open spaces were extremely noisy (i.e., a peak of 98 dB) with recorded noise levels above a recommended range of 60-70 dB. The lack of enclosure in an open space, along with greater levels of noise, tended to create difficulties in controlling children's visual and auditory attraction

[12] Children in Lowry's study (1993) preferred to play either alone or with peers in a closed play structure (i.e., 30"x30"), rather than in an open play structure. Particularly interesting was that children in the open play structure used particular props (i.e., blankets, cushions, blocks) to cover the entrances to the structures. This finding implies a desire in children for privacy.

toward other activities in adjacent regions (Gump, 1987). Further, less contact with staff were provided children in the open space settings (Neill, 1982a).

In order to address the problems of an open space setting, the concept of a semi-open spatial plan[13] was introduced in the design of preschool classrooms. In general, a semi-open space creates several activity regions in a classroom by adding screens, barriers, or even manufactured partitions. The addition of partitions reestablished a moderate degree of enclosure which can increase cooperative behavior and decrease rowdy behavior young children engage in with each other (Johnson et al., 1987). An extensive body of research on this topic has found that a semi-open space can have a number of positive effects on children's social, cognitive, and language development. Desirable social outcomes associated with a semi-open space included a higher level of exploratory behavior, cooperative behavior, and more adult-child social interaction (Field, 1980; Moore, 1986). Other studies also found increased peer interactions (Laike, 1997), and a decreased amount of disruptive, aggressive contact between children (Larson et al., 1990).

A study by Neill (1982b) examined the effects of visual openness (i.e., 1.2 m high screens) and noise levels (i.e., carpets) on the behavior of both staff and children. Staff members reported that the presence of carpets allowed them to have more educational and social talks with the children. Additionally, children in the case study using screens-and-carpets exhibited a greater tendency to be involved in educational activities with other children as well as staff. Further, in Nash's study (1981) children in spatially organized classrooms showed improvements in creative learning skills, language use, as well as in science and number activities, in contrast to those in randomly organized classrooms. Similarly, Gehlbach and Partridge (1984)[14] found a

[13] The term, semi-open spatial plan, has been used by many studies in different ways (i.e., modified open-plan, spatially well-organized plan, semi-enclosed plan). However, they all share similar basic environmental characteristics: (1) flexible space with a variety of large and small activity spaces, (2) visual access to stimuli in adjacent activity spaces, and (3) sufficient enclosure to protect children from visual and auditory distractions (Gump, 1987; Moore, 1994)

[14] Children's verbal behavior was assessed in terms of 'specific' references with the use of nouns and adjectives (i.e., the *yellow* tractor, the *blue* block next to your elbow) versus 'nonspecific' references using mainly adverbs and pronouns (i.e., over *there*, the yellow *one*, *that* block).

positive relationship between the use of partitions in a classroom setting and children's language development. Children used more specific references (i.e., *blue* truck, this truck is *blue*) to communicate with adjacent playmates when the space was divided by partitions. Not surprisingly, several studies of toddlers also showed positive results for moderately open spaces (Campos-de-Carvalho & Rossetti-Ferreira, 1993; Legendre, 1989, 1995, 1999; Legendre & Fontaine, 1991).

1.3.2.3 Furnishings

Furnishings are another major consideration in the preschool environment. For this topic, attention is focused on two features: play material and color. The effects of over-stimulation and under-stimulation can be studied by examining the impact of play material on preschooler's play behavior. Providing too much play equipment in a given space can reduce motor activity (Smith & Connolly, 1986) and encourage isolated play activity (Hendrickson & Strain, 1981). In contrast, Larson and colleagues (1990) found that solitary play was more frequent with simple play units, while group play was more frequent with the use of complex or super play units[15]. These findings imply that too many or too few play materials may encourage socially inappropriate behavior in children.

Color plays a particularly critical role on children's emotional and social behavior. Three studies reported that bright color positively impacted children's moods. However these studies showed mixed results in terms of specific colors, so these results must be regarded cautiously. Hamid and Newport (1989) found that children produced highly expressive, positive mood paintings in pink-colored classrooms and negative mood paintings in blue-colored classrooms. Similarly, Zentner (2001) reported finding that dark colors, including blue, were associated with sad emotional expressions whereas bright colors (i.e., yellow, red, green) were related to happy emotional expressions. In contrast, Boyatzis and Varghese (1994) associated the color blue with positive emotions.

[15] There are three types of play equipment defined in the study by Larson, Greenfield, and Land (1990): simple unit, complex unit, and super unit. A simple play unit provides one piece of play equipment (i.e., a swing, rocking horse, slide, tricycle). A complex unit has two components (i.e., a sand pile with digging equipment, a doll bed with dolls). A super unit offers three or more components of play materials.

Regarding social behavior, Read, Sugawara, and Brandt (1999) found that children exhibited a higher level of cooperative behavior when the wall color was changed from a neutral color to red. Still, further research is necessary to understand the proper role of color on children's development in the preschool environment.

Taken as a whole, it is evident that architectural features play a significant role in young children's development. Given the fact that preschoolers spend an average of 37 hours per week in at least one childcare arrangement in 1997 (U.S Department of Commerce, 2002), it is very important to create developmentally supportive preschool designs. Appendix F summarizes key information from the studies reviewed on architectural design and young children.

1.4 REVIEWS OF METHODOLOGY

1.4.1 Multi-Method Approach

The use of multiple data-collection methods reduces possible errors, ensures trustworthiness of the data collected, and increases confidence in the interpretation of research findings and any implications derived from its interpretation (Sommer & Sommer, 1997). This multi-method approach is based on the concept of methodological triangulation [16] which involves a careful and purposeful combination of different methods in order to increase the validity for studies of the same phenomenon (Flick, 1992). The selection of different methods takes into consideration their inherent weaknesses and strengths as well as theoretical relevance. The triangulation approach fosters an in-depth understanding of a phenomenon under investigation.

Using the triangulation approach, a combination of qualitative and quantitative data collection methods is useful for dealing with the multivariate nature of behavioral research problems. In this way the limitations of each method can be supplemented by the strengths of other methods of analysis. In addition, the different methods used in a triangulation approach employ a rich combination of interpretive tools for presenting the data collected. The statistical and content analyses can be graphically represented. In

[16] The idea of triangulation was originated from "navigation and military strategy that use multiple reference points to locate an object's exact position" (Flick, 1992, p.179).

this study, the multi-method approach is used not just to test hypotheses, but to develop interpretations that foster a deeper understanding of the issues researched. Moreover, the multi-method approach enables the researcher to understand what is happening in a situation and to obtain different perceptions of the phenomena under investigation. Based on this understanding, the triangulation approach in this research consisted of qualitative and quantitative methods of data collection such as naturalistic observation, semi-structured interviews, a survey, behavior mapping, and experimental situations.

1.4.1.1 Qualitative Method

A qualitative approach is a way to understand a phenomenon through discovering the meaning of people's thoughts, feelings, actions, and behaviors in a given situation (Shaw, 1999). Central to the qualitative approach is the belief that a person's valued experiences are situated within a context. Qualitative research must be conducted in the setting where all the contextual variables are in operation. With a holistic framework, qualitative research employs an insider's perspective (e.g., research participant) which enables the researcher to construct an understanding of the issues in order to develop context-bound interpretations (Shaw, 1999). Qualitative methods used in this study included naturalistic observations and semi-structured interviews.

As a qualitative method, naturalistic observation is useful for studying behavioral problems and developing relevant questions in the early stages of research (Sommer & Sommer, 1997). The fundamental reason for using naturalistic observation in most environment and behavior research is that this unstructured and imprecise method is a viable means for finding out what people do in particular situations (Kerlinger, 1986). Without linking the frequency of behavior with the context in which that behavior occurs, naturalistic observation can provide authentic data that may not be obtained by using quantitative methods (Bechtel et al., 1987). Naturalistic observation is almost always used in conjunction with other research methods. For example, the problem of causal inference in naturalistic observation can be overcome by using other methods like interviews, questionnaires, or behavior mapping (Bechtel et al., 1987). Likewise, the intrusive effect of the observer can be reduced by getting people adjusted to the presence of the observer over time.

The semi-structured interview is a reliable method for obtaining the participants' views on questions posed by the researcher, and also allows the observation of nonverbal responses (Sommer & Sommer, 1997). However the wording of questions the structure of sentences used must be appropriate to the ability of respondents as well as the situations being researched (Sommer & Sommer, 1997). Semi-structured interviews are conducted in a fairly open framework in which the order of questions unfolds during the interview to probe elicit as much detail as possible from each participant. This flexible arrangement is suitable for obtaining information about sensitive topics (Sommer & Sommer, 1997). By encouraging two-way communication with the interviewer, the semi-structured interview allows the researcher to get deeper insight on children's feelings and opinions on any general subject (Garbarino et al., 1989). The semi-structured interview can incorporate different materials such as drawings, use of videos, stories, and object manipulation as a basis for asking about a particular topic. This use of other types of material can also act as a useful tool in an intervention context (Ziegler & Andrews, 1990).

1.4.1.2 Quantitative Method

Unlike the qualitative approach, the quantitative approach views the nature of reality as a single, tangible, and fragmentable reality (Lincoln & Guba, 1985). In order to understand a phenomenon, the researcher uses quantitative methods to dissect the nature of reality into independent variables with measurable relationships. Beginning with hypotheses and theories, quantitative methods are primarily concerned with objectivity, generality, predictability, and causal explanation (Lincoln & Guba, 1985). Based on positivistic paradigm[17], quantitative research employs an outsider's perspective

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[17] The positivistic or scientific paradigm considers reality as an object to be studied independently. According to Lincoln and Guba (1985, p. 37), the positivist paradigm has five essential characteristics that distinguish it from the naturalistic paradigm: (1) a single, tangible reality, (2) an independent relationship of the knower to the known, (3) time- and context-free generalization, (4) real causes and effects, and (5) value-free inquiry.

(e.g., structured instruments) which should allow the research to be reliably replicated. Quantitative methods used for this study included a survey, behavior mapping, and an experimental setup.

The survey is a research method widely used for collecting study participants' beliefs, opinions, and attitudes about a single issue in a cost-effective and timely manner (Sommer & Sommer, 1997). Surveys are more suitable for identifying opinions about a specific topic rather than for tabulating opinions on multiple or complex issues (Sommer & Sommer, 1997). As technologies have dramatically advanced, the potential for distributing surveys becomes greater than ever before since surveys can now be delivered by mail, through interviews, via e-mail, as well as on the Web. Electronic survey methodologies have the advantage of allowing extensive coverage for surveying geographically dispersed populations (Dillman, 2000). While a mail survey has the disadvantage of being slow and more costly. Regardless of the survey type, there is a common, but very important, factor to be considered when designing and implementing surveys, and that is *social exchange*. Survey responses are more just than a bulk of data or information gathered. They are outcomes of mutual human interaction obtained through means such as questionnaires and should enhance the rewards, costs, and trust involved in human interaction (Dillman, 2000). Dillman (2000) insists that high-quality survey responses are dependent on "how to increase perceived rewards for responding, to decrease perceived costs, and to promote trust in beneficial outcomes from the survey" (p. 5).

As a supplemental observation tool, behavior mapping provides a better understanding of behavior in a particular location or setting. Typically, behavior mapping involves recording behavior as it occurs using a standardized behavioral map (Sommer & Sommer, 1997). Behavior mapping is a useful tool to demonstrate the association of behavior with environment by documenting people's locations in space (Bechtel & Zeisel, 1987). Because of its characteristics, behavior mapping techniques are widely used for behavioral research in fields such as architecture, environmental psychology, urban planning, and the like (Sommer & Sommer, 1997). Objective and systematic behavior mapping can be achieved by using media such as time-lapse photography, slides, videotapes, or any combination of these. Moreover, behavior mapping can examine the order or sequence of behavior in a physical setting (Sommer & Sommer, 1997).

The use of experimental conditions is a helpful scientific tool for systematically investigating behavioral changes in relation to certain research problems (Kerlinger, 1986; Sommer & Sommer, 1997). Unlike the qualitative framework, where the primary concern is discovering the meaning of a phenomenon in context, the nature of an experimental condition is to identify possible causal relationships between an independent variable (i.e., experimental setting), and a dependent researcher (i.e., behavior) variable which must be observable and measurable (Sommer & Sommer, 1997). Types of experimental methods are distinguished by the degree of random assignment of the independent variable to conditions, including true experiments, quasi-experiments, and single-subject experiments (Sommer & Sommer, 1997). While true experiments entail the random assignment of subjects to treatment or control conditions, subjects in quasi-experiments cannot be randomly assigned to experimental conditions. Quasi-experiments are conducted using comparisons of separate groups of subjects (i.e., pre-test vs. post-test, treatment vs. control). Single-subject experiments focus on behavior change in the individual. Because behavior change is observed by presenting and withholding an independent variable for the same individual, subjects in a single-subject experiment serve as both treatment and control groups, which is a somewhat different concept from the quasi-experiment approach (Sommer & Sommer, 1997; Vasta, 1979). It is possible to use a single-subject experiment to identify some functional relationship between variables applied individually to small groups of subjects (Alberto & Troutman, 2006).

1.4.2 Reviews of Methodology in Aging Studies

Both demented older people and young children require careful methodological attention, because it is difficult to apply many techniques to their situations (Bechtel, et al., 1987). There is no research data available to examine the impact of the architectural environment on demented elders and preschool-aged children together. As a first step, it is necessary to find adequate methods that have been used with cognitively impaired older adults or young children, separately. The next step would be to adapt research methods found in the literature to fit specific research situations involving both populations.

In this section, a literature review of research methodology on aging focuses on the physical environment and social interaction. This review also includes the multi-method approach; a means of methodological triangulation. Table 1.3 presents findings in the literature on types of research methodology. According to this review of the literature, a variety of research methods are used to collect data on the effects of the physical environment on the social interaction of demented older adults. These methods include observation, quasi-experiment, survey, structured interviews, assessment, and post-occupancy evaluation. The review showed that observation is the most frequently used research method. As a research technique, observation includes direct observation, ethnographic observation, and behavior mapping. From these findings it is noted that older adults seem less reactive to the presence of an observer, either participant or non-participant observer, than any other group. Ethnographic observation is also useful with older people when information is so sparse (Lawton, 1990). Day and colleagues (2000) noticed that the quasi-experiment method is another typical research design used in dementia care settings. Four studies used staff and family members as informants who can be effectively surveyed or interviewed. The cognitive impairments that demented older people have are assumed to make their responses unreliable. When interviewing demented older adults, their cognitive ability should be assessed to ensure that reliable and valid interview data are collected. Lawton and et al. (1984) utilized a post-occupancy survey to evaluate a prosthetically designed building from an environmental system perspective. This study involved the direct observation of resident behavior as well as a consumer survey of staff and residents' relatives. Three studies used the multi-method approach including qualitative and quantitative methods (Lawton et al., 1984; Moore, 1999; Moore & Verhoef, 1999).

TABLE 1.3
Research Methodology Reviews on Aging from 1980 to 2006

Authors	Methodologies	Findings
Hubbard et al., 2003	1. Ethnographic observation	• Residents with no cognitive impairments occupied lounges to avoid socializing with those who exhibited behavior problems. • Gates on room doorways were also used to avoid contact with others.
Kihlgren et al., 1992	1. Interviews with staff and relatives 2. Assessments	• A collective living unit (i.e., homelike environment) helped demented residents to improve social abilities.
Lawton et al., 1984	1. Post-occupancy Evaluation: direct observation, survey for staff and relatives	• Special care units with small group size, bright room décor, and large central area increased visits from relatives.
McAllister & Silverman, 1999	1. Ethnographic observation	• Interaction among residents with Alzheimer's disease was influenced by environmental features such as extensive visual access to the outside, activity room for small group, and group living units with clusters of resident rooms and separate dining facilities.
McCracken & Fitzwater, 1989	1. Quasi-experiment	• Small closed unit was associated with improved staff-resident interaction
Moore, 1999	1. Observation 2. Behavior mapping 3. Survey for staff	• An open galley kitchen provided opportunity for social interaction among cognitively impaired older people. • Little differentiation between corridor and activity spaces led to disorientation. • Residents spent 65% of their time in dining areas, which were the hub of social life.
Moore & Verhoef, 1999	1. Assessment 2. Behavior mapping	• Residents in special care units spent most of their time in dining areas in which 72% of the time they exhibited no interaction with others. • Greatest percentage of social interaction occurred in the spaces (i.e., activity room, outdoors) that residents utilized the least.
Paire & Karney, 1984	1. Quasi-experiment	• Environmental Sensory stimulation increased geropsychiatric patients' interest in group activities and interaction with other patients.
Skea & Lindesay, 1996	1. Cross-sectional survey for staff	• Group living units caused significant increase in staff-resident interaction

1.4.3 Reviews of Methodology for Studies on Children

In accordance with the multi-method approach, the literature review of research methodology on children focused on the topics of social interaction and physical environment. Older adults with dementia are cognitively impaired so this factor has to be considered in any research design involving such persons. In addition, the capabilities of preschool-aged children require *age*-appropriate research techniques to measure young children's social behavior. Ziegler and Andrews (1990) have introduced six age-appropriate measurement techniques adapted from Lozar (1974). The techniques appropriate to preschool-aged children include photographic simulation, interviews, instrumental observation, direct observation, sensory stimuli observations, and indirect methods (i.e., tracks, records). Consistent with these recommendations, common research methods for studying children's social interaction in relation to the physical environment are observation, quasi-experiment, interview affiliated adults (i.e., teacher, parents), and structured tests. Observation and quasi-experiment are predominantly used to collect data about young children's social behavior in daycare settings. The observation techniques reviewed were conducted either in person with the researcher in the setting being studied, by using observation media (i.e., videotape) for later analysis. Three studies interviewed teachers, as important informants, to collect data about children's behaviors, abilities, and social relationships. Structured test using validated instrument is also a useful technique to measure children's responses toward peers in relation to the physical environment. Three studies used both qualitative and quantitative methods to examine the effects of the physical environment on children's social interaction (Holloway & Reichhart-Erikson, 1988; Neill, 1982b; Neill & Denham, 1982). Table 1.4 summarizes the key findings from the literature reviewed regarding the types of research methodology to study children's social interaction.

TABLE 1.4
Summary of Literature on Children's Interaction with the Architectural Environment

Authors	Methodologies	Findings
Field, 1980	1. Observation	• A low teacher/child ratio and partitioned play areas increased peer interactions.
Hendrickson & Strain, 1981	1. Observation	• Too many play materials associated with more solitary play activity.
Herrera et al., 2005	1. Cross-sectional survey among staff	• Physical environment of childcare centers had strong positive association on child development (i.e., vocabulary, social behavior).
Holloway & Reichhart-Erikson, 1988	1. Structured test 2. Observation	• Larger group size associated with lower social competence and more antisocial responses among preschoolers.
Howes, 1988	1. Questionnaire for teacher	• Young children in larger group size exhibited signs of social maladjustment.
Howes et al., 1992	1. Observation	• Smaller group size affected the level of social competence and sociability of young children.
Kantrowitz & Evans, 2004	1. Observation	• Higher child/activity area ratio was associated with more unoccupied behavior and lower engagement in constructive play with peers.
Larson et al., 1990	1. Observation	• Group play with peers was most frequent at complex and super units with one or more play materials or equipment in classrooms.
Legendre, 1995	1. Quasi-experiment	• Visually open classroom arrangement increased positive peer interaction and decreased negative peer interaction.
Legendre, 1999	1. Quasi-experiment	• Visually open classroom arrangement was associated with higher positive peer interaction.
Legendre & Fontaine, 1991	1. Quasi-experiment	• Use of visual barriers associated with more prosocial behavior among children.
Li, 1984	1. Observation	• High-density classroom was associated with a decrease in peer interaction.
Maxwell, 1996	1. Observation	• Antisocial behavior was exhibited more by children from high-density homes and classrooms.
Moore, 1986	1. Quasi-experiment	• Spatially well-designed settings with partitions increased levels of social interaction and engagement.
Neill, 1982a	1. Observation	• Classrooms that were more open decreased adult-child interaction.
Neill, 1982b	1. Quasi-experiment 2. Interviews w/ staff	• Adult-child interaction was increased with the use of screens and carpets.
Neill & Denham, 1982	1. Observation 2. Interviews w/ staff	• Small quiet areas contributed to social group formation among children.
Smith & Connolly, 1986	1. Observation	• Crowded classrooms associated with less cooperation among children as well as increased aggression.

Taken as a whole, there are five research methodologies most often used in studies of the relationship between social interaction and the physical environment for older adults with dementia and young children (see Table 1.5). In this study, the researcher utilized four different research techniques based on the multi-method approach. These techniques included observation, survey, quasi-experiment, and semi-structured interviews. Observation is a qualitative method widely used in studies of children and aging. Survey, as a widely used quantitative method, is useful to collect the opinions of experts on a single issue (i.e., elder-child social interaction) in a cost-effective manner. The quasi-experiment technique is used to examine changes in elder-child social interaction before and after design interventions. Unlike the extensive use of observational methods (i.e., direct observation, ethnography, behavior mapping), direct interviews with young children and people with dementia have not been used for this kind of research. The implication is that the respondents' age and cognitive impairment may hinder the interview process and risk interview bias. For this reason, meticulous care was given to formulate appropriate interview questions for preschoolers and demented residents in order to get meaningfully responses to the interview questions.

TABLE 1.5
Review of Research Methodology for Older Adults and Children, 1980 - 2006

Methodologies	Literature on Aging	Literature on Children
Multi-method	-Moore & Verhoef, 1999 -Moore, 1999 -Lawton et al., 1984	-Holloway & Reichart-Erikson, 1988 -Neill, 1982b -Neill & Denham, 1982
Observation	-Hubbard et al., 2003 -McAllister & Silverman, 1999 -Moore & Verhoef, 1999 -Moore, 1999 -Lawton et al., 1984	- Field, 1980 -Holloway & Reichart-Erikson, 1988 -Howes et al., 1992 -Kantrowitz & Evans, 2004 -Larson et al., 1990 -Li, 1984 -Maxwell, 1996 -Smith & Connolly, 1986 -Neill, 1982a -Neill & Denham, 1982 -Hendrickson & Strain, 1981
Survey or Questionnaire	-Skea & Lindesay, 1996 -Moore, 1999 -Lawton et al., 1984	-Herrera et al., 2005 -Howes, 1988
Interview	-Kihlgren et al., 1992	-Neill, 1982b -Neill & Denham, 1982
Quasi-experiment	-McCracken & Fitzwater, 1989 -Paire & Karney, 1984	-Legendre, 1995, 1999 -Legendre & Fontaine, 1991 -Moore, 1986 -Neill, 1982b
Assessment	-Moore & Verhoef, 1999 -Kihlgren et al., 1992	-Holloway & Reichart-Erikson, 1988

1.4.4 Literature Review on Observation Instruments

In general, observation instruments are structured using categories which clearly define and describe behaviors related to a particular research focus or concern. Observation instruments are a useful means for effectively recording what is observed and objectively making interpretations derived from these observations. Observation instruments vary considerably in categories, units of behavior, and collection methods (Simon & Boyer, 1974). For example, Newman and et al (1999) developed an *Elder-Child Interaction Analysis* instrument to record the verbal and nonverbal behaviors of young children and older adults in school settings. The researchers used 40 pre-categorized behavioral items to measure the frequency of the behaviors observed over five 1-minute intervals. Given the importance of meaningfulness, feasibility, and relevance of observation instruments, it is essential to develop observational instruments appropriate for this research. The observation instruments in this review focus on social interaction, especially child-adult and peer interaction. Table 1.6 summarizes observational instruments reviewed in literature on children and also gerontology.

TABLE 1.6
Summary of Observation Instruments Reviewed

Author(s)	Setting(s)	Targeted age groups	Focus
1. Ladd & Profilet (1996)	-Nursery school	-Preschool children	Child-child interaction
2. Schroeer & Flapan (1971)	-Nursery school	-Young children	Child-child interaction
3. Cohen-Mansfield, Werner, & Marx (1989)	-Nursing home	-Older adults (demented)	Elder-elder interaction
4. Moustakas, Sigel, & Schalock (1956)	-Laboratory -Home	-Parent or Therapist -Young children	Child-adult interaction
5. Stover, Guerney, & O'Connell (1971)	-Therapy -Laboratory	-Parent -Young children	Child-adult interaction
6. Angersbach & Jones-Forster (1999)	-Childcare	-Older adults -Preschool children	Elder-child interaction
7. Newman, Morris, & Streetman (1999)	-Elementary school	-Older adults -Children	Elder-child interaction
8. Ward, Kamp, & Newman (1996)	-Nursing home	-Older adults (demented) -Preschool children	Elder-child interaction
9. Hayes (2003)	-Intergenerational daycare	-Older adults (demented) -Preschool children	Elder-child interaction
10. Xaverius & Mathews (2003)	-Nursing home -Senior center	-Older adults (demented) -Children	Elder-child interaction

Some are specifically designed for the behavior patterns of young children and older adults in each of their own peer milieus. Others deal with children's early interaction patterns with parents, therapists, or older adults. Of interest is that three out of seven instruments were designed to measure child-adult social interaction focusing on two populations such as cognitively impaired older adults and young children.

Of these ten observation instruments selected from the review, seven instruments were developed for institutional settings, such as a childcare facility, nursing home, and intergenerational care facility. Each of the instruments focused on specific research issues. For example, Hayes' (2003) instrument was used in an adult and child daycare facility with preschool-aged children and seniors with dementia as the participants. However the study only examined interaction exhibited by the seniors with dementia. A brief description of each of the observation instruments is presented in Appendix G. More detailed issues and findings of the reviewed observation instruments are described in Section 4.3.

CHAPTER II
THEORETICAL FOUNDATION OF RESEARCH

The literature review presented in Chapter I points out the need for research based on interdisciplinary knowledge from the fields of developmental psychology, gerontology, and environmental psychology. Intergenerational activities are firmly established developmental themes associated with reciprocal and shared needs of specific age groups (VanderVen, 1999). In addition, the context or environment provides opportunities and constraints under which an individual's behavior changes in particular ways (Bell et al., 2001). In these regards, the theoretical rationale of this study is based on both developmental and contextual thinking.

This chapter focuses on the development of comprehensive frameworks for this research based on four relevant developmental and environmental theories and models. These include Erikson's psychosocial theory, Vygotsky's social-cognitive theory, a dynamic contextual model, and Latwon and Nahemow's environmental press theory. Developmental theories attempt to define the developmental needs of young children and older adults. Environmental theory is intended to highlight the ways in which a person adapts to environmental changes in relation to their personal competence. The synthesis of developmental and environmental theories provides a fundamental rationale, in this study, for understanding how to create supportive intergenerational environments. This new conceptual framework presented here is intended to organize and structure the study.

2.1 DEVELOPMENTAL THEORIES

Human development is a rich, complex process occurring in rapidly changing environmental and biological contexts. Once thought to be a simple, fixed phase with a continuous forward progression, child development has now been demonstrated to be a dynamic process which depends on contextual support, adults' guiding roles, and emotional security (Frost et al., 2001). In addition, many recent studies have revealed that adult development is also a complex, dynamic developmental web, involving multiple levels, multiple network links, and multidirectional construction (Fischer, et al., 2003). This shift in perception from a single, mechanical view to a systematic perspective enhances our understanding of human development as one that embodies concepts of intergenerational interaction. Erikson's psychosocial theory, Vygotsky's social-cognitive theory, and a dynamic contextual model are of critical importance for illustrating this view.

2.1.1 Erikson's Psychosocial Theory

Erickson's psychosocial theory (1963) is a life-span approach to social development which encompasses eight stages[18] of life from infancy through old age. Critical items of psychosocial development in each stage are systematically correlated and influenced by the preceding and following stages. In addition, psychosocial development is affected and shaped by the environment and social interaction throughout the life stages. Each stage is characterized by a duality of possible positive and negative feelings as well as favorable outcomes known as 'virtues'[19]. When the environment makes new demands on people then different conflicts can arise for them. When the individual resolves the conflicts successfully, favorable outcomes are obtained. In order to obtain favorable outcomes, Erikson stresses the need for supportive environments appropriate to the individual's specific stages.

For example, the central task of the third stage of a child's life (3 to 5 years) is to develop a sense of independence through responsible participation. Children in this stage are assertive and take initiatives such as playing and hero worshipping. When the child's initiative is accepted, then the child can develop a sense of accomplishment and

[18] Erikson (1963) pays special attention to the mechanism of positive and negative feelings at each stage. The conflicts at each stage involves deciding on issues of trust versus mistrust (infancy stage, birth to 1 year), autonomy versus shame and doubt (early childhood, 1 to 3 years), initiative versus guilt (play age, 3 to 5 years), achievement versus inferiority (school age, 6 to 12 years), identity versus role confusion (adolescence, 12 to 18 years), intimacy versus isolation (young adulthood, 19 to 40 years), generosity versus self-absorption (adulthood, 40 to 65 years), and integrity versus despair (old age, 65 to death).

[19] The virtues are hope, will, purpose, competence, fidelity, love, care, and wisdom in the order of each stage (Erikson et al., 1986).

is confident enough to deal with the next stage of development. Furthermore, the child can also be cooperative in acting and planning with other children. If the child is not given a chance to be responsible and do things on her/his own, then that child may exhibit aggressive behavior which reflects infantile jealousy and rivalry, even a sense of guilt. If the child is unable to resolve conflicts between initiative and guilt at this stage, then he or she will confront and struggle with this issue later in life (Erikson, 1963). In this regard, it is important to remember that mature adults can help children learn to balance these conflicting feelings by creating a supportive atmosphere, no matter how small the initiative is.

Erikson's psychosocial developmental stages (Erikson et al., 1986) continue to late adulthood (65 years and over). At this stage, the most important issue for older adults is to evaluate their life and accomplishments and to positively affirm their life's purpose. The struggle for older adults occurs between a feeling of satisfaction with self (i.e., integrity) and a feeling of dissatisfaction with life as it was lived (i.e., despair). Similarly, the concept of integrity is supported by Atchley's Continuity Theory of Normal Aging (Atchley, 1989). According to the continuity theory, middle-aged and older adults use strategies related to their past experience to adapt to changes. Continuity refers to "an abstract cognitive construct tied to individual's perceived past" (Atchley, 1989, p. 184). There are two types of continuities: internal and external. Internal continuity supports and maintains a sense of ego integrity by combining an individual's inner structure with one's perceived past. People with Alzheimer's disease lack internal continuity. External continuity is defined as a remembered past of "physical and social environments, role relationships, and activities" (Atchley, 1989, p. 185). In other words, a person's perception of external continuity is influenced by being in familiar environments, continued use of familiar skills, and interacting with familiar people. External continuity helps older adults cope with physical and mental changes which come with normal aging.

From the life span perspective, Erikson's theory aims to show the developmental progression from trust to achievement to wholeness (Cavanaugh, 1997). Erickson's life-span approach to human development and growth has significant implications for the possible effects of architecture on intergenerational interaction. This is important because of the notion that the physical environment can foster or inhibit the level, or rate of development through meaningful activities. Conflicts (i.e., initiative vs. guilt) that young children may experience can be resolved by interaction with adults who have the sensitivity and understanding to help children effectively deal with these life stage conflicts. Older adults also experience changes in their social relationships which are strongly related to a sense of integrity (Atchley, 1989; Erikson et al., 1986). Opportunities for continued social interaction with others, especially those of younger generations, tend to have a positive, powerful influence on the physical well-being, mental health essential for productive aging (Newman et al., 1997). In summary, Erikson's work is important for providing a developmental framework for understanding the reciprocal needs linking generations. This is the theoretical basis used in developing the conceptual framework for this study.

2.1.2 Vygotsky's Socio-cognitive Theory

Vygotsky approached child development differently than Piaget. Whereas Piaget believed that the child increasingly understands her/his world through four broad stages[20] of development, Vygotsky saw intellectual abilities as being much more specific to the culture. Furthermore, Vygotsky's socio-cognitive theory (1978) portrays human development as a complex process that cannot be understood apart from the social and physical settings in which it occurs. Central to Vygotsky's theory is that social development is influenced by the quality of children's interaction with others (i.e., adults, peers) and the quality of caregiving settings. Because social development is context-bound in dynamic and continuous ways, it is important to understand how well opportunities and constraints, in context, condition children's social development.

[20] These are the sensorimotor stage of infancy, the preoperational stage of early childhood, the concrete operations stage of middle childhood, and the formal operations stage of adolescence and beyond (Slater, Hocking, & Loose, 2003).

According to Vygotsky (1978), child development is mediated by two factors which are explained by two major concepts known as the Zone of Proximal Development (ZPD) and scaffolding. The ZPD is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Scaffolding is the process whereby adults or other partners structure and simplify a child's environment in order to facilitate his or her learning. Vygotsky believed that learning occurs in this space of ZPD by scaffolding children's innate abilities. These concepts have two important implications in relation to the impact of the social and physical environments. First is the growth of internal ability by appropriate interaction with more able others, and secondly, to have a supportive learning or teaching environment in which children play an active role, to interact, and collaborate with others. In other words, the provision of a comfortable atmosphere for children and adults to interact in is just as likely to play a crucial role in children's growth and development.

Taken as a whole, Vygotsky's view on child development has clear implications for intergenerational interaction within an architectural setting. This assertion provides the fundamental rationale for the conceptual framework of this study. Vygotsky's insightful observations demonstrate that children's behavior and social conditioning could be influenced by interaction with adults in a supportive environment. With an aim to create supportive intergenerational care settings, based on Vygotsky's theory, it is important to identify the conditions under which collaboration between young children and older adults can be enhanced and optimized. As Vygotsky claims[21], a developmentally appropriate environment is likely to make important contributions to children's improved performance.

[21] According to Vygotsky (1978), instruction just beyond the child's current developmental level enhances an optimal level of learning. When a child is given an activity that is below his/her developmental level, this activity falls outside this child's ZPD and causes that child's development to lag. Thus, it is more effective to give children challenging assignments.

2.1.3 Dynamic Contextual Model

Similar to Vygotsky's theory, a dynamic contextual model views development as a correlation of competence-person-context (Fischer et al., 1993). The context has a crucial influence on increasing the competence level of individual children. Competence emerges from the integration of a person with his/her context. In other words, competence is a characteristic not only of an individual but also of a context. The competence level of children varies by level of contextual support. Children show a higher degree of competence in optimal contexts, such as having strong support, familiar tasks, and motivation to perform. On the other hand, children in spontaneous contexts with minimal support perform at a lower, functional level. According to this model, the mere provision of social interaction with adults strongly affects children's individual performance. But even without direct assistance from an adult, in a *supportive context*, the child-context relationship still produces optimal performance. This developmental range is similar to the concept of the zone of proximal development (ZPD) outlined by Vygotsky (1978). The common ground between these two theories is the emphasis on the significance of firm connections between the individual and the environment.

In addition, the dynamic contextual model (Fischer et al., 2003) asserts that aging involves growth as well as decline; interweaving gain and loss with cognitive aging. Older adults' cognition can develop deeply and broadly depending on the intellectual skills, increasing slowly, but consistently with age. For example, crystallized intelligence (e.g., vocabulary and general knowledge) derives from accumulated experience and so increases with age, while fluid intelligence (e.g., novel activities and information) declines from middle adulthood (Staudinger & Werner, 2003). The most distinctive characteristics are the significance the level of *contextual support* and the effect of *cooperation of performance* on complex skills. Complex skills are achieved through interaction with others and go beyond individual capacity. Staudinger and Werner (2003) contend that the highest refinement of knowledge and skills called 'wisdom' is developed to an optimal level by two factors. These two factors are: (1) a balance between individual and interactive cognition and (2) appropriate instructional settings. It is important to remember that "practice and familiarity with a domain, contextual support for complex activity, and joint participation with others all affect the level of a person's activities" (Fischer et al., 2003, p.492).

In conclusion, the three developmental theories reviewed above provide a comprehensive approach for identifying the significance of social interaction and environment on an individual's emotional and cognitive development. Child development is predicated on supportive interaction with adults and peer collaboration along with contextual support. Advancing age, given appropriate forms of instruction and environmental support, does not significantly diminish age-related capacity for learning and growth (Cavanaugh, 1997). Focusing on the study population (i.e., young children, older adults), Table 2.1 presents the shared, reciprocal needs of young children and older adults identified in Erikson's and Vygotsky's theories, and the dynamic contextual model. Based on these theories, it is apparent that the architectural environment can mediate elder-child social interaction, resulting in positive behavioral consequences. The next section attempts to identify the mediating mechanisms of environmental perception evident in the physical environment.

TABLE 2.1
Reciprocal Needs Linking Children and Older Adults

Theory	Young Children's Needs	Older Adults' Needs
Erikson's Theory	To be allowed to do things on their own	To encourage To provide wisdom
Vygotsky's Theory	To extend their current skills and knowledge	To guide collaborative interaction To share knowledge
Contextual Model	To share materials, feedback To become motivated	To share the situation To co-construct knowledge through interaction

2.2 ENVIRONMENTAL THEORY

From the previous developmental theories, it is evident that the physical environment has critical influence on behavioral development. In terms of a person-environment relation, it is important to remember that different individuals may react in different ways to similar environmental stimulation (Wachs, 1987), because the competence level of an individual is a key determinant for responding to environmental change (Bell et al., 2001). As generally noted in systems theory, the type of behavior exhibited is heavily impacted by the interrelation between person and environment (Hutchins, 1996). In this regard, the aim of this study is to understand how the physical environment affects the behavior of individuals, and with what consequences. This next section focuses on Lawton and Nahemow's Competence-Press theory.

2.2.1 Lawton and Nahemow's Competence-Press Theory

As one of the most cited aging-environment theories[22], Lawton and Nahemow's Competence-Press theory provides a theoretical framework for understanding the process through which older people adaptation to their environment (Rapoport, 1982). The Competence-Press theory (Lawton & Nahemow, 1973; Lawton, 1999) is based on person-environment interaction, B=f (P, E, PxE), which is developed from Lewin's ecological model of B=f (P, E). This illustration of a theory of adaptation covers three major facets which explain the interactive mechanism between person and environment. These are: (1) personal competence, (2) an environmental effect, and (3) an individual's response (Lawton, 1998). Personal competence includes physical and functional health, perceptual capability, and level of cognitive functioning. Environmental press[23] refers to environmental stimuli which function as either demands or resources. The individual's response to environmental pressures relative to his/her competence has behavioral and psychological consequences (Lawton & Nahemow, 1973).

This theory posits that environmental pressure and personal competence determine, and affect adaptive behavior. The environmental press-competence connection involves hypotheses of environmental docility and environmental proactivity (Lawton, 1999). The hypothesis of environmental docility explains that the environment becomes a powerful determinant of behavior as the competence level of a person decreases. Less competent individuals are more vulnerable to environmental challenges.

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[22] Rapoport (1982) presented six theoretical models most frequently cited in man-environmental studies.
[23] Lawton and Nahemow (1973) classified five environmental domains such as personal environment (i.e., family, friends), suprapersonal environment (i.e., aggregate of individuals, varied by race, age, socio-economic status, in physical proximity to each other), social environment (i.e., society, culture), and physical environment.

This hypothesis takes an environmental prosthesis approach and emphasizes the importance of environmental support in nullifying any deficit the individual may have. On the other hand, the environment proactivity hypothesis views individuals as active participants in adapting to environmental changes. As the environmental competence level of an individual increases, that individual can take advantage of available environmental resources to satisfy their personal needs (Lawton, 1999).

The person-environment congruence is dynamic rather than steady. According to this theory, individuals benefit from two types of mild incongruence between environmental pressure and personal competence (Lawton, 1999). These are the zone of maximum performance potential and the zone of maximum comfort. When the impact of the environmental demands is beyond a person's competence level (in the *zone of maximum performance potential*), the person is likely to experience stimulation and positive affects such as enjoyment. When the environmental demands are lower than the competence of the person (in the *zone of maximum comfort*), the person may feel relaxed (Lawton, 1999). Thus, consideration should be given to the important role the environment plays on the competence level of an individual (see Figure 2.1).

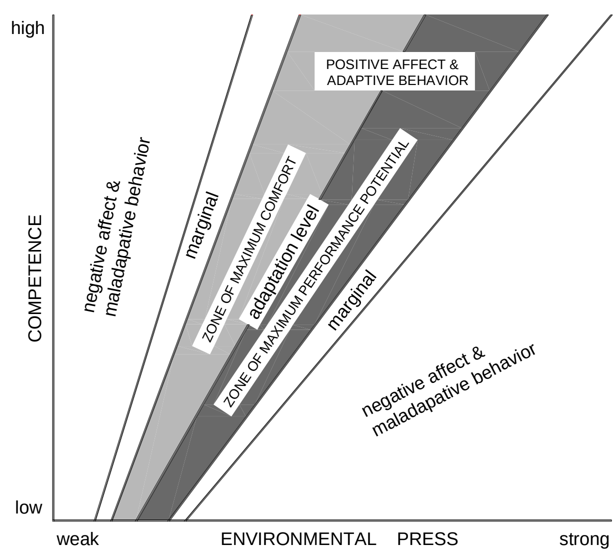

Figure 2.1: Lawton and Nahemow's Competence-Press Theory
Source: Adapted from Lawton & Nahemow, 1973.

In the case of older adults with Alzheimer's disease and young children, these two groups are more sensitive to even modest changes in the environment. They may experience negative feelings and display maladaptive behavior because the environmental press is outside their desired adaptation level. Additionally, it is important to remember that these are both heterogeneous groups, not homogeneous (Bell et al., 2001). Some older adults with Alzheimer's disease may have no functional deficits (i.e., mild level), while others have difficulty with the activities of daily living (i.e., moderate or severe level). Some young children can actively explore or exert control over their physical environment, but others have less competence in this area. In these regard, the level of environmental support or challenge should be more or less within their competence level to produce positive adaptive behavior and feelings. If the environmental demands are much greater or lower than the competence level of the individual, then negative behavioral and psychological consequences can occur.

There is extensive empirical research on the application of Competence-Press theory in long-term care settings (Rapoport, 1982; Lichtenberg et al., 2000). Few pay attention to the usefulness of applying Competence-Press theory, which was developed for seniors, to research on children. In a recent study, Shepley (2004) introduced Competence-Press theory as a legitimate theoretical approach to examine the effects of the environment on infants in the neonatal intensive care unit of hospitals. This study shed light on an awareness of life stage differences and similarities between populations of older adults and young children. Therefore, architectural studies integrating Competence-Press theory in intergenerational care settings can enhance the understanding of how older adults with Alzheimer's disease and young children respond to and adapt under environmental pressure.

2.3 CONCEPTUAL FRAMEWORK OF THE STUDY

From previous developmental and environmental theories reviewed, a conceptual model was developed to direct this study (see Figure 2.2). A central value of the conceptual model is an understanding of person-environment interaction and how this can negatively or positively affect adaptive behavior. The adaptive behavior to be studied in an intergenerational care setting is defined by (1) the environmental press, referring to challenges from the physical environment, and (2) the level of personal competence. These two components make up the domains previously identified by Lawton and Nahemow (1973).

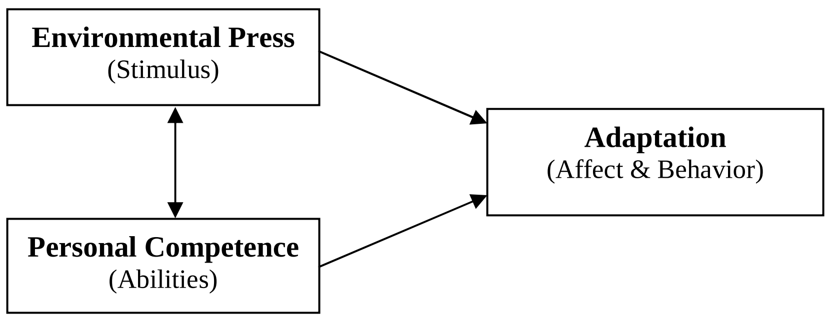

Figure 2.2: Conceptual Framework for the Study

As a contextual framework, the conceptual model for this study involves three context-specific aspects in reference to characteristics of the intergenerational care setting. Environmental press, referring to environmental stimuli or context, includes properties of the physical environment guiding the design of activity spaces for people with Alzheimer's disease and young children. Since these environmental properties are objective and measurable they can generate applicable data on appropriate design interventions in physical environments intended for intergenerational activity (Scheidt & Windley, 1998). The level of personal competence is defined as level of performance ability in such areas as physical health, sensation, motor function, and cognition (Lawton, 1998). Individual characteristics are mainly considered between those groups having similar levels of ability, such as preschool-aged children and older adults with similar stages of dementia (i.e., mild, moderate, severe). Adaptation refers to a maximized congruence between environmental stimuli and individual competence. Adaptation can have positive or negative behavioral impacts. As Lawton notes, the person-environment congruence is “an average state of equilibrium” (Lawton, 1999, p.354). Too much or too little environmental stimuli result in perceived stress and maladaptive behavior.

In conclusion, the strength of this conceptual model, built on developmental and environmental theories, lies in the multiple sources of theoretical frameworks. Such multiplicity of sources extends reliability of the study and expands our understanding of the dynamics between individuals and their environment. Based on a conceptual model, it is of primary interest in this study to examine how physical properties, such as the degree of spatial enclosure in an activity space, can affect the behavior and interaction of demented elderly people and preschool aged children. Also taken into account are the responses of participants in these two groups to different degrees of the spatial enclosure.

CHAPTER III
RESEARCH OBJECTIVES AND DESIGN

The goal of this research is to generate information to guide the design for creating environments appropriate to the developmental needs of preschoolers as well as the therapeutic needs of seniors with Alzheimer's disease. Based on this goal, and on a literature review, this research examines the relationship between spatial enclosures and social interaction between impaired elders and young children. The research focused on physical exercise activity in an assisted living facility for people with Alzheimer's disease in San Antonio, Texas. This facility also houses a childcare center.

3.1 STATEMENT OF THE PROBLEM

Researchers have investigated which environmental characteristics influence social interaction. According to a review of the literature, architectural features promoting social interaction between young children and cognitively impaired elders seem to be systematically related to three key elements (see Sections 1.3.1 and 1.3.2). These elements include: (1) the size of the group involved, (2) the organization of space, and (3) the institutional atmosphere (Foster, 1997; Kuehne, 1999; Moore & Verhoef, 1999; Rosenberg, 1993). Many studies have reported that older adults and preschool children benefited immensely from small group and non-institutional (i.e., homelike) environment. Such conditions evoked positive behaviors and feelings. However, no studies have been conducted to examine spatial organization and elder-child social interaction.

The impact of spatial organization on social behaviors has been studied extensively in environmental studies on young children. According to such empirical studies, the effects of spatial organization are mixed. Preschoolers in open-plan classrooms exhibited more cooperation and greater sensory exploration, while ones in closed-plan daycare centers tended to exhibit disengaged behavior such as looking around in the distance and watching (Prescott, 1987). On the other hand, open-plan structures were also related to more negative social behavior in young children such as aggression, withdrawal, and wandering (Clarke-Stewart & Gruber, 1984; Howes, 1983; Neil & Denham, 1982). Other studies have supported findings that a spatially well-organized plan encourages more exploratory behavior, cooperative play, and positive interaction with peers and teachers (Greenman, 1988; Moore, 1987; Moore et al., 1994; Zimmons, 1997). From these findings, it is clear that the degree of openness should be carefully regulated to avoid either over-stimulation or under-stimulation in social behaviors.

In terms of spatial organization, the use of partitions can be quite effective when allocating space (Neil & Denham, 1982; Johnson et al., 1987). In particular, the degree of visual and physical boundaries circumscribing a behavior setting significantly affected the use of space and social interaction by preschool-aged children (Gehlbach & Partridge, 1984; Moore, 1986; Nash, 1981; Neill, 1982b). In view of the finding that the provision of visual and physical enclosures impacts the level of social interaction, it is worthwhile to examine the following factors. (1) Whether the degree of spatial enclosure affects the level of social interaction and spatial usage between preschoolers and older adults with Alzheimer's disease. Also, (2) how the type of spatial enclosure affects the perception and experience of social interaction between impaired older adults and children.

3.2 RESEARCH OBJECTIVES

The objectives of this research were to determine the effectiveness of spatial enclosures, such as partitions around the perimeter of an activity room, on the patterns of social interaction and use of space by impaired older adults and young children. Specifically, this study examined whether relationships exist between the amount of spatial enclosure (i.e., open, semi-enclosed, enclosed) and the types of social behaviors between impaired elders and young children (i.e., antisocial, neutral, prosocial). Also examined were patterns of spatial usage (i.e., activity, intermediary, miscellaneous) during physical exercise in an activity room of an assisted living facility with an on-site childcare center. Five research objectives were developed based on an examination of person-environment theories, analysis of relevant literature, as well as empirical findings. These objectives are listed as follows:

1. To examine the relationship between spatial enclosures and social interaction between impaired older adults and young children in senior living facilities with onsite childcare.
2. To examine the relationship between spatial enclosures and behavior in such a setting.
3. To gain a deeper understanding of the lived experiences of young children and residents in three types of spatial enclosures.
4. To identify architectural factors that affect social interaction between impaired elders and young children.
5. To generate information for design guidelines to encourage social interaction between cognitively impaired elders and preschoolers.

3.3 RESEARCH HYPOTHESES

The overarching hypothesis in this study is that the types of social behaviors preschoolers and elderly residents engage in during physical exercise are a function of the amount of spatial enclosure available in a behavior setting. It has been noted that different age groups or individuals may react in different ways to similar environmental stimulation (Wachs, 1987). From this perspective it is important to further examine whether there are significant differences in elder-child social behavior and responses to varying levels of spatial enclosure. In order to address the objectives of the study, the researcher generated seven main research hypotheses and three exploratory hypotheses[24] to be tested. Table 3.1 summarizes research objectives and hypotheses of the study.

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[24] Hypotheses are testable statements which are derived from existing theory or empirical research (Sommer & Sommer, 1997). However, researchers are most interested in what is hardly known. In the absence of an extensive theoretical basis or empirical research, the researcher starts out with a preliminary notion or rather general idea of some direction in which new research should progress. Such preliminary ideas could be classified as exploratory hypotheses.

H1. Elderly residents and children are more antisocial in an open plan than in semi-enclosed or enclosed spatial plans.

H2. Elderly residents and children are more neutral in an enclosed spatial plan than in open or semi-enclosed spatial plans.

H3. Elderly residents and children are more prosocial in a semi-enclosed spatial plan than in open or fully enclosed spatial plans.

H4. Children use the activity and intermediary areas of an activity room more in a semi-enclosed spatial plan than in open or enclosed spatial plans.

H5. Children use miscellaneous areas of an activity room more in an open spatial plan than in semi-enclosed or enclosed spatial plans.

H6. Elderly residents prefer an open spatial plan to a semi-enclosed or enclosed spatial plan.

H7. Specific architectural design features are related to social interaction between impaired elders and young children.

HE1. There are significant differences in antisocial behavior in an open spatial plan between elderly residents and children.

HE2. There are significant differences in neutral behavior in an enclosed spatial plan between elderly residents and children.

HE3. There are significant differences in prosocial behavior in a semi-enclosed spatial plan between elderly residents and children.

TABLE 3.1
Research Objectives and Hypotheses of the Study

Research Objectives	Research Hypotheses
To examine the relationship between the level of spatial enclosure and social interaction between impaired elders and young children in senior living facilities with onsite childcare.	H1: Elderly residents and children are more antisocial in an open spatial plan than in semi-enclosed or enclosed spatial plans. H2: Elderly residents and children are more neutral in an enclosed spatial plan than in open or semi-enclosed spatial plans. H3: Elderly residents and children are more prosocial in a semi-enclosed spatial plan than in open or enclosed spatial plans.

TABLE 3.1 (Continued)

Research Objectives	Research Hypotheses
To examine the relationship between the level of spatial enclosure and behavior responses in a spatial setting.	H4: Children use the activity and intermediary areas of an activity room more in a semi-enclosed spatial plan than in open or enclosed spatial plans. H5: Children use miscellaneous areas of an activity room more in an open spatial plan than in semi-enclosed or enclosed spatial plans.
To gain a deeper understanding of the lived experiences of children and residents in three types of spatial enclosures.	H6: Elderly residents prefer an open spatial plan to semi-enclosed or enclosed spatial plans.
To identify architectural factors that affect social interaction between impaired elders and young children.	H7: Specific architectural design features are related to social interaction between impaired elders and young children.
To generate information for design guidelines to encourage social interaction between cognitively impaired elders and preschoolers.	HE1: There are significant differences in antisocial behavior in an open spatial plan between elderly residents and children. HE2: There are significant differences in neutral behavior in an enclosed spatial plan between elderly residents and children. HE3: There are significant differences in prosocial behavior in a semi-enclosed spatial plan between elderly residents and children.

3.4 RESEARCH DESIGN

A multi-method approach is important for understanding these phenomena are interrelated (see Section 1.4.1). The aim of this approach is to understand the meaning of behaviors from a variety of angles. It involves an investigation of how older adults and young children interact. This approach also involves an investigation of why these two groups behave in particular ways. The use of multiple data-collection methods enables the researcher to complement the weaknesses and strengths of research problems, to obtain convergent findings, and to promote a better understanding. This research is both quantitative and qualitative as it uses several research methods to collect data. These research methods include: naturalistic observation, a survey, development of an observation instrument, experimental systematic observation, and semi-structured interviews.

3.4.1 Methods of Data Collection

3.4.1.1 Naturalistic Observation

The process of inquiry into the subjects and their behaviors started with naturalistic observations, which involved a casual investigation of how people behave under similar conditions. This method provided the researcher with a means of open and inductive reasoning to get a sense of how older adults and young children interact in live, realistic settings. Methods for this naturalistic observation entailed observing dyadic or group conversations, posture, gestures, nonverbal signals, and so forth. Naturalistic observation was carried out to record verbal and nonverbal behaviors. In addition, behavior mapping was done to make note of people's locations and movements. Findings from these observations were helpful in developing the initial categories for denoting elder-child interaction. Some of these were included in a final version of the observation instrument used in the systematic observation. This observation helped compensate for the limitations of statistical analysis (i.e., counter-intuitive) in the construction of the observation instrument. The results of this observation enhanced the applicability of the data. Moreover, this naturalistic inquiry provided a vital opportunity to develop and specify research questions by visiting several facilities and observing different contexts (see Section 4.2).

3.4.1.2 Survey

The survey method was intended to identify and evaluate elder-child interaction categories relevant to the focus of this study by additionally comparing findings from the naturalistic observations and experts' opinions. Mixed-mode surveys, both Web-based and by mail, were chosen for this study because these means were considered the most effective strategy for obtaining adequate response rates. Each means compensated for the weaknesses and strengths of the other type. The mail survey contributed responses for people who had computer problems or who preferred to respond using a paper questionnaire. Respondents provided more detailed opinions to open-ended questions on the Web survey than on the paper questionnaire. The mixed-mode surveys also allowed the researcher to consider the cost and time involved in contacting potential respondents who are geographically dispersed (i.e., Japan, Canada). Moreover, two types of pre-test surveys were distributed to non-sample respondents but who had personal profiles similar to the persons who eventually completed the survey. This pre-survey test examined the following points: (1) the ease of access to the online survey and (2) the ease of understanding the directions for and the wording of the questionnaire. In this study, the Web and mail surveys provided substantive data for selecting frequently observable behaviors and evaluating the nature of such behaviors (see Section 4.4).

3.4.1.3 Observation Instrument

The development of an observation instrument appropriate for the focus of the study was conducted to be able to make systematic observations from which reliable and accurate measurement of target behaviors can be done. Reviews of existing observation instruments measuring elder-child interaction helped the researcher make a thorough examination and refinement on the essential attributes of the observation instrument (see Section 4.5). The final version of the Elder-Child Social Interaction (ECSI) observation instrument was composed of the following three social modes: an antisocial mode (one category), a neutral mode (one category), and a prosocial mode (five categories). The ECSI instrument is an environmental and behavioral instrument which records verbal and non-verbal social interactions, in relation to physical environments, between impaired elders and young children during physical exercise in multigenerational care settings. This involved observing and recording the occurrence of pre-categorized behaviors of each child and elder during a 10-second time interval over a 15-minute period of exercise time. This observation instrument was used in the experiment and provided quantitative data of frequently observed behaviors in each of three different physical configurations of an activity room.

3.4.1.4 Experiment using Systematic Observation

As a quantitative method in this study, an experiment using systematic observation was intended to examine how design interventions affect the children's and elderly residents' social behaviors. Design interventions were carried out in an activity room of Freedom House. This entailed placement of visual and physical boundaries using fabric curtains. The degree of spatial enclosure of the activity room was modified to create three different types of spatial plans (see Figures 5.5, 5.6, 5.7). These were designated as an open plan, which used no curtain; a semi-open plan entailed installation of a three-foot high curtain, while the closed spatial plan involved placement of a full-length, floor-to-ceiling curtain. This study used a multiple treatment reversal design to examine behavioral changes between before-and-after interventions. The basic design of the intervention was the A-B-A-B-C-B-C pattern in which A= non-intervention, B= 3 feet high curtain (semi-open plan), C=ceiling height curtain (enclosed plan) in which the effects of B to A and C to B were examined. Each phase took one week and the total intervention was conducted over an eight-week period. The researcher videotaped a 15-minute activity, three times per week (Monday, Wednesday, Friday) at 11:00 a.m. These videotapes were later used to record observations and to map behaviors. One dyad of a resident and child was videotaped in each segment in order to record details of the inter-personal social interactions. Two research assistants observed and recorded the presence of pre-categorized elder-child behaviors and mapped the locations and movements of children and residents by using the ECSI observation instrument. Recording all videotaped segments took nine weeks, including training for these research assistants (see Chapter V).

3.4.1.5 Semi-structured Interview

Follow-up interviews to the study were designed to explore participants' feelings and opinions regarding elder-child social interaction when the behavior setting was in an open, semi-enclosed, or enclosed space. The semi-structured interview consisted of three major sections: intergenerational experience in their family, elder-child interaction experiences during physical exercises, and activity room environments (see Appendix M). Additionally, participants were shown four photographs that simulated each level of spatial enclosure of an activity room while all other components of the room remained constant. The sentence structure and words of interview questions were modified to allow a more effective interview with preschoolers (see Section 6.2.1). The interviews were carried out either in a resident's rooms or in the chapel of Freedom House. Each interview lasted less than one hour and was conducted over a two-week period after participants had previously experienced the experiments on the three variations of spatial environments. A total of eight residents and three children were interviewed. The interviews were audio-recorded with prior permission granted by the children's parents and the residents' legal guardians. An activity leader asked questions based on the interview protocol while the researcher observed and made field notes of information that could add further insight on responses to the questions. Responses to the interview questions helped identify architectural design features associated with spatial enclosures that affected elder-child social interactions during physical exercise (see Chapter VI). Tables 3.2 and 3.3 present the phases of the study and the detailed procedures of data collection. Total time for data collection and analysis was approximately 53 weeks.

TABLE 3.2
The Phases of the Research Study

Research Phases	Research Settings	Methods of Data Collection/Analysis	Study Population
Phase I 1. Expert Survey	Mail and internet	-Mail questionnaire -Web-based questionnaire	-Intergenerational program group (IGSS, N=11) -Child, Youth and Family group (CYF, N=4) -Environment-gerontology group (EDRA, N=12)
2. Pilot Study	Sheridan in Bryan, TX	-Video-recording -Time sampling	-Residents at Sheridan senior facility (N=15) -Children from Jack & Jill preschool (N=6)
Phase II 1. Experiment using Systematic Observation	Freedom House in San Antonio, TX	-Spatial modification with curtains of 3 feet high and ceiling height -Behavior mapping	-Residents at Freedom House senior facility (N=8) -Children at Freedom House (N=5)

TABLE 3.2 (Continued)

Research Phases	Research Settings	Methods of Data Collection/Analysis	Study Population
Phase III 1. Follow-up Interview	Freedom House in San Antonio, TX	-Semi-structured Interview -Simulated photographs	-Residents in the experiment (N=8) -Children in the experiment (N=3)
Phase IV 1. Data Analysis		-Descriptive Statistics -Factor Analysis -Sequential Analysis -Non-parametric tests -Content Analysis	

TABLE 3.3
Data Collection Procedures and Analysis of the Study

Tasks	Sub-Tasks	Time	Total Hours	Notes
Phase I: Observation Instrument	1. Pilot test of web survey	1 week	1 week	-Non-sampling participants (N=10)
	2. Expert survey		14 weeks	-Web and mail questionnaires
	3. Pilot study of observation	30 min x 4 times	4 days	-Observation time: 9:30-10:00a.m. on Tuesdays
Phase II: Experiment using Systematic Observation (ABABCBC design)	1. Site visits to determine the actual physical condition of the activity room		3 days	
	2. Manufacture of curtains & a mock-up of observation room		3 weeks	
	3. Pilot test of videotaping	15 min x 3 days	3 days	
	4. Design Intervention: -Observation with baseline -Observation with phase B -Observation with phase A -Observation with phase B -Observation with phase C -Observation with phase B -Observation with phase C	 15 min x 5 days 15 min x 3 days 15 min x 3 days 15 min x 2 days 15 min x 3 days 15 min x 3 days 15 min x 3 days	8 weeks	-Observation time: 11:00-11:15a.m. -Days: Monday, Wednesday, & Friday -A: No intervention -B: Intervention 1 -C: Intervention 2
Phase III: Follow-up Interview	1. Preparation of simulated photographs		2 weeks	-4 types of photos (open, semi-enclosed, & enclosed views)
	2. Pilot test of interview protocol & photographs		2 weeks	-Jack & Jill preschool (N=10)
	3. Semi-structured interview	1 hr x 8 residents 30 min x 3 children	2 weeks	-Freedom House

TABLE 3.3 (Continued)

Tasks	Sub-Tasks	Time	Total Hours	Notes
Phase IV: Data Analysis	1. Descriptive statistics, Factor analysis		4 weeks	-Observation instrument data
	2. Descriptive statistics, Sequential analysis, Friedman's ANOVA test, Mann-Whitney U test, Kruskal-Wallis test		13 weeks	-Experiment & behavior mapping data -2 observers
	3. Content analysis		4 weeks	-Interview data
Total time of Data collection and analysis = Approximately 53 (± 2) weeks				

3.4.2 Site Selection and Study Settings

3.4.2.1 Pilot Study

In order to find a suitable study setting and participants for a pilot study, the researcher contacted administrators of five childcare centers and two senior care facilities in Bryan and College Station, Texas during September 2004. There were several problematic issues related to a pilot study setting. For the senior facilities, it was difficult to bring residents to a childcare center for the pilot study because of the relatively long time for elders to get ready, and also the limited mobility of some elders. For the childcare facilities, the two problematic issues were the availability of transportation and the tight schedule of daily activities. The concerns from both sides were resolved by conducting the pilot study at a senior facility which was located near to a childcare center which had a van that had insurance coverage enabling it to transport 4 to 5 year olds. In cooperation with the Jack and Jill preschool in Bryan, Texas, the pilot study was carried out at the Sheridan senior facility, also in Bryan, Texas. The Sheridan of Bryan is a long-term care nursing facility with 140 semi-private rooms. Activities for residents and children in the pilot study were carried out in an indoor activity room connected to an outdoor meditation garden and walking paths. This room was enclosed by a series of windows reaching to the ceiling on both the right and left sides of the room. This multipurpose room contained a large television cabinet, two lounge chairs, two side tables, along with many folding tables, and folding chairs.

3.4.2.2 Experiment using Systematic Observation

A multi-stage sampling design was used in selecting a site for this experimental systematic observation. In the first stage, a literature review of intergenerational shared-site (IGSS) programs was carried out. The researcher created a comprehensive listing of places, which have implemented IGSS programs in Texas. A combination of sources was used to create this list, including the Administration on Aging (AoA), the AARP, Generations United (GU), Generations Together, the Texas Department of Human Services via telephone survey, and an internet search during 2003. Although there are numerous long-term care facilities in Texas, only 13 long-term care facilities registered at the Texas Department of Human Services have formally adopted intergenerational programs. Among this group, long-term care facilities with on-site childcare were identified at just three sites[25] in Texas.

In the second stage, two candidate facilities were visited between August and October 2003. Administrators of these facilities were asked to respond to questions about their facility and intergenerational programs. These site visits, along with naturalistic observations, aimed to ascertain how intergenerational spaces (i.e., activity room, dining room, outdoor space) were used by residents and children and what kinds of intergenerational interactions (i.e., formal, informal) occur at these two facilities. Selection of the research site was made based on these three criteria: availability of planned ongoing intergenerational activities, the possibility of spatial modification of an activity room, and geographical locations close to College Station. The researcher decided to conduct the experimental study at Freedom House in San Antonio, Texas. This is an assisted living facility for people with Alzheimer's disease that includes an onsite childcare center. Freedom House has regularly used intergenerational activities for residents and children since they opened in 1997. An activity room of Freedom House is surrounded by a series of columns which allowed modification of the room by hanging curtains between the columns. Additionally, this facility was closer to College

[25] The three long-term care facilities co-located with childcare centers in Texas were Freedom House in San Antonio, King's Manor Methodist Home in Hereford, and Menard Manor in Menard.

Station than the other facility in Hereford. Both design intervention experiments and interviews were carried out at Freedom House.

3.4.3 Population

This research used four methods to collect data. In pase one this included the survey and pilot study, the experiment using systematic observation in phase two, and the interview in phase three. For the survey, three groups of researchers were recruited who were not familiar with the study. They are members of the Intergenerational Dissertation Support Group (IGSS), the Child Youth and Family group (CYF), and the Environment-Gerontology group (EDRA). In the pilot study, older adults residing in the Sheridan senior facility and young children enrolled in the Jack and Jill preschool participated. The participants of the experimental systematic observation and interview were the residents and young children from the Freedom House. Table 3.4 presents the four means of data collection by which participants were involved in this study.

TABLE 3.4
The Participants of the Study

Methods of Data Collection	Survey			Pilot Study		Experiment & Interview	
	IGSS	CYF	EDRA	Resident	Child	Resident	Child
1. Questionnaire	11	4	12				
2. Observation				15	8		
3. Experiment						8	5
4. Interview						8	3

All research participants in the three groups were considered eligible for this study. The original pool of survey population was 95 people. Of this total, 27 persons participated only through a survey by mail or over the internet (see Section 4.4.4.1). In the pilot study, all residents who were willing to participate in physical exercise activities with children were welcomed regardless of their level of cognitive impairment. The younger population of the pilot study was children aged 4 and 5 years, who had to weigh over 40 pounds[26] in order to use the type seat belts available in the van provided by Jack and Jill preschool. Overall, a maximum of 15 residents and 8 children took part in this pilot study, though the sample size for each session varied from 18 to 23 participants. In the experiment and interview, all residents who were physically mobile by means of mobility devices and capable of meaningful response in an interview were considered eligible. The medical staff at Freedom House selected an appropriate participant population for the experiment and interview. All of the children aged three to five were invited to participate in the experiment and interview. Among those children present in the experiment, the only ones excluded were those who dropped out during the experiment or who were incapable of giving consistent responses during the interview (see Section 5.2.1).

3.4.4 Variables

The literature review, presented in previous chapters, was used as the basis for defining each aspect of the built environment and elder-child social interaction involved in this research. This included the following three elements: (1) a behavioral outcome involving social interaction between elders and children, (2) a spatial outcome, in this instance, referring to use of social spaces, and (3) the physical implications of spatial enclosures in the designed environment. The definitions and measurements are presented for each facet of each of these variables presented in this research.

3.4.4.1 Dependent Variables

The dependent variables for this study were elder-child social interaction and the use of social spaces. Elder-child social interaction was divided into three categories of behaviors in this study. These were labeled as prosocial, neutral, and antisocial behaviors. Prosocial behavior was defined as empathetic and cooperative actions. It was characterized by communicative behaviors such as praising, inviting bystanders,

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[26] In terms of vehicle safety restraints (STANDARD 2.003), children weighing under 40 pounds shall use car safety seats and children between 40-80 pounds must use belt-positioning booster seats with lap and shoulder belts when they are driven in a motor vehicle like a van.

demonstrating instructions, and interacting in a friendly manner. Neutral behavior referred to self-absorbed actions, and was characterized by behaviors such as avoiding eye contact, backing off, and watching others without also engaging in activities. Finally, antisocial behavior was defined as inattentive acts, and was characterized by behaviors such as fidgeting, twirling one's hair, squirming, looking around, and yawning (see Appendix K). These behaviors were the basis for behavioral analysis using level of spatial enclosure as the independent variable. The behaviors were measured using the median score of intervals of elder-child social interaction observed during physical exercise activities.

The social spaces of an activity room involved in this research were defined by the level of social interaction between older adults and children. Areas were designated as activity, intermediary, and miscellaneous areas according to the level of social interaction in these spaces. The activity areas in an activity room referred to areas where older adults and children could easily establish physical and visual contact without moving. These areas were designated by their immediate proximity around where residents and children usually sat and exercised (i.e., within 1.5 feet around an individual seat). The intermediary areas referred to areas where older adults and children could make visual contact but no immediate physical contact. These areas were delimited by spaces where residents were designated to sit but with no children next to them. Areas where children chose to relocate their seat, as well as the empty space in the center of an activity room were also considered intermediate areas. Miscellaneous areas referred to spaces where older adults and children could not engage in social interaction because of the amount of physical and visual distance involved. These areas were considered to be spaces such as lavatories, general, open circulation areas, and any room beyond an activity room (i.e., childcare room, chapel) (see Section 5.1.3). This range of spaces was analyzed relative to the independent variable of level of spatial enclosure. The use of social spaces was assessed using the frequency with which children and residents occupied these areas during physical exercise activities.

3.4.4.2 Independent Variables

As the independent variable, the level of spatial enclosure was classified into three spatial arrangements for this study. These included open, semi-enclosed, and enclosed spatial plans. The open spatial plan was a spatial arrangement in which only a visual boundary was created by a series of columns between the circulation and activity areas. This proviso was made on the basis that the columns did not provide a strong physical boundary between different areas of an activity room. This was the existing spatial arrangement of the activity room at this research site. The semi-enclosed plan was a spatial arrangement in which three feet long curtains created moderate visual and physical boundaries around the activity area. The spatial partitioning preserved the activity room as a single physical and visual space. The visual and physical boundaries defining the enclosed plan were characterized by ceiling height curtains around the perimeter of the activity room. These ceiling height curtains restricted any visual connection to any miscellaneous use areas and the structural boundaries of the activity room. Table 3.5 summarizes the dependent and independent variables involved in this research.

TABLE 3.5
The Dependent and Independent Variables of the Study

Dependent Variables	Independent Variables
Elder-Child Social Interaction	Spatial Enclosure
-Prosocial behavior	-Open spatial plan
-Neutral behavior	-Semi-enclosed spatial plan
-Antisocial behavior	-Enclosed spatial plan
Use of Social Space	
-Activity area	
-Intermediary area	
-Miscellaneous area	

3.4.5 Validity

The validity of quantitative and qualitative analyses is important to reduce plausible alternative interpretations of data from which misleading interpretations can be drawn. Using different methods for data collection and analysis allows more reliable agreement of findings across different methods and provides greater confidence in the conclusions obtained. In this regard, several triangulation strategies were used to collect and analyze data with the three major research methods of survey, experimental study, and interview.

According to Dillman (2000), there are four critical sources of survey error. These include miscalculations in coverage, sampling, measurement, and non-response. Coverage error occurs when the sample excludes too many people from the population described. In this study, the target population for the survey was aimed at those who are specialized in studies related to child psychology, aging, and intergenerational programs. Mixed-mode surveys enabled the researcher to include as wide a range of people (i.e., limited computer access, geographical dispersion) as possible. Sampling error is associated with the non-probabilistic sampling process. Since each expert group in the study had a different population size then disproportionate sampling was utilized. In order to reduce inaccuracy resulting from a small sample size, it was necessary to unite three groups to obtain a group median score rather than calculating different median scores for all three groups. Measurement error occurs when respondents' answers are incorrectly recorded. Since measurement error can result from an inaccurate or imprecise questionnaire therefore the questionnaire for this study was pilot-tested to ensure the clarity of the wording of questions, sentence structure, plus the elimination of jargon and abbreviations. The non-response error becomes an issue when too many people in the selected sample do not respond to the survey. This ultimately affects sample size if a large percentage of potential participants do not respond. Since the response rate is closely related to respondents' interest in the survey (Dillman, 2000), extensive follow-up communications were used to minimize the non-response rate for this study.

For the validity of the experiment using systematic observation, there were six types of threats to related to the internal validity of this study (Shadish et al., 2002)[27]. These were identified as selection, history, maturation, attrition, testing, and

[27] The seven threats to internal validity in this study were selected from nine threats suggested by Shadish et al. (2002). The nine threats are ambiguous temporal precedence, selection, history, maturation, regression, attrition, testing, instrumentation, and interactive effects of threats to internal validity.

instrumentation. The first concern, selection, occurs when a difference exists at the start of an experiment. The difference may become an alternate explanation for any difference at the end of the study rather than a treatment effect. In this study, all participants were randomly assigned a designated seat for each session because seating pattern (i.e., mixed age row, age-segregated row) could influence patterns of elder-child social interaction at the start of the experiment. The second concern, history, can affect the observed outcome of all events, other than treatment. Even though it was not practically possible to isolate participants from events, controlling certain physical and organizational conditions reduced the possibility of history in this study. The experimental study followed the same activity time, day, and location that Freedom House has used on a routine basis. Additionally, physical conditions of the activity room were kept identical except during design interventions when curtains were set up and an observation mock-up put in place. The third concern, maturation, is associated with natural changes in participants over time such as growing older and becoming more experienced. Since it was not possible to halt the maturation of preschoolers, a relatively short period of data collection (i.e., eight weeks) was utilized in the study. The fourth concern, attrition which refers to subject mortality, can occur when participants fail to complete experiments. Since this study was voluntary in nature, participants' decision to drop out was beyond the control of the researcher. The fifth concern, testing, may occur when the act of taking a test affects subsequent testing. The normal method of dealing with this is to use different tests or a Solomon Four Group Design[28]. However, this study had a small sample size and both techniques were not practically applicable in this case. As an alternative strategy, a double-blind strategy was so that both participants and observers were unaware of these design interventions since they can unwittingly influence test results. Neither participants nor observers were aware at which point the manipulation occurred. The sixth concern, instrumentation (i.e., regarding the observer's role), can affect measurement of observed outcomes as observers become

[28] The Solomon Four-Group Design is useful to assess the effect of pretest sensitization to treatment (Shadish et al. 2002). Two of four groups receive a treatment and the other two do not. Next, two of the groups receive a pretest and the other two do not.

bored or overly familiar with the measurement. In order to ensure that observer fatigue and observer drift did not occur, observers took a 10-second break after every 10-second observation over a 15-minute observation period, and this was followed by an additional 5-minute break. Further, inter-rater and intra-rater reliabilities were assessed at various points during the study plus at the end, as well as at the beginning, in order to guard against observer drift.

The validity of qualitative analysis is controversial because the qualitative approach is more concerned with the analysis of text or transcripts. Lincoln and Guba (1985) offered a naturalistic analogue to conventional validity criteria with credibility as the equivalent of internal validity and transferability as the equivalent of external validity. Critical issues in dealing with the credibility and transferability of the interview include concerns over informant error and researcher error. Informants may give highly useful, but information that, at the same time, can be subjective and invalid. Informant bias can be nullified by both triangulation and prolonged engagement (Lincoln & Guba, 1985). Multiple data sources and multiple methods were used as a means of validating data findings. Prolonged engagement in the study environment was also beneficial because informants provided valuable insights into some less readily observable aspects of this research inquiry. Another source of error, researcher error, can occur when individual researchers coding narrative records make subjective interpretations and conclusions. Researcher error can be minimized by using member checks and reflexivity, (Gilchrist & Williams, 1999). The best defense against this error was outside checks which allow informants to review study interpretation. Consistent observation with personal reflexivity enabled the researcher to reflect upon different ways of thinking about and experiencing research questions in relation to the study environment. Table 3.6 summarizes the threats to validity and techniques used to enhance validity in this research.

TABLE 3.6
Threats to Validity and Techniques to Increase Validity

Threat	Description	Methods
Survey Method		
1. Coverage error	The result of excluding some people from the survey population.	-Use a mixed-mode survey
2. Sampling error	The result of non-probabilistic sampling process.	-Use disproportionate sample ratio
4. Non-response error	The result of different rates of response between those who participated in survey and did not.	-Increase respondents' interests in the survey
Experiment Method		
1. Selection	The result of differences at the start of an experiment.	-Use random assignment
2. History	The result of events occurring simultaneously with treatment.	-Keep same conditions except intervention
3. Maturation	The result of maturational changes.	-Limit the duration of an experiment
4. Attrition	The result of loss of participants (i.e., drop out).	
5. Testing	The result of taking a pretest.	-Use a double-blind design
6. Instrumentation	The result of observer fatigue and familiarity with testing instrument	-Take regular breaks -Check observer agreement
Interview Method		
1. Informant error	The result of informant's subjectivity	-Triangulation -Prolonged engagement
2. Researcher error	The result of researcher's subjectivity	-Outside checks -Reflexivity

3.4.6 Reliability

In addition to the issue of validity, another important practical consideration is reliability. The concept of reliability is concerned whether the measurement is repeatable or replicable. Given the fact that apparent differences in observed outcomes may, in fact, stem entirely from differences between the observers, then both inter-rater and intra-rater reliabilities were checked on a routine basis throughout the study. In addition, occurrence and nonoccurrence agreements were also checked because these indices are more sensitive than total agreement, and they are the standard indices of observer agreement in the behavioral sciences (Page & Iwata, 1989). In dealing with the reliability of interview data, informal member checks were made with each interviewee to clarify the data collected and to ensure the most relevant questions were asked. In general, triangulation enabled the researcher to improve reliability by employing more than one observer, using multiple methods of data collection, and multiple methods of data analyses.

3.4.7 Methods of Analysis

In order to analyze a variety of data obtained through multiple methods, several statistical techniques were used. The data collected from the mail and internet surveys were subjected to principal component factor analysis. This statistical technique is useful to identify a relatively small number of factors that could be used to represent sets of many interrelated categories of elder-child social interactions. The factor analysis used a varimax rotation method to extract factors with high loadings of more than 0.4. Additionally, an internal reliability test was performed to examine the appropriateness of the extracted factors.

Observation data collected from time interval recording were calculated as the frequency of observed behaviors. Since the observation data for the small sample size did not show a normal distribution and also had unequal variance, then nonparametric statistical methods along with a graphing technique were used to test differences in experimental conditions. A combination of visual analysis and statistical analysis enhances the strengths and minimizes the weaknesses of each technique. Both analyses provided the researcher with a relatively reliable standard for drawing conclusions from data visually inspected and statistically testing the significance of changes. In addition, inter-rater reliability was determined by totaling the number of agreements and dividing this sum by the total number of agreements plus disagreements.

Based on ranked data, a Friedman's ANOVA (Analysis of Variance) test, as an alternative to the repeated-measures ANOVA, was performed to test the effects of design intervention on elder-child social behaviors. To follow up findings from the Friedman test, the Wilcoxon signed-rank test was carried out. As the nonparametric equivalent of the independent *t*-test, the Mann-Whitney U test was also conducted to compare differences in elder-child social behaviors between different groups in relation to three experimental conditions. The Kruskal-Wallis nonparametric test was also used to test the association between design intervention and children's spatial usage. In order to measure the magnitude of the observed effect on the independent variable (i.e., spatial enclosure), the Pearson Product Moment Correlation coefficient effect sizes were calculated. Effect sizes are an objective measure of the importance of a real effect, with a small effect designated as (γ=.10-.29), a medium effect (γ=.30-.49), and a large effect ($\gamma \geq$.50) (Cohen, 1988; Field, 2005). For statistical analyses, SPSS 12.0 for Windows statistical software program was used.

In terms of qualitative analysis, content analysis was utilized to interpret the content of the interview data (Lincoln & Guba, 1985). Content analysis is a systematic and replicable technique for categorizing and classifying text from an observable context which can generate quantitative data (Krippendorff, 2004). The process of creating units of information for the interviews and sorting the data from unit information produced several central themes and sub-themes. Table 3.7 lists the various statistical methods used in this research for testing hypotheses.

TABLE 3.7
Hypotheses and Statistical Tests Used

Hypotheses or Issues to be Tested	Variables		Types of Statistical Test Used
	Dependent	Independent	
• Inter-rater reliability	Each item in observation measurement		Occurrence and nonoccurrence agreements
• Hypothesis One Elderly residents and children are more antisocial in an open spatial plan than in semi-enclosed or enclosed spatial plans. • Hypothesis Two Elderly residents and children are more neutral in an enclosed spatial plan than in open or semi-enclosed spatial plans. • Hypothesis Three Elderly residents and children are more prosocial in a semi-enclosed spatial plan than in open or enclosed spatial plans.	Three types of elder-child social interaction (prosocial, neutral, antisocial)	Three types of spatial enclosure (open, semi-enclosed, enclosed)	-Descriptive -Sequential analysis -Friedman's ANOVA test -Wilcoxon signed-rank test

TABLE 3.7 (Continued)

Hypotheses or Issues to be Tested	Variables		Types of Statistical Test Used
	Dependent	Independent	
• Hypothesis Four Children use activity and intermediary areas of an activity room more in a semi-enclosed spatial plan than in open or enclosed spatial plans. • Hypothesis Five Children use miscellaneous areas of an activity room more in an open spatial plan than in semi-enclosed or enclosed spatial plans.	Three types of activity areas (activity, intermediary, miscellaneous)	Three types of spatial enclosure (open, semi-enclosed, enclosed)	-Descriptive -Kruskal-Wallis test
• Hypothesis Six Elderly residents prefer an open spatial plan rather than semi-enclosed or enclosed spatial plans.	Three types of spatial enclosure (open, semi-enclosed, enclosed)		Descriptive, Content analysis
• Hypothesis Seven Specific architectural design features are related to social interaction between impaired elders and children.	Items identified from interview		-Content analysis
• Exploratory Hypothesis One There are significant differences in antisocial behavior in an open spatial plan for elderly residents and children. • Exploratory Hypothesis Two There are significant differences between elderly residents and children with neutral behavior in an enclosed spatial plan. • Exploratory Hypothesis Three There are significant differences between prosocial behavior in a semi-enclosed spatial plan for elderly residents and children.	Three types of elder-child social interaction (prosocial, neutral, antisocial)	Three types of spatial enclosure (open, semi-enclosed, enclosed)	-Descriptive -Mann-Whitney U test

3.5 SIGNIFICANCE OF THE STUDY

The population and setting of this study contribute to its innovativeness. Despite the growing number of intergenerational studies, the combination of preschoolers and older adults with Alzheimer's disease has not been previously addressed in studies on the architectural environment. In a national survey of the AARP (Goyer & Zuses, 1998), the nursing home/childcare model was the most prevalent model among intergenerational shared-site programs. In addition, studies from the National Institute on Collaborative Aging found that almost 90 percent of older adults in nursing homes had cognitive impairments (Teresi et al., 2000). In view of these two facts, this study will make significant contributions in terms of organizational, personal, and professional levels.

When adult or childcare providers implement and utilize intergenerational care facilities, it is critical to create environments that can promote the health and development of older adults as well as children. The evidence-based design guidelines from this study may help transition the physical and organizational transformation of institutional group care facilities into more homelike care environments. This may raise the prospect that long-term care facilities in the future will constitute age-friendly care facilities. In a broad sense, the greatest potential of the study is to provide valuable information for combining children’s daycare spaces with Alzheimer’s and other senior facilities from the feasibility planning phase.

Secondly, the study can benefit older adults, children, and their families. Among women simultaneously caring for children and elderly parents in the United States, 55 percent had difficulty paying for childcare and 75 percent lacked access to adult care facilities (Stremmel et al., 1994). Considering that caregiving is stressful, especially in view of caregivers' reports of high levels of depression and poor health, a lack of available community facilities to care for young children and older adults may cause even more stress and financial burdens for adult children employed outside the home. This study clearly has implications for intergenerational caregiving systems, which can have a significant emotional and financial impact on families as a whole. In this regard, care providers may work to develop affordable intergenerational care facilities to support family caregivers with multiple roles.

Yet another contribution of this study is that it may help designers to create therapeutic and developmental environments appropriate to foster prosocial interactions between older adults and young children. Architectural professionals studying care facilities for children and the elderly can gain a better understanding about intergenerational needs of the built environment. Additionally, as designers seek to provide architectural environments which meet the specific needs of older adults and young children, both generations would benefit from a level of care which promotes the potential for social interaction and, in turn, an environment for greater healing and development. Therefore, this study will make a significant contribution toward implementing and creating intergenerational care facilities with decent, appropriate care for loved ones.

CHAPTER IV
OBSERVATION INSTRUMENT RESULTS AND DISCUSSION

This chapter covers the results of an observation instrument designed to measure social interactions between demented older adults and young children. The observational instrument was constructed utilizing the following input: naturalistic observation, literature review, expert survey, and pilot study. This multi-method approach allowed the researcher to develop an observational instrument appropriate to the objective of the study.

The observational instrument allows for systematic observations in an experiment. As an environmental and behavioral assessment, the observational instrument included behavior mapping which is a supplemental means of recording the direction of behavior, people's movements, and usage patterns of a behavior setting over time (Sommer & Sommer, 1997). A well-developed instrument, with a thorough understanding of the intergenerational milieu, provides reliable and accurate data about impaired elder-child interaction from which conclusions will be drawn.

4.1 STRATEGY AND SCHEDULE OF OBSERVATION INSTRUMENT

An observational instrument is a useful tool for systematically measuring behaviors or events to be observed (Irwin & Bushnell, 1980). The observer uses observational instruments to provide a strong data basis for making credible inferences. In this observer-judgment-based approach, interpretations are influenced by observers' personal biases (i.e., preconceived opinions), experiences, and incomplete knowledge of behaviors being observed (Kerlinger, 1986). Given the variability of individual observer opinions, careful consideration must be given to providing a measurement procedure from which reliable and objective observations can be made.

The main purpose of observational instrument construction in this study is to develop a valid and reliable tool for measuring specific variables (i.e., elder-child social interaction, spatial usage pattern) in particular research situations (i.e., older adults with

Alzheimer's disease, young children aged 3 to 5, an assisted living facility with on-site childcare, physical exercise activity). In the construction of the observational instrument, consideration was given to what is to be observed and how the behavior data are collected and recorded. For systematically observing behaviors in dynamic contexts and effectively transferring this information, the following four strategies were carefully designed: (1) naturalistic observations at senior care facilities co-located with childcare centers, (2) reviews of existing observational instruments, (3) an expert survey via mail and the internet, and (4) a pilot study.

4.1.1 Strategy of Observation Instrument Construction

The main objectives of observation instrument construction are as follows:

1. To identify impaired elder-child interactive behaviors frequently observed during physical exercise activities.
2. To define behavioral categories of impaired elder-child verbal and nonverbal interactions during physical exercise activities.
3. To develop observational recording formats appropriate to obtain a sequence of impaired elder-child interactions (i.e., proportion) that occur during observation sessions.

As the first step in developing an observation instrument, naturalistic observations were made to select and define the representative behaviors of impaired elder-child social interaction. Naturalistic observations helped the researcher to obtain a sense of elder-child interaction behaviors in real situations at intergenerational care facilities for young children and older adults. Secondly, reviews of published observational instruments were done to identify frequently observed behaviors of elder-child interaction. The observational instruments were reviewed in the areas of child-adult interaction, peer interaction, and agitation in elderly patients with dementia. Thirdly, an expert survey was conducted to further articulate the relevant dimensions of impaired elder-child interaction behaviors and to evaluate the nature of impaired elder-child interaction behaviors. Finally, a pilot study was carried out to refine operational definitions of selected behaviors, to determine appropriate recording formats, and to obtain on-the-field information before the main study was conducted.

4.1.2 Schedule of Observation Instrument Construction

Naturalistic observations were carried out at two long-term care facilities with onsite childcare in Texas. The researcher first toured each facility in August and September 2003. Guided by a childcare director and an activity director, the first visit to each facility helped the researcher to get a sense of how impaired elder-child interactions occurred. The researcher was also given the freedom to unobtrusively watch what was happening in the main lobby, activity rooms, inside childcare centers, and playgrounds. The observations were made twice; first in the morning, then in the afternoon after the children's nap time. These observation times were recommended by the activity coordinators because most activities for both residents and children were taking place during these periods. In order to get a deeper understanding about impaired elder-child interactive behaviors, three additional visits were made to the selected research site, Freedom House in San Antonio, Texas in October 2003.

To find pre-existing tools for measuring elder-child interaction, the literature review included a database search using key-words, and searching peer-reviewed journals for articles related to observational instruments. The instruments included in this literature review were limited to those designed for measuring child-adult interactions. The existing observation instruments were not fully appropriate for this study in terms of settings, populations, and categories. Thus, it was necessary to develop an observational instrument for measuring interactive behaviors between particular populations (i.e., *demented* elders, *preschool aged* children) in a particular research situation (i.e., *physical exercise* activity).

The need to design an observation instrument led the researcher to conduct an expert survey. The previous naturalistic observations and literature review helped determine the initial categories used to delineate impaired elder-child interactions during physical exercise activity. Based on the preliminary categories, three research groups were asked both to identify frequently observed behaviors and to evaluate the nature of these behaviors (see Appendix H). The respondents were not familiar with the study but their areas of specialization are in the study of child development, environmental gerontology, and intergenerational programs. The expert survey took almost four months to complete because each expert had to consider each research group.

For refining the categories and recording formats of the observation instrument that was developed, a pilot study was conducted in the activity room of a nursing home in Bryan, Texas. Children from a local childcare center were brought to the senior facility for each visit. Residents and young children took part in physical exercise activity and were observed for approximately 30 minutes once per week over a four-week period during November and December 2004. The childcare center staff suggested an activity time of 9:30 in the morning to allow for a convenient fit with their other daily programs. All four observation sessions were audio- and video-taped for later data analysis. The researcher made these observations from the perimeter of the activity room. An activity director for the senior facility and a director for the preschool advertised participation in this pilot study through either a flyer or a monthly newsletter (see Appendix J). Table 4.1 summarizes the schedule for constructing an observational instrument. The following sections explain, in detail, the contents and data collection procedures of each method.

TABLE 4.1
The Schedule of Observational Instrument Construction

Methods	Settings	Subjects	Collection Dates
Naturalistic Observation	-King's Manor Methodist Home, Hereford, TX	-Older adults residing at each facility	8.26.2003
	-Freedom House, San Antonio, TX	-Children enrolled in each facility	9.12-10.31.2003
Literature Review	-Peer-reviewed journals	-Young children -Adults	1.21-9.20.2004
Expert Survey	-Mail and internet	-Intergenerational Dissertation Support group -Child, Youth and Family group -Environment-Gerontology group	12.6.2004-3.11.2005
Pilot Test	-Sheridan of Bryan, TX	-Residents at Sheridan -Children from Jack & Jill preschool	11.30-12.28.2004

4.2 NATURALISTIC OBSERVATION

After a comprehensive procedure for finding long-term care facilities with onsite childcare centers in Texas, three candidate facilities were identified (see Section 3.4.2). Two of these facilities were visited between August and October 2003. The two facilities visited are the King's Manor Methodist Home in Hereford, and the Freedom House in San Antonio, Texas. Each facility is distinguished by residential and building characteristics.

4.2.1 Residential and Building Characteristics

4.2.1.1 King's Manor Methodist Home

Co-located with a childcare center in rural area of Hereford, the King's Manor Methodist Home incorporates three types of housing for seniors, such as a nursing home, an assisted living unit, and scattered cottages. This facility accommodated approximately 128 residents aged 70 to 80 and about 20 children aged 6 months to 5 years. Average numbers of residents and children who participated in intergenerational activities were 30 and 15, respectively. Most of the participating residents were cognitively impaired (75% of the total population) but physically mobile, either walking or using a wheelchair. Children who participated in activities with residents were 3 to 5 years old. They were from the surrounding community and children of staff at the facility.

Intergenerational programs occurred once a week on Wednesdays at 9 a.m. for 30 minutes in two lounges; one for assisted living residents and another for nursing home residents. The facility strived to maintain a harmonious balance of ages, genders, and levels of impairments for activities with residents and children. For example, residents in patient beds were invited to intergenerational activities specially designed for people with physical or cognitive impairments. Children with childcare teachers made occasional visits to less mobile residents in their rooms on Fridays after 3 p.m.

This building complex also provided residents and children with accessible outdoor spaces for intergenerational activities, such as a playground, gazebo, garden, and green spaces. According to the director of the childcare center, both indoor and outdoor environments were important for positive intergenerational interaction. Unfortunately, the location of the childcare center and a long, crowded corridor to the nursing home unit were likely to reduce occasional, informal opportunities for daily interactions between the children and the nursing home residents. Figure 4.1 illustrates a site plan of King's Manor and Figure 4.2 shows panoramic views of King's Manor.

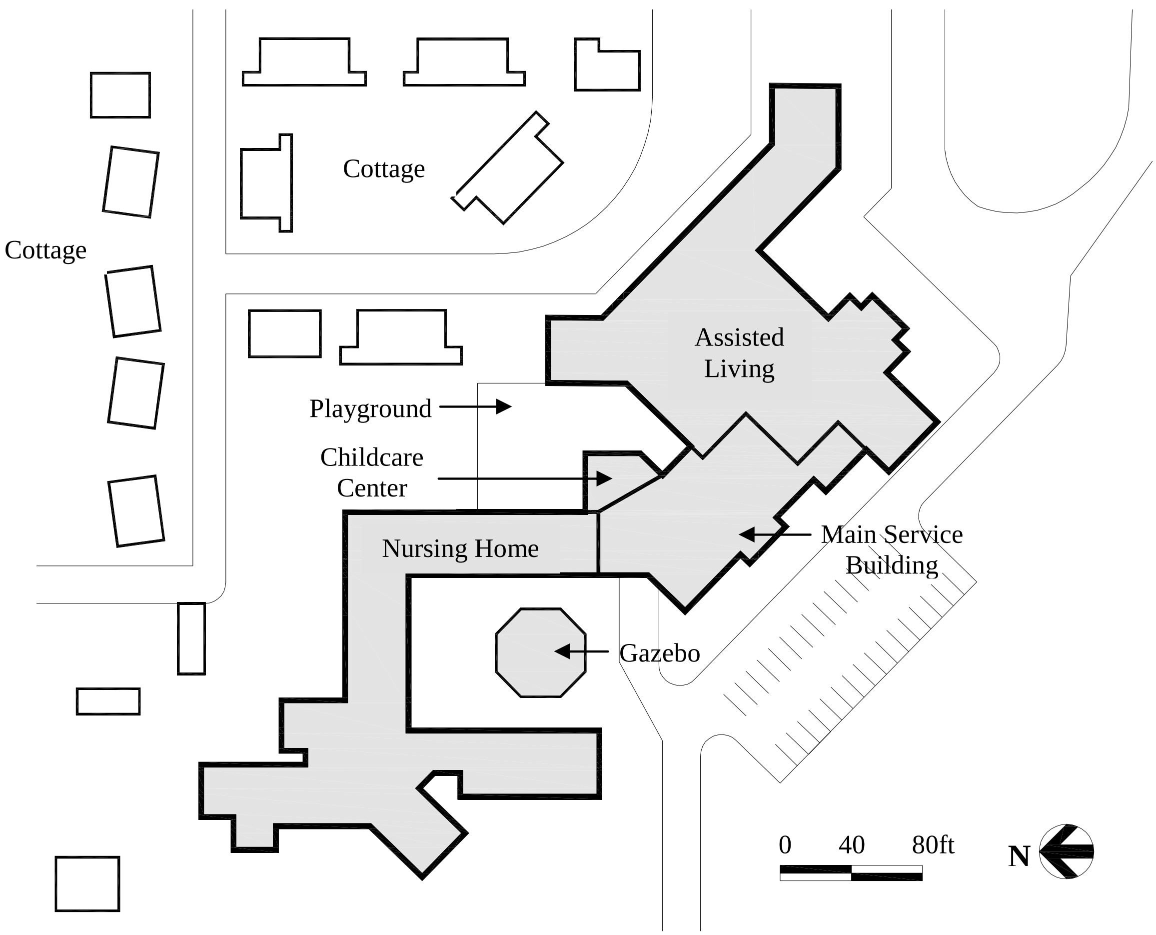


Figure 4.1: Site Plan of King's Manor Methodist Home, Hereford, Texas

Figure 4.2: Panoramic Views of King's Manor Methodist Home, Hereford, Texas

4.2.1.2 Freedom House

Located in a suburban of San Antonio, The Freedom House consists of Alzheimer's residential units as well as an onsite childcare center. This facility served approximately 76 residents with Alzheimer's disease and about 12 children of staff affiliated with the facility. In contrast to King's Manor Methodist Home, approximately 12 residents and 5 children regularly took part in intergenerational activities. The residents who participated in intergenerational activities were in the high functioning phase of Alzheimer's disease. Some residents used wheelchairs or canes, while others were able to walk on their own. Unlike the King's Manor Methodist Home, the childcare center of Freedom House served staff's children aged 6 weeks to 5 years old only.

Regularly planned intergenerational programs occurred three times per week (i.e., Monday, Wednesday, Friday) in a multipurpose room of this facility located at a hub of high traffic walkways connecting two the residential units and the main service building. Freedom House provided physical exercise activities for residents and preschool aged children on Monday and Wednesday mornings at 11:00 for 30 minutes. In addition, residents and children interacted through special exercise activity (i.e., parachute) on Fridays at the same time. Freedom House also strived to provide the residents some interaction with children regardless of their level of Alzheimer's disease. For example, residents in low functioning level of Alzheimer's disease enjoyed occasional visits from children at the co-located childcare center.

The glass-covered walkways to residential units along with central outdoor spaces (i.e., playground, garden) allowed residents to watch children playing outside. For safety and security purposes, residents were not allowed to go alone to the main service building where the on-site childcare center is located. This limited access to the childcare center seemed to prevent residents from having more casual interactions with the children. Figure 4.3 depicts a site plan of Freedom House and Figure 4.4 shows panoramic views of Freedom House.

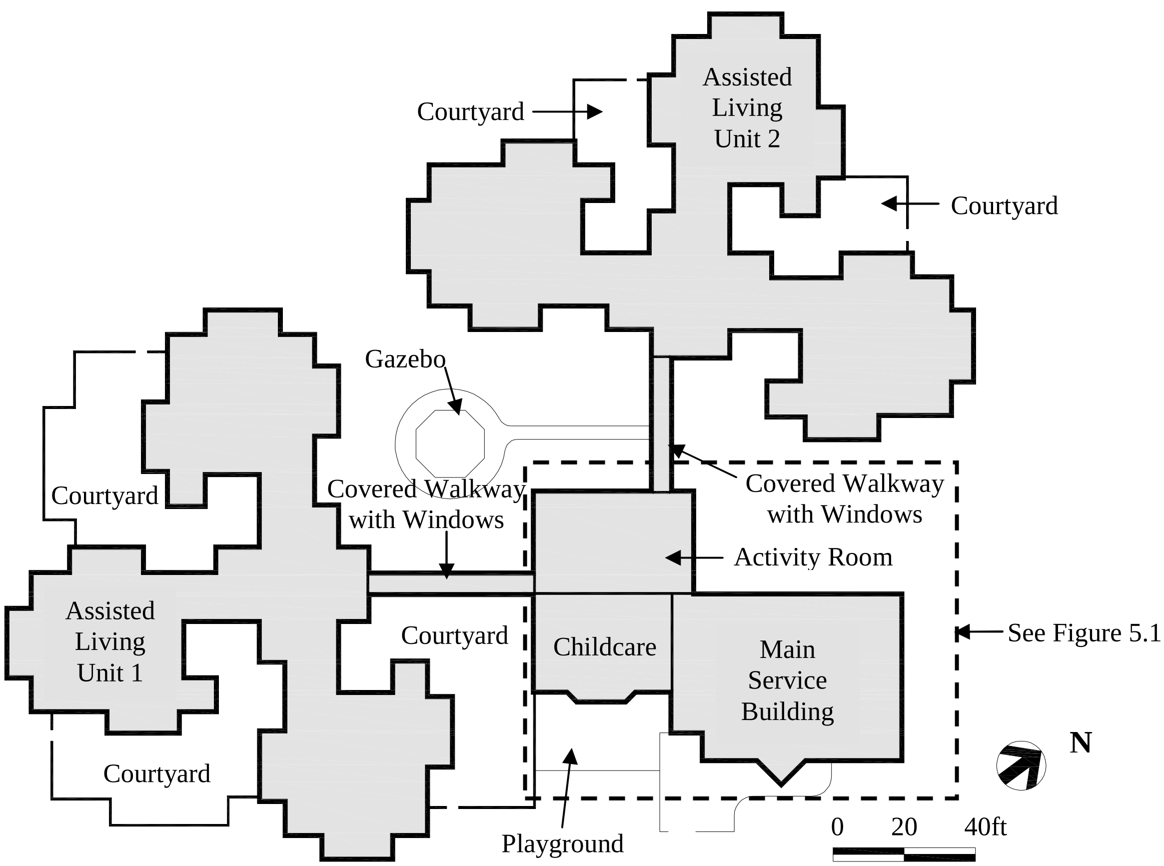


Figure 4.3: Site Plan of Freedom House, San Antonio, Texas

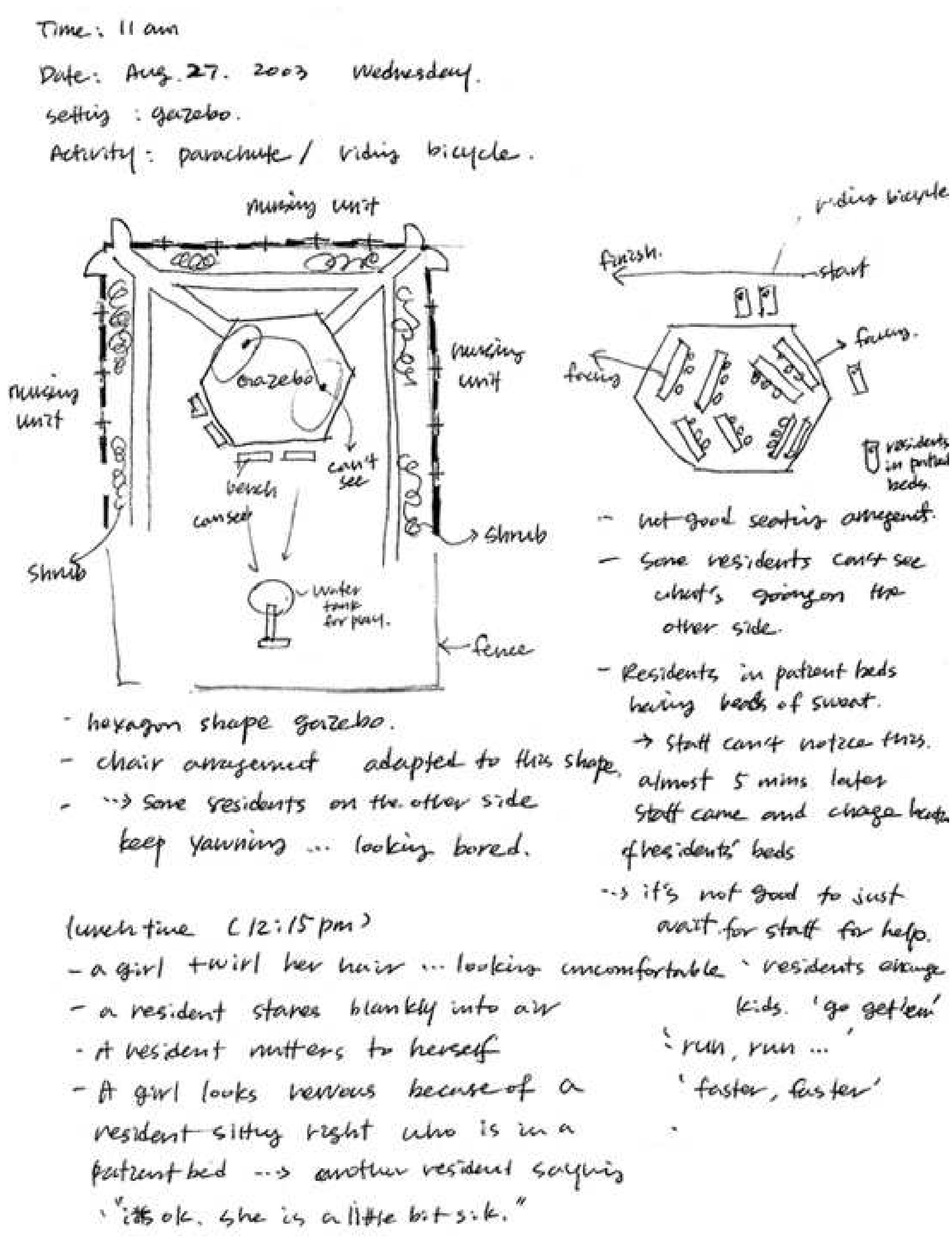
Figure 4.4: Panoramic Views of Freedom House, San Antonio, Texas

4.2.2 Findings of Naturalistic Observation

Throughout the visits to each facility, the researcher made field notes to record first impressions, diagrams, elder-child interactive behaviors, and the researcher's own ideas about the reasons for the behaviors. Specifically, the researcher jotted down verbal and nonverbal behaviors (i.e., dyadic conversations, facial expressions, postures, gestures) and mapped elder-child interaction patterns during the scheduled activities.

4.2.2.1 King's Manor Methodist Home

A director of the childcare center prearranged schedules for an onsite tour and observations of intergenerational activities at King's Manor Methodist Home. An outdoor activity for residents and children was scheduled for one hour at 11 in the morning on August 27, 2003. This onsite visit was casual in nature. Because of the nature of the outdoor activities the residents and children tended to respond more to the events or activities than to the researcher's presence. This obliviousness to being observed helped the researcher to immediately record what behaviors occurred, and with whom in a real setting. Figure 4.5 illustrates a sample of field notes and behavior mappings done at King's Manor Methodist Home during an outdoor activity.



Time: 11 am

Date: Aug. 27. 2003 Wednesday.

setting : gazebo.

Activity: parachute / riding bicycle.

- not good seating arrangement.
- Some residents can't see what's going on the other side.
- Residents in patient beds having beads of sweat.
→ Staff can't notice this. almost 5 mins later Staff came and change beds of residents' beds
--> it's not good to just wait for staff for help.

- hexagon shape gazebo.
- chair arrangement adapted to this shape.
- --> Some residents on the other side keep yawning ... looking bored.

lunch time (12:15 pm)

- a girl twirl her hair ... looking uncomfortable
- a resident stares blankly into air
- A resident mutters to herself
- A girl looks nervous because of a resident sitting right who is in a patient bed --> another resident saying "it's ok. she is a little bit sick."

residents encourage kids. 'go get'em' 'run, run ...' 'faster, faster'

Figure 4.5: Sample of Field Notes with Behavior Mapping at King's Manor

According to the researcher's observations, staff often positioned residents in wheelchairs or patient beds in locations the staff assumed to be good areas for watching children playing. However, the staff's control of residents' seating locations required careful attention to environmental conditions. For example, a resident in a patient bed was positioned under a tree but shade from the tree shifted with the sun's changing position. The resident had to wait with beads of sweat on her forehead until the staff changed her location. In addition, a hexagon-shaped gazebo led staff to make a seating arrangement adapted to this shape. Some residents could see children playing, while others on the reverse side were not able to watch what was happening from the position in which they were seated. These observations revealed how environmental conditions unwittingly dispelled residents' ability to interact with children. Table 4.2 summarizes the researcher's naturalistic observations at King's Manor Methodist Home. The behaviors listed below were included in an initial list of 44 elder-child social behaviors for the expert survey later on.

TABLE 4.2
Summary of Elder-Child Interaction Observed at King's Manor Methodist Home

Observations	Preliminary Categories
-A child moved arms and legs in short, rapid motions. -A child twirled her hair nervously.	-Exhibits restlessness
-Some residents kept yawning repeatedly and looked half-awake.	-Appears drowsy
-A resident next to a child kept smiling, but the child was avoiding eye contact with the resident.	-Avoids elder
-A resident stared blankly into the air because she could not see children playing from where she sat.	-Stares blankly into space
-A resident seemed to mutter to herself.	-Talks to self
-A child looked distressed on seeing a resident in a patient bed. Another resident patted the child's shoulder and said, "It is ok. She is a little bit sick."	-Consoles a child
-Many residents laughed when children made joyful gestures.	-Laughs with child/elder
-A resident coaxed a child who was standing apart from other children, and said, "Do you want to join them? It looks fun."	-Invites child to interact
-Some residents attentively watched children riding bicycles.	-Observe child
-A resident encouraged a child left behind in a bicycle race.	-Encourages child
-A resident listened to a child talk about what he did with his brother the night before.	-Pays attention to child
-A child tried to help a resident, seated on a chair, by moving a walker out of an activity area.	-Gives help

4.2.2.2 Freedom House

The researcher made a total of four onsite visits to Freedom House in San Antonio, Texas from September through October 2003. An activity director coordinated the schedule for onsite tours and observations of intergenerational activities. Typically, activities for residents and children were scheduled in the morning at 11:00 for 30 minutes, for three times a week. On the first visit the residents and children were sensitive to the presence of the researcher. Because of their reaction, field notes and behavior mappings were recorded from the researcher's memory immediately after leaving the activity room. However, the reaction tended to decrease over the course of an additional three visits. Figure 4.6 illustrates a sample of field notes made regarding naturalistic observations at the activity room of Freedom House.

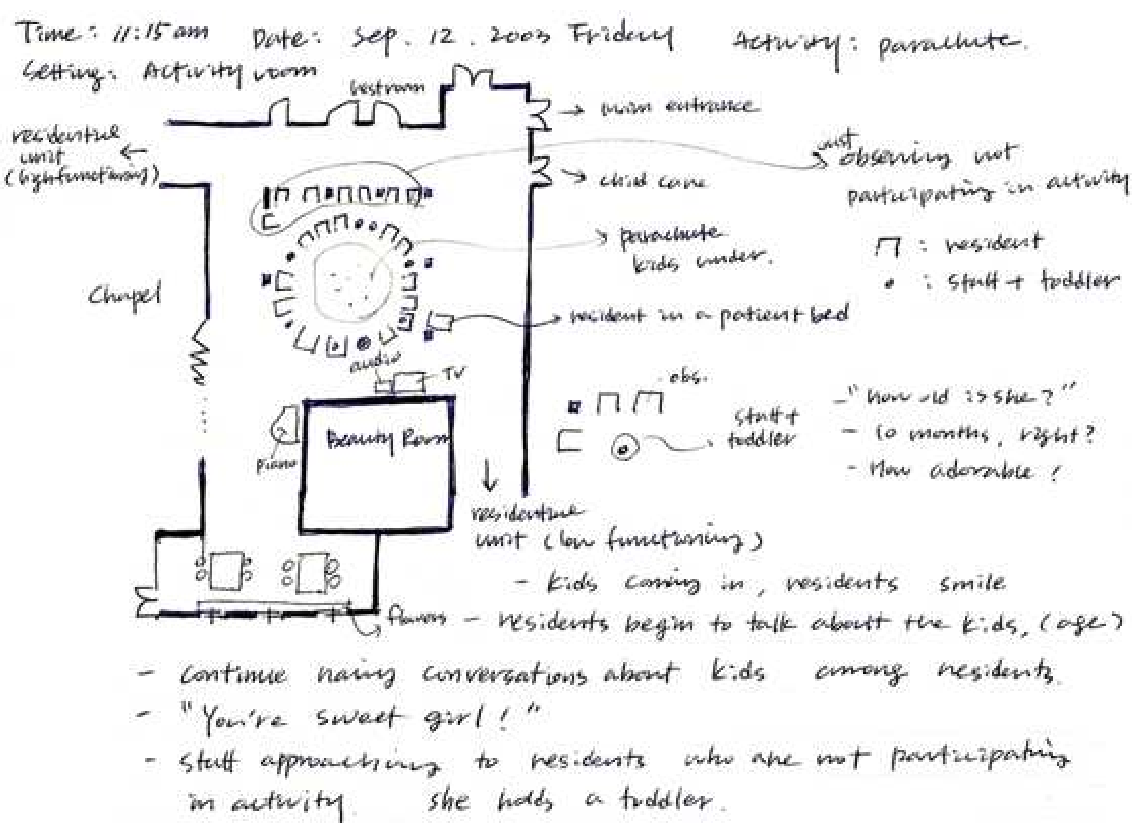


Figure 4.6: Sample of Field Notes with Behavior Mapping at Freedom House

When a group of children, from toddlers to 5 years old, appeared in the activity room with their teachers, the residents turned their full attention on the children. The residents smiled brightly when the children entered. Conversations began among residents who were quiet before (i.e., “Look at her. She is a sweet girl.” “How old is she?”). Some residents interacted with the children in a friendly manner, while others sat away from the social milieu and just watched what was happening in the activity room. A staff member, with a toddler in her arms, approached a group of quiet residents seated some distance away and started a conversation with them. During the four visits to Freedom House the combination of passive and active interaction patterns was observed before the intergenerational activities began.

Similar patterns of interaction between residents and children occurred during general activities (i.e., parachute, physical exercise). Some residents actively joined activities, while others sat in chairs arranged along the perimeter of an activity room. An arrangement of chairs between the circulation and the activity areas seemed to create a favorable environmental condition[29] that allowed persons to see without being engaged. Chairs in this intermediate area attracted those residents who did not want to join the activity but did enjoy watching the children. They were also able to leave the activity room whenever they wanted; even in the middle of an activity. In addition, some passersby (i.e., visitors, staff) stopped by and watched the exercising without disrupting the activity. These observations showed the variety of ways architectural environments can support interaction between residents and children. The built environment facilitates all levels of elder-child interaction, including passive, intermediate, and active patterns. Table 4.3 illustrates a summary of naturalistic observations at Freedom House from which preliminary categories of elder-child interactions were made. The categories, below, were selected for an initial list of 44 elder-child social interactions listed in the expert survey.

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[29] According to Appleton (1975), human beings in nature seek a place to watch without being observed. The popularity of this seating zone between the circulation and activity areas supports his Prospect-Refuge theory.

TABLE 4.3
Summary of Elder-Child Interactions Observed at Freedom House

Observations	Preliminary Categories
-A child repeatedly fidgeted in seat and was told to put his/her feet down on the floor.	-Exhibits restlessness
-A child left an activity room after wandering a few minutes.	
-Children tried to leave for bathroom once another child went to bathroom.	
-A resident walked about aimlessly.	
-A child became absorbed in his/her own activity unrelated to ongoing activity.	
-A child put his arms behind his head to rest.	-Acts disinterested
-A child seemed not interested in an ongoing activity and asked activity instructor, “How many more? This many?”	
-A child started to play with his fingers, hands, and tongue.	
-A child kept yawning as if bored with the activity.	
-A resident glanced at her watch several times during the activity.	
-A child was distracted by a staff person entering a storage room opposite the activity room.	-Gets distracted
-A child was distracted by his shoes for a few minutes during activity.	
-Two children stopped following activity and talked about a spider’s web.	
-A resident’s shoelaces apparently bothered her. She took a few minutes to take off her right shoe and tried to cut off something that bothered her.	
-A resident closed her eyes and did not follow exercise.	-Appears drowsy
-A resident kept trying to lead and invite a child into the activity, but the child kept avoiding her.	-Avoids elder
-Some residents watched the children with folded arms but did not participate in the activity.	-Sits with folded arms
-As an activity was done, children hugged residents. This exchange occurred every time an activity ended.	-Hugs child/elder
-A resident looked at a child exercising while doing his own exercises.	-Observes child
-A resident led activity by showing a child seated next to her what to do.	-Leads activity
-A resident prevented a severe conflict between two children who got into an argument.	-Restricts child’s inappropriate behaviors
-A resident warned a child to be quiet by sternly fingering her lips.	
-A resident helped tie a child’s shoelaces.	-Gives help

4.3 REVIEWS OF OBSERVATION INSTRUMENT

4.3.1 Strategy of Observation Instrument Review

The aims of this literature review were threefold: first, to present an overview of potential observation instruments designed for measuring interactive behaviors between children and adults; second, to compare how these observation instruments are different in their characteristics; finally, and most importantly, to design an observation instrument appropriate for specific conditions of this study (i.e., cognitively impaired elders, young children, group physical activity, intergenerational care setting).

Several strategies were used to identify potential observation instruments for review. The first step involved a key-word search of two major databases[30]: PsycINFO and PubMed. The original search terms proved to be too narrow (i.e., seniors, children, observation, instrument) and found only two journal articles. So it was necessary to use broader key-words[31] to identify more references. Potential observation instruments were also identified by reviewing several peer-reviewed journals[32] and a book[33] on child development research.

Among the many observation instruments identified, the overly broad references were discarded. Those instruments which met the following criteria were included in this review: empirical research with an emphasis on child-adult or peer interaction, written in English. For this review, interaction was defined broadly to include peer interaction (i.e., child-child, elder-elder). Socially appropriate or inappropriate behaviors among peers have been extensively studied in terms of the social development of young children and older adults. Finally, ten observation instruments potentially relevant to this research were included. While some relevant observation instruments may have been overlooked because of this selective search strategy, it is likely that the ten were representative of the field.

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[30] PsycINFO is an electronic journal article database of psychological studies and includes links to full-text articles. PubMed is an abstract database of life science literature and provides links to full-text and other related articles. This database is managed by the National Library of Medicine.

[31] Search terms included the following: child-adult interaction, dementia, Alzheimer's, agitation, instrument, early childhood, parent-child interaction, social behavior, preschooler, aggressive behavior, and withdrawal.

[32] Journals reviewed were *Child Development*, *Developmental Psychology*, *Journal of Psychology*, *Journal of Psychological Studies*, *Child & Youth Services*, *Journal of Applied Behavior Analysis*, *Journal of Gerontology*, *Journal of Intergenerational Relationships and Environment and Behavior*.

[33] For a comprehensive review of early childhood observation instruments especially, refer to Simon, A., & Boyer, E. G. (1974). (Eds.), *Mirrors for behavior III: An anthology observation instruments.* Philadelphia: Research for Better Schools.

4.3.2 Findings of Observation Instruments Reviewed

The ten selected observation instruments covered a wide range of phenomena of social interaction[34] with a variety way of data collection techniques. Each instrument was generated to systematically collect observation data concerning categorizing, uniting, sampling, recoding, collecting target behaviors, and time intervals. The subsections below summarize findings from the selected observation instruments based these six areas. The detailed issues and findings of the ten observation instruments are illustrated in Table 4.4. Abstracts of the observation instruments are available in Appendix G.

TABLE 4.4
Summary of Key Information on Observation Instruments Reviewed

		Categories			Units of behavior		Sampling methods				Recording methods			Collection methods		
No	Author(s)	Prosocial	Neutral	Antisocial	Category system	Sign system	Narrative recording	Time sampling	Event sampling	Checklist or rating	Occurrence	Frequency	Duration	On-the-spot	Video and/or audio equipment	More than one observer or coder
1	Ladd & Profilet (1996)	●	●	●	●	●		●				●		●		●
2	Schroeer & Flapan (1971)	●		●	●		●				●			●		●
3	Cohen-Mansfield, Werner, & Marx (1989)			●	●	●		●		●		●		●		
4	Moustakas, Sigel, & Schalock (1956)	●		●		●		●				●		●		
5	Stover, Guerney, & O'Connell (1971)	●			●					●	●			●		
6	Angersbach & Jones-Forster (1999)	●	●	●		●		●				●			●	
7	Newman, Morris, & Streetman (1999)	●	●			●		●				●		●		●
8	Ward, Kamp, & Newman (1996)	●				●		●			●			●	●	●
9	Hayes (2003)	●	●	●	●		●				●			●	●	●
10	Xaverius & Mathews (2003)	●				●		●			●			●		●

[34] Instruments have particular focuses of observation research such as child-child interaction (instruments 1 and 2), elder-elder interaction (instrument 3), child-adult interaction (instruments 4 and 5), and elder-child interaction (instruments 6, 7, 8, 9, and 10).

4.3.2.1 Categories

The first, and most important, step in constructing an observation instrument is to determine what is to actually be observed. That is, each observation instrument has a set of categories which represents observable behaviors related to the particular focus of research. For convenience, this researcher grouped behaviors into three categories: prosocial, neutral, and antisocial interactions. If the primary focus of a category is on empathic and cooperative dimensions of interaction, the category is said to be prosocial. If the specific focus of a category is on self-absorbed components of interaction, the category is said to be neutral. If the focus is description of aggressive and hostile behaviors, the category is labeled as antisocial interaction.

Each instrument in the review had one or more categories of interaction. According to Table 4.4, the prosocial category has received the most attention in the elder-child observation instruments reviewed. This finding demonstrates that prosocial, or socially appropriate behavior is an important indicator of social development in early childhood (Cole et al., 2005) and the quality of life of elderly persons in long-term care facilities (Cohen & Weisman, 1991). Interestingly, antisocial behavior was also heavily studied because antisocial, or socially inappropriate behavior is a useful indicator (i.e., aggression, agitation) of socialization in early childhood (Ladd & Profilet, 1996) and seniors' adjustment to institutional group living facilities (Cohen-Mansfield & Libin, 2004).

4.3.2.2 Units of Behavior

Categories must be exhaustive and mutually exclusive. However, establishing comprehensive and independent categories has the molar-molecular problem [35] (Kerlinger, 1986). When categories are very broadly defined, observers may make subjective interpretations of observed behaviors resulting in a low degree of agreement among the observers. On the other hand, narrowly defined categories reduce incorrect inferences by observers, but may lose meaningful data and generality by relying on what

[35] The molar approach establishes broader wholes of behavior as units of observation. The molecular approach takes narrower parts of behavior as units of observation.

is seen only. Thus, it is important to create a satisfactory balance between narrow and broad categorization so that observations may become meaningful and useful data.

In specifying categories, there are two approaches. These are the category and sign systems (Boehm & Weinberg, 1997). A category system requires every behavior observed to be classified into only one category. Therefore, a category system includes both mutually exclusive and exhaustive behaviors. In contrast, a sign system records only specific, predetermined behaviors into each category. Thus, a sign system contains mutually exclusive categories, but not exhaustive categories. The decision to use a category or sign system depends on the purpose for an observation. If the primary purpose is to account for all observed behavior, a category system is more suitable. In contrast, if the interest is in a specific target behavior, a sign system will suffice (Irwin & Bushnell, 1980).

As suggested by the literature review, the effectiveness of sign systems in recording was salient in elder-child observation instruments[36]. The majority of instruments focusing on elder-child interaction used specific, predetermined categories such as smiling, hugging, laughing, and so on. Only one instrument developed by Hayes (2003) involved a category system because this study used qualitative field-based techniques such as anecdotal records and observational notes. The prevalent use of a sign system in these studies can likely be attributed to the particular focus of these studies. They used an empirical approach rather than a theoretical one in examining the relationship between intergenerational activities and elder-child interactions.

4.3.2.3 Sampling Methods

Sampling is a way of obtaining observations. Time sampling is a technique which targets prearranged behaviors within a specific time interval. The behaviors have to be easily observable and should occur at least once every 15 minutes, on average (Irwin & Bushnell, 1980). Compared to narrative recordings, time-sampling involves less time and effort; a large number of observations is collected in a shorter period of

[36] Instruments 6, 7, 8, 9, 10 focused on elder-child interaction.

time, and provides quantitative data. Key disadvantages of time-sampling are time constraints, isolation of the behavior being studied from its context, and the possibility of overlooking important behaviors. In contrast, narrative recording places greater emphasis on these features (Irwin & Bushnell, 1980).

Typically, the majority of reviewed observation instruments used a time-sampling method, according to Table 4.4. Of interest is a narrative recording also used to evaluate interactions between young children and elderly persons (Hayes, 2003). Another interesting feature of the review is that those instruments that used a sign system as a unit of behavior also employed a time-sampling method. This phenomenon was found in all four of the elder-child observation instruments (e.g., instruments 6, 7, 8, 10). This suggests that time sampling methods can efficiently collect data about specific target behaviors. These include dyadic elder-child interaction (Angersbach & Jones-Forster, 1999), social and academic mentor-student interaction (Newman, Morris, & Streetmen, 1999), positive affective behavior (Ward, Kamp, & Newman, 1996), and affective expressiveness (Xaverius & Nathews, 2003).

4.3.2.4 Recording Methods

Once categories, units of behavior, and sampling methods are selected, the next step is to determine what kind of information to record and what kind of time interval to use. Selecting which information to record is dependent on the purpose for the observation. This purpose can fit at least one of the following categories: occurrence, frequency, duration, portion of target behaviors within a specified observational period (Boehm & Weinberg, 1997). The optimum time interval is also determined by the observation's purpose, the observer's resources, and the number of individuals to be observed (Boehm & Weinberg, 1997; Irwin & Bushnell, 1980). Thus, it follows that selection of appropriate recording methods lead to the collection of useful observational information. Then the final step is to develop reasonable interpretations of the findings.

Half of the reviewed observation instruments used checkmarks to denote whether or not a particular behavior occurred. For example, Xaverius and Mathews (2003) recorded cognitively impaired elders' behaviors by using checkmarks to show whether an elder was engaged in activities and whether the behaviors were expressive. The time interval used was a 2-minute coding interval over fifteen observation sessions. One observer watched one elder at a time. This simple recording procedure, using just two categories, allowed the calculation of both individual and group data. On the other hand, the other group of instruments used tally marks to record how often the target behavior occurred. For example, Newman and her colleagues (1999) used time sampling to study elder-child interaction as a mentor-student relationship. Specifically, they observed each elder-child pair in five 1-minute time intervals. They used 40 behavioral items to calculate the total frequency.

4.3.2.5 Collection Methods

Observations can be recorded either in a live, on-the-spot situation or by using observation media with more than one observer or coder involved. The trend now is to use available audio and videotape technology in behavior settings, because these provide a much more complete account of observations at a given time and they enhance our understanding of target behaviors (Boehm & Weinberg, 1997). However, each medium has strengths as well as limitations. For example, direct observations and recordings allow immediate collection of data and useful interpretation derived from on-the-scene observational sequences. Some important behaviors can be missed because of the presence of the observer, the observer's biases, and the selectivity of the observer. The medium of audio and videotape has the important advantage of possibly obtaining complete accounts of observations with the added ability for repeated recall for later analysis. Yet, videotapes are costly, observers may need training to operate this equipment, and some behaviors can be screened out by the limited camera angle. Therefore, it is helpful to use various media to collect a wider range of information.

According to the review all but one of the instruments required live, on-the-scene recording (see Table 4.4). The one instrument employed the observational technologies of videotapes and still photographs, instead of firsthand observation. Angersbach and

Jones-Forster (1999) used videotapes to record dyadic, small, or large group interactions between elders and young children over twelve 2-hour observation sessions. They also used still photographs to obtain information from facial expressions and body language. To compensate for some of the weaknesses of on-the-scene and videotaped recordings, two other observation instruments combined these two observation media. Ward and his colleagues (1996), for example, videotaped behaviors during activities with elders and young children for later coding. Two observers in a natural setting coded the occurrence of positive behaviors listed on the same observational sheet used by videotape recorders. Findings from the two media types showed no significant differences. In another interesting example, Hayes (2003) used field observation notes to complement videotaped data. This observation instrument also utilized a progress log journal to record ancillary behaviors. 26 graduate students were employed to do narrative analysis of the videotaped data.

4.3.2.6 Time Interval

Consideration of time intervals becomes important if the time-sampling method is selected. The optimum time interval to be used is related to the purpose of the observation. There are various time interval techniques. Effective recordings in time-sampling observations are dependent on four major features: the time interval used, the information to be recorded, the number of behavior categories being considered, and the number of subjects being observed. According to Table 4.5, four time-sampling instruments (6, 7, 8, 10) used time intervals of less than two minutes. This is more generous than the one-minute time interval often used in time-sampling studies (Irwin & Bushnell, 1980). It is also important to keep the recording format as simple as possible. For example, Newman and her colleagues (1999) observed an elder-child pair in 1-minute intervals over a total of five minutes in watching for a large number (40) of categories.

TABLE 4.5
Summary of Time Intervals in Elder-Child Observation Instruments Reviewed

No	Author(s)	Time interval	Information	Number of categories	Number of subjects observed
6	Angersbach & Jones-Forster	30 seconds	Frequency	23	Dyadic, group
7	Newman, Morris, & Streetman	1 minute	Frequency	40	Dyadic
8	Ward, Kamp, & Newman	30 seconds	Occurrence	9	One only
9	Hayes	Not applicable	Occurrence	9	One only
10	Xaverius & Mathews	2 minutes	Occurrence	14	One only

4.3.3 Generation of Behavior Incidents

Incidents of elder-child social interaction were generated from reviews of the existing literature and naturalistic observations. Behavior incidents were organized into three modes (i.e., prosocial, neutral, antisocial) based on the degree of social interaction. The intent of this organization was to maintain a continuum of interactive patterns, since behaviors can be thought of as occurring on a continuum rather than as a dichotomy (Thurston, 1970).

Three strategies were used in selecting appropriate behavior categories. First, several aggressive behaviors (i.e., spitting, hitting, kicking) were deleted, since the activity directors of two facilities visited noted that the participants in this study typically did not display these behaviors. Second, specific behaviors developmentally inappropriate to preschool-aged children (i.e., clarifies statement) were not selected. Third, those categories that do not typically occur during physical exercise activities were eliminated because behavioral patterns are systematically related to the type of activity (Angersbach & Jones-Forster, 1999). For example, several academic categories (i.e., review student's work, correct student's work) in the Elder-Child Interaction Analysis instrument (Newman, Morris, & Streetmen, 1999) do not occur in physical exercise activities.

Based on the literature review and findings from naturalistic observations, an initial list of 44 items of elder-child social behaviors was made (see Table 4.6). Additionally, a shorter list was made of about 20 behavioral categories for use in actual systematic observations. These were developed based on the survey of experts and the pilot study.

TABLE 4.6
Origins of Initial 44 Elder-Child Social Interaction (ECSI) Behaviors

Original Behaviors	Concept Source(s)
1. Smiles at child/elder	2, 6, 7, 8, 9, 10, 11
2. Laughs at child/elder	8, 9, 10, 11
3. Nods head	8, 10, 11
4. Stares blankly into space	10, 11
5. Looks down	10, 11
6. Appears drowsy	10, 11
7. Shows anger toward child/elder	6, 9
8. Acts disinterested	1, 6, 7, 9, 11
9. Exhibits restlessness	1, 6, 9, 11
10. Touches child/elder	4, 6, 7, 8, 9, 10
11. Leans forward in chair	5, 8, 10, 11
12. Hugs child/elder	2, 4, 6, 9, 11
13. Claps	11
14. Imitates child/elder	6
15. Places a child on lap	6, 10, 11
16. Consoles a child	6, 11
17. Comforts upset an child	11
18. Clowns around in play	11
19. Sits/stands with folded arms	6, 9, 10, 11
20. Observes child/elder	4, 5, 6, 7, 8, 9, 11
21. Wanders away from groups	6, 9, 10
22. Shows aggressive actions	1, 10
23. Grabs child/elder	3
24. Pushes child/elder	5
25. Acts fearful	1, 4, 11
26. Be physically active with child/elder	1, 4, 9, 10
27. Runs (skips, hops, jumps) a lot	9
28. Invites child/elder into activity	6
29. Leads activity	4, 5, 6, 11
30. Plays alone	1, 11
31. Avoids child/elder	1, 4, 7, 9, 11
32. Plays with only child	1, 4
33. Withdraws from child/elder	1, 5, 11
34. Praises child/elder	2, 4, 7, 11
35. Sings while playing	11
36. Talks while playing	7, 8
37. Initiates conversation	5, 6
38. Asks child/elder questions	3, 4, 6, 7, 9
39. Answers questions	6, 7
40. Talks calmly to child/elder	6, 7
41. Talks to self	11
42. Cries	3
43. Makes strange noises	3, 11
44. Screams	3

Source keys: 1=Ladd & Profilet (1996); 2=Schroeer & Flapan (1971); 3=Cohen-Mansfield, Werner, & Marx (1989); 4=Moustakas, Sigel, & Schalock (1956); 5=Stover, Guerney, & O'Connell (1971); 6=Angersbach & Jones-Forster (1999); 7=Newman, Morris, & Streetman (1999); 8=Ward, Kamp, & Newman (1996); 9=Hayes (2003); 10=Xaverius & Mathews (2003); 11=Naturalistic observation

4.4 SURVEY OF ELDER-CHILD SOCIAL INTERACTION

This section presents the results of surveys generated to develop an Elder-Child Social Interaction (ECSI) observation instrument for systematic observation in a new experiment. Three groups of researchers in the fields of child development, environmental gerontology, and intergenerational program participated in mixed-mode surveys, including a Web survey and a mail survey. The surveys consisted of four major parts: personal information, identification of frequently observed behaviors, evaluation of elder-child social behaviors, and sampling techniques. The responses to the surveys from the three groups provided slightly different responses on the inclusion of certain behaviors in a final list. However there were similar responses regarding the nature of the behaviors selected.

4.4.1 Content of Elder-Child Social Interaction Survey

As part of developing an observation instrument, the Elder-Child Social Interaction (ECSI) survey was designed to obtain experts' opinions about the initial 44 items of elder-child social interaction. The aims of this expert survey were threefold: first, to select elder-child interaction behaviors frequently observed in intergenerational care settings; second, to group a large number of related behaviors into smaller sets; and finally, to gather more practical information on sampling techniques for use in the main study.

There were four parts to the questionnaire for the Web and mail surveys (see Appendix H). The questionnaire began with general questions and transitioned to specific questions. Part I involved general background information of participants with three questions: name, specialized field (i.e., children, environmental gerontology, intergenerational programs), and years of job experience in these fields. The descriptive information was intended to compare findings between different groups and to establish a demographic profile.

Part II focused on identification of elder-child interaction behaviors that would occur fairly frequently during physical activities. An initial list of 44 elder-child social behaviors was generated from the literature review and naturalistic observations. Respondents were asked to check one of a series boxes to indicate their practical opinions for each item. Choices were listed on a five-point Likert scale from 1 (not frequently) to 5 (very frequently). The responses to Part II provided experts' opinions on which items should be selected as representative elder-child social behaviors. The list of items the experts selected, together with the literature review, observation field notes was then refined by developing categories of exhaustive and mutually exclusive behaviors.

Part III focused on evaluating the nature of the elder-child social behaviors as being antisocial, neutral, and prosocial dimensions. The same 44 items used in Part II were evaluated. Respondents were asked to rate the nature of each item on a continuous scale of 1 to 11; with 1 representing antisocial behavior, 6 being neutral, and 11 as prosocial behaviors. The responses to Part III provided the basis for ascertaining which behaviors are based on similar underlying actions and so could be combined into smaller sets of related behaviors. Reduction of behaviors into smaller sets with underlying common themes was done using principal component factor analysis.

Part IV, the last question on the survey asked for descriptive information about techniques associated with observation samplings such as the appropriate number of items to watch for, the length and number of time intervals to record effectively, any observable behaviors omitted in the list of 44 items, and other issues to be considered in observational studies. The experts' practical experience available from responses to Part IV, together with findings from the pilot study, greatly enhanced the systematic observation recording. Table 4.7 summarizes the content and strategies for the questionnaire.

TABLE 4.7
Summary of the Content and Strategies for Questionnaire

Part	Content(s) & Scale	Purpose	Strategies
Part I	-General background of participants (Descriptive)	-To note professional expertise	-Percentage
Part II	-Identification of elder-child social behaviors frequently observed (5-point Likert scale: 1-not frequently, 5-very frequently)	-To select appropriate behaviors to be observed	-Frequency analysis -Literature review
Part III	-Evaluation of the nature of elder-child social behaviors (11-point Likert scale: 1-antisocial, 6-neutral, 11-prosocial)	-To group items into smaller sets	-Factor analysis
Part IV	-Behaviors not shown in the survey and sampling/recording information (Descriptive)	-To select a recording format	-Pilot test

4.4.2 Format of Elder-Child Social Interaction Survey

In general, the questionnaire of mix-mode surveys began with an introductory statement, followed by general and specific questions on the research topic, and closed with a note of appreciation for the respondents' time and effort. The introductory message for the Web and mail questionnaires contained six common components: the purpose of the survey, the significance of responses to the survey, the major content of the questionnaire, the estimated time required to complete the questionnaire, information about the protection of human subjects, and instructions to mail back the questionnaire or to move on to the next pages (see Appendix H).

Along with the motivational, welcoming introduction, the layout of questions and sections was carefully designed to avoid influencing responses to later questions and to minimize the potential fatigue of dealing with a list of 44 items. Questions were sequenced from general to specific issues. The list of 44 behavior items was first grouped into intuitively similar items, and then sets of related items were regrouped into categories[37] of prosocial, neutral, and antisocial (see Appendix H).

A combination of open and closed-ended formats was used in the both questionnaires (see Table 4.7). General background information questions (Part I) and any other comments (Part IV) were asked as open-ended questions, while identification

[37] Intuitively, items 1, 2, 3 seem to be prosocial, items 4, 5, 6 to be neutral, and items 7, 8, 9 to be antisocial. Items 10 to 18 seem to be prosocial, items 19 to 21 to be neutral, and items 22 to 25 to be antisocial. Consistently all items were arranged in the same order of prosocial to neutral to antisocial.

(Part II) and evaluation of the 44 items (Part III) were in a closed-ended question format. A rating scale was used for Parts II and III. Scales throughout the questionnaire consistently ran in one direction from negative to positive. A neutral category was included to avoid forced-selections in one direction or the other and to respect respondents' neutral opinions about items. In addition, the 44 items and answers were arranged in a matrix with headings for responses along the top and items down the left side. The rating scale and matrix format were suitable for the large number of items to be ranked (Sommer & Sommer, 1997).

Questions for Part II and III in the Web were constructed screen-by-screen. This questionnaire required the use of radio buttons (response circles) which allowed respondents to provide only one answer to each question and to erase a previous answer by clicking an alternate button. An important issue raised by the screen-by-screen construction format is whether respondents who did not complete questions on each page were allowed to move on to the next page. To address this concern, respondents were allowed to continue to the next question with no obligation to answer to every question on each page. This decision was made based on the fact that participation in this survey was absolutely voluntary, and to eliminate the option to skip questions was likely to prompt respondents to terminate the survey in mid course (Dillman, 2000).

4.4.3 Data Collection Procedure for Elder-Child Social Interaction Survey

Two major strategies were employed in recruiting survey participants. First, personalized messages were sent to each potential respondent in the Intergenerational Dissertation Support group[38] and mass messages were sent to the Child Youth and Family[39] members and members of the Environment and Gerontology[40] group. A list of

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[38] The Intergenerational Dissertation Support group is concerned with issues related to intergenerational programs for young and old generations. Member in this group are professionals, educators, and doctoral students. More information about this group is available at http://intergenerational.cas.psu.edu/.

[39] Composed of faculty members, the Children, Youth, and Families Interdisciplinary Research Program at Texas A&M University is concerned with issues promoting the quality of life of children, youth, and families by enhancing research and graduate education. The Child Youth and Family network website is available at http://cyf.tamu.edu/.

names, mailing addresses, phone numbers, and e-mail addresses was obtained quickly for people who were involved in the Intergenerational Dissertation Support (IDS) group, because the researcher is a member of this group. Thus, it was possible that IDS members received as many as four personalized messages, such as a preliminary e-mail, a Web questionnaire, an e-mail reminder, as well as an e-mailed 'Thank you'' note. The original pool of subjects in the IDS group was 24 individuals.

By contrast, people in the Child Youth and Family (CYF) group and the Environment and Gerontology (EG) group were contacted only through a coordinator or secretarial staff. A copy of the Web survey and the cover letter needed to be sent to the contact persons for a decision on whether it would be appropriate to send the survey questionnaire to CYF and EG members. Considering members' busy schedules and the massive amount of e-mails they often received, it was recommended that just two messages be sent to these groups. These messages included the Web questionnaire and an e-mail reminder to 58 individuals in the EG group as well as 13 individuals in the CYF group (see Appendix I).

Potential respondents in the Intergenerational Dissertation Support (IDS) group were given an advance letter via e-mail. This letter outlined the purpose of the survey questionnaire and encouraged persons to participate in the survey one week prior to submitting the Web questionnaire. However, respondents in the Environment and Gerontology (EG) and Children Youth and Family (CYF) groups received an e-mailed introduction which contained a direct link to the survey's URL[41]. Individuals in all three groups were designated to receive the Web questionnaire, but those who had computer compatibility problems were mailed a questionnaire. An e-mail reminder was also sent to people who had not completed the Web questionnaire one week before the survey's deadline date. The mailed survey packets included a cover letter, the questionnaire, and

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[40] The Environment and Gerontology network is composed of several organizations and individuals whose concerns are related to physical environments for older adults. The Environment-Gerontology network website is available at http://arch.knu.ac.kr/~gero/.

[41] The URL service was provided by Texas A&M University. The Web survey questionnaire was available at http://people.tamu.edu/~hjk6573/survey.

a stamped, self-addressed return envelope. These were sent via first class mail. Recruitment and data collection procedures for the survey are presented in Table 4.8.

TABLE 4.8
Recruitment and Procedure for the Survey

Groups	Intergenerational Dissertation Support group	Environment-Gerontology group	Child Youth and Family group
Survey methods			
Web survey	Yes (N=9)	Yes (N=12)	Yes (N=4)
Mail survey	Yes (N=2)	None	None
Contact methods	In person	A coordinator	A coordinator and secretarial staff
Procedures			
Introduction letter	1 week prior to questionnaire	None	None
Web questionnaire	December 6, 2004	February 18, 2005	February 18, 2005
A reminder	1 week before due date	1 week before due date	1 week before due date
A thank you email	2 days after due date	None	None

4.4.4 Descriptive Analysis of Elder-Child Social Interaction Survey

To refine the Elder-Child Social Interaction (ECSI) observation instrument, survey questions were analyzed in three major steps along with specific strategies for each step. These steps involved selecting appropriate behaviors, grouping a number of behaviors into smaller sets of related behaviors, and determining a recording format.

4.4.4.1 Description of the Respondents

Table 4.9 shows the number of people responding to the survey. The respondents fit into three research groups: 44.44% (n=12) were from the Environment-Gerontology group, 40.74% (n=11) were from the Intergenerational Dissertation Support group, and 30.77% (n=4) came from the Child Youth and Family group. In terms of return rate, approximately 28% of participants (n=27) responded to the survey. This response rate represented 45.83% of the Intergenerational Dissertation Support group, 30.77% of the Child Youth and Family group, and 20.69% of the Environment-Gerontology group. It is likely that factors such as the use of an impersonal message and a limited amount of contacts contributed to the lower response rates for the Environment-Gerontology group and the Child Youth and Family group.

TABLE 4.9
Responses by the Participant Groups

Groups	Number of sample	Number Returned	Response Rate (%)	% of Total Responses
Intergenerational Dissertation Support	24	11	45.83%	40.74%
Environment-Gerontology	58	12	20.69%	44.44%
Child Youth and Family	13	4	30.77%	14.82%
Total	95	27	28.42%	100%

The three groups of respondents showed a difference in average years in their fields. Respondents in the Intergenerational group have been in their current fields between 2 and 20 years, with an average of 10 years. The Child, Youth and Family group respondents reported between 10 and 30 years in their current fields, with an average of 19 years. The Environment-Gerontology group respondents have between 3 and 32 years of job experience, with an average of 15 years. The difference in average years of job experience in their fields probably reflects the relative novelty of intergenerational studies in academia. Table 4.10 gives a synopsis of the number of respondents by years of work experience in each field.

TABLE 4.10
General Description of the Respondents

Questionnaire Items	Choices	Number	Percentage	Mean
Years on intergenerational issues	Less than 5 year	3	27.27%	9.95 years (SD=5.96)
	6-10 years	5	45.45%	
	11-20 years	3	27.27%	
	Over 21 years	0	0	
Years in gerontology	Less than 5 year	2	16.67%	14.67 years (SD=8.31)
	6-10 years	3	25.00%	
	11-20 years	5	41.66%	
	Over 21 years	2	16.67%	
Years working with children	Less than 5 year	0	0	18.5 years (SD=8.7)
	6-10 years	1	25.00%	
	11-20 years	2	50.00%	
	Over 21 years	1	25.00%	
Frequently observed behaviors	Not frequently (1)-Very frequently (5)	27*		

TABLE 4.10 (Continued)

Questionnaire Items	Choices	Number	Percentage	Mean
Nature of the behaviors	Antisocial (1)-Neutral (6)-Prosocial (11)	27**		
Recommendable number of items	Less than 10	1		
	10-15	2		
	20-30	3		
	No answer	21		

* There were missing data on items 6, 20, 32, and 43. ** There were missing data on items 10, 27, and 32.

4.4.4.2 Descriptive Analysis of Elder-Child Social Interaction

The first step in refining the ECSI observation instrument was to select appropriate behaviors that were to be recorded in observation. Three selection strategies were used to identify frequently observed elder-child interaction behaviors. First, 26 behaviors from the original 44 items were selected based on experts' practical knowledge. Secondly, elder-child observation instruments were published and findings from the field observations were used to include six additional behaviors likely to occur. Thirdly, a total of 28 mutually exclusive behaviors were selected reduce possible confusion and increase reliability.

<u>Strategy One: Frequency Analysis</u>

The following two decisions had to be made about the frequency analysis. First, some of the frequency histograms had a right-skewed distribution and some were skewed left. Therefore the median was considered as a more representative indication of the central tendency in order to avoid mean's vulnerability to extreme values (Ott & Longnecker, 2001). Secondly, responses from all three groups were combined (n=27 or 100%) and the results of the questionnaire survey were presented as one group because of the small number of respondents (n=27) in this survey. To differentiate the Intergenerational Dissertation Support group from the Environment-Gerontology and the Child Youth and Family groups, the researcher designated them as an intergenerational group (IG group) and a non-intergenerational group (Non-IG group), respectively. In general, each group had very similar selections for the frequently observed behaviors. Table 4.11 shows the frequency analysis result for elder-child social behaviors. Items were formatted with the 5-point Likert type response scaling from 1 (not frequently) to 5 (very frequently).

TABLE 4.11
Frequency Analysis of Elder-Child Social Behaviors

Groups	All Groups			IG group			Non-IG group		
Items — Median	3	4	5	3	4	5	3	4	5
1. Smiles at child/elder		4			4			4	
2. Laughs at child/elder	3			3			3		
3. Nods head		4			4		3.5		
4. Stares blankly into space									
5. Looks down									
6. Appears drowsy							3		
7. Shows anger toward child/elder									
8. Acts disinterested									
9. Exhibits restlessness							3		
10. Touches child/elder		4			4		3.5		
11. Leans forward in chair		4			4			4	
12. Hugs child/elder	3			3			3		
13. Claps	3			3			3		
14. Imitates child/elder	3			3			3		
15. Places a child on lap	3			3			3		
16. Consoles a child	3				4		3		
17. Comforts an upset child		4			4			4	
18. Clowns around in play									
19. Sits/stands with folded arms	3			3			3		
20. Observes child/elder		4				5		4	
21. Wanders away from groups									
22. Shows aggressive actions									
23. Grabs child/elder									
24. Pushes child/elder									
25. Acts fearful									
26. Is physically active with child/elder	3			3					
27. Runs (skips, hops, jumps) a lot	3						3		
28. Invites child/elder into activity	3			3			3		
29. Leads activity	3			3					
30. Plays alone									
31. Avoids child/elder									
32. Plays with only one child	3			3			3		
33. Withdraws from child/elder									
34. Praises child/elder		4			4			4	
35. Sings while playing	3			3			3.5		
36. Talks while playing		4			4			4	
37. Initiates conversation		4			4			4	
38. Asks a child/elder questions		4			4			4	
39. Answers questions		4			4			4	
40. Talks calmly to child/elder		4			4			4	
41. Talks to self	3						3		
42. Cries									

TABLE 4.11 (Continued)

Items	Groups Median	All Groups 3	4	5	IG group 3	4	5	Non-IG group 3	4	5
43. Makes strange noises										
44. Screams										
Sub-Total Items selected		14	12		11	12	1	16	10	
Total Items selected		26			24			26		

Note: Median values higher than 3 are included.

To obtain the most frequently observed behaviors, it was decided to retain only those behaviors with high median values (i.e., 3 and above) in each category from the frequency analysis shown above. For all groups, 26 items were identified with median values greater than 3 that were frequently observed during physical activities with children and older adults. Interestingly, the Non-IG group showed slightly different opinions on four items (6, 9, 26, 29). Inclusion of items 6 (appears drowsy) and 9 (exhibits restlessness) probably reflects the salience of asocial behaviors in children as early as preschool age (Ladd & Profilet, 1996) and in nursing home residents (Cohen-Mansfield & Libin, 2004). In contrast, items 26 (is physically active with child/elder) and 29 (leads activity) were observed less frequently. This finding is in agreement with data from Stremmel et al (1994), who reported that childcare and adult care administrators who were not familiar with intergenerational programs were afraid of intergenerational exchanges "because of children's lack of opportunity to be around older adults and of seniors' physical impairments in particular" (p. 516).

Another point of interest is that all 26 items selected by the groups were associated with *positive* elder-child interactions. Conceivably, this result may be due to an assumption that socially inappropriate interactions would not occur frequently in public. However, the preliminary observations consistently demonstrated that children and older adults displayed socially inappropriate interactions (i.e., avoids eye contact, exhibit restlessness, acts disinterested). Instead of relying solely on the statistical results, it is necessary to make a closer examination of behaviors conceivable in similar situations. This is part of the process of making exhaustive categories (Boehm & Weinberg, 1997).

Strategy Two: Exhaustive Behaviors

Existing elder-child observation instruments and findings from field observations were re-examined to search for more representative elder-child interactive behaviors, including socially inappropriate behaviors. Among five elder-child observation instruments reviewed in previous section (see Table 4.4), one instrument designed by Ward et al. (1996) was not included in this review because this instrument measured *positive* elder-child interaction only. Table 4.12 presents the socially inappropriate behaviors extracted from the four instruments and the researcher's field notes (see Tables 4.2, 4.3).

TABLE 4.12
Review of Socially Inappropriate Behaviors

Items in survey	Source				
	6	7	9	10	11
4. Stares blankly into space				●	●
5. Looks down				●	●
6. Appears drowsy				●	●
7. Shows anger toward child/elder	●		●		
8. Acts disinterested	●	●	●		●
9. Exhibits restlessness	●		●		●
18. Clowns around in play					●
21. Wanders away from groups	●		●	●	
22. Shows aggressive actions				●	
23. Grabs child/elder					
24. Pushes child/elder					
25. Acts fearful					
30. Plays alone					●
31. Avoids child/elder		●	●		●
33. Withdraws from child/elder					●
42. Cries					
43. Makes strange noises					●
44. Screams					

Notes: 1. Source number is identical to the number of observation instruments seen in Table 1.4. The number 11 refers to naturalistic observation.
2. The items found in both instruments and naturalistic observations are italicized.

According to the review, six items were commonly found in both elder-child observation instruments and field notes. Even though item 21, "wanders away from groups", was mentioned in three instruments (6, 9, 10), this behavior was not sufficiently distinguishable and independent from item 31, "avoids child/elder". It was considered reasonable that only six items were added to the list of 26 behaviors selected from the statistical analysis, resulting in a final list of 32 behaviors. Another important issue noted during this process was the failure to sufficiently distinguish similar actions. The list of 32 actions was refined further in order to increase the level of observer agreement.

Strategy Three: Mutually Exclusive Behaviors

The most basic requirement for reliable instruments is that behaviors be discrete in their performance (Boehm & Weinberg, 1997). Examples are hugging and clapping; avoiding a child and touching a child; as well as smiling and appearing drowsy. Another consideration for mutual exclusiveness is to state the types of behaviors to be observed and whether the behaviors represent a state or an event (Bramlett & Barnett, 1993). Behaviors of a state occur over longer durations (i.e., observing, avoiding), whereas event behaviors occur for relatively brief periods (i.e., laughing, clapping). Some of these behaviors can occur at the same time, or in sequence, while others do not occur simultaneously. For example, a resident observing a child laughs at the child after a few seconds but cannot fall asleep at the same time. Thus, the selection of mutually exclusive behaviors was made based on these two considerations. Table 4.13 lists the 32 behaviors selected from the previous refinement process.

TABLE 4.13
Summary of Mutual Exclusiveness for 32 Actions

28 Items kept	4 Items rejected
1. Smiles at child/elder	32. Plays with only one child (26)*
2. Laughs at child/elder	36. Talks while playing (26, 32, 37, 38, 39)
3. Nods head	37. Initiates conversation (38)
4. Stares blankly into space	40. Talks calmly to child/elder (36, 38, 39)
5. Looks down	
6. Appears drowsy	
8. Acts disinterested	
9. Exhibits restlessness	
10. Touches child/elder	
11. Leans forward in chair	
12. Hugs child/elder	
13. Claps	
14. Imitates child/elder	

TABLE 4.13 (Continued)

28 Items kept	4 Items rejected
15. Places a child in lap	
16. Consoles a child	
17. Comforts an upset child	
19. Sits/stands with folded arms	
20. Observes child/elder	
26. Is physically active with child/elder	
27. Runs (skips, hops, jumps) a lot	
28. Invites child/elder into activity	
29. Leads activity	
31. Avoids child/elder	
34. Praises child/elder	
35. Sings while playing	
38. Asks child/elder questions	
39. Answers questions	
41. Talks to self	

*Numbers in parenthesis indicates the number of overlapping items.

According to Table 4.13, four items from the list of 32 items were discarded because these behaviors overlapped with some other actions. Item 32, "plays with only one child" was not distinguishable from item 26 "is physically active with child/elder". Item 26 was kept but item 32 was rejected because this study was most interested in elder-child interaction as well as the degree, or quality, of that interaction. Items (36, 37, 40) were not mutually exclusive. For example, if a child initiates a conversation (item 37) by asking an elder a question (item 38), it may be difficult to categorize and record this observation. In addition, these three actions also relate to the issue of whether observation categories were to be very narrow or broad. Since this study was interested in how elder-child interaction occurred, it was decided to keep relatively specific behaviors (items 38, 39).

These revisions left a list of 28 actions. The next step in the refinement process involved the reduction of behaviors by performing a factor analysis. Creating several steps in refining an observation instrument is important, as this helps to develop reliable and valid measures (Smith & McCarthy, 1995).

4.4.5 Factor Analysis of Elder-Child Social Interaction Survey

The second step in the refinement of the ECSI observation instrument was to group and reduce the 28 items into several smaller groupings of behaviors. The results of Part III of the survey were analyzed using two methods. First, an exploratory factor analysis was conducted on the 28 items. Secondly, individual factor analyses with six sets of four or six items were carried out along with a reliability test. For statistical analyses, the researcher used the SPSS 12.0 for Windows statistical software program. Principal component analysis and reliability testing were two statistical methods used.

4.4.5.1 Factor Analysis with 28 Items

Data reduction is, generally, achieved through exploratory factor analysis; in this case, specifically, principal component analysis (Floyd & Widaman, 1995). Before conducting principal component analysis, it is important to consider the correlation and sample size. When computing a correlation matrix for the 28 behaviors, there were moderately significant correlations between behaviors at the 0.05 level. In terms of sample size, there is no common rule on the necessary sample size. However, there should be more samples than the number of variables. Additionally, if there are four or five times as many as variables, then greater confidence can be placed in the reliability of the factor analysis (Field, 2005). However, the sample size (n=27) for this survey with only 28 variables (or behaviors) did not satisfy these two conditions. Thus, it would not be worthwhile to conduct factor analysis with a set of 28 items.

In conducting principal component analysis on such a small sample was problematic as connections between variables resulted in counter-intuitive factors being extracted (see Appendix O). For example, a rotated component matrix showed that six items loaded heavily onto factor 4 (e.g., “places a child in lap;” “consoles a child;” “comforts upset child;” “*avoids child/elder*;’ “*talks to self*;” “claps”). The high reliability coefficient (Cronbach’s alpha=0.77) suggested that these six behaviors were consistent enough to imply a common theme. In reality however, it was not easy to identify a common, underlying theme among the six behaviors. Thus, it was necessary to decide how to satisfy the important consideration of sample size for principal component analysis. It was decided to group the 28 behaviors into smaller sets of four or six behaviors that were intuitively related.

4.4.5.2 Individual Factor Analysis

In order to maintain a subject-to-variable ratio of 4:1 or 5:1, the 28 behaviors were divided into six sets of less than six actions. Behaviors were grouped on the basis of their relative similarities. The social categories of prosocial, neutral, and antisocial were also a factor for grouping behaviors. Table 4.14, below, presents the initial six sets of related behaviors.

TABLE 4.14
Intuitively Categorized 6 Sets of 28 Elder-Child Social Interaction Behaviors

Set number	Theme*	Behavior descriptions
Set 1	Disengagement	5. Looks around
		6. Appears drowsy
		8. Acts disinterested
		9. Exhibits restlessness
Set 2	Withdrawal	4. Stares blankly into space
		19. Sits/stands with folded arms
		31. Avoids child/elder
		41. Talks to self
Set 3	Comfort/Affection	10. Touches child/elder
		12. Hugs child/elder
		15. Places a child on lap
		16. Consoles a child
		17. Comforts a child
Set 4	Happiness	1. Smiles at child/elder
		2. Laughs with child/elder
		13. Claps
		35. Sings while playing
Set 5	Sociability	28. Invites child/elder into activity
		29. Leads activity
		34. Praises child/elder
		38. Asks child/elder questions
		39. Answers questions
Set 6	Active attention	3. Nods head
		11. Leans forward in chair
		14. Imitates child/elder
		20. Observes child/elder
		26. Is physically active with child/elder
		27. Runs, skips, hops, jumps a lot

*Each set has a theme which best describes the characteristics of behaviors grouped in each set.

Individual factor analysis was based on the eigenvalue, scree plot, correlation analysis, and reliability analysis. The decision on how many factors were extracted in an analysis was based on the eigenvalue and the scree plot. From Kaiser's criterion, those factors with an eigenvalue greater than one would be retained. The scree plot provided a graphical view of those factors near the cut-off point between the steep slope and the flat slope (Bryman & Cramer, 2005). Moreover, the factoring procedure was followed by a varimax, or orthogonal rotation, which maximizes the dispersion of loadings within factors and helps make interpretation easier (Field, 2005). Behaviors with factor loadings greater than 0.4 were considered as statistically meaningful (Field, 2005). For behavior-level analysis, the reliability test, known as Cronbach's alpha, was performed to examine the consistency of each set of variables. Variables with a Cronbach's alpha of 0.7 or higher were considered as being similar (Bryman & Cramer, 2005). Consequently, this procedure resulted in seven groups of 27 behaviors from the original six sets of 28 behaviors. The results of individual factor analyses, including all tables and figures, are described in detail in Appendix P.

Set One: "Disengagement"

Four items were grouped as a single factor with the common theme of disengagement. All but one item were significantly correlated at less than the 0.05 level (see the correlation matrix in Appendix P). Both the eigenvalue and scree plot indicated this was a meaningful factor. This factor had an eigenvalue of 2.65 and accounted for 66.31% of the variability. Factor loadings of the four behaviors ranged from 0.75 to 0.92, representing high variable saturation for this factor. The four behaviors had a Cronbach's alpha reliability coefficient of 0.82. Table 4.15 shows the four behaviors included in the grouping, 'disengagement,' along with factor loadings for each behavior and the related Cronbach's alpha coefficients.

TABLE 4.15
Factor Analysis for Set One: Disengagement (Category 1)

Item number	Behavior description	Factor loading	Cronbach's alpha if behavior deleted
5	Looks down	.767	.811
6	Appears drowsy	.924	.692
8	Acts disinterested	.800	.773
9	Exhibits restlessness	.754	.807

Note: Cronbach's alpha=0.818 for all four behaviors

Set Two: "Withdrawal"

Four behaviors related to social withdrawal were included in one factor. Most of the behaviors were significantly correlated at the 0.05 level. This factor had an eigenvalue of 2.12 and accounted for 54.70 % of the variability. Factor loadings ranged from 0.63 to 0.84. The reliability coefficient of 0.71 showed a strong internal consistency for three behaviors without behavior 19 (sits/stands with folded arms). Since behavior 19 was frequently observed during field observations and with a Cronbach's alpha coefficient of 0.69 for all four behaviors represented a substantive value, it was considered worthwhile to retain these four behaviors as a single factor. This factor was labelled "withdrawal." Table 4.16 shows the four behaviors with the relevant factor loadings, and Cronbach's alpha coefficients.

TABLE 4.16
Factor Analysis for Set Two: Withdrawal (Category 2)

Item number	Behavior description	Factor loading	Cronbach's alpha if behavior deleted
4	Stares blankly into space	.733	.621
19	Sits/stands with folded arms	.634	.712
31	Avoids child/elder	.737	.637
41	Talks to self	.840	.527

Note: Cronbach's alpha=0.688 for all four items

Set Three: "Comfort/Affection"

The third set originally contained five behaviors: touches child/elder (10), hugs child/elder (12), places a child on lap (15), consoles a child (16), and comforts an upset child (17). Evaluation of both criteria, the scree plot and the eigenvalues over 1, separated this set into two factors. The factor analysis was run again, specifying two factors[42].

The first factor in the third set contained three items: places a child on lap (15), consoles a child (16), and comforts an upset child (17). Before rotation, the first factor had an eigenvalue of 2.57 and accounted for more than half of the total variance (51.44 %). After optimizing the factor structure through factor rotation, this factor had an eigenvalue of 2.16 and still accounted for a considerable portion of the variance (43.21%). Factor loadings ranged from 0.78 to 0.88. A reliability test for this factor showed that all behaviors except behavior 17 (comforts an upset child) were found to be reliable. The Cronbach's alpha reliability coefficient was 0.84 for retaining the other two behaviors only. By keeping only behaviors 15 and 16, this factor referred to "comfort". Table 4.17 gives the factor loadings, and Cronbach's alpha coefficients for the two behaviors along with the deleted behavior.

TABLE 4.17
Factor Analysis for Set Three: Comfort (Category 3)

Item number	Behavior description	Factor loading	Cronbach's alpha if behavior deleted
15	Places a child on lap	.846	.720
16	Consoles a child	.880	.652
17	*Comforts an upset child**	.780	.839

Note: Cronbach's alpha=0.81 for all three behaviors.
* This behavior is excluded from the factor of "comfort".

A second factor in the third set contained two behaviors: touches child/elder (10) and hugs child/elder (12). This factor accounted for a substantive portion of variance (27%) with an eigenvalue of 1.35, before rotation. After rotation, the relative importance of this factor was enhanced with the variance increasing to 35.23% and an eigenvalue of 1.76. The two items showed high factor loadings accounting for 0.88 and 0.90. A reliability test for this factor showed a Cronbach's alpha coefficient of 0.75.

[42] The dialog box for factor extraction in SPSS provides two choices, either selecting eigenvalues over 1 or specifying the number of factors.

This factor referred to “affection”. Table 4.18 shows the two behaviors included in the affection category and factor loadings.

TABLE 4.18
Factor Analysis for Set Three: Affection (Category 4)

Item number	Behavior description	Factor loading	Cronbach’s alpha if behavior deleted
10	Touches child/elder	.903	NA*
12	Hugs child/elder	.881	NA

Note: Cronbach’s alpha=0.749 for two items
* At least three variables are required to test Cronbach’s alpha if a behavior is deleted.

Set Four: “Happiness”

This set contained four items: smiles at child/elder (1), laughs at child/elder, claps (13), and sings while playing (35). Most items were significantly correlated at the 0.05 level. Both the eigenvalue greater than one and the scree plot suggested a single factor. This factor had an eigenvalue of 2.17 and accounted for 54.24% of variance. Factor loadings of the four behaviors ranged from 0.62 to 0.83. The four behaviors had a Cronbach’s alpha reliability coefficient of 0.71. The common characteristic for this factor was happiness, which became its label. Table 4.19 shows the four behaviors included in this factor, the factor loadings, and the Cronbach’s alpha coefficients.

TABLE 4.19
Factor Analysis for Set Four: Happiness (Category 5)

Item number	Behavior description	Factor loading	Cronbach’s alpha if behavior deleted
1	Smiles at child/elder	.623	.714
2	Laughs at child/elder	.819	.571
13	Claps	.646	.699
35	Sings while playing	.832	.567

Note: Cronbach’s alpha=0.711 for all four behaviors

Set Five: “Sociability”

Five behaviors were included in this single factor. All items in this factor were significantly correlated at less than the 0.01 level. This single factor had an eigenvalue of 3.55 and accounted for the considerably high variance of 71%. High factor loadings were calculated for all five behaviors, ranging from 0.79 to 0.89. The reliability coefficient of 0.89 showed a strong internal consistency for all five behaviors. The common theme for this factor was labeled, ‘sociability’. Table 4.20 lists the five behaviors, factor loadings, and Cronbach’s alpha coefficients.

TABLE 4.20
Factor Analysis for Set Five: Sociability (Category 6)

Item number	Behavior description	Factor loading	Cronbach’s alpha if behavior deleted
28	Invites child/elder into activity	.786	.882
29	Leads activity	.810	.876
34	Praises child/elder	.886	.858
38	Asks child/elder questions	.850	.873
39	Answers questions	.878	.861

Note: Cronbach’s alpha=0.89 for all five behaviors.

Set Six: “Active Attention”

This sixth set contained six behaviors related to active attention. All six behaviors were moderately correlated at the 0.05 level. The Kaiser’s criterion indicated that two factors could be removed, while the scree plot suggested only a single factor be retained. When the factor analysis was run again using only the two factors, the results were statistically consistent but intuitively inappropriate. The first factor (α=0.78) included these three behaviors, “nods head (3)”, “leans forward in chair (11)”, and “is physically active with child/elder (26)”. The second factor (α=0.82) included these remaining three behaviors, “imitates child/elder (14)”, “observes child/elder (20)”, and “runs a lot (27)”. The researcher believed that a single factor encompassing the six behaviors of a related type (i.e., active attention) maintained this underlying relationship more effectively than creating two new factors would, the decision was made, based on criterion from the scree plot, to keep just the one factor.

This single factor had an eigenvalue of 3.23 and accounted for 53.79% of variance. Factor loadings for the four behaviors ranged from 0.58 to 0.84. The four behaviors had a Cronbach’s alpha reliability coefficient of 0.83. This was slightly higher than any of the reliability coefficients calculated for two factors based on the Kaiser's criterion (i.e., α=0.78, α=0.82). The label, "active attention" was considered to best represent the common characteristics of the six behaviors. Table 4.21 shows the six behaviors, along with their factor loadings, and Cronbach's alpha coefficients.

TABLE 4.21
Factor Analysis for Set Six: Active Attention (Category 7)

Item number	Behavior description	Factor loading	Cronbach's alpha if behavior deleted
3	Nods head	.658	.810
11	Leans forward in chair	.623	.820
14	Imitates child/elder	.833	.767
20	Observes child/elder	.580	.829
26	Is physically active with child/elder	.840	.770
27	Runs (skips, hops, jumps) a lot	.818	.776

Note: Cronbach's alpha=0.825 for all six behaviors

To sum up, the principal component factor analysis revealed seven interpretable factors (or categories), consisting of 27 behaviors. The seven factors of the 27-behavior Elder-Child Social Interaction (ECSI) instrument included four behaviors related to actions suggesting "disengagement," four behaviors related to actions indicating "withdrawal," two behaviors associated with actions denoting "comfort," two behaviors denoting "affection," four behaviors suggesting "happiness," five behaviors indicating "sociability", and six behaviors relating to "active attention."

4.5 PILOT STUDY

With the final list of 27 behaviors, the last step in refining the ECSI observation instrument was to specify operational definitions for the behaviors and to determine an appropriate recording format for use in the systematic observation. For this reason a pilot study was conducted. The pilot study enabled the researcher to develop a final version of the ECSI observation instrument from which reliable and accurate data could be gathered.

4.5.1 Data Collection Procedure of Pilot Study

The pilot study was carried out at a facility for seniors in Bryan, Texas in cooperation with a local childcare center also in Bryan, Texas. The facilities involved in the pilot study were the Sheridan senior facility and the Jack and Jill preschool. The participants of the pilot study were young children aged 4 and 5 years, and elderly residents residing in the senior facility. Approximately 8 children and 15 residents, both with dementia and without dementia, took part in this study. The number of children and residents in each observation varied from 18 to 23. The preschool staff brought the children to the senior facility in their van for each visit. Recruitment for the children's participation was advertised on a flyer distributed by the childcare center in November 2004. The nursing home advertised participation in this pilot study in the October 2004 issue of their monthly newsletter (see Appendix J).

The researcher videotaped interactions between residents and children from the perimeter of an activity room of the senior facility during physical exercise to music. Residents and children, sitting on chairs, were given instructions from a cassette tape. The activities included actions such as stretching, clapping, bicycling and tapping toes. This seated exercise took place over a four-week period between November and December 2004. Sessions were conducted in the morning around 9:30, once a week, and lasted for 20 minutes. A preliminary version of the Elder-Child Social Interaction instrument was tested on the videotaped interactions between residents and children in the pilot study. The behavioral events and recording formats of the ECSI observation instrument were modified in consideration of levels of objectivity, relevance, efficiency, reliability, and accuracy (Bramlett & Barnett, 1993; Martin, 1976).

4.5.2 Refinement of Operational Definition

Unclear operational behavioral definitions contribute to ineffectual and misguided interpretations (Irwin & Bushnell, 1980). Thus, it is important to refine categories and behaviors until they are clearly understood by other observers or coders. In refining operational definitions, many sources were used to delineate the categories and behaviors listed in the Elder-Child Social Interaction instrument. The sources used were the previously reviewed observation instruments, Webster's dictionary, observational field notes, and observations from the pilot study. The final version of these refined categories, along with brief definitions, appears in Table 4.22. For ease of remembrance and efficient recording, each item has a unique code, made by combining the first letter of each category's title plus an ordinal number.

TABLE 4.22
Categories and Brief Descriptions of Elder-Child Social Interactions

Code	Behaviors	Definitions
Category 1: Disengagement		As an antisocial mode, the disengaged behavior category is defined as socially-inattentive action that is impulsive, hyperactive, or inactive.
D1	Exhibits restlessness	A child/elder moves nervously and appears uncomfortable in activity or interaction.
D2	Acts disinterested	A child/elder shows verbally or physically indifferent behavior that can be interpreted as being bored with the activity.
D3	Gets distracted	A child/elder constantly turns his/her attention to something of momentary interest that is not a part of the activity or interaction with other in the activity.
D4	Appears drowsy	A child/elder appears to be falling asleep/ sleepy.
Category 2: Withdrawal		As a neutral mode, the withdrawal behavior category is defined as socially-inhibited action that is self-absorbed and not engaged with others.
W1.	Avoids child/elder	A child/elder does not overtly participate in the activity or interaction.
W2.	Stares blankly into space	A child/elder looks at no specific target with a steady, often wide-eyed gaze, for several seconds.
W3	Talks to self	A child/elder mutters to him/herself.
W4	Sits with arms or fingers folded	A child/elder occupies himself/herself watching the activity or interaction, but appears unwilling to engage in the activity.
Category 3: Comfort		As a prosocial mode, the comfort behavior category is defined as sympathetic action that is caring, soothing, and supporting.
C1	Places a child on lap	An elder holds a child on his/her lap as an expression of caring.
C2	Consoles a child	An elder makes a child feel less sad, disappointed, or upset by offering verbally or physically comforting actions.
Category 4: Affection		As a prosocial mode, the affection behavior category is defined as socially emphatic action that can be interpreted as friendly.
A1	Touches child/elder	A child/elder comes into physical contact with another child/elder through the use of the hand or fingers, with gentle and loving touches/gestures.
A2	Hugs child/elder	A child/elder affectionately embraces another, placing arms gently and closely around him/her.

TABLE 4.22 (Continued)

Code	Behaviors	Definitions
Category 5: Happiness		As a prosocial mode, the happiness behavior category is defined as joyful behavior that occurs as part social interaction exchanges.
H1	Smiles at child/elder	A child/elder expresses pleasure, favor, amusement, or joy, characterized by an upward curving of the corners of the mouth.
H2	Laughs with child/elder	A child/elder expresses mirth or joy by a series of articulated sounds, with the mouth open in a wide smile.
H3	Claps	A child/elder strikes the palms of both hands together as in applauding.
H4	Sings	A child/elder makes a series of sounds or words in musical tones.
Category 6: Sociability		As a prosocial mode, the sociability behavior category is defined as socially-inclusive action that is friendly and encouraging.
S1	Invites child/elder into activity or interaction	A child/elder verbally or physically appeals or requests the presence or participation of child/elder into the activity and/or interaction.
S2	Asks child/elder questions	A child/elder uses words in seeking an answer.
S3	Answers questions	A child/elder responds in a spoken exchange of opinions, thoughts, and feelings.
S4	Praises child/elder	A child/elder expresses verbal encouragement and makes a socially-targeted child/elder feel cheerful.
S5	Leads activity or interaction	A child/elder guides an activity or mediates a conflict between children in a group.
Category 7: Active Attention		As a prosocial mode, the active attention behavior category is defined as mutual social behavior in exchanges of positive interactions.
AA1	Observes child/elder	A child/elder looks at a socially targeted child/elder for a minimum of two seconds.
AA2	Nods head	A child/elder lowers and raises the head in response to social overtures and also to indicate agreement.
AA3	Leans forward in chair	A child/elder bends upper body toward a social target (e.g., object, child, elder) and exhibits interest, concern, or curiosity.
AA4	Imitates child/elder	A child/elder models himself/herself after the behavior, words, or actions of a socially targeted child/elder.
AA5	Acts exuberantly	A child/elder physically shows excessive behavior with much enthusiasm and joy.
AA6	Is physically active with child/elder	A child/elder physically takes part in the activity and/or interaction alongside child/elder.

The intent of refining behaviors was to establish a clear, concise basis by which all observers or coders could understand the activities when defined each behavior. A total of eight behaviors were refined in the following four ways: renaming, replacing, adding, or removing. The first decision to rename two behaviors was made because they were deemed to be too narrow to allow for more meaningful interpretation. The names of two behaviors were replaced with ones considered more relevant and which more effectively reflected the major characteristics of the original behavioral categories.

Behaviors 5 and 27 were renamed. Behavior/action 5, “looks down,” was originally intended to measure distracted behaviors. However, this term was considered too narrow to include all meaningfully related behaviors in this category. So a broader label, “*gets distracted* (D3),” was adopted. Behavior/action 27, “runs, skips, hops, jumps a lot” was intended to measure physical actions exhibiting enthusiasm and joy. To fully reflect this intent, a more comprehensive label, “*acts exuberantly* (AA5)” was employed.

The second modification was to replace parts of behavior terms in order to facilitate communication. Behavioral terms which were partially replaced were behavior 8 and behavior 2. Behavior/action 8, “acts disinterested” was originally used to explain a behavior of showing no interest or being bored. Since the word, ‘disinterested’ is more commonly used in contemporary English to convey this meaning, and is also interchangeable with the word, ‘disinterested’, a new label, “acts *uninterested* (D2)”, was adopted. In addition, one of the survey respondents noted that behavior 2, “laughs at child/elder,” as opposed to, “laugh with” implied a negative tone for such an elder-child interaction. To more explicitly convey behavior related to happiness, a label, “*laughs with child/elder* (H2)” was adopted.

For better communication and to minimize confusion, certain words had be added or removed. The word, ‘stands’, was deleted and the word, ‘fingers’, added for behavior 19, “sits/stands with folded arms.” The physical activity is a seated exercise, so it was hardly possible to observe people standing with folded arms while exercising. In addition, based on the videotaped observations some residents sat with their fingers folded rather than their arms. Thus, behavior/action 19 was revised as “*sits with folded or fingers* (W4).” In the case of behavior 35, the phrase, ‘while playing’ was deleted and the original label was changed to read, “*sings* (H4).” Since the instrument measures interactive behaviors during activity keeping the term, ‘the phrase’ would be redundant. For behaviors 28 and 29, an additional word, ‘interaction’, was included for a more concise interpretation. Thus, labels for behaviors 28 and 29 were changed to “*invites child/elder into activity or interaction* (S1)” and “*leads activity or interaction* (S5),” respectively.

The final version of the ECSI observation instrument was composed of seven factors and 27 behavioral items that explained the following three types of social modes: antisocial (one category), neutral (one category), and prosocial (five categories). A thorough refinement of the operational definitions of each behavior was carried out regarding each category and behavioral item. A complete list of categories, definitions, and specific examples are available in Appendix K.

4.5.3 Refinement of Observation Recording Format

The development of recording formats is affected by how the behaviors would be measured. The following recording formats to be used: (1) on the basis of duration, frequency, or pattern, (2) by continuous or interval time samples, (3) with or without videotaped documentation, and (4) by one or more than one observers (Bramlett & Barnett, 1993; Mann et al., 1991; Martin, 1976; Page & Iwata, 1989). The recording format can significantly affect the accuracy of observations and the reliability of inter-observer interpretation of data to be analyzed. In this regard, refining the recording procedure is a prerequisite to any systematic observation.

The primary interests of this study were concerned with which behavioral aspects should be assessed. One interest was the frequency of certain behaviors during a given observation session and across several observation sessions. Another interest was to examine any changes in frequent behaviors that may have been affected by different experimental conditions. In light of these specific interests, it was considered appropriate to measure the frequency and proportion of behaviors over time. The combination of two dimensions (i.e., frequency, proportion) was likely to provide meaningful information about behaviors on the molar and molecular levels.

Accuracy in estimating the actual frequency of behavior over time is closely related to both the time interval and total duration of a behavior (Mann et al., 1991). Mann et al. (1991) found that error rates for estimating the actual frequency of behavior increased as time interval lengths increased, while error rates decreased as total duration of a behavior increased (i.e., static behaviors). This finding was consistently observed in a pilot study. A 10-second coding interval, as opposed to 15 or 30 second intervals, showed more accurate estimates of frequencies of pre-arranged behaviors in the pilot study. In addition, the relatively brief interval enabled the researcher to pay more careful attention during observations than longer intervals would have allowed. Interestingly, the 10-second interval was the mean observation sampling interval length among 339 child development observational studies surveyed by Mann et al. (1991). Based on support in the literature and the pilot study, a 10-second interval was determined to be an optimal time interval to estimate the frequency and proportion of pre-categorized behaviors for the main study.

The third decision, the use of videotaped documentation, involved the consideration of two issues; the large number of categories (i.e., 27 behavioral events) and the large number of observation intervals (i.e., 90 intervals[43]). Videotaping can help overcome some of the complexities of recordkeeping for a research project. Videotaping, now widely used in behavioral observation studies, provides the flexibility of adjusting frame length. The recording remains available for future observation. It provides a means for many observers to review the footage at the same time. Videotaped footage makes a wide range of sequential information available indefinitely (Boehm & Weinberg, 1997). However, videotaping does have some inherent weaknesses. These include the cost of the camera, tapes, and other equipment such as a tripod, the intrusiveness of media equipment, and the screening out of some information by the camera's limited viewing angle (Boehm & Weinberg, 1997). Despite the limitations, videotaped documentation can enhance the accuracy of observations by maximizing such strengths as the brief time intervals involved and by minimizing the observer's observation fatigue.

The fourth decision, use of more than one trained observer, was dependent on the ability to handle the number of participants being observed during a given observation session (Simon & Boyer, 1974). Observer fatigue was likely to be affected by the short

[43] In the main study which followed, a pair of participants was videotaped for a 15-minute observation segment. A basic unit of recording is composed of a 10-second interval for observation and a 10-second break for coding. Specifically, there are six 10-second intervals per minute, and a 15-minute observation segment comes to have 90 time intervals. When observing and coding one person only in a 15-minute videotape segment, it takes a total of 30 minutes.

time interval. Given the fact that the ECSI instrument's recording format consists of a 10-second observation and a 10-second break, a 15-minute observation session requires 30 minutes of observing and recording activity from a videotape. With a maximum of 13 persons present in an observation session, one observer could spend up to six and a half hours to record the data generated by a 15-minutie videotaped observation session. Because recording observational data is so time-consuming, it was more efficient for two observers, together, to record data about dyads then move on the next videotaped segment. Each observer observed one dyad in a videotaped segment then went on to observe another individual in the next videotaped segment. This process was continued until data from all the videotaped segments had been recorded.

In summary, the final version of the Elder-Child Social Interaction instrument used a 10-second time interval to measure the frequency and patterns of elder-child interactive behaviors. The ECSI instrument employed audio and video recordings as a means of collecting observational data for coding and analysis. This procedure also required at least two trained observers who, together, observed and coded dyadic interactions.

4.6 CONCLUSIONS FROM OBSERVATION INSTRUMENT

As a prerequisite to systematic observation, the Elder-Child Social Interaction (ECSI) observation instrument was designed to measure socially interactive behavior between impaired elders and preschoolers during physical exercise. To construct and refine the ECSI observation instrument, several strategies were employed to ensure that the resulting observation instrument was soundly based on reliable and realistic premises. Strategies were naturalistic observation, a review of relevant literature, a survey of experts in related fields, and a pilot study. A thorough instrument refinement process, along with statistical analysis, improved the definition of target behaviors as well as the procedure for recording observations.

4.6.1 Elder-Child Social Interaction (ECSI) Observation Instrument

Meticulous care was given to generating potential behaviors arising out of social interaction between impaired older adults and pre-school aged children. A large pool of behaviors was collected through naturalistic observations and reviews of existing observation instruments. These behaviors/actions were selected because they were in some way related to the target behavior event of social interaction during physical exercise. An initial list of 44 items was generated based on the criteria of adequacy (i.e., frequent occurrence) and relevance (i.e., developmental level, type of activity). Mail and internet surveys revealed that socially appropriate behaviors tend to occur more frequently than socially inappropriate behaviors so this was reflected in selecting categories of behaviors/actions. Conceivably, this result may be due, in part, to the fact that social interaction between older adults and young children is already generally governed by rules to inhibit antisocial behavior. For example, children were instructed to be nice and not to disrupt the activity with residents. However, socially inappropriate behaviors such as avoiding eye contact and exhibiting restlessness were frequently observed during naturalistic observations. Moreover, four elder-child observation instruments reviewed included categories of antisocial behaviors. Some research has found that aggression and agitation are common in early childhood (e.g., Ladd & Profilet, 1996) as well as in nursing home residents (e.g., Cohen-Mansfield & Libin, 2004).

On closer examination of the selected behaviors it was deemed appropriate to include six socially inappropriate behaviors which were commonly mentioned in existing elder-child observation instruments. At the same time, the decision was made to eliminate four behaviors which were not sufficiently distinct and could be subsumed under other behaviors/actions. For practical utility the number of behaviors needed to be reduced. To accomplish this objectively the already shortened list of 28 behavior/actions were submitted to a principal component factor analysis. The small sample size resulted in the grouping of some behaviors that were only minimally related.

By putting smaller sets of four or six intuitively related behaviors through a factor analysis, it was possible to delineate seven sets for 27 behaviors on the basis of their underlying common themes. Results of the factor analysis identified these seven components (disengagement, withdrawal, comfort, affection, happiness, sociability, active attention) as the simplest feasible structure. The total variance explained by each factor ranged from 35.23% to 66.31%. The seven sets of 27 behaviors had reliability coefficients ranging from 0.71 to 0.89, indicating a high level of consistency for behaviors grouped together under each factor.

After revising the ECSI instrument to a final list of 27 behaviors the next step was to refine the categories and the recording procedure through a pilot study. Results of the pilot study showed that unclear definitions for behaviors and complexities of the recording format were obstacles hindering the reliability of behavior categories being studied and inter-observer reliability in recording data. To increase category reliability, the some operational definitions were renamed so that the specified behaviors would more effectively reflect the major characteristics of the category. In other cases, words had to be added in order to convey the full meaning for the behavior more adequately.

Furthermore, to maximize accuracy and minimize complexity, the recording formats were revised from four aspects. Measurement and recording of behaviors were considered from two angles; that of frequency and proportion. This dual treatment is especially important because monitoring the timed behaviors intervals is extremely time-consuming and tedious for an observer unless a very small number of behavioral categories are used (Irwin & Bushnell, 1980). A coding interval of 10 seconds produced more accurate estimates for the frequency of elder-child social interactions. This finding supports data reported by Mann et al. (1991). Their studies demonstrated the negative correlation for frequency estimates between the length of timed intervals and the accuracy of the frequency of behaviors recorded. Regarding the complexity of recordkeeping, it is argued that the use of videotaped footage documented by more than one trained observer can provide more accurate and efficient data. The effectiveness of all these refinements was later evaluated in the main study.

CHAPTER V
SYSTEMATIC OBSERVATION RESULTS AND DISCUSSION

This chapter presents the results of an experiment using systematic observation in an activity room of Freedom House in San Antonio, Texas. The experiment helped demonstrate how design interventions influence the social behaviors of young children and older adults with Alzheimer's disease. A reversible multiple treatment design was used to evaluate the functional relationship between the level of spatial enclosure and elder-child social interaction. Also evaluated was the usage of space within a behavior setting.

The researcher used the observation instrument, explained in Chapter IV, to measure the occurrence of pre-categorized behaviors participants engaged in under three different conditions (i.e., nonintervention, intervention1, intervention2). Behavior mappings were also conducted for recording participants' usage patterns of the activity room of Freedom House in relation to design interventions. A total of 22 observation sessions were videotaped and resulted in 215 observation records and 215 behavior mapping records.

5.1 STRATEGY AND PREPARATION OF EXPERIMENT USING SYSTEMATIC OBSERVATION

As a variation of the reversible design (i.e., the ABAB design), the multiple reversal design is useful to verify the effect of design interventions on behavior using three components of baseline logic. These components include prediction, verification of prediction, and replication of treatment effect (Cooper et al., 1987). The multiple reversal design also involves use of a sequence of design interventions across participants. Supported by the logical and sequential application, this design provides precise and systematic analysis for demonstrating a functional relationship between design intervention and behavior. However, the reversible design is not applicable to the situations in which the target behavior is likely to be irreversible (i.e., academic behaviors[44]) or in which the target behavior is undesirable (i.e., banging head) for ethical reasons (Alberto & Troutman, 2006).

The main purpose of the design intervention experiment, comparing two or more treatments within the context of a multiple reversible design, is to examine the effects of treatment 1 (i.e., semi-enclosed spatial plan) to the baseline (i.e., open spatial plan) and treatment 2 (i.e., enclosed spatial plan) to treatment 1 (i.e., semi-enclosed spatial plan). Experiments using systematic observations allowed the researcher to test the effects of the level of spatial enclosure on interactive behaviors and the usage of space by young children and older adults. To ensure systematic data collection, the following four strategies were employed: (1) a pilot test, (2) design interventions, (3) systematic observations, and (4) behavior mappings.

5.1.1 Data Collection Strategy

An experiment using systematic observation was used to test the main hypothesis of this study that the level of spatial enclosure in a behavior setting influences the types of elder-child social behaviors and the patterns of spatial usage during physical exercise. The main objectives of the design intervention experiment in the study are as follows:

1. To identify the functional relationship between spatial enclosure and elder-child social interaction.
2. To identify the effect of the level of spatial enclosure on the use of social spaces.
3. To explore differences in social behaviors and spatial usage patterns between elderly residents and young children across interventions.
4. To understand the sequential nature of elder-child social interactions in relation to the level of spatial enclosure.

As the first step in preparing a systematic experiment, a pilot study was carried out to schedule observations and handle effects of extraneous variables[45]. The pilot

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[44] Because many academic behaviors are associated with the developmental and learning process, it is not feasible to test the effect of environment on academic behavior in the context of reversible or multiple reversal design.

[45] Extraneous variables are confounding variables that might influence the effect of an experiment. The extraneous variables involve five sources of error such as subjects, observers, setting, apparatus, and

study helped the researcher to check the adequacy of data collection techniques and procedures as well as to be able to control extraneous variables that could impact the study. Secondly, design interventions were prepared based on a thorough analysis of the information obtained from the pilot study. The schedule of design interventions was based on the multiple reversal design. Thirdly, systematic observations involved planning sampling procedures, videotaping observations, and recording videotaped observations. Observations of occurrence and nonoccurrence of specific behaviors were recorded over a 15-minute period of activity time. Finally, behavior mappings were carried out to see how participants, especially children, used areas of an activity room according to the degree of spatial enclosure in the room. Table 5.1 summarizes the schedule for the experiment using systematic observation from the pilot study to the behavior mapping.

TABLE 5.1
The Schedule of Experiment using Systematic Observation

Methods	Setting	Subjects	Collection Dates
Pilot Study			4.29-5.3.2005
Design Intervention			5.4-6.24.2005
Systematic Observation	Freedom House, San Antonio,	-8 residents	10.12-12.5.2005
Observer Training	TX	-5 children	10.12-11.4.2005
Coding			11.7-12.5.2005
Behavior Mapping			11.7-12.5.2005

5.1.2 Pilot Study

Besides four onsite visits to check actual physical conditions at Freedom House, a pilot study was conducted three days before collecting data for the systematic observations. The pilot study served to (1) obtain baseline information, (2) establish observation times and duration, (3) provide an opportunity to address the effects of extraneous variables, and (4) allow staff and participants time to adjust to the presence of new apparatus (i.e., a mock-up of observation room, curtains) for the experiment.

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procedure. These sources can be controlled in three ways: (1) eliminate or hold them constant across treatments, (2) measure them and statistically take them into account, and (3) use a control group (Sommer & Sommer, 1997).

Selecting observation times is important because different conditions (i.e., season, day, time, duration) could inhibit any meaningful comparison of behavioral changes between before-and-after interventions. Therefore, the times of observation should be standardized to allow equal opportunity for the occurrence and consistency of the behavior with the baseline conditions (Cooper et al., 1987). With a minor change in duration, the observation time for the study followed the existing time schedule at Freedom House. The present physical exercise programs have taken place between 11:00 a.m. and 11:30 a.m. on Monday, Wednesday, and Friday every week. However, the duration of observation sessions for the study changed from 30 minutes to 15 minutes because the activity leader observed that children tended to get bored if activities lasted more than 15 minutes. Thus, it was decided to conduct the experiment using systematic observations in the morning at 11:00 for 15 minutes, for three times a week.

Another concern was the need to control extraneous variables because they have the potential to distort behaviors being observed for the experiment. When observing interactions between residents and children, a seating system (i.e., age-mixed or age-separate) might influence behavior. For example, older adults who sit with children nearby have more direct opportunities to interact with children than their counterparts who do not. The seating system in the study was controlled by randomly assigning seats to residents and children across the treatments using a table[46] of random numbers (Sommer & Sommer, 1997). Residents and children were separately listed in alphabetical order by their first names. Residents were first arranged in chairs, then children were seated between residents. The order depended on the number of subjects who were able to participate in the experiment each time. In reality, however, the

[46] A table of random numbers consists of a randomly generated series of digits (i.e., 0-9). Statistics books often include this table of random numbers. It is used by starting at any point on the table and moving consistently in any direction (i.e., up, down, right, or left) until the ordinal number for each subject appears in the table of random numbers. Then, each subject is assigned to chairs according to the numbers selected from the table.

random order could not be effectively used as prepared. There were situations[47] that were beyond the researcher's control but had to be accommodated.

Another extraneous variable is involved when participants are aware of either receiving treatment or being observed. This phenomenon is known as the Hawthorne effect (Martin & Bateson, 1993). In addition to the effect of the observer on the subject, another experimenter bias occurs when an experimenter measuring behaviors is aware of which treatment administered to each subject and so unwittingly responds to the treatment in measuring behaviors. In these cases, the behavioral changes are not a mere effect of treatment but might result from the presence of the experimenter instead (Martin & Bateson, 1993).

In order to remove the participant and experimenter biases, a double blind design and a mock-up of the observation room were incorporated into the study. Widely used in experimental design, a double blind design masks both the subject and the observer from conscious awareness of the experimental manipulation. The double blind design uses a third party to carry out experimental manipulation. In this study, the researcher acted as the third party in the experiment, and none of the participants and two research assistants were aware of the experiment. However, it was not possible for the participants involved in the study to be completely blind to the experiment due to the presence of the mock-up. To address this logistical difficulty, the mock-up of the observation room was constructed and placed in an activity room in the Freedom House one week before the main study began (see Section 5.1.3.2). The staff and participants at Freedom House became adjusted to the presence of the mock-up[48].

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[47] Occasionally, some participants did not come to the study because of personal reasons (i.e., illness, an absence from preschool, visits by relatives). The researcher coped with this situation by making random assignments in each observation session. Also, some residents who confirmed their participation 10 minutes before an observation started were unable to participate in the observation because of unscheduled medical examinations. This latter situation was beyond the researcher's control and there was insufficient time to make any changes because the researcher had to remain inside the mock- up observation room 10 minutes before each activity started.

[48] On the first day of setting up the mock in the activity room, residents and staff observed what was going on in the room. They asked the reason for installing the mock-up and curtains. Since there were a variety of activities at Freedom House in May and June, the researcher told them that the mock-up and curtains were part of decorations to temporarily make the room look nicer. Meticulous care was taken in the

In summary, the pilot study was aimed at preparing optimal experimental conditions in which the collection of useable data could be made. This pilot study allowed a smooth transition into the main study in cooperation with staff at Freedom House. In addition, the design intervention which followed was also prepared based on the information from the pilot study.

5.1.3 Design Intervention

This study used a multiple treatment reversal design to test environmental effects on the social behavior of young children and older adults with Alzheimer's disease. The multiple treatment reversible design was especially appropriate for this study because it was concerned with any observed preferences for three types of spatial plans (i.e., open, semi-enclosed, enclosed). The multiple treatment reversible design involved the analysis of behavioral changes observed between before-and-after the baseline phase (i.e., open plan) was introduced. This led to a more unambiguous interpretation of behavioral change (Touliatos & Compton, 1988). In addition, the replicating treatments (i.e., semi-enclosed plan, enclosed plan) helped rule out the possibility that any observed behavioral changes were due to some unrelated concurrent event (Cooper, et al., 1987). The basic design of the intervention was the A-B-A-B-C-B-C pattern, in which A= non-intervention, B= use of a 3 foot high curtain (semi-enclosed plan), C= use of a ceiling height curtain (enclosed plan). The effects of B to A and C to B were then examined.

5.1.3.1 Research Setting for Design Intervention

The research setting for the design intervention was the activity room of Freedom House. This room is located in a hub connecting residential units with the main service building. Also nearby are a childcare center, a beauty room, and a chapel. The central location of the activity room meant there is a constant traffic of passersby (i.e., staff, visitors, children, residents). Additionally, the activity room functioned as the main space for a variety of activities (i.e., physical activities, bingo, story telling, music

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selection of color, materials, and fitting the mock-up into the current scheme of the room. It was successful and some residents expressed their pleasure about the mock-up and curtains.

concert, a beauty contest). A series of columns around the activity room facilitated the multipurpose function well. Figure 5.1 shows the architectural floor plan of the activity room.

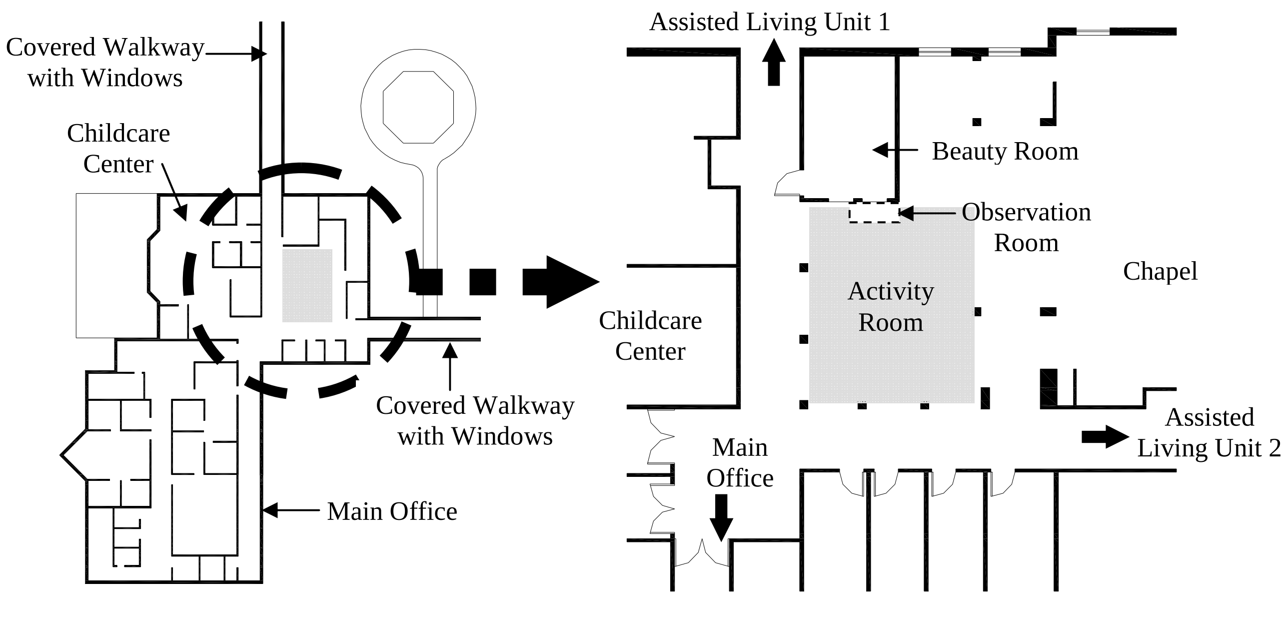

Figure 5.1: Architectural Floor Plan of the Activity Room used for Design Intervention

This room is 24’ by 22’-6” with a ceiling height of 9’-9”. It is surrounded by a series of seven columns which define the room and separate it from circulation paths leading to residential units and the main service building. In this room there were plants hanging from the columns. This multi-functional, open space houses a television, a CD storage cabinet, two side tables, eight lounge chairs, four square tables, and sixteen chairs. The furniture arrangement in the activity room varied according to the types of activity happening there. When dynamic activities (i.e., exercise, beauty contest) are underway all furniture is moved into the corridor space between the activity room and the chapel. When there are group activities incorporating food or other materials (for example, bingo or a birthday party) the furniture is arranged in the usual manner with four chairs around each table. Figure 5.2 shows interior views of the activity room arranged for different group activities.

Figure 5.2: Interior Views of the Activity Room used for the Design Intervention

As shown in Figure 5.2, a series of columns surrounding the activity room provide an open visual and physical boundary. This porous border allows the occasional intrusion by passersby during activities. Even though the columns provide a visual spatial separation of the activity room from the hallways and other adjacent rooms (i.e., chapel, childcare, beauty room), the degree of visual and physical division provided by the columns was not enough to eliminate intrusions by passersby. Analysis of the findings on spatial organization led the researcher to wonder what degree of spatial enclosure would foster social interaction between young children and older adults without disruptions by passersby during activities. Based on a literature review on empirical studies (see Section 3.1), the researcher developed the hypothesis that a semi-enclosed spatial plan might promote more elder-child social interaction than the open or fully enclosed spatial plans. In order to test this hypothesis, the degree of spatial enclosure around the activity room of Freedom House was modified to allow several types of design interventions. The spatial modifications were made based on the degree of visual and physical boundaries surrounding the activity room. All other physical components of the activity room remained unchanged. The differences between these three spatial arrangements were tabulated in Table 5.2 and Figure 5.3.

TABLE 5.2
Three Types of Spatial Arrangements in the Study

Types of Spatial Arrangement	Degree of visual connection between spaces	Degree of physical closure in the room
Open spatial plan	Strong	No
Semi-enclosed spatial plan	Mild	Mild
Enclosed spatial plan	No	Strong

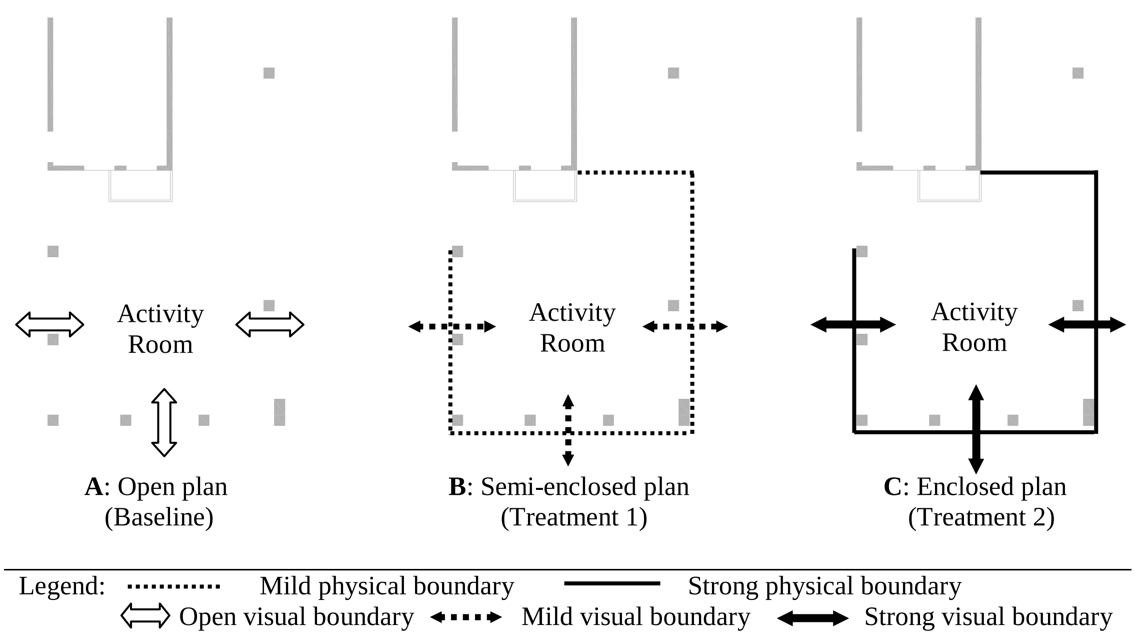

Figure 5.3: The Schema of the Degree of Spatial Enclosure

5.1.3.2 Design Intervention Material

The design intervention materials used in the experiment were (1) a mock-up of the observation room that was made for videotaping and (2) fabric curtains that served as partitions. Videotaping during physical activities was originally conducted from a small space behind a window of the beauty room which is adjacent to the activity room. However, in view of certain physical and organizational conditions at Freedom House, some changes had to be made to the original plan. Some residents used the beauty room between 10:30 am and noon. Since the observation time at 11:00 a.m. conflicted with the operating time for the beauty room, it was not possible to keep a portion of the beauty room dark to videotape participants in the brightly lit activity room[49]. In addition, the area of the beauty room allocated for videotaping was not sufficient to place six video-camcorders, six tripods, and other electronic equipment. Therefore, it was decided to make a mock-up observation room to be placed in front of the beauty room. The blinds of the two windows in the beauty room adjacent to the observation room were to be kept closed.

To keep conditions of the mock-up observation room similar to the research setting, meticulous care was taken to have the same paint color, crown molding around the mock-up, and other decorative elements. The plastic windows of the mock-up were camouflaged with artificial ivy in order to hide the video camcorders. Decorations for Memorial Day and birthday parties in the research setting helped make the presence of the mock-up seem less intrusive. For example, pictures of American presidents created points of interest and focused participants' attention on such elements and diverted attention from the mock-up structure. In this way, the mock-up allowed the researcher to videotape observations by placing six digital camcorders inside the mock-up. The camcorders, on wooden shelves of the mock-up, were positioned at a height of approximately 3 feet 6 inches above the floor so as to offer the best view of participants' facial expressions and body movements. The ceiling of the mock-up was uncovered so

[49] This technique functions like a one-way mirror. If one room is kept dark while the other room is brightly lit, people in the darkened room can more readily watch people in the brightly lit room than vice versa.

that audio recording was possible without having to use external microphones. Figure 5.4 shows the exterior (upper low) and interior (bottom row) of the observation room mock-up.

Figure 5.4: The Observation Room Mock-up

The perimeter of the activity room was modified, using fabric curtains, to create three different types of spatial plans. These were designated as an open plan which used the current spatial plan with no curtain; a semi-enclosed spatial plan entailed installation of a three-foot high curtain, while the enclosed spatial plan involved placement of a full-length, floor-to-ceiling curtain. The curtain was made from a single layer of off-white fabric. It provided visual and physical separation from adjacent areas such as the chapel and hallways. In the enclosed spatial plan, it was difficult for both the adults and children in the activity room to look over or past these screens when passersby came very close to the screens. For the semi-enclosed spatial plan, the curtain rods were attached to the sides of the permanent columns, using hooks, at a height of three-feet. For the enclosed spatial plan the curtain was fastened to the ceiling. The bottom of the curtain was fastened to the floor. The curtain was spread evenly across all the rods. The boundaries of the experimental space were signified by off-white curtains matching the ivory color of the columns and walls of the activity room. The basic equipment and furniture used for the study consisted of child-size chairs, adult-size chairs, a large TV screen, curtains, and a mock-up observation room. Figures 5.5 through 5.7 show views of each spatial modification: open spatial plan, semi-enclosed spatial plan, and enclosed spatial plan.

Figure 5.5: Views of the Open Spatial Plan in the Activity Room

Figure 5.6: Views of the Semi-enclosed Activity Room Spatial Plan

Figure 5.7: Views of the Activity Room Enclosed Spatial Plan

5.1.3.3 Design Intervention Schedule

Based on the A-B-A-B-C-B-C pattern, each phase took approximately one week to complete. In total the design intervention lasted for 22 days over an eight-week period. The duration and time for videotaping observations was revised for the data collection schedule. It took five days to collect sufficient stable data for baseline observations that would be used to judge the effectiveness of different design interventions on participants' behavior. The baseline stability[50] refers to the natural occurrence of experimental interest (i.e., elder-child social interaction) and not simply the absence of a design intervention (Cooper et al., 1997). Another variation was the duration of the second B treatment which was conducted for only two days, on Wednesday and Friday because the Memorial Day holiday (May 30th) happened on the Monday of that week so there were no children at the childcare center.

Videotaping the activity sessions was carried out at the same time each day, during the physical exercise hour in the morning at 11:00 a.m. However, it was necessary to revise the observation time for the 20th, 21st, and 22nd observations. On the 20th observation, the physical exercise started 10 minutes late because of some special activity involving all the Freedom House residents Instead of beginning at 11:00 a.m.

[50] The stability of a baseline is assessed by two factors: the level, referring to the variability of data points, and the slope, referring to trends in the data points (Alberto & Troutman, 2006).

the physical exercise started at 11:20 a.m. During the week of the 21^{st} and 22^{nd} observations, there were special luncheons for Freedom House donors that started at 11:30 a.m. Therefore, the data collection time was shifted to 10:45 a.m. for the last two observations.

The preparation schedule for each observation also involved confirming the available participants for each observation. In addition, seating arrangements had to be made using a table of random numbers, and all equipment (i.e., name tags, curtains, camcorders) had to be set up 10 minutes before the physical exercise activity started. Total videotaping time was about 330 hours over an eight-week period. One camcorder was used to videotape each dyad of a resident and a child in order to record the details of inter-personal social interactions. Table 5.3 summarizes the observation sessions schedule for the design intervention.

TABLE 5.3
The Schedule of Observation for the Design Intervention

Interventions	Observation Sessions	Time	Collection Date
A: No Curtain	1		5.4.2005
	2		5.6.2005
	3		5.9.2005
	4		5.11.2005
	5		5.13.2005
B: 3-foot High Curtain	6		5.16.2005
	7		5.18.2005
	8		5.20.2005
A: No Curtain	9		5.23.2005
	10	11:00 – 11:15 a.m.	5.25.2005
	11		5.27.2005
B: 3-foot High Curtain	12		6.1.2005
	13		6.3.2005
C: Floor-to-Ceiling Curtain	14		6.6.2005
	15		6.8.2005
	16		6.10.2005
B: No Curtain	17		6.13.2005
	18		6.15.2005
	19		6.17.2005
C: No Curtain	20	11:10 – 11:25 a.m.	6.20.2005
	21	10:45 – 11:00 a.m.	6.22.2005
	22	10:45 – 11:00 a.m.	6.24.2005

5.1.4 Systematic Observation Protocol

Because different sampling procedures produce different results, meticulous care was taken in planning procedures for sampling, videotaping, and coding. Thorough sampling techniques allowed for the collection of reliable data during the observation sessions. This study focused on elder-child social interaction within a 15-minute activity period. A partial-interval recording method was used to record the approximate number[51] of occurrences of each categorized behavior using the observation instrument described in the previous Chapter IV. The researcher used one video camcorder to videotape one dyad (i.e., a child and a resident, or two residents) of participants in each observation segment over an observation session. The15-minute videotaped observation was divided into 10-second coding intervals. This allowed two research assistants to independently observe the first interval and during the second interval to record what was observed in the first interval. This process[52] was continued throughout the observation period. In total, this process of observe-then-record resulted in 90 ten-second observation intervals and 90 ten-second breaks for each observation segment. In the following sub-sections are more detailed descriptions on the procedures used for sampling, videotaping, and coding.

5.1.4.1 Sampling

Participants

In order to maintain the most natural research conditions, the subjects who were observed were those who normally participated in the activity programs. They included residents diagnosed as being in the high functioning phase of Alzheimer's disease, and also young children aged three to five years. The research site, Freedom House, has offered physical exercise activities accompanied by children only to residents in the high functioning stage. Among the 8 elderly residents involved in the study, some used wheelchairs or canes, while others are able to move about on their own. For reliable

[51] Time sampling is an approximation of the actual number of times the categorized behavior occurred within an observation period (Cooper et al., 1987).

[52] This process is called noncontinuous observational control, and is useful when recording several categories (Cooper et al., 1997).

interview data, the Freedom House medical staff assessed the stages of cognitive function for the residents, using the Global Deterioration Scale (Reisberg et al., 1982). The assessment showed high levels of cognitive and behavioral functioning for the residents. The five preschoolers involved in the study were children of staff members at Freedom House. All of the five children have experienced physical activities with elderly residents at Freedom House. They were familiar with the residents and the physical activity involved in the study. None of the children have any physical disability. The total number of children and residents present in each observation session varied from six to twelve. In most videotaped footage there were nine or eleven participants (see Table 5.4).

Time Sampling Technique

As mentioned previously, time sampling is an *approximation* of the actual number of *times* the categorized behavior occurred within an observation period (Cooper et al., 1987). Strictly speaking, it reports on the number of *intervals* in which a behavior occurred. The time sampling technique makes it possible to record state behaviors (i.e., behaviors of longer duration) as well as event behaviors (i.e., high frequency behaviors). This technique only allows for limited conclusions to be drawn from the record of the behavior's occurrence because each interval has only a single notation regardless of the level of occurrence during the given interval.

Time sampling is a general term for measuring behavior occurrence. There are three different techniques of time sampling: whole-interval recording, partial-interval recording, and momentary time sampling (Cooper et al., 1997). Whole-interval recording is an estimate of behavior occurrence for the *entire* duration of an observation interval (i.e., 10 seconds of a 10-second interval). Partial-interval recording requires that the target behavior be present at *any* time during the interval (i.e., at least once during a 10-second interval). Momentary time sampling requires that the behavior be only scored at the end of an observation interval (i.e., at the 10^{th} second of a 10-second interval). For this study the partial-interval recording procedure was used to estimate behavior occurrence, because it allowed the recording of several categories during a given coding interval.

5.1.4.2 Videotaping

As mentioned in the previous section (see Section 5.1.2), this study used a double blind design to eliminate observer bias. In this regard, the researcher, as a third-party observer, videotaped physical activity sessions using six standard VHS and digital camcorders over a 15-minute activity period. The videotaped observations were then viewed by two research assistants who were able to observe and record participant's behavior. For the effective and complete recording of most situations, the videotaping formats were developed based on the layout of seating arrangements as well as the angle of the camcorders. Important behaviors can be missed when participants do not face the camcorders and the angle of the lens cannot capture all events taking place in a behavior setting. These problems were noted during the pilot study at the Sheridan senior facility (see Section 4.5). When zooming out to capture a child who moved frequently, it was very difficult to videotape facial expressions of the resident in a pair with that child. Additionally, a closed circular seating arrangement meant some participants would have their backs to the camcorders. To solve this issue, the researcher structured an open circular seating arrangement that was open toward the camcorders. This seating arrangement was effective in capturing facial expressions and body movements during the activities.

Regarding the angle of camcorders, the wide-angle lens of the digital camcorders provided a sufficiently broad view to focus on a pair of participants. The camcorders were positioned on shelves inside the mock-up observation room. These shelves were approximately 3 feet 6 inches above the floor. The camcorders were also angled slightly downward so as not to create a glare from the overhead lighting. Each camcorder focused on a dyad (i.e., a child and a resident, or two residents) for a period of 15 minutes. Inside the mock-up, artificial ivy and plants around windows helped camouflage the cameras. The researcher had to adjust the angles of camcorders to capture all events of target participants who frequently moved. The camcorders were turned on when children and residents entered the activity room and were turned off after at least two minutes of activity. Each videotaped session was categorized based on activity date and filed in chronological order. The total number of digital camcorders used in each observation session varied from four to six. Table 5.4 summarizes variations in participants present and camcorders used in the study over 22 observation sessions.

TABLE 5.4
Variations in Participants and Camcorders in the Study

	Number of Participants			
Observation Sessions	Children	Residents	Total*	Camcorders Used**
Session 1	5	5	10	6
Session 2	4	2	6	4
Session 3	4	7	11	6
Session 4	5	7	12	6
Session 5	4	6	10	6
Session 6	4	6	10	6
Session 7	4	6	10	5
Session 8	4	7	11	6
Session 9	1	8	9	5
Session 10	4	6	10	5
Session 11	1	6	7	4
Session 12	4	7	11	6
Session 13	2	7	9	5
Session 14	3	8	11	6
Session 15	4	7	11	6
Session 16	1	7	8	5
Session 17	3	7	10	5
Session 18	3	7	10	5
Session 19	2	7	9	5
Session 20	4	7	11	6
Session 21	3	6	9	5
Session 22	2	8	10	5

Note: *The total number of observation records is 215. **The number of digital camcorders is equal to the number of videotaped segments in an observation session.

5.1.4.3 Coding

This section focused on issues concerned with the analysis of the videotaped observations. A multi-pronged approach was used to analyze the videotaped observations as well as to map the spatial usage of individuals involved in the study.

Meticulous care was taken to remove potential sources of observer bias that could affect the coding results. In response to this concern, several strategies were considered for dealing with observer training, coding techniques, and inter-observer agreement.

Observers and Observer Training

Upon the completion of videotaping observations, two undergraduate students in the Psychology program at Texas A&M University were recruited to analyze the videotaped data. The students were recruited through flyers, advertising a part time job, posted in the departments of Psychology and Educational Psychology. As noted earlier, observer bias can arise when the observer knows the intentions of the experiment. In this case, the observer can have an unwitting influence in measuring the subject's behavior. In order to remove the observer bias, a blind design strategy was used. So although the two observers were aware of the significance of the observation study, they did not know the focus of the study or what experiment each subject involved in the study had part of.

Another concern was the low level of inter-observer agreement which could be due to insufficient training in observation and recording. Thus, it was important that the observers be adequately trained. The training for these observers consisted of four major parts ranging from general to specific categories. These included (1) an introduction to the observation process, (2) time sampling, (3) inter-observer agreement, and (4) behavior mapping (see Appendix L). At the outset of the training session, significant attention was given to explaining the purpose of observation and the significance of training in subjectivity and objectivity. To reinforce this issue the observers were presented with the task of making observations which were then interpreted from both subjective and objective perspectives.

For the second part of training session, the observers studied the definitions of elder-child social behavior involved in the Elder-Child Social Interaction (ECSI) instrument developed by the researcher. In general, the observer may be less at ease during data collection when he or she is unfamiliar with the specific behavior and the specific behavior setting (Boehm & Weinberg, 1997). The observers in the study acknowledged that unfamiliarity with the definitions of categorized behaviors made it difficult to consistently record observations as different situations occurred. To address this concern, particular attention was paid to memorizing the behaviors. So the observers were quizzed to test their knowledge of these categorized behaviors, they also reviewed the observations against a protocol, and discussed the ambiguity of the operational definitions and examples with the researcher. Additionally, the observers were encouraged to practice the rules and procedures of time sampling that was employed in this study.

With two or more observers available to analyze the videotapes, it is likely that apparent differences between individuals being observed could, in fact, stem entirely from differences between the observers (Cooper et al., 1987). In research situations using many categories and having a relatively short time interval for coding, it is important to verify (1) that each observer records using consistent standards on different occasions (i.e., good intra-rater reliability). It is also important (2) that the observers record the same behavior in the same way (i.e., good occurrence reliability). In this regard, special emphasis was focused on explaining the purpose and significance of inter-observer agreement in the third segment of the training session. This training included discussion of inter-observer agreement. There was also practice in rating videotapes made during the pilot study at the Sheridan senior facility. Upon completing the review of each videotape, the two observers discussed any disagreements they had in rating the behavior of participants exhibited in the videotapes. The observers were required to reach an agreement criterion level of 90 % without discussing the practice tapes prior to coding the main study observations.

In the fourth, last section of the training session, the observers practiced mapping subject’s location and movement, using the ECSI behavior mapping sheet. The behavior mapping for the design intervention was carried out to record which social spaces in the activity room were used in each 10-second interval. The observers also recorded how each subject reacted to the presence of passersby under each treatment condition. This observer training took about two hours every weekday over a four-week period. It was during this period in which the pre-established criterion of 90% agreement was reached. More detailed information about behavior mapping is described in Section 5.1.5. Figure 5.8 illustrates a sample of behavior mappings done by one of the observers during the observer training sessions.

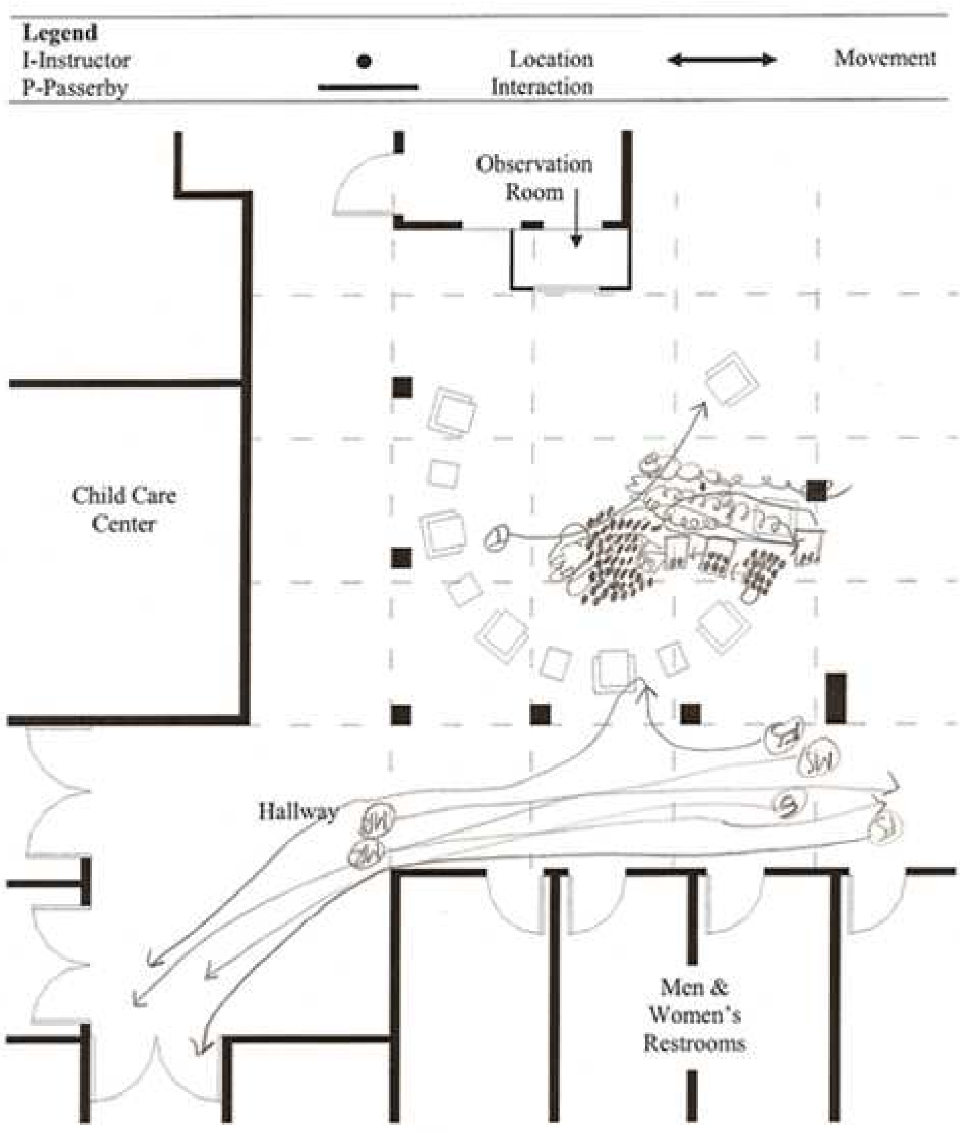

Figure 5.8: Sample of Behavior Mapping made during Observer Training Sessions

Coding Technique

Videotaped observation data was gathered from a total of 22 observation sessions. Each videotape consisted of the observation session for one day that was divided into 15-minute activity periods. A standard VHS videotape for each one day observation session consisted of four or six segments in which a pair of participants (i.e., a child and a resident, or two residents) was videotaped. Thus, the total videotaping length of an observation session varied from 60 to 90 minutes. Coding procedures were carefully organized and timed to increase the accuracy of measuring behavior as well as to remove the effects of observer fatigue and boredom. Specific coding techniques were developed to distinguish intervals for observation and coding, breaks between each interval, and breaks between segments.

Partial-interval sampling and noncontinuous observational control techniques were used for systematic observation and coding. The partial-interval sampling technique is useful when coding several categories (Cooper et al., 1987). Every child and resident present in the videotapes was continuously coded during the 15-minute activity period following the partial-interval sampling procedure. The partial-interval sampling technique followed involved establishing a series of 10-second time intervals for recording the occurrence of observed behaviors at least once in the given interval. Thus, each 15-minute videotaped segment was divided into 10-second time intervals and resulted in 90 separate ratings for each subject over an observation session.

The noncontinuous observational method was used to control the order of coding and breaking on a continuum at both the interval and segment levels (Cooper et al., 1987). At the interval level, the observer noted behaviors during the first 10-second interval and recorded what was observed during the second 10-second interval. During the third interval the observer again noted behaviors and then recorded in the fourth interval. This procedure continued until each participant in the 15-miniute segment was observed and coded. At the segment level, a 5-minute break was given between videotaped segments in an observation session in order to avoid observer fatigue and loss of concentration. To use this procedure, the observer watched the first 15-minute videotaped segment, took a 5-minute break, observed the second 15-minute videotaped segment, took a second 5-minute break, and so on. This procedure was followed until the last pair of participants in an observation session was observed and coded. Thus, the total coding time[53] for each observation session varied from 135 minutes to 205 minutes, through four segments and six segments, respectively.

Based on the coding procedures, two observers recorded the subjects' behaviors, using the ECSI observation sheet, exhibited during the 15-minute activity period. Videotapes were presented in chronological order beginning with the first session of the physical exercise activity. All behaviors that took place in a 10-second interval were tallied but each behavior received only one tally during any 10-second interval. For example, even if a child touched a resident five times during the 10-second interval, only one notation was recorded for this action. Thus, a behavior was scored only once per interval and the total number of intervals represented the total accumulation over a 15-minute observation session throughout the duration of the experiment. These scores were averaged to yield a median social behavior score that provided an average performance of groups; either a residents' group or a children's group for each treatment condition.

Due to the brief coding interval, it was very difficult for the observers to record behaviors, pause videotapes every 10 seconds, and pay attention to an audio-beeper simultaneously. So the researcher, using ear plugs, played and paused the videotapes using a tape player with the capability to operate for specified time segments (i.e., 10-second play and 10-seocnd pause). To help the observers make quick, accurate identification of participants, photographs of each participant present during that session were placed on a stand beside the television monitor. The photos were arranged in the seating order used during that session. Each observer independently recorded only one individual from a dyad in each videotaped segment. After scoring the first person on a

[53] The total number of videotaped segments in each observation session varied from four to six. In an observation with four segments, observations for 120 minutes (i.e., 30min. x 4 segments) and breaks for 15 minutes (i.e., 5 min. x 3 breaks) totals 135 minutes. In an observation with six segments, observations for 180 minutes (i.e., 30min. x 6 segments) and breaks for 25 minutes (i.e., 5 min. x 5 breaks) totals 205 minutes.

prepared observation sheet, the observer selected another participant in the second segment to observe and identified the name of the participant for recording purposes.

5.1.5 Behavior Mapping Protocol

Behavior mapping was intended to record participants' responses to the design interventions in relation to their use of social spaces (i.e., activity area, intermediary area, miscellaneous area). This method, behavior mapping, was useful for determining whether the observed behaviors remained constant across the different design interventions. Each observer carried out both coding behaviors and mapping locations for just one child or resident at a time. The participants' precise locations and movements were noted on a 1'-6" grid partitioning the activity room map (see Appendix L). In each 10-second interval, each participant's movements were noted with an arrow to indicate the direction of movement, and their location was marked with a dot. The use of social spaces was assessed by noting the frequency with which children and residents used different areas during physical exercise activities. The use of behavior mapping helped the researcher understand the occurrence of certain situations; especially the physical features in settings for the different design interventions, which could hamper or facilitate movement during.

The observation sheet consisted of two elements; one for coding behaviors and the other for mapping movements. The observation coding sheet was composed of a series of columns to record tallies for the time intervals and the rows denoted the 27 categories of interactive behavior (see Appendix L). One blank row was provided to note any additional information or unexpected events that might be useful in interpreting the results later. The behavior mapping sheet was an architectural floor plan depicting the different seating arrangements for each observation session. This mapping sheet had horizontal and vertical grid lines with a spacing of 1'-6" which delineated the three types of social spaces in the activity room.

5.2 RESULTS OF SYSTEMATIC OBSERVATION WITH EXPERIMENT

Two observers independently recorded the occurrence of elder-child social behaviors across all design interventions, using the ECSI observation instrument. It took approximately four weeks, involving 215 observation records, to collect all the data for 22 observation sessions. A preliminary inspection of this data was conducted to screen for potentially useful data and also to help determine appropriate methods of analysis. Some methods of statistical analysis considered included the use of missing values, parametric assumptions tests, and inter-rater or intra-rater agreement. A variety of data analysis methods (descriptive, sequential, nonparametric analyses) were used to enhance the reliability and validity of conclusions. In general, the results of the experiment on design interventions demonstrated an association between elder-child social interaction and the level of spatial enclosure. In addition, residents' group and the children's group showed differences in social behaviors. For statistical analyses, the researcher used the SPSS 12.0 for Windows statistical software program.

5.2.1 Description of the Participants

The experiment's sample included 8 resident (2 males, 6 females) and 5 children (4 boys, 1 girl). At the time of the observation, the mean age of the children was 4 years (SD=13.85), with a range from 2 years 7 months (31 months) to 5 years 3 months (63 months). Three children were Hispanic and two children were Caucasian. The mean length of time enrolled in the childcare center at Freedom House was 2 year 3 months (SD=1.71). Four children have participated in the intergenerational programs for 1 year, while one child had only attended the childcare facility for three months.

Eight residents ranging in age from 78 to 95 years (M=84.75, SD=5.26) also participated in the experimental study. All of the residents involved were Caucasian (100% or n=8) and widowed (100% or n=8). The mean length of time residents have resided at Freedom House is 2 years 6 months, with a range from 1 year to 7 years. All of the residents have participated in the intergenerational program for 1 year. The residents have all been diagnosed with Alzheimer's disease but still retain high levels behavioral and cognitive function. Table 5.5 shows the characteristics of the participants involved in the experiment.

TABLE 5.5
Characteristics of the Participants in the Design Intervention

Characteristics	Residents' Group	Children's Group
Number of Participants	8	5
Gender		
Male	2	4
Female	6	1
Mean Age	84.75 years (SD=5.26)	4 years (SD=13.85)
Ethnicity		
Caucasian	8	2
Hispanic	0	3
Marital Status		
Widowed	8	N/A
Length of Stay	Mean=2.5 years (SD=1.85)	Mean=2.25 years (SD=1.71)
Less than 1 year	0	1
1-3 years	7	2
4-6 years	0	2
Over 7 years	1	0
Length of IG programs involved	Mean=1 year (SD=0)	Mean=0.85 year (SD=0.34)
Less than 1 year	0	1
1 year	8	4

5.2.2 Preliminary Inspection of Data

5.2.2.1 Missing Data

The data set in the study contained missing observations which are a common practical problem in longitudinal research. Some children and residents were absent from some of the 22 observation sessions, came late, left early, or went momentarily outside the activity room. Since each subject's data were important and could not be ignored, especially in a study with such a small sample size, it was necessary to devise some procedure to handle any missing observations. The researcher reviewed statistical methods for dealing with missing data and compared the differences among these methods with actual data from this study. These procedures enabled the researcher to find the most appropriate and practical method to handle missing observations.

Missing observations, or absence of participation, in applied research are handled in four different ways either by deletion, mean substitution, mean of adjacent observations, and maximum likelihood estimation (Schafer & Graham, 2002; Velicer & Colby, 2005). When missing data occurs at random[54], then the deletion technique generally produced accurate results. This method can be quite effective when discarding a small part of the sample (Schafer & Graham, 2002). The second technique involves substituting the mean of all the non-missing observations obtained. This technique ignores the order of the observations and results in the least accurate approach (Velicer & Colby, 2005). The mean of adjacent observations technique preserves the order of the observations and produces reasonable results. The fourth option, maximum likelihood estimation is the most accurate approach and can be valid for a large sample size (Schafer & Graham, 2002; Velicer & Colby, 2005).

Even though the maximum likelihood approach yields accurate results and is recommendable, a limitation of this approach was that estimates of the actual missing data points were not available in the current version of SPSS 12 statistical software program. Because of the unavailability of a computer program to perform the function, this approach was not considered for use in handling missing data involved in the study. The mean substitution approach was not selected because of the possibility of inaccurate estimation. The mean of adjacent observations was not appropriate in this study because there is variability in the data. According to a preliminary sequential analysis in the study (see Section 5.2.4), the low observation was followed by extremely high observation between and within treatments. In this regard, substituting the mean of adjacent observations might have a carry over effect and result in biased findings and interpretations. Therefore, these three methods were not selected for dealing with missing observations involved in this study.

[54] When data are missing and the probability is unrelated to the outcomes being measured, it is called 'missing at random' (Schafer & Graham, 2002). There are three variations of missing at random: missing at random (MAR), missing completely at random (MCAR), and missing not at random (MNAR). When the amount missing is unrelated to the outcomes, it is called MAR (i.e., illness, dropout). Missing completely at random (MCAR) can occur because equipment malfunctions, the weather is terrible, or the data are not entered correctly. However, the amount missing may have a certain, not causal, relationship with the outcomes. This is called missing not at random (MNAR). If data are MCAR or MAR, the amount missing is negligible.

The deletion approach seemed to be an appropriate method because the absence of observations in the study was missing at random. The occurrence of missing data was beyond the control of the researcher because of unforeseen events such as illness, dropping out of the study, a family visit, a prearranged schedule for personal shopping. However, it was reasonable to perform the deletion approach and compare the results to data with and without deletion. The examination would provide a relatively reliable standard for further performing data analysis. At this point of deleting missing observations, the researcher used a conservative strategy to drop off missing observations for subject and treatment. For subject, only the data from residents and children who were present at least 50% of the total activity sessions were analyzed. One resident who missed 12 out of 22 observations and one child who missed 13 out of 22 observations were excluded for the future data analyses. This yielded a total of seven residents (1 man, 6 women) and four children (3 boys, 1 girl) in the study. For the treatment, those treatments absent in 50 % of each experimental treatment session were excluded. One treatment for one resident and eight treatments for three of the children were excluded from further data analyses. The missing treatments were treated as *absence* rather than missing values, which would affect mean values.

The researcher examined the comparison of elder-child social interactions with and without deletion of two subjects and nine treatments across treatments. In the resident group, there was a slightly different rank for antisocial behavior between the open and semi-enclosed spatial plans. In cases without deletion, the high rank of residents' antisocial behavior was in the semi-enclosed (Mdn=36), open (Mdn=27), and enclosed (Mdn=14) plans, respectively. In cases with deletion, the high rank of residents' antisocial behavior was in the open (Mdn=44), semi-enclosed (Mdn=40), and enclosed (Mdn=17) plans, respectively. However, the difference of median intervals was very small, differing only by three or four intervals out of a total of 90[55] intervals. For the children's group, a similar result was found regarding the rank of antisocial behavior. Children showed more antisocial behavior in the enclosed plan (Mdn=270.5)

[55] A 10-second time resulted in a total of 90 intervals over a 15-minute observation session.

than in the semi-enclosed (Mdn=254) and open (Mdn=138) plans when keeping all subjects and treatments constant. In contrast, the rank was higher for the semi-enclosed (Mdn=238) than the enclosed (Mdn=207) and open (Mdn=119) plans when deleting two study participants and nine treatments. Even though deletion led to an underestimation of the median of intervals for the semi-enclosed plan, the rank of the total frequency of intervals for the children's antisocial behavior was identical with the deletion across all treatments. For each treatment plan the findings were as follows: semi-enclosed plan (n=905 with deletion; n=1144 without deletion), enclosed (n=903 with deletion; n=1030 without deletion), and open (n=648 with deletion; n=850 without deletion). Therefore, this examination showed that deletion was the best approach for handling missing observations and treatments for this study. Table 5.6 and Figure 5.9 summarize and illustrate median intervals of elder-child social interactions with and without deletion of two subjects and nine treatments.

TABLE 5.6
Frequency and Median of Elder-Child Social Interaction with and without Deletion

		Resident		Children	
		Frequency	Median	Frequency	Median
No Deletion Approach					
Open Plan	Antisocial	370	27*	850	138
	Neutral	50	4	274	54
	Prosocial	2098	254	836	184
Semi-enclosed Plan	Antisocial	435	36*	1144	254**
	Neutral	91	8	401	83
	Prosocial	3025	408	1173	219
Enclosed Plan	Antisocial	283	14	1030	270.5**
	Neutral	26	1.5	131	28.5
	Prosocial	2220	287.5	717	193
Deletion Approach					
Open Plan	Antisocial	368	44*	648	119
	Neutral	49	5	157	30
	Prosocial	1967	258	695	154
Semi-enclosed Plan	Antisocial	434	40*	905	238**
	Neutral	84	6	202	50.5
	Prosocial	2807	508	890	217
Enclosed Plan	Antisocial	272	17	903	207**
	Neutral	25	2	99	15.5
	Prosocial	2121	355	614	155.5

* Residents showed a difference in level of antisocial behavior calculated with and without deletion.
** Children showed a difference in level of antisocial behavior calculated with and without deletion.

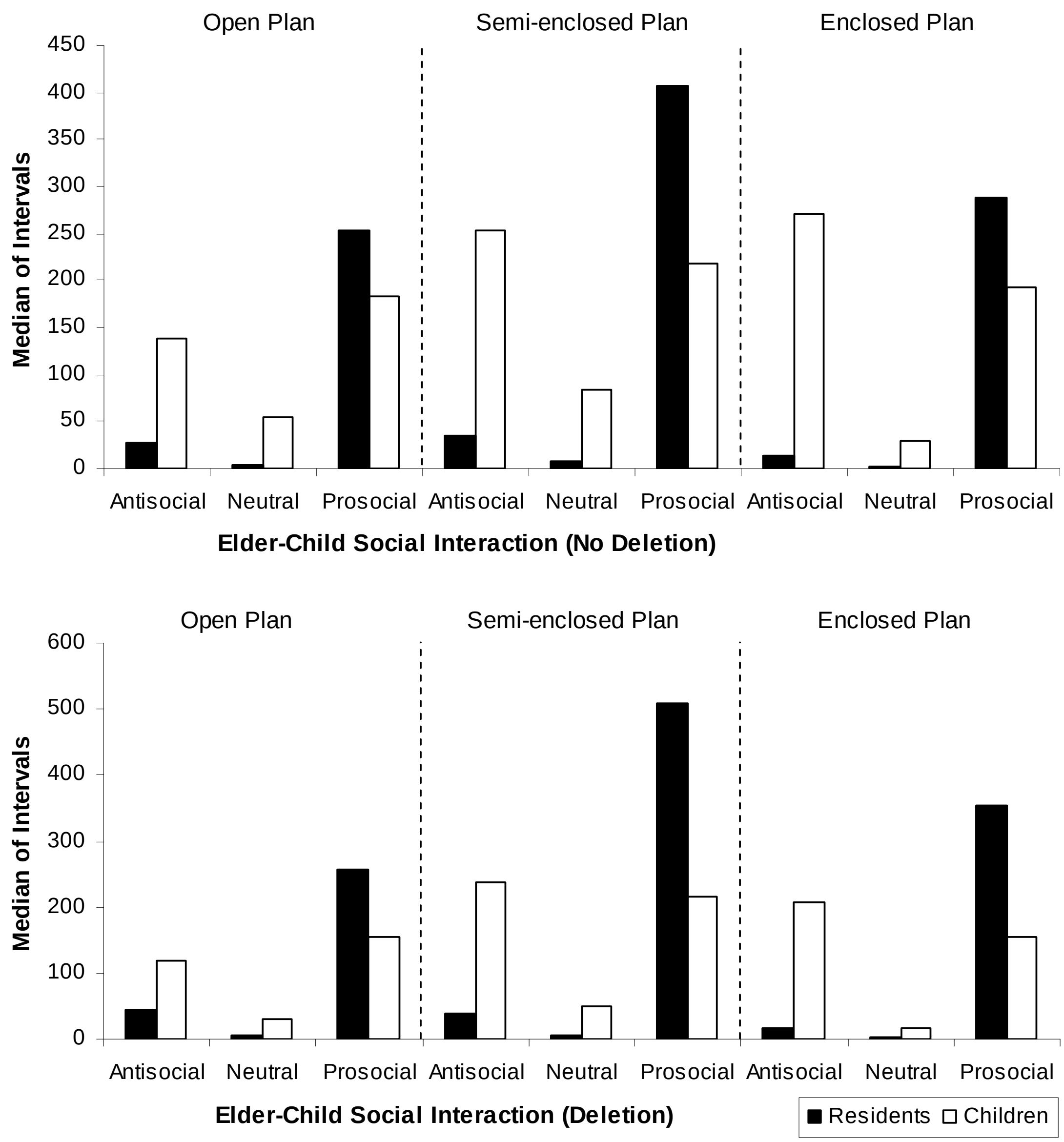

Figure 5.9: Median of Elder-Child Social Interaction with and without Deletion

5.2.2.2 Assumptions of Parametric Data

When a parametric test is used to analyze non-parametric data, this can possibly lead to a misinterpretation of the results. Before processing descriptive or statistical analyses, it is important to explore whether the data collected meet the assumptions of the parametric test. This preliminary inspection of data enhances any legitimate interpretation of the results by using appropriate statistical tests. Parametric tests are based on four robust assumptions: normal distribution, equal variance, interval data being measured, and independence of observation or measurement (Field, 2005). For testing whether the distribution is normal, visual (i.e., skewness, kurtosis) and statistical (i.e., Kolmogorov-Smirnov test[56]) techniques were used (Field, 2005). The results of two tests indicated that some groups of data were not normally distributed. In order to correct this condition, a logarithm function transformation was carried out. This particular transformation is useful for transforming positively skewed data. The log transformation failed to correct the abnormal distribution of the study data. In addition, the homogeneity of variance was tested using Levene's test[57] which explores whether variances in the group are equal (Field, 2005). Like the results for normal distribution, some groups of data showed non-equal variances.

Data involved in the study violated the assumptions for parametric tests that data are normally distributed and are equally spread around the mean. In situations where groups of data are abnormally distributed and have unequal variance, then non-parametric tests are useful tools to use for small ($n<10$) sample sizes, as often found in behavioral observation studies (Martin & Bateson, 1993). Therefore, the following analyses are based on data collected from seven residents and four children involved in the experiments. These examinations used sequential analysis and nonparametric tests. One resident and one child were excluded from the experiment data analyses because they did not meet the criterion of being present for 50% of all observation sessions.

[56] There are three ways to test for a normal distribution: plotting a histogram, skewness and kurtosis, and Kolmogorov-Smirnov (Field, 2005). Interpretations based on histograms are likely to be subjective. While skewness and kurtosis tell us about deviations from only one aspect of abnormality (i.e., skewed or flat), the Kolmogorov-Smirnov test determines whether the sample distribution as a whole deviate from the norm. If the p-value is less than .05 ($p<.05$ or significant), the distribution is abnormal. If the test is not significant ($p>.05$), the distribution is normal.

[57] Levene's test is useful when checking whether the variances in groups are equal or not (Field, 2005). If the test is significant at the level of .05 (i.e., $p\leq.05$), the null hypothesis is rejected which tells us the variances are significantly different. If the test is not significant at the level of .05 (i.e., $p>.05$), the null hypothesis is accepted which tells us the variances are equal.

5.2.2.3 Inter- and Intra-rater Agreement

In any study involving two or more observers, it is important to verify that each observer consistently records in a similar manner (Cooper et al., 1987). Whether the measurement by two or more observers is consistent can be indicated by two types of agreement[58] assessment: inter-rater agreement and intra-rater agreement. Inter-rater agreement occurs when two or more observers observe the same behavior (or subject) on the same occasion, record it independently, and then check the extent to which their recordings agree (Irwin & Bushnell, 1980). Intra-rater reliability occurs when an observer observes and records the same subject on different occasions (or on subsequent days) and then checks how consistent the observer is over time (Cooper et al., 1987). Good intra-rater agreement (single observer reliability) demonstrates personal consistency.

In addition to the types of agreements, there are other important practical considerations. These include the measurement of frequency of agreement, methods to assess agreement, and scores for the acceptability of agreement (Cooper et al., 1987). Measurement of the frequency of agreement involves a minimum of one measurement per condition for at least 20% of the observations sessions (Cooper et al., 1987). It is also recommended to report the total agreement as well as the occurrence and non-occurrence agreement for interval data (Page & Iwata, 1989). Agreement measurements are reported as the percentage of agreement between observers. The total agreement is computed by dividing the number of agreement intervals by the total number of all intervals and multiplying the quotient by 100 (Irwin & Bushnell, 1980). Since the total agreement reports the overall level of responses by computing the total occurrences, there is no assurance that two observers record the same behavior occurrences for the same intervals. In response to the concern, occurrence agreement was calculated in a

[58] Behavioral research uses the terms agreement and reliability interchangeably. Reliability tests refer to consistent measurement using statistical indexes such as Cronbach's alpha coefficient and intra-class correlation coefficient (Page & Iwata, 1989). This study did not use reliability tests to measure consistency between observers. Thus, the term, agreement is more appropriate in the study.

similar way[59] with the exception of ignoring all intervals in which both observers record the non-occurrence of behavior. On the other hand, all intervals are ignored in which both observers record the occurrence of behavior when calculating non-occurrence agreement. An inherent weakness in determining occurrence and non-occurrence agreements is that both agreements are sensitive to how often a behavior occurs. In general, occurrence agreement produces lower agreement scores whereas non-occurrence agreement produces higher agreement scores.

In response to the considerations for using agreement between two or more observers, the researcher assessed the inter-rater and intra-rater agreement for this study. Two observers independently recorded the same subject on the same day using videotaped observations to check inter-rater agreement. The measurements for inter-rater agreement were collected from 31 subjects at least once during non-intervention (A1, A2), intervention 1 (B1, B2, B3) and intervention 2 (C1, C2). Once the two observers recorded a different subject, they observed and recorded the same individual again on a subsequent day to check the level of intra-rater agreement. A total of 46 intra-rater agreement measurements were obtained at least once per session. The agreement measurements were conducted at the beginning, middle, and end of each observation recording session. Table 5.7 summarizes inter-rater and intra-rater agreements for total, occurrence, and non-occurrence agreements. The levels of agreement are reported for the mean agreement, and range of agreement, for all sessions used for assessing agreement.

[59] Occurrence agreement=agreement of occurrence intervals/(agreement of occurrence +disagreement intervals)x100. Non-occurrence agreement =agreement of non-occurrence intervals/(agreement of non-occurrence +disagreement intervals)x100 (Page & Iwata, 1989).

TABLE 5.7
Summary of Inter- and Intra-rater Agreement

Techniques		Inter-rater Agreement	Intra-rater Agreement
Total Agreement	Average	76.99 %	69.24 %
	Minimum	42.39 %	27.78 %
	Maximum	97.52 %	94.74 %
Occurrence Agreement	Average	50.24 %	44.04 %
	Minimum	17.78 %	10.00 %
	Maximum	94.84 %	81.65 %
Nonoccurrence Agreement	Average	91.54 %	89.15 %
	Minimum	80.95 %	71.43 %
	Maximum	100 %	100 %

The results showed that total agreement between two observers averaged approximately 77% ranging from 42.4 % to 97.5%. Total personal agreement for each observer averaged 69.24%, with a low of 27.78% and a high of 94.74%. As discussed before, the mean agreement and range of occurrence were lower than those for the total agreement. The occurrence agreement between two observers averaged 50.24%, ranging from 17.78 % to 94.84%. The occurrence agreement for each observer averaged 44.04%, ranging from 10 % to 81.65%. It was not surprising that the mean and range for non-occurrence agreement were higher than the total agreement and occurrence agreement. The non-occurrence agreement between two observers averaged 91.54% ranging from 80.95% to 100%. The non-occurrence agreement for each observer averaged 89.15%, ranging from 71.43 % to 100%.

Observational data obtained as categorical scores yielded two low scores (10 %, 27.78%) for intra-rater agreement and one low score (17.78 %) for inter-rater agreement. These low scores seemed to be associated with observer drift which involved the improvement of observers in measuring the behaviors as time passed. The lowest agreement levels were calculated from data which were obtained at the beginning and end of observation sessions. According to the two observers, they became more familiar with the definitions and criteria for the categorized behaviors over time. Even though they received sufficient observation training over four weeks, it seems that the training period was not enough to guard against observer drift. In addition, the lowest level agreement scores might be associated with such specific research circumstances as having many categories (27 categories) and a long time for recording (135-205 minutes) (see Section 5.1.4.3). Thus, it was necessary to consider a less rigorous determination of inter-rater and intra-rater agreement in the study, even though this lacked a certain amount of precision[60].

5.2.3 Descriptive Analysis of Systematic Observation with Experiment

5.2.3.1 Elder-Child Social Interaction across Design Interventions

According to the results, residents predominantly showed prosocial behavior (Mdn=1121 or 90.77%) across all areas of the experiment. Antisocial behavior was the second most frequent behavior (Mdn=101 or 8.18%). The tendency for residents to show neutral behavior (Md =13 or 1.05%) was less frequent and it was also much lower than the level of neutral behavior for children (Mdn=96 or 8.09%). Unlike the residents, the children showed a slightly higher level of antisocial behavior (Mdn=564 or 47.58%) than prosocial behavior (Mdn=526.5 or 44.37%) across experimental conditions. Approximately 8% (Mdn=96) of the total elder-child interactions was neutral behavior observed from children. Table 5.8 shows the median of intervals of elder-child social interaction during physical exercise between residents and children. Figure 5.10 illustrates the comparison of three types of elder-child social interaction in three experimental conditions.

TABLE 5.8
Median Intervals of Elder-Child Social Interaction by Design Interventions

Group	Modes	Open (A)	Semi-enclosed (B)	Enclosed (C)	Total
Residents	Antisocial	44	40	17	101 (8.18 %)
	Neutral	5	6	2	13 (1.05 %)
	Prosocial	258	508	355	1121 (90.77 %)
	Total	307	554	374	1235 (100%)
Children	Antisocial	119	238	207	564 (47.54 %)
	Neutral	30	50.5	15.5	96 (8.09 %)
	Prosocial	154	217	155.5	526.5 (44.37 %)
	Total	303	505.5	378	1186.5 (100%)

[60] Even though there is no established criterion for inter-observer agreement, a rule of thumb is an average of 80% agreement (Cooper et al., 1987).

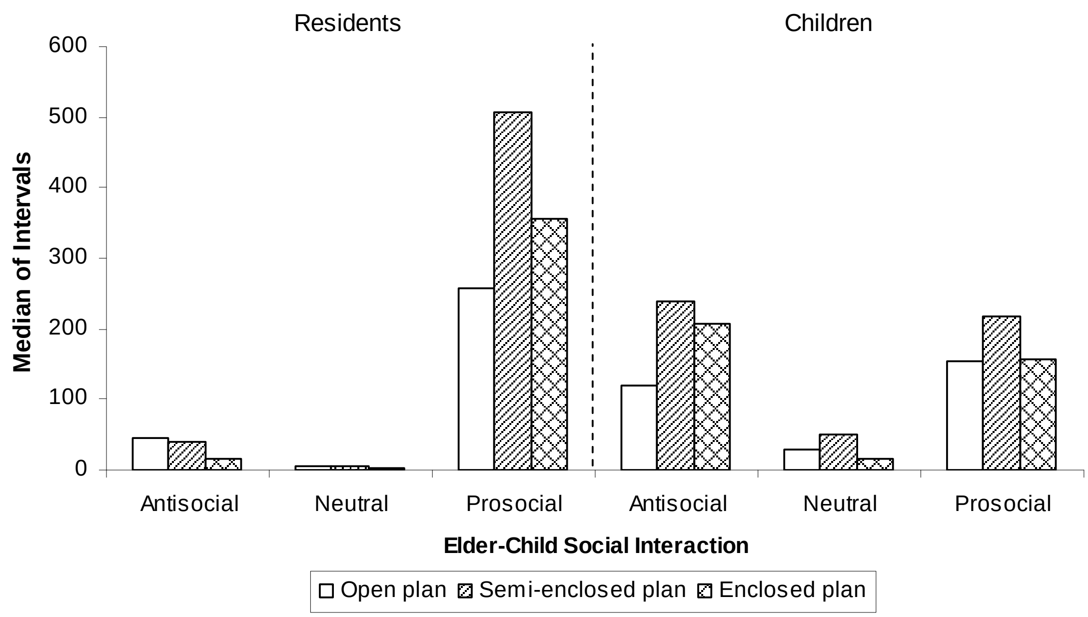

Figure 5.10: Median Intervals of Elder-Child Social Interaction by Groups

As shown in Figure 5.10, the most frequent behavior for residents was prosocial behavior, which was observed more in the semi-enclosed plan (Mdn=508) than in the enclosed (Mdn=355) and open (Mdn=258) plans. Residents' antisocial behavior was observed in the open plan (Mdn=44) slightly more often than in the semi-enclosed plan (Mdn=40). In contrast, children showed antisocial behavior most frequently in the semi-enclosed plan (Mdn=238), followed by the enclosed plan (Mdn=207) and the open plan (Mdn=119), respectively. Interestingly, children also showed more prosocial behavior in the semi-enclosed plan (Mdn=217) than in the enclosed (Mdn=155.5) and open (Mdn=154) plans. The difference between antisocial behavior (Mdn=238) and prosocial behavior (Mdn=217) in the semi-enclosed plan was not large. However, it was necessary to test whether or not the difference is significant (see Section 5.2.5). The neutral behavior for children and residents was higher in the semi-enclosed plan than for other spatial plans. However, neutral behavior was less frequently observed compared to antisocial and prosocial behaviors. Overall, both residents and children showed more prosocial behavior in the semi-enclosed plan than in the open and enclosed plans.

Children were more antisocial in the semi-enclosed, while residents were more antisocial in the open plan. Particularly noticeable was that three types of social behavior by children occurred more frequently in the semi-enclosed plan than in the open and enclosed plans. Based on the results, it seemed likely that there were similarities and differences between the antisocial and prosocial behaviors of residents and children in relating to different levels of spatial enclosure (see Section 5.2.5.2).

To further examine the similarity and difference, the researcher calculated the median scores for the 27 behaviors in the ECSI observation instrument by groups and spatial plans. This examination identified frequently observed behaviors in the study. One rule of thumb observed for this study was that behaviors which occur, on average, once every fifteen minutes were considered frequently observed behaviors appropriate for the time sampling method (Irwin & Bushnell, 1980). Based on the criteria, there were 13 behaviors whose median scores greater than one during the 15-minute activity period. The effects of the level of spatial enclosure were further examined on the 13 frequently observed behaviors. Table 5.9 presents the median intervals for the 27 behaviors included in the ECSI observation instrument.

TABLE 5.9
Median Intervals of 27 Behaviors

Items	Residents			Children		
	Open	Semi	Enclosed	Open	Semi	Enclosed
Antisocial Behavior						
D1. Exhibits restlessness	0	0	0	54	67	93.5
D2. Acts disinterested	1	0	0	35.5	122	93.5
D3. Gets distracted	7	18	2	38.5	49	27
D4. Appears drowsy	15	14	15	0	0	0
Neutral Behavior						
W1. Avoids child/elder	0	0	0	0	2	0
W2. Stares blankly into space	0	0	0	0	0	0
W3. Talks to self	0	0	0	0	0	0
W4. Sits with arms or fingers folded	5	6	2	30	44.5	15.5
Prosocial Behavior						
C1. Places a child on lap	0	0	0	0	0	0
C2. Consoles a child	0	0	0	0	0	0
A1. Touches child/elder	0	1	0	2.5	1	1.5
A2. Hugs child/elder	0	0	0	0	0	0
H1. Smiles at child/elder	37	33	27	29	33.5	28.5
H2. Laughs with child/elder	5	13	10	2	9	3.5
H3. Claps	0	0	0	0	0	0
H4. Sings	0	0	0	0	1	0.5
S1. Invites child/elder into activity	1	5	4	5.5	7	3
S2. Asks child/elder questions	0	0	0	0	0	0
S3. Answers questions	0	0	0	0	0	0
S4. Praises child/elder	0	0	0	0	0	0
S5. Leads activity or interaction	0	1	0	0	0.5	0
AA1. Observes child/elder	199	364	248	89.5	133.5	95.5
AA2. Nods head	0	1	1	0	0	0
AA3. Leans forward in chair	0	0	0	0	0	0
AA4. Imitates child/elder	0	0	0	0	0	0
AA5. Acts exuberantly	0	0	0	25	19	10
AA6. Is physically active with child/elder	6	8	5	3	13.5	6

5.2.3.2 Elder-Child Antisocial Behaviors across Design Interventions

Among four antisocial behaviors frequently observed during the experiments, the most frequent antisocial behavior by residents was drowsiness (Mdn=44 or 61.11%). The second most frequent antisocial behavior was getting distracted (Mdn =27 or 37.5%) by passersby. Residents did not exhibit the other two antisocial behaviors (i.e., restless, disinterested). Residents showed more antisocial behaviors in the semi-enclosed

(Mdn=32 or 44.45%) plan than in the open (Mdn=23 or 31.94%) or enclosed (Mdn=17 or 23.61%) plans.

There were three antisocial behaviors related to the children. The most frequent antisocial behavior for children was acting disinterested (Mdn=251 or 43.28%). The second most frequent antisocial behavior was exhibiting restlessness (Mdn=214.5 or 36.98%). The two antisocial behaviors of acting disinterested and exhibiting restlessness accounted for over 80% of the total antisocial behaviors exhibited by children. Getting distracted was also observed in approximately 20% of children's antisocial behaviors (Mdn=114.5). Unlike residents, the children did not appear drowsy during the activity time. Children showed more antisocial behaviors in the semi-enclosed (Mdn=238 or 41.03%) plan than in the enclosed (Mdn=214 or 36.9%) or open (Mdn=128 or 22.07%) plans. Overall, elder-child antisocial behaviors were exhibited more often by children (Mdn=580) than by residents (Mdn=72) throughout all types of design interventions. The elder-child antisocial behaviors occurred more in the semi-enclosed plan than in the other two spatial plans. Table 5.10 and Figure 5.11 show the results of elder-child antisocial behaviors across the design interventions.

TABLE 5.10
Median Intervals of Antisocial Behaviors by Design Interventions

Group	Items	Open	Semi-enclosed	Enclosed	Total
Residents	D1. Exhibit restlessness	0	0	0	0 (0%)
	D2. Acts disinterested	1	0	0	1 (1.39%)
	D3. Gets distracted	7	18	2	27 (37.50%)
	D4. Appears drowsy	15	14	15	44 (61.11%)
	Total	23	32	17	72 (100%)
Children	D1. Exhibit restlessness	54	67	93.5	214.5 (36.98%)
	D2. Acts disinterested	35.5	122	93.5	251 (43.28%)
	D3. Gets distracted	38.5	49	27	114.5 (19.74%)
	D4. Appears drowsy	0	0	0	0 (0%)
	Total	128	238	214	580 (100%)

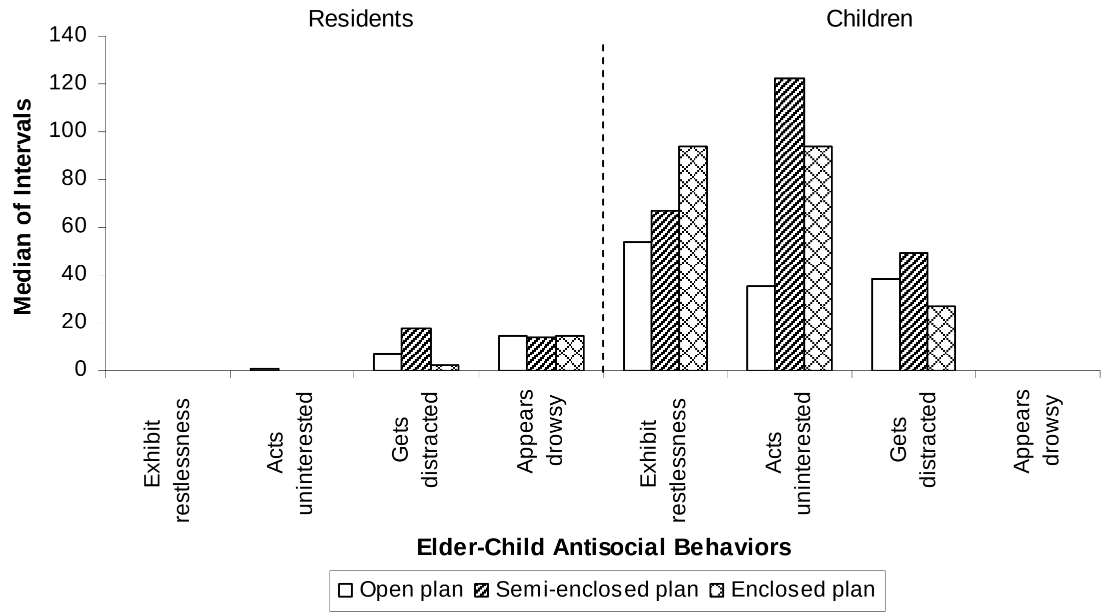

Figure 5.11: Median Intervals of Elder-Child Antisocial Behaviors by Groups

As shown in Figure 5.11, residents were getting drowsy in all of the experiments. It appears that getting drowsy was not related to the degree of spatial enclosure. However, the residents' behavior of getting distracted varied among the three different spatial plans. Residents were getting distracted more in the semi-enclosed spatial plan (Mdn=18) than in the open (Mdn=7) and enclosed (Mdn=2) plans.

Children acted more disinterested in the semi-enclosed (Mdn=122) plan than in the enclosed (Mdn=93.5) or open (Mdn=35.5) plans. The second most frequent behavior, exhibiting restlessness, occurred more in the enclosed (Mdn=93.5) than in the semi-enclosed (Mdn=67) or open (Mdn=54) plans. The behavior of getting distracted was observed more in the semi-enclosed (Mdn=49) plan than in the open (Mdn=38.5) or enclosed (Mdn=27) plans. Overall, the most frequent antisocial behaviors were somewhat different for each age group. Residents were getting distracted and drowsy during the activity time, whereas children were exhibiting restlessness, were disinterested, and distracted most often. Residents were appearing drowsy throughout all the experiments. Children were acting disinterested more often in the semi-enclosed plan, and exhibiting restlessness more in the enclosed plan. It was particularly noticeable that both residents and children were more getting distracted in the semi-enclosed plan than in the other two spatial plans.

5.2.3.3 Elder-Child Neutral Behaviors across Design Interventions

Based on the results, the most frequent neutral behavior for both residents and children was sitting with arms or fingers folded. This behavior occurred more in children (Mdn=90) than in residents (Mdn=13) throughout the design interventions. Interestingly, both residents and children exhibited this behavior more in the semi-enclosed plan than in the open or enclosed plans. The other neutral behavior, avoiding others, was exhibited only by children (Mdn=2). Overall, more neutral behaviors were exhibited by children (Mdn=92) than by residents (Mdn=13) across the design interventions. There was similarity in elder-child neutral behavior to the level of spatial enclosure, although more of this type behavior was evident in the semi-enclosed plan than in the open and enclosed plans. Table 5.11 summarizes the frequency of neutral behaviors for residents and children for all design interventions. Figure 5.12 compares neutral behaviors between residents and children within the three spatial plans.

TABLE 5.11
Median Intervals of Neutral Behaviors by Design Interventions

Group	Items	Open	Semi-enclosed	Enclosed	Total
Residents	W1. Avoids child/elder	0	0	0	0 (0%)
	W4. Sits with folded arms	5	6	2	13 (100%)
	Total	5	6	2	13 (100%)
Children	W1. Avoids child/elder	0	2	0	2 (2.17%)
	W4. Sits with folded arms	30	44.5	15.5	90 (97.83%)
	Total	30	46.5	15.5	92 (100%)

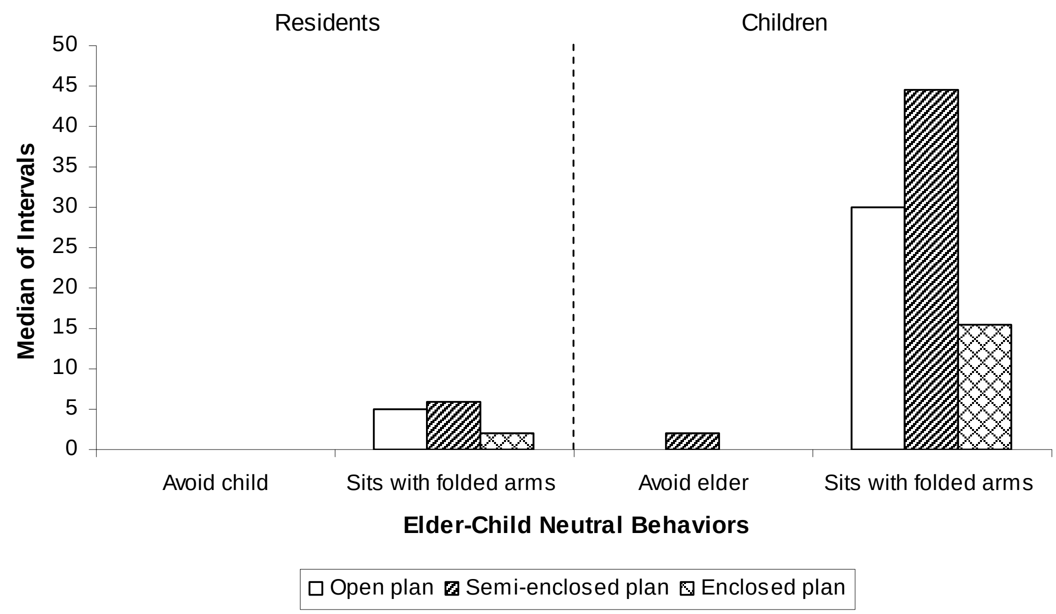

Figure 5.12: Median Intervals of Elder-Child Neutral Behaviors by Groups

5.2.3.4 Elder-Child Prosocial Behaviors across Design Interventions

Based on the results, the most frequent prosocial behavior exhibited by residents was observing children (Mdn=811 or 83.95%). The second most frequent prosocial behavior of residents was smiling with children (Mdn=97 or 10.04%), followed by laughing with children (Mdn=28 or 2.9%). Being physically active (Mdn=19 or 1.97%) and inviting child into the activity (median=10 or 1.04%) were also frequent behaviors that residents displayed during the activity time. Touching a child (Mdn=1) was rarely observed, and acting exuberantly did not occur. The elder-child prosocial behaviors of residents occurred more in the semi-enclosed spatial plan (Mdn=424 or 43.89%) than in the enclosed (Mdn=294 or 30.44%) or open (Mdn=248 or 25.67%) plans.

The children in the study behaved similarly in terms of their prosocial behaviors. The most frequent prosocial behavior for children was observing residents (Mdn=318.5 or 61.13%). The second most frequent prosocial behavior was smiling at residents (Mdn=91 or 17.47%). Unlike residents, acting exuberantly (Mdn=54 or 10.36%) and being physically active (Mdn=22.5 or 4.32%) were the third and fourth most frequent behaviors, respectively, displayed by children. Inviting an elder into the activity (Mdn=15.5 or 2.98%) and laughing with an elder (Mdn=14.5 or 2.78%) were also frequent prosocial behaviors during the activity time. Of interest was that children touched residents (Mdn=5) in a friendly manner more than residents (Mdn=1) touched children during the activity time. The children's prosocial behaviors occurred more in the semi-enclosed (Mdn=216.5 or 41.55%) than in the open (Mdn=156.5 or 30.04%) or enclosed (Mdn=148 or 28.41%) plans. Elder-child prosocial behaviors were exhibited more by residents (Mdn=966) than by children (Mdn=521) across the design interventions. Table 5.12 and Figure 5.13, below, show the results of elder-child prosocial behaviors for residents and children across the design interventions.

TABLE 5.12
Median Intervals of Prosocial Behaviors by Design Interventions

Group	Items	Open	Semi-enclosed	Enclosed	Total
Residents	A1. Touches child/elder	0	1	0	1 (0.1%)
	H1. Smiles at child/elder	37	33	27	97 (10.04%)
	H2. Laughs with child/elder	5	13	10	28 (2.90%)
	S1. Invites child/elder into activity	1	5	4	10 (1.04%)
	AA1. Observes child/elder	199	364	248	811 (83.95%)
	AA5. Acts exuberantly	0	0	0	0 (0%)
	AA6. Is physically active	6	8	5	19 (1.97%)
	Total	248	424	294	966 (100%)
Children	A1. Touches child/elder	2.5	1	1.5	5 (0.96%)
	H1. Smiles at child/elder	29	33.5	28.5	91 (17.47%)
	H2. Laughs with child/elder	2	9	3.5	14.5 (2.78%)
	S1. Invites child/elder into activity	5.5	7	3	15.5 (2.98%)
	AA1. Observes child/elder	89.5	133.5	95.5	318.5 (61.13%)
	AA5. Acts exuberantly	25	19	10	54 (10.36%)
	AA6. Is physically active	3	13.5	6	22.5 (4.32%)
	Total	156.5	216.5	148	521 (100%)

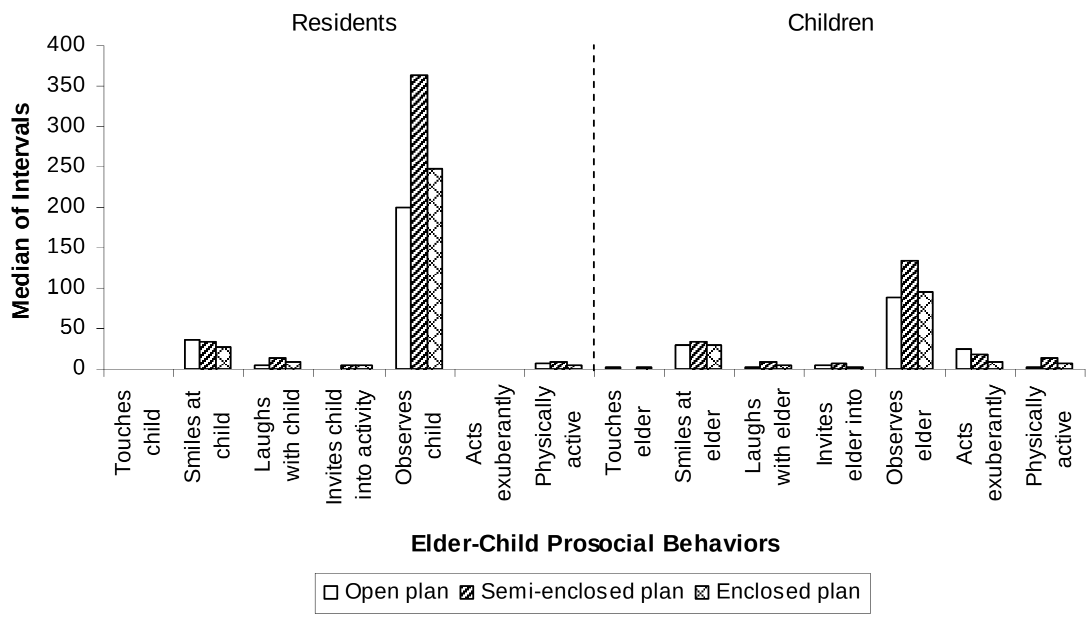

Figure 5.13: Median Intervals of Elder-Child Prosocial Behaviors by Groups

As shown in Figure 5.13, during the activity time residents were observing children more often in the semi-enclosed (Mdn=364) spatial plan than they did when the activity room was set up on the enclosed (Mdn=248) or open (Mdn=199) spatial plans. Similarly, two other prosocial behaviors, laughing and inviting, were observed more in the semi-enclosed plan than in the enclosed or open plans. However, the median score for smiling at a child was slightly greater in the open (Mdn=37) spatial plan than in the semi-enclosed (Mdn=33) plan. Residents were slightly more physically active in the semi-enclosed (Mdn=8) plan than they were in the open (Mdn=6) or enclosed (Mdn=5) plans. In short, all prosocial behaviors, except the behavior of smiling at a child, occurred more often in the semi-enclosed plan than in the other two spatial plans.

Like the residents in the study, the children were observing residents more often in the semi-enclosed (Mdn=133.5) plan than in the enclosed (Mdn=95.5) or open (Mdn=89.5) plans. Three prosocial behaviors (i.e., smiling, being active, laughing) occurred more frequently in the semi-enclosed plan than in the enclosed or open plans. Children were acting exuberantly more often in the open (Mdn=25) plan than in the semi-enclosed (Mdn=19) or enclosed (median=10) plans. The behavior of inviting an elderly adult into the activity occurred more frequently in the semi-enclosed (Mdn=7) spatial plan than it did in the open (Mdn=5.5) or enclosed (Mdn=3) plans. Even though touching an older adult occurred more frequently in the open (Mdn=2.5) spatial plan, there was only a slight difference (i.e., enclosed=1.5, semi-enclosed=1). In short, all of the elder-child prosocial behaviors except two (i.e., touching, acting exuberantly) occurred more frequently in the semi-enclosed plan than in the other two spatial plans.

5.2.4 Sequential Analysis of Experiment using Systematic Observation

A multiple treatment reversal design was analyzed to evaluate the effectiveness of the amount of spatial enclosure on elder-child social behavior. The observation data were discussed by properties of behavioral data such as variability, level, and trend, both within and across different phases (Cooper et al., 1987; Krishef, 1991). The variability refers to the extent to which measurement of the behavior will oscillate under a given phase or condition. There are, in general, three types of variability or instability in data: (1) an extremely variable pattern over the entire phase, (2) an initially stable pattern followed by instability, and (3) beginning variability followed by later stability (Krishef, 1991). The level is concerned with an averaged change in frequency of the behavior over a given phase, and is examined in terms of the mean, median, and/or range (Cooper et al., 1987). Although there is no standard rule for determining averaged value in graphed data, a median level line is appropriate when a series of data points in a given phase show variability. The trend, also called a slope, refers to the overall direction in the course of data points, and is described in terms of increase, decrease, or zero (Cooper et al., 1987). There are three ways[61] of determining the direction of a data path: freehand trend line, split-middle trend line, and regression trend line. The split-middle line

[61] The freehand technique involves drawing a straight line, which provides the best fit through the data. This is the easiest and fastest method but its subjective interpretation is a drawback (Krishef, 1991). The second method, split-middle trend line, is more reliable than the freehand approach. This approach entails dividing data in a given phase in half, calculating the mean for each half, drawing a line connecting the two mean points, and adjusting the line up or down until there are equal numbers of data points above and below the line (Cooper et al., 1987). The regression line provides complete reliability and requires rigorous mathematical operations performed on a computer program (Cooper et al., 1987).

approach is more reliable than the freehand approach and less so than the time-consuming regression approach.

Visual analysis between adjacent phases includes all of the three issues above. In general, there are several ways[62] to interpret changes in level and trend for the treatment intervention (Cooper et al., 1987; Krishef, 1991; Velicer & Colby, 1997). It is important to examine and compare changes in behavior within and across phases based on all of the three characteristics because one measurement can obscure important information. In this regard, visually sequential analysis in the following subsections was based on the issues described above. The median level was used in this analysis to avoid vulnerability to instable data within a phase. The use of the split-middle trend approach helped obtain a reliable interpretation on changes in direction. In addition, the data points indicated the averaged percentage[63] of intervals in which the target behavior (i.e., antisocial, neutral, prosocial) occurred for each group (i.e., residents, children). Table 5.13, below, shows the averaged percentage of intervals of elder-child social interaction across conditions in the experiment. Figures 5.14, 5.15, and 5.16 illustrate visual analyses with variability, level, and trend of the three categories of behavior exhibited by residents and children during physical exercise at Freedom House.

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[62] Outcomes for intervention can be interpreted in the following ways (Cooper et al., 1987; Krishef, 1991; Velicer & Colby, 1997): (1) no treatment effect (i.e., no change in level or trend), (2) change in level and no change in trend, (3) no immediate change in level and a change in trend, (4) immediate change in both level and trend, (5) delayed treatment effect, (6) temporary change in level, and (7) decaying treatment effect.

[63] The average percentage is calculated by dividing the total observed intervals in each session by the total time intervals of subjects multiplied by 100. The calculation is applied: for the resident group, total observed intervals x 7 subjects ÷ (90 intervals x 7 subjects) x 100; for the children's group, = total observed intervals x 4 subjects ÷ (90 intervals x 4 subjects) x 100. Here, the 90 intervals refer to the total intervals over a 15-minute observation period when recording every 10-second interval.

TABLE 5.13
Averaged Percentage of Intervals of Elder-Child Social Interaction

Group	Behavior	A1 (Baseline)	B1 (Semi)	A2 (Open)	B2 (Semi)	C1 (Enclosed)	B3 (Semi)	C2 (Enclosed)
Residents	Antisocial	6.1 %	5.66 %	9.3 %	9.2 %	7.04 %	11.1 %	7.35 %
	Neutral	0.92 %	2.7 %	1.06 %	1.19 %	0.69 %	0.95 %	0.64 %
	Prosocial	37.9 %	57.9 %	40.9 %	42.9 %	58.9 %	62.1 %	53.3 %
Children	Antisocial	26.1 %	25.8 %	16.6 %	33.9 %	37.4 %	35.4 %	46.2 %
	Neutral	8.06 %	13.3 %	1.11 %	2.09 %	3.8 %	4.07 %	5.37 %
	Prosocial	32.5 %	36.9 %	6.21 %	26.4 %	23.1 %	27.9 %	33.8 %

Note: A=Open spatial plan (Baseline), B=Semi-enclosed spatial plan, C=Enclosed spatial plan

5.2.4.1 Elder-Child Antisocial Behavior across Design Interventions

According to Figure 5.14, a different pattern was observed for the resident and children's groups. The black dot representing the residents' antisocial behavior, measured across all phases, was much lower than the light-colored dot representing the children's antisocial behavior. The data points for residents' antisocial behavior were stable in each phase in the A1-B1-A2-B2 design. In terms of level, the residents' antisocial behavior averaged 6.1% on the baseline (A1) and was reduced to an average of 5.66% (B1) after the semi-enclosed plan design intervention. The decrease in antisocial behavior at the second intervention point was replicated in A2 (9.3%) and B2 (9.2%). The changes in level at the two points of intervention were predicted, verified, and replicated. However, the changes of trend did not occur in the way desired in the A1-B1-A2-B2 design. The steady data showed that the semi-enclosed spatial plan intervention of had some influence on residents' antisocial behavior in the A1-B1-A2-B2 design.

The results of the B2-C1-B3-C2 design showed that the data points for residents' antisocial behavior were considerably stable across all experimental phases. The levels of residents' antisocial behavior decreased at each intervention of the enclosed plans (C1=7.04%, C2=7.35%) from the semi-enclosed plans (B1=9.2%, B2=11.1%). The changes in level went through the logical processes of prediction, verification, and replication. However, changes in trend continued increasing across all phases in the B2-C1-B3-C2 design. It was apparent that the enclosed spatial plan had some influence in decreasing residents' antisocial behavior in the B2-C1-B3-C2 design. Based on the findings above, it is likely that the residents' antisocial behavior was at least partially affected by both the semi-enclosed spatial plan and the enclosed spatial plan.

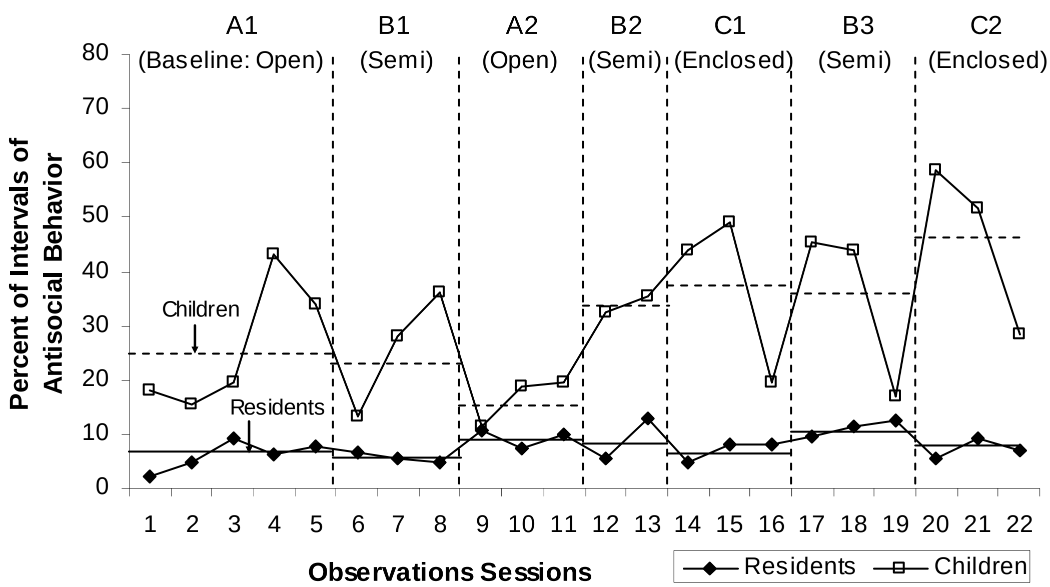

Figure 5.14: Percentage of Elder-Child Antisocial Behavior
Note: The horizontal bars represent average percentage of antisocial behavior of residents (solid bars) and children (dotted bars) during each phase.

In the A1-B1-A2-B2 design, data points for the children's antisocial behavior displayed considerable baseline variability (A1) but were then stable in the other three phases (B1, A2, B2). The introduction of the semi-enclosed plan design intervention (B1, B2) led to inconsistent results with abrupt changes in level; deceasing to an average of 25.8% (B1) and increasing to an average of 33.9% (B2) from the previous measurement of the open plan (A1=26.1%, A2=16.6%). No changes in were found the direction of the data across the phases. Thus, it is evident that there is no functional relationship between the semi-enclosed plan and children's antisocial behavior.

In the B2-C1-B3-C2 design, data points abruptly dropped off within each phase, suggesting the instability of the children's antisocial behavior. The introduction of the enclosed plan led to level changes. The children's antisocial behavior increased to an average of 37.4% (C1) compared to the semi-enclosed plan (B2=33.9%). The increased levels were verified and replicated with conditions B3 (35.4%) and C2 (46.2%). However, no changes in direction were found after the enclosed plan intervention. Even though there was a change in level, it would be difficult to claim that the enclosed plan intervention really had so much of an effect on the children's antisocial behavior because the variable data did not show any changes in trend. To sum up, it cannot be confirmed that the children's antisocial behavior was associated with the level of spatial enclosure.

5.2.4.2 Elder-Child Neutral Behavior across Design Interventions

According to Figure 5.15, what is particularly noticeable is that the black dot representing residents' neutral behavior generally remained low across all phases of the study. Resident's neutral behavior was stable through all phases of the A1-B1-A2-B2 design. The level of neutral behavior for residents increased to an average of 2.7% (B1) from the previous baseline average of 0.92% (A1). This increase was repeated with the introduction of the B2 treatment; going from an average of 1.06% (A2) to 1.19% (B2). There were slight decreases with the introduction of the semi-enclosed plans (B1, B2) shifting from the non-treatment phases (A1, A2). The stability of data across phases allowed a more clear understanding of the overall impact of a semi-enclosed spatial plan on residents' neutral behavior.

In the B2-C1-B3-C2 design, data points for residents' neutral behavior were also stable across all phases. There was a decrease with the introduction of an enclosed spatial plan design intervention. The level during the B2 treatment phase averaged 1.19% and was further reduced to an average of just 0.69% (C1). The decrease in neutral behavior at the second point of intervention was verified with B3 (0.95%) and C2 (0.64%) conditions. However, changes in the slope of the series were not clear across all phases in the B2-C1-B3-C2 design. The results identified a partial association of residents' neutral behavior with an enclosed spatial plan. Based on these findings, it is likely that the residents' neutral behavior was significantly related to the semi-enclosed plan but was only partially associated with an enclosed spatial plan.

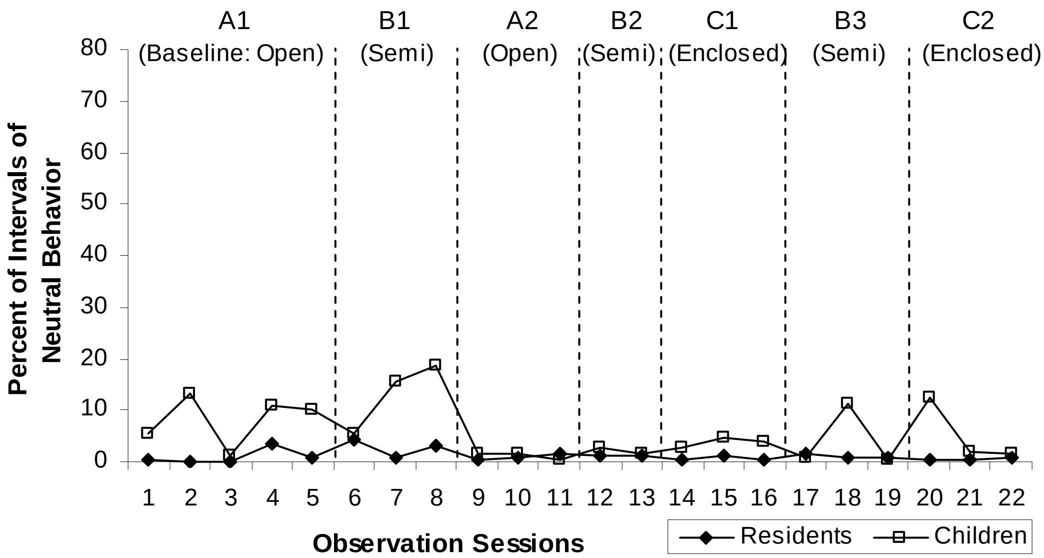

Figure 5.15: Percentage of Elder-Child Neutral Behavior

As shown in Figure 5.15, above, baseline (A1) data for the children displayed considerable instability although later phases became more consistent in the A1-B1-A2-B2 design. The level of the children's neutral behavior increased from an average of 8.06% (A1) to an average of 13.3% (B1). This increasing level was verified with the design intervention of the semi-enclosed plan, going from an average of 1.11% (A2) to 2.09% (B2). No treatment effect was identified on the slope. With unstable data and no change in the slope, it would be difficult to confirm the true effect of a semi-enclosed plan on the children's neutral behavior.

In the B2-C1-B3-C2 design for children, data points showed stable patterns in B2 and C1 but then became more unstable in each phase of B3 and C2. The intervention for the enclosed plan showed an increase in level from an average of 2.09% (B2) to an average of 3.8% (C1). This increase in level continued to rise from an average of 4.07% (B3) to an average of 5.37% (C2). The changes in level were predicted in phases B2 and C1, and replicated in phases of B3 and C2. However, it would be difficult to confirm that the replication resulted from the intervention because the change in level was not verified at the second point of intervention between C1 and B3. The changes of slope for the series within and between phases were hard to discern because of variable data. The unstable data identified no functional relationship between the enclosed spatial plan and the children's neutral behavior. Based on the findings above, it is likely that spatial enclosure might not have had any significant influence on the children's neutral behavior.

5.2.4.3 Elder-Child Prosocial Behavior across Design Interventions

According to Figure 5.16, the black dot representing residents' prosocial behavior was higher than the light-colored dot representing the children's prosocial behavior measured across all phases. Residents' prosocial behavior in the A1-B1-A2-B2 design showed considerable variability in the non-intervention phases (A1, A2). Observed changes in level were found. The level of the series averaged 37.9% for the baseline condition (A1). This increased on the introduction of the semi-enclosed spatial plan (B1=57.9%). There was an immediate change in level as the average decreased on return to the non-intervention phase (A2=40.9%) but increased again with the reintroduction of the intervention (B2=42.9%). No change in slope was found between phases A1 and B1, resulting from variable data in the baseline. In contrast, a change in slope did occur between phases A2 and B2. The variable data showed the changes in level but did not show the changes in direction which supported the functional relationship between a semi-enclosed plan and the residents' prosocial behavior. Thus, it was necessary to further examine whether the functional relationship was statistically significant (see Section 5.2.5.1).

In the B2-C1-B3-C2 design, data points of residents' prosocial behavior showed considerable variability within the C1, B3, and C2 phases. An immediate increase in level was observed at the first point of intervention for the enclosed spatial plan (C1=58.9%), increasing from an average of 42.9% for the B2 treatment. The increase in level continued even with a return to the semi-enclosed plan (B3=62.1%), but again decreased with a reintroduction of the intervention (C2=53.3%). The change in slope for this series was hard to discern because of variable data points within each phase. It could be confirmed that changes in the residents' prosocial behavior were truly effected by the introduction of an enclosed spatial plan. Based on the finding above, it is likely that the residents' prosocial behavior showed a partial relationship to the semi-enclosed plan, but no had relationship to the enclosed spatial plan.

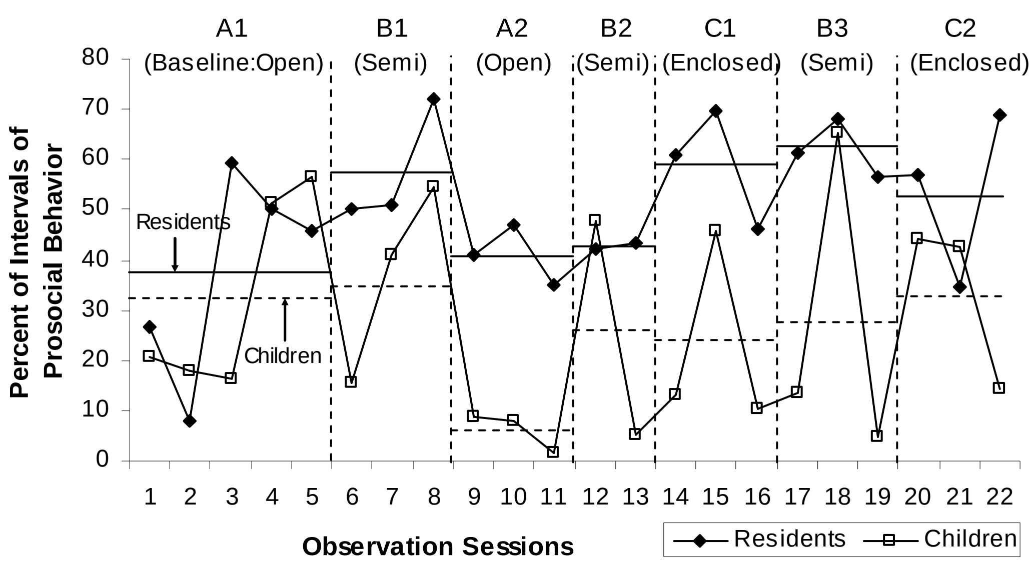

Figure 5.16: Percentage of Elder-Child Prosocial Behavior
Note: The horizontal bars represent the average percentage of prosocial behavior for the residents (solid bars) and children (clear bars) during each phase.

Observation data for the children in the A1-B1-A2-B2 design phase showed some variability from the baseline, but the data later became more consistent for each of the following phases; B1, A2, and B2. Immediate and abrupt level changes were found across all phases for the series. The children's prosocial behavior averaged 32.5% for the baseline phase (A1) but increased to an average of 36.9% with the introduction of the semi-enclosed spatial plan (B1). A return to the non-intervention phase (A2) led to a considerable decrease to an average of only 6.21%, then the level skyrocketed with the re-introduction of the semi-enclosed spatial plan (B2=26.4%). The change in trend did not show any logical consistency in relation to the intervention of a semi-enclosed spatial plan. However, what is particularly noticeable is that the value for observation 13 (5%) is above the lowest point (observation 11=1.67%) for phase A2, and is near the median level (6.21%) for the phase A2 series. Thus, it seemed apparent that the intervention using a semi-enclosed spatial plan partially influenced the level of the children's prosocial behavior but not the direction.

Data points for the series of children's prosocial behavior varied considerably within each phase of the B2-C1-B3-C2 design intervention. Even though there was a decrease in level from the semi-enclosed phase of B2 (26.4%) to an enclosed phase in C1 (23.1%), this level change did not occur in the same for phases B3 (27.9%) and C2 (33.8%). In addition, the slope of the series in phases C1, B3, and C2 were unstable and produced no meaningful information. The results of changes in level and slope across all the phases for the B2-C1-B3-C2 design intervention verified that there was no functional relationship between an enclosed spatial plan and the children's prosocial behavior. To sum up, it was likely that any changes in the children's prosocial behavior were partially affected by the semi-enclosed spatial plan, but were not associated with the introduction of an enclosed spatial plan.

5.2.5 Statistical Analysis of Experiment using Systematic Observation

Due to violation of assumptions for parametric data, nonparametric statistics were used to analyze the data collected from the seven residents and four children during experiments in this study. Friedman's ANOVA, a nonparametric equivalent of repeated measures, was conducted to compare the mean ranks of two or more experimental conditions drawn from the same population (Field, 2005; Siegel & Castellan, 1988). To follow up on the findings from the Friedman's ANOVA test, post hoc procedures were carried out, using Wilcoxon signed-rank tests, to determine which conditions are different (Field, 2005). The Mann-Whitney U test, an alternative to the independent t-test, was also used to test the difference of median ranks between two independent groups (Siegel & Castellan, 1988). The levels of impact were also calculated to measure the strength of any relationship between variables. A small effect was designated as

(γ=.10-.29), a medium effect (γ=.30-.49), and a large effect ($\gamma \geq$.50) (Cohen, 1988; Field, 2005). For these statistical analyses the statistical program, SPSS 12.0 for Windows, was used.

5.2.5.1 Friedman's ANOVA Test

By using the Friedman's two-way analysis of variance (ANOVA) by ranks, the researcher tested any differences in elder-child social behaviors (i.e., antisocial, neutral, prosocial) observed within three different kinds of spatial plans (i.e., open, semi-enclosed, enclosed). The spatial plans were divided into two spatial combinations: the ABAB design and the BCBC design. The Friedman's ANOVA test was performed for the resident group (n=7) only because there were not enough valid cases for processing in the children's group (n=4). Additionally, there was one non-matching case in the ABAB design. Since the Friedman's ANOVA test is based on using matched conditions, data from only six residents were used (N=6 subjects, k=4 conditions) for the ABAB design while data from all seven residents were analyzed (N=7, k=4) for the BCBC design. Furthermore, post hoc tests performed in the study used the Bonferroni correction[64] as a strict criterion for significance (i.e., a critical value of 0.0125). The size of impact was also calculated to indicate the significance of an effect regardless of its statistical significance.

<u>Elder-Child Antisocial Behavior of Residents</u>

In the ABAB design, the observed chi-square value (χ^2=3.0) was less than the critical chi-square value (χ^2=7.6) at the 0.05 level of significance (p<.01, N=6, k=4). The significance value was 0.392, which is greater than the 0.05 level of significance, indicating the acceptance of the null hypothesis. This suggested that changes in the

[64] Post hoc tests are designed to compare the means of all pairs of experimental conditions (Field, 2005). In this process, it is necessary to correct the level of significance because the TYPE I error rate (α) for each comparison can be reduced by using a conservative level of significance. This correction is called the Bonferroni correction, which is the easiest and most popular method for making this correction. The conservative level of significance is the α-level (normally 0.05) divided by the number of comparisons. In this study, the criterion of significance for post hoc tests is 0.0125 (0.05÷4).

residents' antisocial behavior did not change significantly with the introduction of a semi-enclosed spatial plan (χ^2=3.0, p<.05). In contrast, the observed chi-square value (χ^2=8.344) was greater than the critical value of chi-square (χ^2=7.8) at the chosen significance level (p<.05, N=7, k=4) for the BCBC design. The significance value of 0.039 was less than the p-value of 0.05, indicating the rejection of the null hypothesis. This meant that the residents' antisocial behavior changed significantly after with the intervention of an enclosed spatial plan (χ^2=8.344, p<.05). Table 5.14 summarizes statistics for the Friedman test for the antisocial behavior of residents.

TABLE 5.14
Friedman's ANOVA Test for Elder-Child Antisocial Behavior

Design	N	Chi-square	df	Asymp. Sig (2-tailed)
A1-B1-A2-B2	6	3.000	3	0.392
B2-C1-B3-C2	7	8.344	3	0.039*

*p<.05

Post hoc tests were carried out to follow up on the findings above. Table 5.15 compared mean ranks of each pair, using Wilcoxon signed-rank tests, for residents' antisocial behavior under all conditions. The critical level of significance was set at 0.0125, based on the Bonferroni correction. In the ABAB design, none of the comparisons were significant as they had one-tailed significance values of 0.173, 0.038, 0.119, and 0.119, respectively, which were all well above the critical value of 0.0125. Given the lack of significance for the Friedman test, it was not surprising that the differences between all pairs of conditions were also not significant. However, it was noticeable that a fairly large effect size for the A2-B1 combination (γ=0.51) was not significant for a small sample (n=6). For the BCBC design, it appears that comparisons of all conditions were not significant from a semi-enclosed spatial plan to an enclosed plan, and vice versa. This was surprising because the Friedman's ANOVA test was significant. The researcher assumed that a lack of significance in the comparisons might be due to the conservative critical value (0.0125). This assumption was supported by the effect size. The effect sizes represented a medium impact for a relationship between C2 and B3 (γ=0.48) and a huge impact for the relationship between B3 and C1 (γ=.51). To summarize, the residents' antisocial behavior did not change significantly in the semi-enclosed spatial plan and the differences in all paired conditions were not significant either. On the other hand, residents' antisocial behavior changed significantly in relation to an enclosed spatial plan. Even though the differences in all paired conditions were not statistically significant, the second (B3-C1) and third (C2-B3) combinations seemed to have a fairly significant effect. Thus, it was necessary to further examine the effect of an enclosed spatial plan on residents' antisocial behavior using a larger sample size.

TABLE 5.15
Post Hoc Test for Elder-Child Antisocial Behavior

	A1-B1-A2-B2 Design				B2-C1-B3-C2 Design			
	B1-A1	A2-B1	B2-A2	B2-A1	C1-B2	B3-C1	C2-B3	C2-B2
Z	-0.943	-1.782	-1.183	-1.183	-0.508	-1.892	-1.782	-0.085
Asymp. Sig (2-tailed)	0.345	0.075	0.237	0.237	0.611	0.058	0.075	0.933
Asymp. Sig (1-tailed)	0.172	0.037	0.118	0.118	0.305	0.029	0.037	0.466
Effect Size (γ)	-0.27	-0.51**	-0.34	-0.34	-0.14	-0.51**	-0.48*	-0.02

Note: a small effect (γ=.10-.29), *a medium effect (γ=.30-.49), and **a large effect (γ≥.50)

Elder-Child Neutral Behavior

The results of the Friedman's ANOVA test for elder-child neutral behavior are summarized in Table 5.16. For the ABAB design, the observed value of chi-square (χ^2=2.946) was smaller than the critical chi-square value of (χ^2=7.6) at the chosen significance level (p<.05, N=6, k=4). The significance level of 0.4 was greater than the p-value of 0.05, meaning the acceptance of the null hypothesis. This indicated that the neutral behavior of residents did not significantly change after interventions of a semi-enclosed spatial plan (χ^2=2.946, p<.05). For the BCBC design, the observed value of chi-square (χ^2=2.211) was smaller than the critical chi-square value (χ^2=7.8) at the chosen significance level (p<.05, N=7, k=4). The significance value of 0.53 was much greater than the p-value of 0.05, meaning the acceptance of the null hypothesis. It meant that residents' neutral behavior did not significantly change when enclosed spatial plans were introduced.

TABLE 5.16
Friedman's ANOVA Test for Elder-Child Neutral Behavior

Design	N	Chi-square	df	Asymp. Sig (2-tailed)
A1-B1-A2-B2	6	2.946	3	0.400
B2-C1-B3-C2	7	2.211	3	0.530

Wilcoxon signed-rank tests were carried out to follow up the findings, above, using a critical level of significance of 0.0125. For the ABAB design, it appeared that residents' neutral behavior did not significantly change from an open (A1) to a semi-enclosed spatial (B1), T=3, γ=0.35, from a semi-enclosed (B1) to an open (A2) spatial plan, T=4.5, γ=0.36, or from an open (A2) to semi-enclosed spatial plan (B2), T=8.5, γ=0.12. Thus, it would seem that the interventions using a semi-enclosed spatial plan did not affect the neutral behavior of residents. The same results were found for the BCBC design. None of the comparisons of treatments were significantly different as they all had one-tailed significance values of 0.342, 0.263, 0.031, and 0.293, respectively, which are well above the critical value of 0.0125. Particularly noticeable was the fairly large impact that occurred (γ=0.50) in the relationship between a semi-enclosed spatial plan (B3) and an enclosed plan (C2). In short, the residents' neutral behavior did not significantly change in either the semi-enclosed spatial plan, or in the enclosed plans. Regardless of the significance of the test statistic, there were important differences between the conditions with medium effects (B1-A1, A2-B1, B2-A1) in the ABAB design, and a fairly large impact (C2-B3) for the BCBC design. Table 5.17 lists the z-score, significance value, and effect size calculated from Wilcoxon signed-rank tests.

TABLE 5.17
Post Hoc Test for Elder-Child Neutral Behavior

	A1-B1-A2-B2 Design				B2-C1-B3-C2 Design			
	B1-A1	A2-B1	B2-A2	B2-A1	C1-B2	B3-C1	C2-B3	C2-B2
Z	-1.214	-1.261	-0.425	-1.160	-0.406	-0.632	-1.857	-0.544
Asymp. Sig (2-tailed)	0.225	0.207	0.671	0.246	0.684	0.527	0.063	0.586
Asymp. Sig (1-tailed)	0.112	0.103	0.335	0.123	0.342	0.263	0.031	0.293
Effect Size (γ)	-0.35*	-0.36*	-0.12	-0.33*	-0.11	-0.17	-0.50**	-0.15

Note: a small effect (γ=.10-.29), *a medium effect (γ=.30-.49), and **a large effect ($\gamma \geq$.50)

<u>Elder-Child Prosocial Behavior</u>

For the ABAB design, the observed value of chi-square (χ^2=12.6) was greater than the critical chi-square value (χ^2=10) at the 0.01 level of significance (p<.01, N=6, k=4). The significance level of 0.006 was much less than the p-value of 0.01, indicating the rejection of the null hypothesis. Which meant that the prosocial behavior of residents changed significantly with the interventions of a semi-enclosed spatial plan (χ^2=12.6, p<.01). For the BCBC design, the observed value of chi-square (χ^2=9.0) was greater than the critical chi-square value (χ^2=7.8) at the chosen significance level (p<.05, N=7, k=4). The significance value of 0.029 was much less than the p-value of 0.05, indicating the need to reject the null hypothesis. This was evidence that the residents' prosocial behavior did significantly change when an enclosed spatial plan was introduced. Table 5.18 summarizes the data analysis for elder-child prosocial behavior using Friedman's ANOVA test.

TABLE 5.18
Friedman's ANOVA Test for Elder-Child Prosocial Behavior

Design	N	Chi-square	df	Asymp. Sig (2-tailed)
A1-B1-A2-B2	6	12.600	3	0.006**
B2-C1-B3-C2	7	9.000	3	0.029*

*p<.05 ** p<.01

Since the prosocial behavior of residents significantly changed across all of the conditions, post hoc tests were used to examine any differences among all conditions used in the study. As for the previous tests, the critical level of significance was set at 0.0125, based on the Bonferroni correction. For the ABAB design, it appeared that only the fourth difference (0.009) between the baseline (A1) and the second intervention using a semi-enclosed spatial plan (B2) was very significant and had a large impact (γ=0.68). The second difference (0.014) between the semi-enclosed spatial plan (B1) and the open (A2) plan was fairly significant with a sizeable impact (γ=0.64). The third difference (0.045) did not seem to be significant but had a medium impact (γ=0.49). Thus, it is likely that the intervention using the semi-enclosed spatial plan has some effect on the residents' prosocial behavior. For the BCBC design, only the first difference between the enclosed spatial plan (C1) and the semi-enclosed plan (B2) was significant with a one-tailed significance value of 0.009, which is much less than the critical value of 0.0125. The first difference also showed a very strong relationship (γ=0.63). The fourth comparison between the enclosed spatial plan (C2) and the semi-enclosed plan (B2) differed moderately with a one-tailed significance value of 0.014, which is slightly above the critical value of 0.0125. The fourth difference also had a strong impact (γ=0.59). The second and third comparisons were not significantly different as they had one-tailed significance values of just 0.199 and 0.102, which are well above the critical value of 0.0125. However, the third comparison displayed a medium effect (γ=0.38). To sum up, it is clear that the residents' prosocial behaviors were significantly affected by both the semi-enclosed and the enclosed spatial plans. The differences between conditions were significant along with medium or strong relationships with each other. Of interest were the two comparisons (i.e., B1-A1, B3-C1) which showed little significance and a small impact. The researcher assumed that this low impact might be attributed to the variability of the data and the small sample size. Table 5.19 summarizes the z-score, significance value, and level of impact for the residents' prosocial behavior.

TABLE 5.19
Post Hoc Test for Elder-Child Prosocial Behavior

	A1-B1-A2-B2 Design				B2-C1-B3-C2 Design			
	B1-A1	A2-B1	B2-A2	B2-A1	C1-B2	B3-C1	C2-B3	C2-B2
Z	-0.314	-2.201	-1.690	-2.366	-2.366	-0.845	-1.270	-2.197
Asymp. Sig (2-tailed)	0.753	0.028	0.091	0.018	0.018	0.398	0.204	0.028
Asymp. Sig (1-tailed)	0.376	0.014	0.045	0.009	0.009	0.199	0.102	0.014
Effect Size (γ)	-0.09	-0.64**	-0.49*	-0.68**	-0.63**	-0.22	-0.38*	-0.59**

Note: a small effect (γ=.10-.29), *a medium effect (γ=.30-.49), and **a large effect ($\gamma \geq$.50)

5.2.5.2 Mann-Whitney U Test

To test the exploratory hypotheses, a series of Mann-Whitney tests were conducted on the differences in elder-child social behaviors (i.e., antisocial, neutral, prosocial) between the resident and children's groups in relation to the three spatial plans (i.e., open, semi-enclosed, enclosed). The Mann-Whitney U tests were chosen because both groups in the study were independent and were small sample sizes (residents=7, children=4). Estimates of the level of impact were used to provide an indication of the degree of practical importance. Figure 5.17 illustrates comparisons of median intervals between the residents' and children's groups across the three spatial plans.

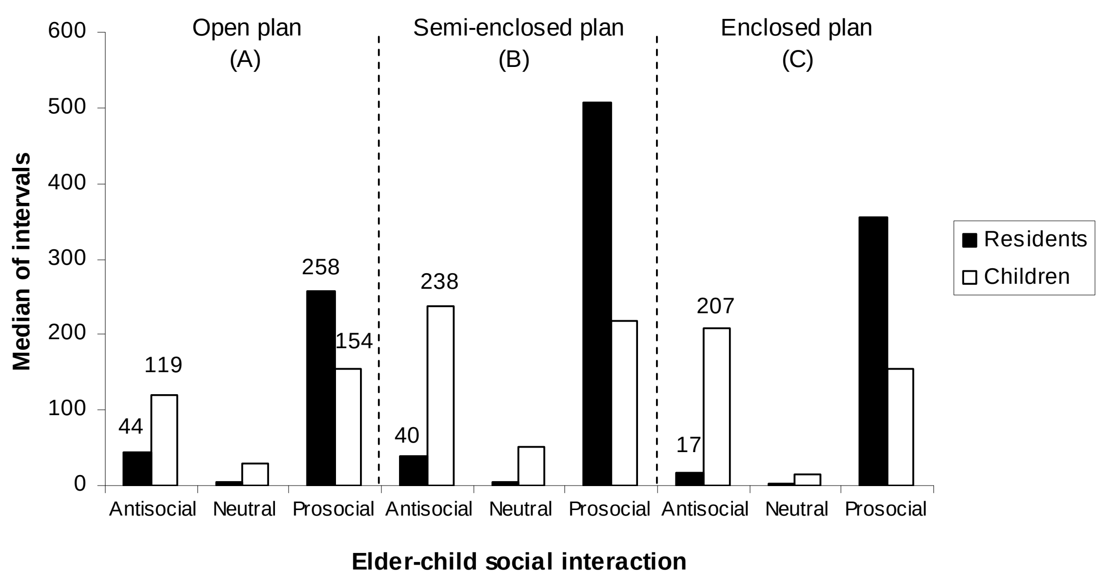

Figure 5.17: Comparison of Median of Elder-Child Social Behavior
Note: The values above the bars indicate the median value for each group whose medians significantly differed at the given level of significance (i.e., normally p<.05).

Elder-Child Antisocial Behavior

In the open spatial plan, the significance value was 0.047, which is less than the 0.05 level of significance, indicating the need to reject the null hypothesis. The value of the mean rankings indicated that the children (8.63) had significantly higher levels of antisocial behavior than the residents (4.50). These findings meant that in the open spatial plan the children (Mdn=119) differed significantly from the residents in their level of antisocial behavior (Mdn=44) at the 0.05 level of significance (U=3.5, $p<.05$, $\gamma=0.60$). In the semi-enclosed spatial plan, the significance value of 0.023 is much less than the p-value of 0.05, meaning that the null hypothesis is to be rejected. The value of the mean rankings indicated that the children (9.0) had significantly higher levels of antisocial behavior than residents (4.29). The results suggested that the children's antisocial behavior (Mdn=238) in the semi-enclosed spatial plan differed significantly from that of residents (Mdn=40) at the 0.05 level of significance (U=2.0, p<.05, γ=0.68). In the enclosed spatial plan, the significance value of 0.014 is much less than the 0.05 level of significance. It was not surprising that the value of the mean rankings showed the children (9.25) to have significantly higher levels of antisocial behavior than the residents (4.14). This meant that the children's antisocial behavior (Mdn=207) in the enclosed spatial plan differed significantly from the resident's antisocial behavior (Mdn=17) at the 0.05 level of significance (U=1.0, p<.05, γ=0.74).

Based on these findings, it could be assumed that the children behaved in a more antisocial manner than the residents did across all three spatial plans. The extent of the differences was also significant, in addition to the statistical significance. Table 5.20 summarizes test statistics for the Mann-Whitney test for elder-child antisocial behavior across the three spatial plans.

TABLE 5.20
Mann-Whitney Test for Elder-Child Antisocial Behavior

	Open Plan	Semi-enclosed Plan	Enclosed Plan
Mann-Whitney U	3.5	2.0	1.0
Z	-1.989	-2.268	-2.457
Aymp. Sig (2-tailed)	0.047*	0.023*	0.014*
Effect Size	-0.60***	-0.68***	-0.74***

*p<.05 ** a medium effect (γ=.30-.49) *** a large effect (γ≥.50)

Elder-Child Neutral Behavior

In the open spatial plan, the significance value was 0.343, which is much greater than the 0.05 level of significance, so the null hypothesis is accepted. The value of the mean rankings indicated that the level of the children's neutral behavior (7.25) was slightly above the level for residents (5.29). This means that in the open spatial plan the children (Mdn=30) did not differ significantly from residents (Mdn=5) in their neutral behavior at the 0.05 level of significance (U=9.0, p<.05, γ=0.29). For the semi-enclosed plan, the significance value of 0.088 is greater than the p-value of 0.05, meaning the null hypothesis is accepted. The value of the mean rankings indicated that the children (8.25) had slightly higher levels of neutral behavior than residents did (4.71). These findings suggest that in the semi-enclosed spatial plan the children (Mdn=50.5) did not seem to differ from residents (Mdn=6) in their levels of neutral behavior at the 0.05 level of significance (U=5.0, $p<.05$, $\gamma=0.51$). It is interesting to note that the fairly large impact of neutral behavior in the semi-enclosed spatial plan ($\gamma=0.51$) was not significant for this small sample (resident=7, children=4). For the enclosed plan, the significance value of 0.058 is slightly above the 0.05 level of significance. The value of the mean rankings showed that the children (8.5) had higher levels of neutral behavior than did the residents (4.57). Even though the statistical test concluded that children's neutral behavior (Mdn=15.5) in the enclosed spatial plan did not significantly differ from residents' neutral behavior (Mdn=2) at the 0.05 level of significance (U=4.0, $p<.05$, $\gamma=0.57$). The practical importance of the fairly large impact size ($\gamma=0.57$) needs to be considered Based on these findings, the conclusion was that the children's neutral behavior did not differ significantly from that of the residents across the three spatial plans. However, it was necessary to further examine the difference of neutral behavior between residents and children in the semi-enclosed and enclosed spatial plans with a larger sample size. Table 5.21 summarizes test statistics for the Mann-Whitney test for elder-child neutral behavior across all three spatial plans

TABLE 5.21
Mann-Whitney Test for Elder-Child Neutral Behavior

	Open Plan	Semi-enclosed Plan	Enclosed Plan
Mann-Whitney U	9.0	5.0	4.0
Z	-0.949	-1.705	-1.898
Aymp. Sig (2-tailed)	0.343	0.088	0.058
Effect Size	-0.29	-0.51***	-0.57**

*p<.05 ** a medium effect (γ=.30-.49) *** a large effect ($\gamma \geq .50$)

Elder-Child Prosocial Behavior

In the open spatial plan, the significance value was 0.023, which is much less than the 0.05 level of significance, indicating the rejection of the null hypothesis. The value of the mean rankings indicated that residents (7.71) had significantly higher levels of prosocial behavior than the children (3.0). The findings indicated that residents (Mdn=258) in the open plan differed significantly in their prosocial behavior from the children (Mdn=154) at the 0.05 level of significance (U=2.0, p<.05, γ=0.68). For the semi-enclosed plan, the significance value of 0.131 is greater than the p-value of 0.05, signaling the acceptance of the null hypothesis. The value of the mean rankings indicated that residents (7.14) had higher levels of prosocial behavior than the children (4.0). The results indicated that the residents' prosocial behavior (Mdn=508) in the semi-enclosed spatial plan did not significantly differ from that of the children (Mdn=217) at the 0.05 level of significance (U=6.0, p<.05, γ=0.46). Surprisingly, the difference between the two groups was not statistically significant in spite of the medium impact size (γ=0.46) and the huge difference in median values (508, 217). The researcher assumed that the small sample size contributed to this low statistical significance. For the enclosed spatial plan, the significance value of 0.088 was greater than the 0.05 level of significance. The value of the mean rankings indicated that residents (7.29) had higher levels of prosocial behavior than the children (3.75). The findings suggested that the residents' prosocial behavior (Mdn=355) in the enclosed spatial plan did not significantly differ from the children's prosocial behavior (Mdn=155.5) at the 0.05 level of significance (U=5.0, p<.05, γ=0.51). As in the case of the semi-enclosed spatial plan, discussed above, the statistical insignificance is probably related to the small sample size, especially in view of the fairly large impact size (γ=0.51) and the considerable difference in median values (355, 155.5).

Based on the findings above, it was concluded that residents behaved in a prosocial manner significantly more often than the children did in the open spatial plan. However, it is worthwhile to further examine the difference in elder-child prosocial behavior for both the semi-enclosed and enclosed spatial plans with a larger sample size because of the implications of the medium or large impacts calculated. Table 5.22 summarizes the Mann-Whitney test statistics for elder-child prosocial behavior across all three spatial plans.

TABLE 5.22
Mann-Whitney Test for Elder-Child Prosocial Behavior

	Open Plan	Semi-enclosed Plan	Enclosed Plan
Mann-Whitney U	2.0	6.0	5.0
Z	-2.268	-1.512	-1.705
Aymp. Sig (2-tailed)	0.023*	0.131	0.088
Effect Size	-0.68***	-0.46**	-0.51***

*p<.05 ** a medium effect (γ=.30-.49) *** a large effect (γ≥.50)

5.2.6 Hypotheses Results of Experiment using Systematic Observation

A total of seven hypotheses and three exploratory hypotheses were proposed for this study (see Section 3.3). Multiple methods for data collection and analysis were used to test these hypotheses. The researcher used design interventions, along with observation, to test three research hypotheses and three exploratory hypotheses among the total of ten hypotheses. The three research hypotheses were tested by descriptive analysis, sequential analysis, Friedman's ANOVA test, and Wilcoxon signed-rank test. The three exploratory hypotheses were tested using descriptive analysis and the Mann-Whitney U test. The six hypotheses tested are listed as follows:

H1. Elderly residents and children are more antisocial in an open plan than in semi-enclosed or enclosed spatial plans.

H2. Elderly residents and children are socially more neutral in an enclosed spatial plan than in open or semi-enclosed spatial plans.

H3. Elderly residents and children are more prosocial in a semi-enclosed spatial plan than in open or enclosed spatial plans.

HE1. There are significant differences in antisocial behavior in an open spatial plan between elderly residents and young children.

HE2. There are significant differences in socially neutral behavior in an enclosed spatial plan between elderly residents and young children.

HE3. There are significant differences in prosocial behavior in a semi-enclosed spatial plan between elderly residents and young children.

H1 Test Results

Descriptive statistics (see Table 5.8) indicated that residents tended to be more antisocial in the open spatial plan (Mdn=44 or 43.57%) than in the semi-enclosed (Mdn=40 or 39.60%) or enclosed (Mdn=17 or 16.83%) spatial plans. According to the sequential analysis (see Figure 5.14), the stable data across all phases showed that the level of residents' antisocial behavior was higher in the open spatial plan than in the semi-enclosed spatial plan (A1=6.1%, B1=5.66%, A2=9.3%, B2=9.2%). It was also higher in the semi-enclosed spatial plan than in the enclosed spatial plan (B2=9.2%, C1=7.04%, B3=11.1%, C2=7.35%). The change in direction was consistent with the change in level in both the ABAB and the BCBC designs. The results of the Friedman's ANOVA test (see Tables 5.14 and 5.15) showed that the residents' antisocial behavior did not significantly change from the open plan (Mdn=44) to the semi-enclosed spatial plan (Mdn=40), χ^2=3.0, p<.05. However, the residents' antisocial behavior was significantly higher in the semi-enclosed spatial plan (Mdn=40) than in the enclosed plan (Mdn=17), χ^2=8.344, p<.05. Therefore, Hypothesis 1 for residents is also rejected because the residents were not more antisocial in the open spatial plan than in the other two spatial plans. However, it is notable that the residents were significantly more antisocial in the semi-enclosed plan than in the enclosed spatial plan.

Descriptive statistics (see Table 5.8) showed that the children tended to be more antisocial in the semi-enclosed spatial plan (Mdn=238 or 42.2%) than in the enclosed (Mdn=207 or 36.7%) or open (Mdn=119 or 21.1%) spatial plans. According to the results of the sequential analysis (see Figure 5.14), the level of the children's antisocial behavior did not change consistently in the ABAB design (A1=26.1%, B1=25.8%, A2=16.6%, B2=33.9%). However the change in level was higher for the enclosed plan than in the semi-enclosed spatial plan (B2=33.9%, C1=37.4%, B3=35.4%, C2=46.2%). There was no consistent change in direction of the series across phases because of the variability within treatments especially in the BCBC pattern. Therefore, Hypothesis 1 for the children is rejected because the children were not more antisocial in the open spatial plan than in other spatial plans.

H2 Test Results

Descriptive statistics (see Table 5.8) signified that residents tended to be more socially neutral in the semi-enclosed spatial plan (Mdn=6 or 46.152%) than in the open (Mdn=5 or 38.46%) or enclosed (Mdn=2 or 15.391%) spatial plans. According to the sequential analysis (see Figure 5.15), the stable data across all phases showed changes in level that increased for the semi-enclosed spatial plan the case of both the ABAB and BCBC designs. The change in direction occurred only for the ABAB design, but not in the BCBC design. The results of the Friedman's ANOVA test (see Tables 5.16 and 5.17) showed that residents' neutral behavior did not significantly change from the open plan (Mdn=5) to the semi-enclosed spatial plan (Mdn=6), χ^2=2.946, p<.05. Similarly, the residents' socially neutral behavior did not significantly differ between the semi-enclosed (Mdn=6) and enclosed spatial plans (Mdn=2), χ^2=2.211, p<.05. Therefore, Hypothesis 2 for residents is rejected because the residents were not more socially neutral in the enclosed spatial plan than in the other plans.

Descriptive statistics (see Table 5.8) showed that the children tended to be more prosocial in the semi-enclosed spatial plan (Mdn=50.5 or 52.60%) than in the open (Mdn=30 or 31.25%) or enclosed (Mdn=15.5 or 16.15%) spatial plans. According to the results from the sequential analysis (see Figure 5.15), the level of the children's socially neutral behavior was higher in the semi-enclosed plan than in the open plan. The change in level between the semi-enclosed and enclosed spatial plans differed inconsistently. The variability of data in several phases of the intervention had no effect on the children's socially neutral behavior. Therefore, Hypothesis 2 for the children is rejected because the children were not more socially neutral in the enclosed spatial plan than in the other plans. The children were only more socially neutral in the semi-enclosed spatial plan than in the open spatial plan.

H3 Test Results

Descriptive statistics for residents (see Table 5.8) suggested that they tended to be more prosocial in a semi-enclosed spatial plan (Mdn=508 or 45.32%) than in enclosed (Mdn=355 or 31.67%) or open (Mdn=258 or 23.01%) spatial plans. In the sequential analysis (see Figure 5.16), the level of residents' prosocial behavior was higher in the semi-enclosed spatial plan than in the open plan (A1=37.9%, B1=57.9%, A2=40.9%, B2=42.9%), along with the change in direction of the series for the ABAB design. However, the level of residents' prosocial behavior did not change consistently (B2=42.9%, C1=58.9%, B3=62.1%, C2=53.3%). There was also an ambiguous change in direction for the BCBC design. The partial changes in level and direction might be attributed to the variability of data in the three phases (C1, B3, C2) of the BCBC design. According to the results of the Friedman's ANOVA test (see Tables 5.18 and 5.19), residents' prosocial behavior was significantly higher in the semi-enclosed spatial plan (Mdn=508) than in the open plan (Mdn=258), $\chi^2=12.6$, $p<.01$. Furthermore, the prosocial behavior of residents was significantly higher in the semi-enclosed spatial plan (Mdn=508) than in the enclosed plan (Mdn=355), $\chi^2=9.0$, $p<.05$. Therefore, Hypothesis 3 for residents is accepted but only in relation to the open and semi-enclosed spatial plans. In addition, the most frequent prosocial behaviors exhibited by residents in the semi-enclosed spatial plan were observing children (Mdn=364 or 85.85%), smiling at children (Mdn=33 or 7.78%), and laughing with children (Mdn=13 or 3.07%) (see Table 5.12).

Descriptive statistics for the children (see Table 5.8) showed that they seemed displayed more prosocial behavior in the semi-enclosed spatial plan (Mdn=217 or 41.22%) than in the enclosed (Mdn=155.5 or 29.53%) or open (Mdn=154 or 29.25%) spatial plans. Based on the results of sequential analysis (see Figure 5.16), the increase in level and trend immediately followed the intervention using a semi-enclosed spatial plan in the ABAB design (A1=32.5%, B1=36.9%, A2=6.21%, B2=26.4%). While the level of prosocial behavior was higher for the semi-enclosed spatial plan (B2=26.4%, B3=27.9%) than for the enclosed plan (C1=23.1%), this pattern was not replicated the second time the enclosed spatial plan (B3=27.9%, C2=33.8%) was used with the BCBC design. In addition, the change in direction was ambiguous because of the variability of data in the BCBC design. Therefore, Hypothesis 3 for the children is accepted only in the relation to the open and semi-enclosed spatial plans.

<u>HE1 Test Results</u>

Given the sequential analysis finding that antisocial behavior was higher in the open spatial plan (see Figure 5.14), the researcher assumed that the effect of spatial enclosure on antisocial behavior might differ between residents and children. Based on the results of the Mann-Whitney test, antisocial behavior in the open spatial plan differed significantly between residents (Mdn=44) and children (Mdn=119), U=3.5, $p<.05$, $\gamma=0.60$ (see Table 5.20). Therefore, Exploratory Hypothesis 1 is accepted. Furthermore, the Mann-Whitney test identified a significant difference in elder-child social behavior between residents and children. Antisocial behavior in open, semi-enclosed, and enclosed spatial plans differed significantly between the two groups at the 0.05 level of significance.

<u>HE2 Test Results</u>

Exploratory Hypothesis 2 was tested using the Mann-Whitney U test to follow up the findings from research hypothesis 2. As research Hypothesis 2 was rejected, this implied that socially neutral behavior in the enclosed plan was not significantly different between residents (Mdn=2) and children (Mdn=15.5), U=4.0, $p<.05$, $\gamma=0.57$ (see Table 5.21). Even though Exploratory Hypothesis 2 is rejected, it is worthwhile to test Exploratory Hypothesis 2 with a larger sample size because of the fairly large impact size ($\gamma=0.57$).

<u>HE3 Test Results</u>

Given the acceptance of Hypothesis 3, involving more prosocial behavior in the semi-enclosed spatial plan, the Mann-Whitney U test was used to test exploratory Hypothesis 3. The results indicated that prosocial behavior in the semi-enclosed plan did not differ significantly between residents (Mdn=508) and children (Mdn=217), U=6.0, $p<.05$, $\gamma=0.46$ (see Table 5.22). In contrast, prosocial behavior in the open plan differed significantly between the two groups at the p-value of 0.05. Therefore, Exploratory Hypothesis 3 is rejected. However, the magnitude of the relationship was not insignificant ($\gamma=0.46$), showing a medium impact. Thus, it was necessary to further examine Exploratory Hypothesis 3 with a larger sample size. Table 5.23 summarizes the six hypotheses tested by sequential and statistical analyses.

TABLE 5.23
Summary of the Hypotheses Tested by Visual and Statistical Analyses

Hypotheses tested		Results
H1.	Elderly residents and children are more antisocial in an open plan than in semi-enclosed or enclosed spatial plans.	-Resident: accepted by sequential test, but denied by statistical test -Children: rejected
H2.	Elderly residents and children behave more socially neutral in an enclosed spatial plan than in open or semi-enclosed spatial plans.	-Residents: rejected by both sequential and statistical analyses -Children: rejected
H3.	Elderly residents and children behave more prosocially in a semi-enclosed spatial plan than in open or enclosed spatial plans.	-Resident: accepted by both sequential test and statistical test -Children: accepted
HE1.	There are significant differences in antisocial behavior in an open spatial plan between elderly residents and young children.	-Accepted (p=.05)
HE2.	There are significant differences in socially neutral behavior in an enclosed spatial plan between elderly residents and young children.	-Rejected
HE3.	There are significant differences in prosocial behavior in the semi-enclosed spatial plan between elderly residents and young children.	-Rejected

5.3 RESULTS OF BEHAVIOR MAPPING

Along with the experiment using systematic observation, the two observers also conducted behavior mapping based on videotapes. Space usage was recorded on data sheets (see Figure 5.8) designed for quick and easy use by the observers. The observer recorded not only the location and movement of participants within specified intervals but also the movement of passersby. The space used by participants was classified in three areas such as activity area, intermediary area, and miscellaneous area. Behavior mapping data from seven residents and four children who met the criteria of missing value were analyzed (see Section 5.2.2). The numbers in the tables presented in Section 5.3 show the median of intervals at the particular location indicated over a total of 22 observations.

5.3.1 Descriptive Analysis of Behavior Mapping

According to the results, residents only used the area of the activity area assigned for seating (Mdn=90 or 100%). Regardless of types of spatial plans, residents did not move around the activity room during physical exercise. In contrast, the children used all three of the spatial areas in all the experimental conditions. Like the residents, the most frequently used area is the activity area (Mdn=248.09 or 92.93%). The second most frequently used area is an intermediary area (Mdn=16.33 or 6.12%), followed by a miscellaneous area (Mdn=2.53 or 0.95%).

For residents, there was no difference in their use of the activity area across experimental conditions. However a different pattern was observed for the children. The activity area measured in the semi-enclosed spatial plan (Mdn=85.68 or 34.53%) was greater than in the open (Mdn=81.74 or 32.95%) or enclosed (Mdn=80.67 or 32.52%) plans. Also of note was that the children used the intermediary area slightly more often in the enclosed plan (Mdn=7.59 or 46.48%) than in the open (Mdn=6.54 or 40.05%) or semi-enclosed (Mdn=2.20 or 13.47%) spatial plans. Particularly noticeable was that the children used the miscellaneous area (i.e., hallway, restroom adjacent to the activity room) more often in the semi-enclosed spatial plan (Mdn=1.23) than in the enclosed (Mdn=0.67) or open plans (Mdn=0.63). Even though the number was relatively small, it seemed that visual and physical boundaries might not keep children in the activity room during physical exercise.

Overall, residents tended to confine themselves to the seating area during physical exercise, while the children used the intermediary and miscellaneous areas in addition. Given the finding that children had a different pattern of spatial usage, it was necessary to further examine the usage pattern in relation to the number of passersby across experimental conditions and to test (2) whether this pattern is statistically different. Table 5.24 and Figure 5.18 showed median intervals of spatial usage by the two groups across the three experimental conditions.

TABLE 5.24
Median Intervals of Spatial Usage by Groups

Group	Areas	Open (A)	Semi-enclosed (B)	Enclosed (C)	Total
Residents	Activity	90	90	90	270 (100 %)
	Intermediary	0	0	0	0 (0 %)
	Miscellaneous	0	0	0	0 (0 %)
	Total	90	90	90	270 (100%)
Children	Activity	81.74	85.68	80.67	248.09 (92.93 %)
	Intermediary	6.54	2.20	7.59	16.33 (6.12 %)
	Miscellaneous	0.63	1.23	0.67	2.53 (0.95 %)
	Total	88.91	89.11	88.93	266.95 (100%)

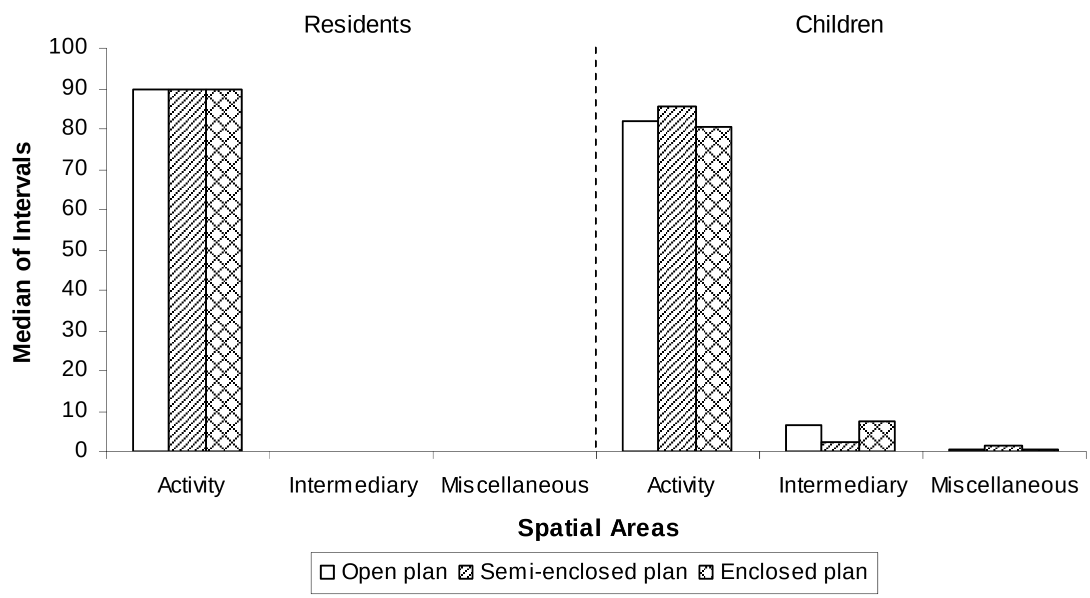

Figure 5.18: Median Intervals of Spatial Usage by Both Groups

Table 5.25 summarizes how many passersby moved through for the intervention of each spatial plan. The numbers in Table 5.24 represent each experimental condition through 15-minute activity periods. The results showed that the number of passersby, who were visible to participants, was different for the three experimental conditions. More visitors and staff walked by the activity room with the semi-enclosed spatial plan in place (159 or 54.64%) than with the open plan (130 or 44.67%). The open and semi-enclosed spatial plans allowed visual contact between passersby and study participants during the time for physical exercise (see Figures 5.5, 5.6). The enclosed spatial plan clearly attracted the least number of passersby (2 or 0.69%) because the fabric curtains produced a visual barrier to the hallways surrounding the activity room (see Figure 5.7).

TABLE 5.25
Number of Passersby across Treatments

	Open (A)	Semi-enclosed (B)	Enclosed (C)	Total
Number of Passersby	130 (44.67 %)	159 (54.64 %)	2 (0.69 %)	291 (100 %)

5.3.2 Statistical Analysis of Behavior Mapping

In order to test the existence of difference, the Kruskal-Wallis test was used. The Kruskal-Wallis test is the nonparametric counterpart to a one-way independent ANOVA (Field, 2005). This test is useful for comparing the difference between scores using a quantitative variable (i.e., social space) obtained from two or more conditions (i.e., open plan, semi-enclosed plan, enclosed plan). Because of the very small sample size (n=4), it was not possible to use the Friedman's ANOVA test which is a nonparametric alternative of repeated measures. The order of conditions was ignored and the accumulated frequencies of spatial usage were compared for the three experimental conditions in the study. Effect-size estimates were used to tell whether the impact of a spatial plan is significant. Impact sizes with a small effect were designated as (γ=.10-.29), a medium effect (γ=.30-.49), and a large effect ($\gamma \geq$.50) (Cohen, 1988; Field, 2005). For these statistical analyses, SPSS 12.0 for Windows was used.

According to the results, the observed value of chi-square (χ^2=1.631) was much less than the critical chi-square values (χ^2=5.99) at the 0.05 level of significance (df=2, *p*<.01). The significance level of 0.442 was much higher than the 0.05 level of significance, indicating the acceptance of the null hypothesis. It seemed that the use of the activity area was not significantly affected by the degree of spatial enclosure (χ^2=1.631, *p*<.05). Using the Krusal-Wallis test, the frequency of use for the intermediary area was not significantly different among the three spatial plans, χ^2=2.325, df=2, *p*<.05. For the miscellaneous area, the observed chi-square value (χ^2=0.218) was much lower than the critical value of chi-square (χ^2=5.99) at the chosen significance level (df=2, *p*<.05). The significance value of 0.897 was much higher than the p-value of 0.05, meaning the null hypothesis could be accepted. It showed that the children's use of the miscellaneous area was not significantly different among the three types of spatial plans. Table 5.26 summarizes the data for the children's use of social space among the three spatial plans analyzed using the Kruskal-Wallis test.

TABLE 5.26
Kruskal-Wallis Test for Use of Social Spaces

Social Spaces	N	Chi-square	df	Asymp. Sig (2-tailed)
Activity Area	4	1.631	2	0.442
Intermediary Area	4	2.325	2	0.313
Miscellaneous Area	4	0.218	2	0.897

Mann-Whitney tests were used to follow up the findings and to calculate impact sizes. Table 5.27 summarizes z-scores and impact size estimates for each pair in the three types of social spaces. For the use of the activity area, the second (semi-enclosed vs. enclosed, γ=0.36) and third (open vs. enclosed, γ=0.41) comparisons had medium impacts, which indicated that the effect of the degree of spatial enclosure was fairly substantial between the semi-enclosed and (Mdn=85.68) and enclosed (Mdn=80.67) plans and between the open (Mdn=81.74) and enclosed (Mdn=80.67) plans. For the use of the intermediary area, only one comparison (γ=0.61) indicated a fairly large impact between the open (Mdn=6.54) and semi-enclosed spatial plans (Mdn=2.2). All comparisons for the use of the miscellaneous area showed very small (γ=0.0, 0.05) to small impacts (γ=0.21). Particularly noticeable was that the medium or large impact sizes could be statistically insignificant for a small sample size (n=4).

TABLE 5.27
Effect Size Estimates for Social Spaces

	Activity Area			Intermediary Area			Miscellaneous Area		
	A-B	B-C	A-C	A-B	B-C	A-C	A-B	B-C	A-C
Z	0.0	-1.016	-1.155	-1.732	-0.436	-0.577	-0.149	-0.592	0.0
Effect Size (γ)	0.0	-0.36*	-0.41*	-0.61*	-0.15	-0.2	-0.05	-0.21	0.0

Notes: 1. Effect size: a small effect (γ=.10-.29), *a medium effect (γ=.30-.49), and **a large effect (γ≥.50)
2. The three letters A, B, and C refer to the three types of spatial plans: A for the open spatial plan, B for the semi-enclosed spatial plan, C for the enclosed spatial plan.

5.3.3 Hypotheses Results of Behavior Mapping

Two hypotheses were proposed to test the relationship between the degree of spatial enclosure and the children's spatial usage patterns. Behavior mappings allowed quantitative data, which were analyzed by a nonparametric one-way ANOVA test to indicate any statistical difference. The two hypotheses tested by the Kruskal-Wallis test are listed as follows:

H4. Children use the activity and intermediary areas of the activity room more often in the semi-enclosed spatial plan than in the open or enclosed spatial plans.

H5. Children use the miscellaneous areas of the activity room more often in the open spatial plan than in the semi-enclosed or enclosed spatial plans.

<u>H4 Test Results</u>

According to a descriptive analysis, the frequency with which children used the activity area during physical exercise was highest for the semi-enclosed spatial plan (Mdn=85.68). However, the difference was not statistically significant at the 0.05 level of significance. Similarly, the children seemed to use the intermediary area more often in the enclosed spatial plan (Mdn=7.59) than for other spatial plans, but the difference was statistically insignificant (*p*<.05). Therefore, Hypothesis 4 is rejected.

H5 Test Results

The children tended to use the miscellaneous area more often with the semi-enclosed spatial plan (Mdn=1.23), but the Kruskal-Wallis test showed no statistical significance in the differences among the three spatial plans. Therefore, Hypothesis 5 is also rejected. Even though there is no statistical significance among in the spatial usage of the three spatial plans, it is important to note that there were substantial impacts in the degree of spatial enclosure in comparing the three spatial plans. There were two comparisons in the use of the activity area, and one comparison in the use of the intermediary area. The small study sample (n=4) proved to be insignificant in spite of the medium or large impact sizes. Thus, it is worthwhile to re-test the difference in the use of the activity and intermediary areas for each spatial plan with a larger sample. Table 5.28, below, summarizes the two hypotheses tested using the Kruskal-Wallis test by ranks.

TABLE 5.28
Summary of the Hypotheses Tested by Statistical Analysis

Hypotheses tested		Results
H4.	Children use activity and intermediary areas of activity room more often in the semi-enclosed spatial plan than in the open or enclosed spatial plans.	-Rejected
H5.	Children use miscellaneous areas of activity room more in the open spatial plan than in the semi-enclosed or enclosed spatial plans.	- Rejected

5.4 CONCLUSIONS FROM EXPERIMENT USING SYSTEMATIC OBSERVATION

Systematic observations with design interventions were conducted to examine the effects of spatial enclosure on elder-child social behavior, as well as the usage patterns of social spaces in the activity room at the research setting. For accurate and reliable data collection, several preparation strategies were employed to provide optimal experimental conditions. These included a pilot test, design interventions, time sampling, videotaping, and coding. Special cooperation[65] was requested from the activity leader,

[65] The activity leader was asked not to structure the children's activities in ways that would physically harm the residents or disrupt the regular activity. She was also asked to remain seated in a designated area,

medical staff, and caretakers at the research site. However, it was difficult to control experimental conditions completely because of unexpected situations such as visits by relatives, unscheduled aquatic therapy, and special events at Freedom House.

Design interventions were coordinated based on the ABABCBC pattern to examine the effects of B to A and C to B (A=open plan, B=semi-enclosed plan, C=fully enclosed plan). Materials to set up the design intervention and the schedule for videotaping were planned with special consideration for the current organizational and physical circumstances of the research setting. For example, a mock-up of the observation room and a revision of the activity time (i.e., 10:45 a.m., 11:10 a.m.) were organized. For a double blind design, the researcher videotaped 22 observation sessions in which none of the participants and observers were aware of the design interventions. Each 15-minute observation period was segmented into four or six videotapes used to capture an elder-child or elder-elder dyad per videotaped segment.

For reliable agreement between the two observers, observer training lasted about two hours every weekday over a 4-week period. When inter-rater observer agreement reached a level of 90% agreement, then the two observers conducted data collection for the main observations independently. Each child and resident's behavior was coded over a 15-minute continuous period for each session with a coding interval of 10 seconds. A non-continuous observational technique was used to provide sufficient breaks after each 10-second coding interval, and after each 15-minute videotaped segment. After every 10-second observation interval, each child and resident's behavior was recorded on a prepared observation sheet. The two observers also mapped the locations and movements of each participant while recording the observed behaviors of each participant. Systematic observations and behavior mappings, along with observer trainings, produced useful information from which valid interpretations could be made.

Meticulous care was also given to analyzing the observational data, including a preliminary inspection of the data, sequential analysis, and nonparametric statistical

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which allowed unobtrusive access for the systematic observation. The caretakers were asked (1) to arrange time for residents' medication before or after the activity, if possible; (2) to have residents ready on time for the activity, and (3) to tell residents the mock-up was part of the décor for the activity room if they asked about the presence of the mock-up.

analyses. The use of multiple methods for data analysis strengthened any legitimate conclusions which were drawn from the visual and statistical procedures. On closer inspection of missing values it was deemed appropriate to keep only the data from those residents and children who were present during at least 50% of the activity sessions in each phase of the study. The decision was also made to eliminate some data which were not representative of each group and could cause responses to unintentionally drift from a previous condition to a different condition. In spite of thorough observer training, there was a low agreement score (50.24%). This is a more stringent interval agreement than total or nonoccurrence agreement. Total agreement between the observers averaged 76.99% while non-occurrence agreement averaged 94.84%. In view of some conditions for this research (i.e., 27 categories, 135-205 minutes for recording each observation session), less rigorous criteria of inter-rater observer agreement were allowed. Usually this agreement level averages a rate of 80%.

5.4.1 Spatial Enclosure, Elder-Child Social Interaction, and Spatial Usage

Three hypotheses were tested for the effects of spatial enclosure on elder-child social behavior. The first results for the design intervention dealt with the effects of a semi-enclosed spatial plan on elder-child prosocial behavior. It showed that the semi-enclosed spatial plan, in comparison to the open spatial plan, clearly produced more prosocial behavior from older adults and young children. This finding supports and extends the results of similar studies done previously in preschool settings (Legendre, 1995, 1999; Legendre & Fontaine, 1991). The second set of results involved the effects of an enclosed spatial plan on elder-child socially neutral behavior. However statistical analyses did not support this view. Some visual analysis indicated the influence of a semi-enclosed spatial plan, compared to an open spatial plan, on socially neutral behavior in older adults and young children. The third set of results dealt with the effects of an open spatial plan on elder-child antisocial behavior. Interestingly, it revealed a different perspective than that produced for the semi-enclosed spatial plan when compared to an enclosed spatial plan, suggesting an even higher level of elder-child antisocial behavior.

Two research hypotheses were tested for the effects of spatial enclosure on usage patterns of social spaces in the activity room at the research setting. The design intervention in this study did not provide evidence for the impact of spatial enclosure on children's usage patterns of social spaces in a behavior setting. However, trends were noted in the use of the activity area across all three spatial plans, and in the use of an intermediary area between the open and semi-enclosed spatial plans. Since the magnitude of observed results was not statistically significant for the small sample size of this study, it is necessary to examine the functional relationship between spatial enclosure and the use of spaces with a larger sample.

Three exploratory hypotheses were also tested for the observed difference in elder-child social behavior between older adults and young children. The results showed that children were more antisocial than older adults across all experimental conditions. Older adults were more prosocial than children in the open spatial plan only. However, there were significant differences in prosocial behavior for these two groups in both the semi-enclosed and enclosed spatial plans. At the current stage of exploring the difference in social behavior between older adults and young children, the results of these design interventions clearly suggest that there are differences in the levels of antisocial and prosocial behavior between cognitively impaired elderly adults and preschool-aged children.

A closer examination was necessary to discover any factors affecting the ambiguous results of the intervention suggesting that a semi-enclosed spatial plan affected both the prosocial and antisocial behaviors of older adults and young children. It was observed that partial partitioning had no effect in controlling auditory or visual contact with passersby during exercise. According to the results of the behavior mappings, the heaviest traffic around the activity room occurred during the semi-enclosed spatial intervention (n=159). The open spatial intervention attracted the next highest level of traffic (n=130), while the enclosed spatial intervention produced the least amount of traffic (n=2). It is likely that the number of people passing by the behavior setting might directly influence elder-child antisocial behavior.

An examination of elder-child social behaviors found that the number of behaviors could be reduced to 13 behaviors. Results of the systematic observations identified the 13 behaviors as the simplest feasible structure. This involved four actions as antisocial behavior (exhibit restlessness, act disinterested, get distracted, appear drowsy); two actions as socially neutral behavior (avoid others, sit with folded arms); and seven actions as prosocial behavior (touch, smile, laugh, invite into activity, observe, act exuberantly, be physically active). For practical utility it was deemed appropriate to reduce the number of elder-child social behaviors to 13 categories.

Based on these findings, the scope of the conclusions for this study was limited by the small sample size and the ambiguous results from both sequential and statistical analyses. The main conclusion is that minimal visual and physical boundaries (i.e., semi-enclosed spatial plan) can facilitate socially appropriate behaviors between older adults and young children. Usually, residents and children were observing, smiling, or laughing more frequently in the semi-enclosed spatial plan. The children also acted exuberantly more frequently in the semi-enclosed spatial plan. On the other hand, the semi-enclosed spatial plan also contributed to more elder-child antisocial behavior as compared to the enclosed plan. Given these tentative results, it was necessary to examine whether this increase in antisocial behavior in the semi-enclosed spatial plan was affected by the degree of spatial enclosure or people walking by the activity room. In response to this, the researcher conducted follow-up interviews with residents and children who participated in the experiment. The results of these semi-structured interviews are described in Chapter VI.

CHAPTER VI
SEMI-STRUCTURED INTERVIEW RESULTS AND DISCUSSION

This chapter reports the results of a semi-structured interview with participants who took part in the previous systematic observation at Freedom House. Individual interviews helped obtain more insight into the experiments by questioning participants' perceptions and experiences about the degree of spatial enclosure in the activity area. Interviews were supported visually with photographs which compared the four variations of visual and physical boundaries around the behavior setting. The interview, aided by photographs, helped to identify architectural design features which hampered or facilitated social interaction between young children and older adults with Alzheimer's disease. Responses from a total of eight residents and three children were recorded on audio tape, transcribed, then analyzed based on the process of content analysis (Krippendorff, 2004).

6.1 STRATEGY AND SCHEDULE OF SEMI-STRUCTURED INTERVIEW

An interview is a good supplementary means to investigate more deeply into areas where observation is limited (Sommer & Sommer, 1997). The interview is particularly useful to probe underlying reasons for responses to questions as well as to follow up on unexpected results from other methods (Kerlinger, 1986). This verbal method for collecting data can also be effectively expanded by using a visual method such as photographic simulation. Both the interview and photographic simulation are age-appropriate methodologies for preschool-aged children (Ziegler & Andrews, 1990) and are also empirically feasible methodologies in environmental research with older adults (Lawton, 1990; Rodiek & Fried, 2005).

The main purpose for including a semi-structured interview in this study was to further explore unexpected results from the previous experiment and to identify architectural features influencing elder-child social interaction. The semi-structured interviews allowed questions to be rephrased and a re-analysis of preferred selections for particular respondents without altering the focus of each question to be asked. For effective interview and reliable data collection, the following three strategies were carefully designed: (1) photographic simulation, (2) interview protocol construction, and (3) individual interviews.

6.1.1 Data Collection Strategy

The semi-structured interview with photographic simulation was conducted to get better understanding of the previous experiment. It also provided an opportunity to obtain participants' opinions about various features of the physical environment that they deem to be conducive to elder-child social interaction. The main objectives of this interview process are as follows:

1. To generate reliable photographic comparisons.
2. To develop wording and sentence structure of questions appropriate to the comprehension of preschoolers and older adults.
3. To understand respondents' preferences for the different degrees of spatial enclosure used in the previous experiment.
4. To identify architectural features which promote positive social interaction between older adults and young children while exercising together.

To further enhance the reliability of data collected from the interview, simulated photographs were used to provide a visual means of effectively comparing a hypothesized feature (i.e., visual and physical boundary). All other conditions remained identical in all photos. As the interview is a verbal method, it was also important to adapt the sentence structure and wording of questions to better suit the comprehension of preschoolers and older adults. In this regard, the adequacy of interview questions was checked, pre-tested, and revised. Individual interviews with participants from the previous experiment were carried out after all three design interventions had been carried out at least once.

6.1.2 Schedule of Semi-structured Interview

Before conducting the actual interviews, the words and sentence structure of the interview questions were checked by preschool teachers to ascertain their effectiveness for children, and by the activity leader to ascertain their effectiveness for seniors (see Section 6.2.1). The two types of interview questions, one group for residents and the other for children, were similar with as little change as possible in the overall meaning of he questions being asked. The preliminary interview was pre-tested with children from Jack and Jill Preschool and older adults from Freedom House who were not involved in the main interview. It took two weeks to finalize the semi-structured interview protocol for the main interview.

The main intent for using the photographic simulation in this study was to measure the preference for the degree of spatial enclosure in the behavior setting. Photographs were taken in a lobby area of a local church in College Station, Texas. This site was chosen primarily because of the similarity of this space to the actual activity room, ease of modifying the area for the image, and accessibility to re-arrange the furniture while taking the photos (see Section 6.2.2). Preliminary versions of the images were pre-tested with non-sample children and older adults who were personal acquaintances of the researcher. It took three weeks to take the original photos, pre-test the photos with non-sample children, and modify the furniture for these photos.

Individual interviews with residents and children at Freedom House were carried out after at least one intervention of the three types of interventions had been completed. An activity leader who was familiar with all the residents and children participating in the study, conducted the individual interviews in the presence of the researcher. The interviews focused on the perceptions and experiences of the children and residents during the experiment. It took two weeks to conduct all the interviews for eight residents and four children. Table 6.1 summarizes the schedule for the semi-structured interview with photographic simulation.

TABLE 6.1
The Schedule of Semi-structured Interview

Methods	Settings	Subjects	Collection Dates
Photographic Simulation	Vision Mission Church, College Station, TX	10 children from Vision Mission Church	3.23-4.13.2005
Interview Protocol Construction	Jack & Jill preschool, Bryan, TX	10 children from Jack & Jill preschool	4.18-4.29.2005
Individual Interviews	Freedom House, San Antonio, TX	8 residents and 4 children	6.9-6.22.2005

6.2 DATA COLLECTION PROCEDURE FOR SEMI-STRUCTURED INTERVIEW

6.2.1 Interview Protocol Construction

The semi-structured interview consisted of three major sections: family background, elder-child interactions, and activity room environments (see Appendices M, N). Part I focused on the family background of the interviewees. This was addressed to understand what the grandparent-grandchildren relationships were and also to see what factors might affect this intergenerational relationship. The researcher assumed that the presence of children or grandparents in families positively influenced elder-child social interaction during the experiments. This section highlighted the intergenerational family experience, especially the availability of intergenerational contacts, types of intergenerational activity, and the frequency of these contacts.

Part II dealt with elder-child interaction experiences during physical exercises. This section examined social relationships with children or residents at Freedom House, the level of social activity, and which children or residents subjects preferred to sit with. The responses to Part II provided children's and older adults' thoughts about their experience in intergenerational activities. The intention of this section was to find architectural or organizational factors promoting or inhibiting social interactions between older adults and young children.

Part III focused on the environmental preferences of residents and children among four levels of spatial enclosure used in the experiment. For promoting better comprehension about respondents' perceptions of and experiences with the various spatial enclosures, a photographic simulation technique was used. Four simulated photos of the different spatial enclosures (i.e., closed plan, column plan, partition plan, open plan) were presented and the residents and children were asked how they felt using each of the four spaces. The responses in this section helped identify architectural dimensions and design elements associated with the spatial enclosures that most affect elder-child social interactions. Table 6.2 summarizes the content and purpose for the semi-stretched interview.

TABLE 6.2
Summary of the Content of Semi-structured Interview

Part	Contents	Purpose
Part I	Family background of respondents (Descriptive)	Intergenerational experience in family
Part II	Elder-child interactions (Descriptive)	Experiences during physical exercise
Part III	Activity room environment (Descriptive, 1-4 rank scale)	Preference of spatial enclosure

Interviewing children and older adults required careful attention to their level of linguistic and interactive competence when sharing their feelings and experiences with the interviewer. Even though preschool children are capable of giving information using their own words, they cannot provide adult-like verbal accounts (Garbarino et al., 1989). The credibility of an interview can be affected not only by the structure of the interview, but can also be affected by the respondent, and the interviewer. According to Garbarino et al. (1989), there are five problems [66] related to the interview structure which commonly come into play when interviewing adults and children.

In order to better suit the preschoolers' and older adults' understanding, the sentence structure and wording of questions were reviewed by preschool teachers at the Jack & Jill Preschool. Two preschool teachers modified the interview questions for children without changing the meaning of the questions. A total of seven sections were refined in the following three ways: replacing, rephrasing, or deleting. The first decision to replace words was made because several words would not be easily understood by

[66] The five problems related to the structure of the interview are (1) complex and multidimensional concepts of the question, (2) number of questions, (3) question structure, (4) sensitive element in the questions, and (5) complex terms and sentences (Garbarino et al., 1989).

preschool-aged children. For example, the words, “residents,” “prefer,” “space,” and “feel comfortable” were not part of the vocabulary of preschool-aged children. To fully reflect the child’s terms, “people your grandparents’ age,” “like to,” “room,” and “easy to play with”, were used instead.

The second modification was to rephrase parts of sentences in order to clarify the intent of questions appropriate to preschoolers’ linguistic or comprehensive level. The third question in Part I (Are you close to your grandparents?) was intended to understand how close the child is to their grandparents. The level of closeness could be assessed by the frequency of contact, so that the question was rephrased as follows, “Do you get to see your grandparents every day or every week?” The first question in Part II (Do you like to play with people your grandparents’ age?) was likely to be better understood in this way, “Do you have fun playing with people your grandparents’ age?” The rephrased sentences were considered to more effectively reflect the major intent of the original questions for preschool-aged children.

The third modification was to delete a question which required a certain level of understanding about social relationships. The third question in Part II (Are you very active in exercise programs with people your grandparents’ age?) required considerable reasoning ability. Children at the preoperational stage (two to seven years) begin *primitive* reasoning by the use of images and words (Siegal, 2003). At this age, since the child has an incomplete logical ability (i.e., egocentricity), the question was considered inappropriate for preschool-aged children so it was deleted.

In summary, the original questions for the semi-structured interview were adjusted to better suit the preschoolers’ level of comprehension and the cognitive ability of residents. The modified interview questions were pre-tested with non-sample children from Jack & Jill Preschool and older adults from Freedom House. A combination of double-check by preschool teachers and caretakers, along with a pre-test with preschoolers and residents, allowed participants in the study to give meaningfully responses during the actual interviews. Appendices M and N present the interview protocol, which comprised 14 questions for residents and 13 questions for the children, respectively.

6.2.2 Photographic Simulation

6.2.2.1 Strategies to Obtain Original Photos

The aims of this photographic simulation were threefold. The first was to assess the preferences of the older adults and children for different levels of spatial enclosure in the activity room. Secondly, to control a hypothesized feature (i.e., degree of spatial enclosure) and exclude non-relevant features (i.e., color, decors) which might confound the content of the simulations. Finally, the intention was to help researchers make more informed design decisions based on people's perceptions. For generating reliable photo comparisons, a multi-stage design was used to locate a setting similar to the activity room used in the study, and which also allowed for simple modification of the area presented in the simulated image. In the first stage, a review of pictorial magazines[67], related to education, long-term care, and healthcare facility design, was carried out. One practical problem found in using photos obtained from magazines was that the size of images usable for the simulation was too small to provide clear, high-resolution images. The enlarged images could not be reproduced with sufficient visual quality for the actual presentation.

In the second stage, the researcher decided to conduct the visual simulation in an actual setting. The closest, suitable setting available was the lobby area of Vision Mission Church in College Station, Texas. Photographs were taken of this area to be modified for the photo simulations. This setting was selected because it had suitable furniture, was accessible at times convenient for the researcher, and had a non-institutional image. Furniture and decorations in the lobby were rearranged to more readily depict the non-institutional style of the activity room used in the experiment for this study. The original images were modified to produce four different variations of

[67] The pictorial magazines reviewed were *Healthcare Design*, *Texas Architecture*, and *Architectural Record.*

spatial enclosure. Figure 6.1 delineates images of activity room before and after the simulation.

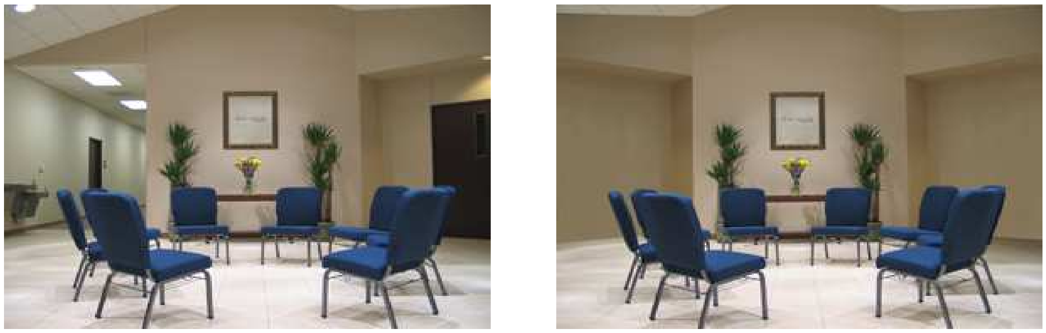

Figure 6.1: Samples of Original and Modified Images for Photographic Simulation

6.2.2.2 Production of Simulated Images

The original photos taken in a real setting and were modified based on a set of criteria proposed by Sheppard (1989). Good simulations should be (1) representative, (2) accurate, (3) clear, (4) interesting, and (5) defensible. First, representative views of simulations refer to simulations which express all the important aspects depicted in typical views and conditions (Sheppard, 1989). The representative views emphasize the distance and the angle of sight which do not distort or omit important views. In this study, digital photographs were taken from a seated eye level (approximately 3 feet and 6 inches above the floor) rather than a standing eye level in order to maximize the validity of the photographs. This level was representative because it captured a similar level as the seating arrangement (i.e., open circle) and provided an overall view of the behavior setting (i.e., enough space to walk beside chairs). This perspective in the photographs was intended to help residents and children imagine the scene where they exercise together. There was also an attempt to provide shadows as cues showing depth of objects in the scene.

Secondly, views of the simulations aim to maintain all potentially confounding variables (i.e., position, scale, color, detail, and texture) from the actual scene (Sheppard, 1989). The research setting for the previous experiment had a non-institutional atmosphere that included quilts, wallpaper, carpets, and seasonal decor. For producing images of an activity room similar to the research setting, this study initially used a variety of decorations (i.e., flower, plants, paint) in the simulations (see Figure 6.1). However, the decorative elements used in the simulations created distractions from the hypothesized feature (i.e., spatial enclosure). Most children in the pre-test were confused by these non-relevant features and failed to recognize any differences among the four simulated photos[68]. It was decided to eliminate these non-essential features from the final version of the simulated photos (see Figure 6.2). This approach seemed to reduce the accuracy of depicting homelike images because of the elements deliberately excluded.

Thirdly, the clarity of simulations refers to the visual quality of the simulation, which clearly shows details without any loss of contrast or sharpness (Sheppard, 1989). For a clear depiction of details, the images were digitally edited at a high resolution of 400 dpi and were printed at only a moderate resolution of 200 dpi, using Adobe Photoshop 8.0. The brightness and saturation of images were regulated to produce clear images. During the simulation development, various sizes of photos were pre-tested to reduce the possibility for response bias and to obtain reliable responses. The elderly adults and children tended to hold the simulated photos closer to their eyes for more careful inspection. Glossy paper caused a glare problem for the elderly adults. In response to these findings, images were landscape oriented on letter sized paper (8½” x 11”) and were printed using a Hewlett-Packard 6210 color inkjet printer on HP matte heavyweight paper.

Fourthly, simulations must be interesting enough to hold people’s attention (Sheppard, 1989). Distraction by non-relevant elements (i.e., color) may mislead respondents and detract from the real focus of the photographic simulation study. According to preliminary findings from the pre-test with non-sample children, preschool-aged children tended to pay more attention to the color red. Two recent studies found that red is the preferred color for young children (Boyatzis & Varghese,

[68] The four spatial arrangements are open plan, column plan, 3 foot high curtain plan, and ceiling height curtain plan.

1994; Zentner, 2001). In addition, warm colors, such as pink and red, prompted greater stimulation and a high positive mood of preschool-aged children whereas a cool color, such as blue, was shown to have the opposite effect (Hamid & Newport, 1989). Since perceptual attractiveness of colors could influence the preference of spatial enclosure, so mild (i.e., brown) or cool (i.e., a dark blue) colors were selected in order to make the spatial enclosures more salient and memorable (see Figure 6.2).

Lastly, defensible simulations refer to the extent to which simulations are repeatable and reliable. The simulated photos in the study kept the actual overall scale. Modifications to adjust the simulation area used only objects (i.e., chair, wall). Overall, simulations of the original scene were based on the five criteria described above as well as on findings from the pre-test with non-sample children and older adults whom the researcher knew personally. Figure 6.2 depicts four simulated images which were used later for the semi-structured interview.

Closed View

Column View

Partition View

Open View

Figure 6.2: Final Version of Images for Photographic Simulation

6.2.3 Individual Interviews

6.2.3.1 Interview Respondents and Interviewer

Eight residents and four children, who were involved in the previous observation experiment, were considered eligible to participate in the semi-structured interview. In order to ascertain these participants' capability to be interviewed, their cognitive function was assessed using the Global Deterioration Scale[69] (Reisberg, et al., 1982). Medical staff at Freedom House assessed the cognitive ability of all of the eight residents. They all were considered capable of giving meaningful responses to the interview questions. In terms of the children's communicative competency, the only children excluded were those who could not give coherent responses to the interview questions. The youngest child (2 years 8 months at the time of the interview) was invited to participate in the interview. However his interview was discarded because he gave incoherent responses to the interview questions, especially regarding the preference for a spatial enclosure using the photographic simulation. Thus, the respondents in the interview study comprised eight residents (6 female, 2 male) and three children (1 girl, 2 boys).

The presence of familiar adults (i.e., parent, teacher) is a key component to help children successfully complete the interview (Garbarino et al., 1989). Both children and residents were familiar with the activity leader, who guided physical exercise activities during the experiment. She asked the respondents predetermined questions, adapting questions as necessary. The presence of the researcher depended on the respondents. Respondents were given the freedom to accept or reject the presence of the researcher. Only one child did not want the researcher present during the interview because he tended to be uncomfortable in the presence of an unfamiliar person. This was also the only child whose interview data were discarded because of his limited communication ability. The other children and residents agreed to participate in the interview with the researcher present.

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[69] A widely used assessment tool for a primary degenerative dementia such as Alzheimer's disease, developed by Dr. Barry Reisberg (1982).

The residents' family and the children's parents were informed about the audio-taped interviews via a consent form (see Appendices C, D). The residents and the children were also given the choice to have their interview audio-taped. All of the respondents agreed to have their interviews audio-taped. Audio-taping interviews allowed the researcher to observe and record field notes about the atmosphere of interview settings, respondents' tone of voice, gestures, facial expressions, and other nonverbal behaviors. The impressions recorded in the field notes created a reflexive and collaborative process that guided further data collection for the next interviewees.

6.2.3.2 Interview Settings

The selection of an interview setting is important because it influences the overall process of the interview, and involves issues such as the respondents' privacy, concentration, fatigue, mood, and potential information related to respondents (Garbarino et al., 1989; Sommer & Sommer, 1997). For the provision of a comfortable atmosphere, interviews were conducted in either the resident's room, or in the chapel of the research site. The activity leader has frequently made casual visits to residents in their rooms. Thus, the resident rooms were a good place for carrying out the interview as a continuation of casual conversation with the activity leader. In addition, the physical environment around the chapel was decorated with items such as photos, flags, and plants. Children frequently used the chapel for intergenerational activities (i.e., story telling, music concert). Thus, the chapel was deemed suitable to provide a comfortable atmosphere for the children during the interview.

6.2.3.3 Interview Procedures

Interview schedules were completely dependent upon the respondents' and activity leader's schedules. Freedom House offers flexible, personalized schedules (i.e., getting up time, meal time). The activity leader had a busy schedule everyday, involving jobs at both the Freedom House and another nursing home facility. The order of interviews was intentionally arranged to explore any distinctive characteristics of age.

Also, new inquiries emerging within the context of the interview were incorporated as much as possible. The researcher arranged interviews with the first four respondents in terms of age (i.e., resident followed by child). This purposeful order of interviews was intended to find out any salient characteristics of each age group.

The interviews were conducted individually. In each interview, the activity leader and the researcher tried to make respondents feel relaxed by opening with casual conversation (i.e., What a beautiful day! Did you have fun with your mom and dad yesterday? You have a nice view from your room window. Your pink shirt tells me that it's Friday.). In general, the interviewer followed the order of the interview protocol. When the question was deemed to be unclear, the interviewer rephrased it. In addition, when children were less spontaneous or showed little interest about the interview questions, the interviewer allowed time for the child to express what had temporarily engaged his/her interest.

In order to control arrangement bias, the order of presentation for the photographs was randomly arranged using the table of random numbers (Sommer & Sommer, 1997). The four simulated photos were listed in order according to the amount of spatial enclosure. Beginning with the closed view, the column view was second, the partition view was third, the fourth and last was the open view. Each respondent was given the four simulated photos according to the random order selected from the table. In this spatial enclosure preference task, children were first asked to identify the different levels of spatial enclosure among the four simulated photos. When a child could not tell the difference, the interviewer explained each picture. Most of the children[70] were able to identify the differences among the four pictures displaying closed, column, partition, or open views. The children were asked to pick the picture he or she liked most and to give it to the interviewer. The same procedure was then repeated for the three remaining pictures until the last, and least preferred one, was left. After the picture was given to the interviewer, it was not available for any further selections. In

[70] The youngest child was incapable of identifying the differences in the four simulated photos. It appeared that his incoherent response to the spatial enclosure preference task was related to his incomplete logical ability.

each case the researcher recorded a preference rank for spatial enclosure. The same four photo cards used for the children were shown to the residents when they were asked to indicate their order of preference. The responses, aided by this photographic simulation, helped identify the architectural characteristics and elements associated with spatial enclosure that affect elder-child social interactions. Normally, the interview took less than one hour with residents and less than thirty minutes with children.

6.3 ANALYSIS OF SEMI-STRUCTURED INTERVIEW

Among interview data from 12 respondents, one interview with a child was discarded due to incoherent response to the preference for spatial enclosure. A total of 11 valid interviews were analyzed using a content analysis technique. Content analysis was utilized to uncover details coming out of the interview data (Krippendorff, 2004). The transcription of the interviews was done soon after completing each interview, in addition to noting any non-verbal communication such as gestures and tone of voice from the researcher's field notes. The combination of field notes and audio-taped transcripts provided more complete information, and produced three central themes and sub-themes. The three categorical themes below were organized as follows: (1) intergenerational contacts, (2) elder-child social interaction, and (3) spatial enclosure. With regard to the ethical responsibilities to research participants, the anonymity of individuals was assured by use of pseudonyms, and avoidance of any identifiers in narrative descriptions of individuals.

6.3.1 Intergenerational Contacts

Relationships between grandparents and grandchildren changed at several transition points. As individuals transition into and out of certain roles at various points in the course of life, they also experienced a different level of the grandparent-grandchild relationship. Like any other relationship, how grandparents interact with and maintain relationships with their grandchildren differed, both in style and in frequency. When faced with constraints to maintaining family relationships, grandparents could, to some extent, be vulnerable to having a less intimate relationship with their grandchildren. From the interviews, intergenerational contact in family was likely to be affected by several interrelated factors such as geographical distance, physical mobility, the age of the grandchild, and availability of intergenerational contacts. It was of interest to find factors influencing intergenerational contacts and consequences of the changed intergenerational contacts in their family.

6.3.1.1 Geographical Distance

Residents involved in the study were likely to live apart from their children and grandchildren. Numerous studies have found that the frequency of intergenerational contact with kin is greatly affected by geographical distance (Pillemer et al., 2000). Consistent with this finding, the interviews with residents unanimously reiterated geographical distance as a strong factor affecting contact with their grandchildren. For example, “I don’t really see my grandchildren often enough. They live in Houston. Houston is quite a drive, 4 hours” (R.F.4.c64)[71]. The increased physical distance was caused by residents’ placement in an assisted living facility designed for people with Alzheimer’s disease. The placement, with such accompanying limitations as geographical distance, decreased the opportunities for interaction with more distant grandchildren (R.M.9.c140; R.F.5.c81). One resident said calmly, with an air of nostalgia, “As close I could be because I lived in Fort Worth and he (grandson) lived in Dallas” (R.F.5.c81). Indeed, geographical distance was also related to intergenerational activity. Some residents with more distant grandchildren discontinued activities and engagement in relationships with their grandchildren (R.F.2.c34; R.F.5.c79). Conversely, other residents who continued engagement with grandchildren closer by were able to keep up with indoor and outdoor intergenerational activities when their grandchildren visited them at Freedom House (R.F.4.c63).

When the intergenerational contact was viewed from the child’s perspective, another set of interesting findings emerged. All of the three children realized that their

[71] In this chapter, the numbers at the end of sentences represent the units of data derived from the interviews with residents and young children at Freedom House in San Antonio.

grandparents lived far away even though their grandparents resided within 20 to 30 miles from San Antonio (K.M.3.c51; K.M.7.c114; K.F.10.c155). The perceived physical distance from their grandparents did not appear to affect the frequency of contact they had with their grandparents. The children referred to a close relationship with their grandparents in response to the frequency of contact: "I get to see grandma and grandpa every day" (K.M.3.c53). In addition, they experienced more playful time with their grandparents through various activities such as bike riding, playing with toys, swimming, fishing, cooking, and planting (K.M.3.c52; K.M.7.c114; K.M.7.c115; K.M.7.c116; K.F.10.c154). To be sure, the interviews portrayed the complex relationship between geographical distance and intergenerational contact as well as activities children and older adults are able to participate in and enjoy.

6.3.1.2 Physical Mobility

Another factor related to the decrease in intergenerational contact is the level of mobility, which is generally associated with the declining health of residents. Although Americans now live longer and are healthier than ever before (Pillemer et al., 2000), it is also obvious that older adults suffering from chronic illness, such as Alzheimer's disease, are likely to have greater challenges in traveling. The experiences of two residents who have both physical disabilities and Alzheimer's disease provided good examples of how reduced mobility, with geographical distance, can inhibit interactions with their grandchildren. Because of one resident's limited mobility, her adult children and grandchildren who live within a 30-minute drive "visit her a couple times a week" (R.F.8.c127). In contrast, reduced mobility discouraged another resident from traveling to see his adult children and grandchildren who are scattered across the country (R.M.9.c140). Although a decrease in mobility does not necessarily mean less family contact, it could place older adults at risk for family relationships of more limited quality.

6.3.1.3 The Age of the Grandchild

The interviews with residents revealed that intergenerational contact appears to vary with the age of the grandchild, both in frequency and in style. Residents used to have closer, more frequent contact with their grandchildren when these grandchildren were younger (R.F.2.c36; R.F.6.c100). A childless resident had maintained a close relationship with her two nephews when they were younger (R.F.11.c166). As these children moved to different parts of the country this intergenerational contact had become less frequent (R.F.5.c80; R.F.11.c165). For example, adult children who moved with their spouse and children tended to leave to pursue education and/or employment. As a consequence of this migration, grandchildren lived far away from and made fewer visits to their grandparents who lived in a long-term care facility. Although residents accepted the infrequent contact as their grandchildren grew older, they missed the time when they lived nearby and participated in activities together (R.F.1.c9; R.M.6.c100; R.F.4.c64; R.F.5.c82; R.F.11.c165).

Activities between grandparents and grandchildren seemed to depend on the age of both groups. Younger grandchildren were likely to participate in more fun-seeking outdoor activities with grandparents, such as bike riding, going to the park, and going fishing (K.M.3.c52; K.M.7.c114; K.F.10.c154). On the contrary, older, school-aged grandchildren tended to have more indoor activities with their grandparents such as playing the piano, watching movies, and reading together (R.M.9.c139; R.F.8.c126). Most of the residents discontinued activities with their grandchildren as they grew older. However, two residents were able to keep up with both indoor and outdoor activities with their grandchildren who live nearby (R.F.4.c63; R.F.8.c126). Not surprisingly, some residents cited feeling detached from their grandchildren because they participated in fewer activities together as their grandchildren have grown up (R.F.1.c2; R.F.2.c34; R.F.5.c79; R.M.6.c101). These findings about different styles in intergenerational activities over time reflected one of Robertson’s four dimensions of grandparenting styles[72]. According to Robertson (1977), there is a greater likelihood of having a remote grandparenting role as both the grandchildren and grandparents age.

6.3.1.4 Availability of Intergenerational Contacts

The experience of a childless resident revealed the importance of having the social support of secondary kin such as nephews and nieces. Donna talked about having an intimate relationship with her two nephews when they were younger (R.F.11.c166). Her nephews continued the relationship with her by updating her with stories about their own families. On the day of the interview with her, the researcher noticed that her bright smile and shiny eyes were due to the fact that one of her nephews, who now lives in California, had sent a package to her.

Like Donna, the availability of intergenerational contacts may be important for baby boomers who are more likely to live alone, have fewer adult children, and higher divorce rates (Pillemer & Glasgow, 2000). As they age, these factors may impair intergenerational ties, including less contact and emotional support. Along with the findings from the interview in the study, it is likely that provision of intergenerational contacts from the surrounding community can be important. This view was supported by the residents' positive reports about frequent contact with children (R.F.1.c4; R.F.2.c38; R.F.4.c66; R.F.11.c168; R.M.6.c103; R.M.9.c142). In this regard, it was necessary to go further in examining the development of elder-child social interaction during activities for older adults and young children. The second theme, elder-child social interaction, was developed as a way to integrate the need for intergenerational contact and the importance of creating meaningful intergenerational contacts.

[72] Robertson (1977) identifies four dimensions of grandparenting styles based on such personal factors as individual needs, societal needs, and societal expectations. These four dimensions of grandparenting styles are termed appointed style, remote style, symbolic style, and individualized style. The appointed style is a strong grandparent-grandchildren relationship. Grandparents with the remote style have low personal and social expectations about the relationship with their grandchildren. Symbolic style grandparents emphasize social expectations whereas grandparents with an individualized style emphasize the personal aspects of grandparenting.

6.3.2 Elder-Child Social Interaction

The role of social interaction in relationships implies the significance of social affordance, which is defined as "some situations that are better than others for allowing social interaction to occur," (Lawton et al., 1986). The potential of the physical environment can be explained by the logical reasoning of the competence-person-social affordance correlation. Contextual support (i.e., architectural environment) can enhance feelings of comfort and increase an individual's competence level and so promote positive interpersonal relations (Bell et al., 2001). The importance of the architectural environment was also evident from the study interviews.

Contact between children and residents at Freedom House takes place on a daily basis, for mutual benefits. Residents and children in this study were equally likely to evaluate the exercise program positively. They also mentioned the importance of various programmatic factors influencing elder-child social interaction. To help create places that enhance social interaction, three essential sub-themes have emerged from the content analysis: age-integrated seating arrangements, freedom of choice to participate in social activities, and access to a compatible child or a favorite resident.

6.3.2.1 Age-integrated Seating Arrangement

Many studies on the relation between seating arrangement and social behavior confirmed that furniture arrangements could influence social interaction within a group either in a sociopetal or sociofugal manner[73] (Bell et al., 2001; Cassidy, 1997). More specifically, seating arranged in a sociopetal manner encourages social contact by providing ease of eye contact and maintaining closer distances conducive to conversation. According to the study interviews, other factors fostering or hindering social interactions are age-integrated or age-separate seating arrangements. The interviews revealed that age-integrated seating arrangement is a sociopetal pattern which fostered more frequent, close interaction between residents and children during physical

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[73] Sociopetal spacing means encouragement of interaction and involves face-to-face orientation in a small, circular seating arrangement. Sociofugal spacing discourages interaction by arranging side-by-side seating (Bell et al., 2001, p.265).

exercise. Among the 11 respondents, four residents and three children preferred the age-integrated seating arrangement (R.F.1.c21; R.F.5.c97; R.M.6.c110; R.F.8.c131; K.M.3.c58; K.M.7.c121; K.F.10.c159).

The age-mixed seating arrangement was likely to have potential for stimulation, providing a focal conversation point for the child within a group. In addition, the resident-child seating arrangement seemed to provide comfortable interpersonal distances, the closeness of which supporting the ability to hear conversations, and the opportunity for children or residents to touch one another. A resident cheerfully said, “If you stop to think and pay attention to children, they will tell you some unbelievable stuff” (R.F.5.c98). A variety of potential stimulations such as tactile (R.F.1.c32; R.F.5.c97; K.M.7.c124), visual (R.F.1.c23; K.F.10.c160), and auditory (R.F.5.c98; R.F.8.c137), were attributed to being adjacent to children or residents in a sociopetal pattern. Furthermore, the most frequent activity that could be engaged in was talking with people in adjacent seats. Seven out of the eight residents and two of the three children liked to talk to residents or children. Interestingly, even three residents who showed no particular seating preference liked to maintain at least visual stimulation from children which can occur from a distance (R.F.2.c50; R.F.4.c77; R.F.11.c170).

However, the age-integrated seating arrangement was not the unanimous preference selected by older adults. One resident preferred the age-separate seating arrangement, stating that, “They (children) don’t follow the exercise very well. I focus on exercising and do it without focusing on kids” (R.M.9.c150). This view showed an individual preference for personal protection. According to Bell et al (2001), appropriate personal space[74] has two important functional characteristics: protection and communication. In other words, people desire sufficient distance to protect themselves from environmental threats (i.e., over-stimulation) as well as to utilize environmental resources (i.e., visual, tactile, auditory stimulation). In a similar view, an empirical study by Duffy et al. (1986) found that older adults in nursing homes preferred a sociofugal furniture arrangement which provided privacy. Even though it was quite

[74] Personal space, as individual-level perception, is a “portable, invisible boundary surrounding us, into which others may not trespass” (Bell et al., 2001, p.253).

evident from the interviews that the age-integrated seating arrangement fostered elder-child social interaction, it is equally important to allow the freedom to choose individually preferred seating plans.

6.3.2.2 Freedom of Choice

In accordance with the choice of seats, residents and children wanted to the freedom to manage the frequency of participation and to be able to choose their favorite spots. In general, having the ability to make choices is especially important to older adults and young children who live or are cared for in group-care facilities (Cohen & Weisman, 1991; Olds, 2001). Being in a larger group may hinder the natural engagement of residents and children in activities by forcing them to participate in the activity. Six out of the eight residents and all three children in the study liked to have physical exercise three times a week as usual. However, three-times-a-week was too much for two residents, who did not feel like exercising on a certain day (R.F.8.c128; R.M.6.c102). It is therefore important to allow older adults the autonomy to develop an individualized plan for participating in activities.

In addition to choice in participation, another important factor influencing elder-child social interaction is the freedom to sit in a favorite spot during exercise. As favorable locations in a classroom setting promoted the learner's performance (Stires, 1980), it is also likely that an individual's preferred seat provides a feeling of comfort and can result in positive social interaction. One resident noted that she is a center-oriented person (R.F.4.c74). She just automatically went to the center and sat down because she wanted to see everything around her. Similarly, a little boy, James, also gave his seating preference. He liked to sit on the end because that is where most people sit (K.M.3.c61). His favorite spot afforded a greater possibility of intimate social interaction with residents. The choice of preferred seating is likely to determine the quality and quantity of stimulation (e.g., touch, visual communication, verbal communication) that is exchanged between older adults and young children.

6.3.2.3 Access to a Compatible Child or a Favorite Resident

The last factor influencing elder-child social interaction was access to a compatible child or a favorite resident. Five residents were impartial to all children involved in the study, because “a child is a child” (R.F.5.c88) and “all of them are sweet and pretty good kids” (R.F.1.c15). Even though most residents liked all of the children in the study, some residents tended to prefer certain types of children who were compatible with them. There were three types of children whom residents prefer to sit beside and play with. These would be those children who are attentive, sociable, and active (but not out of control).

First, the children who paid attention and tried to exercise were welcomed by those residents who are goal-driven (R.F.2.c15; R.F.11.c172). Attentive children might provide a feeling of comfort and help encourage the residents to fulfill their goal of exercising. Like the protection of personal space, attentive-type children seemed to function as a buffer against over-stimulation for the elderly adults. Secondly, resdents also like to sit beside a sociable child during physical exercise (R.F.1.c10; R.F.8.c132; R.M.9.c143). The two residents who preferred to sit next to sociable children were more concerned with the children’s perceptions of older adults. For example, a male resident likes to talk to all children but he feels that children do not talk to him very much because he believes that children perceive him as a grumpy old man (R.M.9.c143). Making a similar observation, a female resident liked those who did not stay away from her and did not appear to be afraid of interacting with her (R.F.1.c10). Lastly, some residents prefer active children, who do not get out of control (R.F.4.c70). For example, some residents liked having young children sit on their laps because they used to have their children and grandchildren sit on their laps when they were young. In contrast, other residents tended to keep away from active children as a safety measure. Preschool aged children have very short attention spans and are easily distracted by visual movement and noise (Frost et al., 2001). In contrast, older adults are often concerned about physical safety because of their age-related changes which restricts their ability to react to dangers (Cavanaugh, 1997). With regard to safety, it is important to ensure the physical safety and psychological security of older adults when interacting with active, young children.

In addition to access to a compatible child, children in the study noted that they also liked to have their favorite resident right next to them while exercising. Every child remembered the name of the resident they liked to sit beside. Apparently, they are incapable of articulating why they preferred the characteristics of these residents. Instead, they make such comments as, “I have fun exercising with Ms. Nancy every time” (K.M.7.c118). However, it is clear that access to a compatible child or a favorite resident tends to yield frequent and close interactions such as smiles, touching, encouraging, and initiating conversation during physical exercise (R.F.2.c42; R.F.4.c69; R.F.5.c87; R.M.6.c105).

6.3.3 Spatial Enclosure

According to Lawton and Nahemow’s Competence-Press theory (1973; 1999), a person becomes continually involved in a process of negotiating between two opposite environmental dimensions such as autonomy-security and control-stimulation. In this adaptation process, the competence level of an individual is a key determinant in how well environmental changes are received. The emphasis here is on how people with Alzheimer’s disease and young children experience different levels of spatial enclosure. In light of this environment-behavior perspective, two architectural dimensions and several design elements were identified from the content analysis of interviews for the study. The two dimensions, control and stimulation, are conceptually in opposition to one another. Architectural features can mediate between the level of stimulus and behavioral consequences by the level of control and provided. In this regard, it is important to have a satisfactory balance between control and stimulation because potential consequences of such stimulation can negatively affect the degree of social interaction between older adults and children.

According to the results of the photographic simulation, both residents and children prefer an open spatial plan, the spatial plan with a series of columns, and the fully enclosed spatial plan, in that order. In contrast, a majority of residents and children dislike a fully enclosed spatial plan and an open spatial plan. These preferences for spatial plans are related to the two architectural dimensions of control and stimulation. It was also noticeable that the reasons for spatial enclosure preference are interrelated with several design elements, not just one element, in relation to these two dimensions. Greater elaboration on the reasons for this is described below. Table 6.3 summarizes the preference of spatial enclosure by residents and children in the study.

TABLE 6.3
Summary of Spatial Enclosure Preference

	Open View		3’ Partition View		Column View		Fully Closed View	
Preference	Resident	Child	Resident	Child	Resident	Child	Resident	Child
Like Most	3	1	1	0	2	1	2	1
Like Least	2	1	1	0	1	0	4	2

6.3.3.1 Control

Control is defined here as the capability to regulate exposure to environmental stimulation from one’s surroundings (Bell et al., 2001). When the environment places a constraint on us and there is nothing we can do about it the negative consequences of such over-stimulation are loss of perceived control and a sense of discomfort. The cognitive and emotional consequences can cause further feelings of helplessness if the uncontrollable conditions are prolonged and repeated attempts to regain control result in failure. The logical reasoning is in agreement with the experiences of residents and children in the study that spaces with more or less visual and physical boundaries can threaten feelings of perceived control. Four key design concepts relevant to perceived control have emerged from the content analysis of the interviews. These include concepts of adequate space, unobtrusive movement, prospective refuge, and privacy.

<u>Adequate Space</u>

The experiences of residents and children provided an interesting example of psychological comfort which could result from a behavior setting which is surrounded by sufficient visual openness. Visual openness is related to a sense of crowding. As shown in Table 6.3, six residents and two children preferred visually open spatial plans in some degree (i.e., open view, 3-foot-high partition view, column view) because they felt they had plenty of room and comfort in those spaces (K.F.10.c161; K.M.3.c59; R.F.2.c46; R.F.4.c71; R.F.8.c133; R.F.11.c176; R.M.6.c108; R.M.9.c147). The most preferred spatial plan is the open spatial plan which maximizes the amount of visual openness and minimizes feelings of crowding. Similarly, the reason three residents did not like the fully closed spatial plan was the visual and physical limitations of the perimeter of the activity room (R.F.8.c135; R.M.9.c149; R.F.11.c134). The three residents, who disliked the closed plan commonly expressed feelings of crowding and discomfort when they were closed up in a room while exercising. The bipolar qualities of openness versus closure are most likely to be key contributors to a sense of control in feeling crowded. Interestingly, there was no age-related variation in the preference of visual openness in relation to perceptions of adequate space. Thus, visual openness, which led to perceptions of sufficient space, is likely to contribute to perceptions of control against crowding.

Unobtrusive Movement

The ease of access into and out of the space was another design element that some residents wanted to have control over in the physical environment. For example, one male resident often came to the activity room late and left before the exercise was done, according to the activity leader. The resident preferred a spatial plan with a series of columns because this spatial plan provided more ease of access over other spatial plans (R.M.6.c107). A series of spaces created by several columns allowed easy movement at a number of locations whereas a spatial plan with 3-foot-high curtains circumscribing the perimeter of the activity room forced people to walk around through the activity room to a specified exit. It is likely that a physical boundary hindered the ease of access and resulted in a perceived loss of control over access. This view is supported by Cohen and Weisman (1991), who argue that enhanced accessibility has a therapeutic effect regarding maintaining demented people’s sense of control.

Regarding freedom of access, a female resident revealed the importance of unobtrusiveness during exercise. She does not like furniture and walls in her way when she is exercising (R.F.11.c173). Based on her experience, an open spatial plan seemed to provide appropriate personal space between people without obstructing her movement in a group setting. Consistent with her experience, many studies on personal space demonstrated that people prefer more space when they are in corner, crowded, sitting, and indoor than if they are in the center, standing, not crowded, or outdoors (Bell et al., 2001). It is likely that highly confined spaces, either horizontally or vertically, resulted in the negative perceptions of feeling restricted and uncomfortable. Therefore, it is important to provide an atmosphere of openness by differentiating the height, depth, penetrability, and transparency of boundaries which affect a room's spaciousness.

Prospect and Refuge

The experiences of two boys, James and Joe, provide a good illustration of the prospect-refuge model (Appleton, 1975) in an architectural environment. James said, "I don't like the whole curtain because I can't see anybody going by. I like to see the people going by" (K.M.3.c60). In contrast, Joe said, "I like the curtain up. Nobody else can see me because I don't want the people to look at me" (K.M.7.c122). James was referring to the prospect aspect of the environment, involving an open, unobstructed, and extended view of the activity room, whereas Joe was more concerned with the refuge property of the environment, generating a sense of safety and shelter. These opposite experiences regarding the extent of spatial enclosure indicate the importance of achieving an optimal level of spatial enclosure, which would generate both a sense of control and comfort.

Privacy

Another paradoxical relationship between openness and privacy was revealed from the interview with residents and children. Residents preferred a high level of openness while preserving certain kinds or amounts of privacy (R.F.2.c48; R.F.5.c93).

Residents' privacy-related concerns relate to issues of physical invasion and direct or indirect audible disruptions by passersby. For example, two residents consider the exercise time with the children as a private experience. Thus, they tend to want to be with the children in the activity room away from unwanted intrusion by casual passersby. They wanted to achieve an atmosphere of *group* privacy and intimacy. Any variations in the extent of the physical boundary therefore resulted in less privacy because people walking by the activity room either passed through the room or interrupted ongoing activities.

Like these two residents concerned with group privacy, one child valued privacy and wanted to avoid visual and audible intrusion (K.M.7.c123). He expressed a feeling of discomfort when he was consciously aware of being observed by passersby, not people in the activity group. The researcher observed many times there appeared to be considerable noise from staff walking by. The squeaking noise from the wheels of the meal cart passing along the corridor made it difficult to focus on the activity. This child's experience and researcher's observation seem to be associated with the issue of control over invasion rather than a choice of solitude or interaction. This environmental approach to group privacy reflected two of four types[75] of privacy in childhood proposed by Wolfe and Laufer (1974): (1) controlling access to places and (2) being free from noise. Thus, the privacy-related experiences of the two residents and the child in different spatial plans implies the important function of the boundaries of a room in regulating sensory invasion into activities that can be engaged in by a group of people.

6.3.3.2 Stimulation

In addition to the first aspect of perceived control over an environment, the second dimension, environmental stimulation in a behavior setting, can also influence elder-child social interaction. Environmental stimulation is defined here as the amount of information in one's setting. People want appropriate forms and an optimal level of

[75] In an interview study with young children and adolescents, aged 5-17, a content analysis yielded four types of privacy for a concept of environmental management. These four types of privacy are (1) having a place of one's own, (2) controlling access to places, (3) being free from distraction (i.e., noise), and (4) having the opportunity to be alone (Wolfe & Laufer, 1974).

environmental stimulation which has three recognizable aspects[76]: (1) intensity, (2) diversity, and (3) patterning (Bell et al., 2001). Too much or too little stimulation from the environment leads to negative behavioral consequences. The importance of optimizing stimulation from an environment was quite evident from the interviews in the study. The content analysis of descriptions of residents' and children's experiences yielded four design elements relevant to stimulation. These four design elements are openness, distraction, enclosure, and sparseness.

<u>Openness</u>

Openness or visual permeability was recognized as the most preferred positive form of stimulation related to a fully open spatial plan. For residents, visual openness has the beneficial influence of minimizing any feeling of being closed in and promotes positive interaction with children (R.F.2.c45; R.F.8.c133; R.F.11.c134; R.M.9.c147). For the child, visual permeability allowed greater exposure to sources of stimulation outside the activity whenever he gets bored exercising (K.M.3.c59). What was particularly noticeable with the respondents' experiences were the different perspectives on the role of visual openness as a stimulus or distraction in elder-child social interaction. Openness functioning as a stimulus allows residents to interact with children positively, while visual permeability functioning as a distraction took children's focus away from the ongoing activity to other things (i.e., passersby, a dog, visitors) irrelevant to the activity. The researcher observed many times that children had difficulty focusing on the exercise activity when passersby walked by the activity room regardless of the number or frequency of passersby. In terms of intensity, too much visual exposure seemed to distract the attention of the children or even the residents from the exercise

[76] Intensity involves the strength to which environment produces. Too much auditory stimulation produces irritation whereas too little sound results in dullness. Diversity refers to the variety of elements in an environment. Too much diversity leads to distraction while too little diversity produces boredom. Patterning in structure refers to the degree to which an environment is coherently organized. Very complex patterning can be stressful while too little patterning is monotonous and causes loss of interest (Bell et al., 2001).

activity (R.F.1.c49). Therefore, it is seems to be important that the transparency or penetrability of the boundaries of a behavior setting are regulated.

Distraction

Distraction is a negative consequence of stimulation related to different levels of open spatial plans (i.e., open view, 3-foot-high partition view, column view). The majority of residents were very concerned with distractions, which made it difficult to focus on the exercise activities (R.F.1.c20; R.F.2.c49; R.F.5.c95; R.F.11.c178; R.M.9.c147). Among the five residents, three did not mind having exercise in an open spatial plan but they noted that the openness of the perimeter of the activity room could potentially be a distraction for the children as people walked by. One resident pointed out the children-distraction relationship interestingly, saying, “Children are like little sponges. They see people going by and want to know where they are going and why they are going. If anything looks different, they got to see what it is. They got to get up and run around” (R.F.1.c30). Additionally, the researcher observed many times that a heavy flow of people was passing through the corridors along the perimeter of the activity room. Passersby also continued talking which tended to make it hard to hear what people in activity group said (R.F.2.c49).

Exposure to visual and acoustic distraction is affected by the distance from sources of stimulation such as the distance to circulation paths. When an adequate buffer against the distracting stimulation is not provided, negative behavioral consequences are most likely to occur. For example, the activity room for this study was between two major walkways connecting the two residential units and the main service building (see Figure 5.1). As a response to the unpleasant distraction, residents wanted to close up or install the boundary around the activity room in spite of their desire for a certain amount of openness (R.F.1.c27; R.F.5.c96). Regarding the intensity aspect of stimulation, too much visual and auditory stimulation is likely to produce irritation and inappropriate elder-child social interaction. Thus, it is important to regulate the transparency and rigidity of boundaries of a behavior setting to help foster positive behavioral consequences from environmental stimulation.

Enclosure

Unlike visual openness, a certain amount of closeness was valued and desired by two residents and one child in the fully enclosed spatial plan. They wanted to have a sense of closeness or intimacy with the children and other residents during exercise in the activity room (R.F.5.c89; R.F.11.c174; K.M.7.c122). According to their experiences, they were able to focus on the activity more in the closed and highly defined spatial plan than in the open and undefined type spatial plan. These respondents' experiences reflected one of the essential aspects of spatial enclosure often neglected in group-care settings. That is, enclosed social spaces in some ways can promote small-group activities and provide opportunities for intimacy by sharply differentiating activity spaces from circulation paths (Cohen & Weisman, 1991; Olds, 1987). It was quite evident that an appropriately defined space promoted a sense of intimacy among participants as well as brought a greater focus on activities being engaged in. Therefore, it is necessary to provide a certain level of shielding to minimize distraction from outside, and this in turn helps encourage stimulation (i.e., elder-child social interaction) within the group.

Sparseness

Sparseness is a negative form of stimulation generated by a fully enclosed spatial plan. Two residents in the study pointed out that they felt bored and more confined in a space surrounded by ceiling-to-floor curtains (R.F.4.c72; R.M.6.c109). Bare, undecorated spaces may stifle interest because the homogeneous boundaries in the behavior setting are likely related to the low level of stimulation. In the absence of variation, positive social interaction between residents and young children is unlikely to occur and continue. Based on the patterning dimension of stimulation, the monochrome design of the boundaries has limited visual appeal (Bell et al., 2001). Since monotonous boundaries of the fully enclosed spatial plan are not visually stimulating, it is important to minimize sparseness in patterning and to present a varied but harmonious blend of color in the enclosed space.

6.3.4 Hypotheses Results of Semi-structured Interview

The researcher proposed seven hypotheses and three exploratory hypotheses (see Section 3.3). Among them, two hypotheses were generated to test children's and residents' perceptions and experiences with different levels of spatial enclosure. The researcher used a semi-structured interview along with a photographic simulation to collect descriptive data. These data were analyzed using content analysis. The two hypotheses tested are listed as follows:

H6. Elderly residents prefer an open spatial plan to a semi-enclosed or enclosed spatial plan.

H7. Specific architectural design features are related to social interaction between impaired elders and young children.

<u>H6 Test Results</u>

The residents were asked which spatial plans they prefer to interact in with the children. They were also asked to put the four simulated photos in the order from the most to the least preferred. According to the results, the spatial plan most preferred by residents is the open spatial plan (3 out of 8 residents). Some residents preferred to play with children in a fully enclosed space (2 out of 8 residents) while some preferred the spatial plan with a series of columns (2 out of 8 residents). Each child involved in the interview process preferred different spatial plans. The spatial plans preferred included the open spatial plan (1 out of 3 children), the fully enclosed spatial plan (1 out of 3 children), and also the plan with a series of columns (1 out of 3 children). Therefore, hypothesis 6 is accepted.

<u>H7 Test Results</u>

The residents were asked what in the pictures would make them feel comfortable playing with children. Content analysis of the interviews yielded five architectural design features that promote social interaction between children and residents. These design features were adequate space, ease of access, removal of barriers, openness, and degree of enclosure. When the amounts and levels of these features are optimized, positive behavioral consequences are most likely to occur. Table 6.4 summarizes the two hypotheses tested by content analysis.

TABLE 6.4
Summary of the Hypotheses Tested by Content Analysis

Hypotheses tested		Results
H6.	Elderly residents prefer an open spatial plan to a semi-enclosed or enclosed spatial plan.	-Accepted
H7.	Specific architectural design features are related to social interaction between impaired elders and young children.	-Accepted

6.4 CONCLUSIONS FROM SEMI-STRUCTURED INTERVIEW

Semi-structured interviews with residents and children, who took part in the previous experiment, were conducted to see how they perceived and experienced three different spatial arrangements. Meticulous care was given to collecting reliable data, including the construction of an interview protocol, photographic simulations, and individual interviews. Interview questions were refined to ensure the words and structure of questions were appropriate for preschool-aged children as well as the cognitive ability of elderly people with Alzheimer’s disease. For more informative decision-making, the photographic simulation technique was used to identify factors which foster or hinder interactions between children and residents. To ensure the success of the interview, several strategies were employed to get reliable responses from the participants. For the children, the interview was conducted in the presence of a familiar adult. In this case the activity leader served as the interviewer. Another helpful condition for children and seniors was the provision of a comfortable interview setting (i.e., resident room, chapel), and the use of a flexible interview procedure (i.e., personalized schedule, courtesy introduction and transition to each interview question).

The results of the content analysis indicated the importance of social interaction between residents and young children available at senior residential facilities. Residents involved in the interview had less contact with their grandchildren because of geographical distance, limited physical mobility accompanied by declining health, and the migration of working-age grandchildren. Residents value the substitution of interaction with children, unrelated to them, at Freedom House in lieu of contact with their own grandchildren. Children in the interview also showed positive attitudes toward older adults by expressing their willingness to regularly participate in activities with residents at Freedom House three times a week.

The results of the content analysis suggested that the promotion of elder-child social interaction depends on programmatic arrangements as well as architectural features. These features are likely to be integrated with activities for children and older adults. Such features also serve to improve the meaningfulness of elder-child social interaction. Programmatic features identified from the interviews included an age-integrated seating arrangement, freedom of choice to participate in activities, and finding a compatible child/resident. As sociopetal space, the age-integrated seating arrangement (i.e., child-resident layout) was likely to encourage interaction. It was important to provide freedom to choose when to participate in activities. Additionally, positive elder-child interaction resulted when residents and children were allowed to sit in a favorite spot as well as to sit next to a child or resident they particularly like. Since these programmatic features are personal and individual, it is necessary to understand and support such personalization of activities for an enhanced the quality of life.

Furthermore, elder-child social interaction also entails providing an optimal level of openness and enclosure. These details relate to two architectural concepts, namely control and stimulation. The level of social interaction was partly associated with the perception of the activity room as a well-defined space that promotes both control and stimulation of social interaction. Conversely, insufficient spatial enclosure between the activity area and nearby hallways could negatively affect the level of stimulation and a sense of control over the environment. Specifically, the design elements that residents and children wanted to control were the perception of adequate space, ease of access into and out of the area, no barriers to movement within the room, group privacy, and no visual and audible intrusions. In addition, residents and children preferred to have some level of openness and enclosure of boundaries to minimize visual and acoustic distraction. Such variation of the boundaries of the activity area also limited any monotonous pattern.

In the open spatial plan, there were many complaints due to the lack of privacy, as well as the amount of distraction caused by people walking by the activity room. Some residents did not like having to be in an open activity room because they regard so much openness as an invasion of privacy or lack of control over the environment. Children in the open spatial plan were very likely to be the most susceptible to visual and acoustic distraction. Loss of perceived privacy, along with distractions, negatively affected social interaction between children and residents. In the enclosed spatial plan, residents and children noted the lack of adequate space, limited ease of access, and sparseness of the decor. Too little openness in the perimeter of an activity room produced a feeling of crowding. Physical boundaries around the perimeter hindered free access in and out of the area. The enclosed spatial plan with homogeneous boundaries was considered to be unstimulating.

No satisfactory balance between spatial openness and enclosure could be defined based solely on the interviews for this study. However, given the fact that an open area without visual and acoustic distraction is the environmental preference of most residents and children, it is important that design solutions that address these issues should respect the desire for control while providing stimulation. Based on the results of the interviews with residents and children, the researcher outlined some appropriate design recommendations in Chapter VII.

CHAPTER VII
CONCLUSIONS AND RECOMMENDATIONS

This final chapter summarizes the research procedures, methods, hypotheses, and findings for this study. Based on the research findings, design recommendations are provided as guides for architectural design of intergenerational care facilities for older adults and young children. Several suggestions, based on observations and issues that arose during the study, are also given for future research.

7.1 SUMMARY OF RESEARCH

As a viable option for an aging population and age segregation, intergenerational programs have proliferated in the United States since the mid-1960s. As intergenerational programs have expanded across the country, increasing attention has been paid to the systematic provision of the quality of intergenerational care, incorporating physical, social, and organizational contexts. Many studies of intergenerational programs have demonstrated the important role of the physical environment in promoting positive behavioral responses from children and older adults in intergenerational care settings. The review of literature on the built environment confirmed that architectural design features can foster or inhibit children's development as well as older adults' physical and psychological health. This information provides the background context for this study.

Given the importance of outlining a theoretical framework in conducting research, four developmental and environmental theories serve as the backbone for the study. These include Erikson's psychosocial theory, Vygotsky's social-cognitive theory, the use of a dynamic contextual model, and Latwon and Nahemow's environmental press theory. Based on the life-span approach to human development and growth, it is evident that human development is influenced by social interaction and environmental support appropriate to the specific needs of an individual. In addition, environmental stimuli are functionally correlated to personal competence, resulting in effective behavioral consequences. Since it is recognized that the physical environment has a life-long influence on development and behavior, this study on the person-environment relationships in intergenerational care settings can help with awareness of new aspects of architectural influence on social interaction between older adults and young children.

In light of this, the purpose of this study was to investigate the impact of the architectural environment on elder-child social interaction as a therapeutic effect for older adults with Alzheimer's disease and for the developmental benefit of young children in intergenerational care settings. Meticulous care was taken in the triangulation of multiple data-collection methods. The multi-method approach complements the weaknesses and strengths of different research methodologies. To select the most appropriate research methods for this study, a comprehensive review was carried out on research methods that have been used in studies on cognitively impaired older adults or young children. Five research techniques were selected to conduct this study. These included naturalistic observation, survey, observation instrument, quasi-experiment, and semi-structured interviews. The triangulation method was also used to analyze the collected data. A combination of qualitative and quantitative analyses provided highly reliable and valid findings as well as greater confidence in the conclusions obtained. The analytical triangulation was carried out on data collected through a survey, quasi-experiment, and semi-structured interviews.

Before conducting the main study, a preliminary study was carried out to develop an observation instrument to be used in the main study. To create a reliable and realistic product, the observation instrument was constructed and refined using several strategies including naturalistic observations, a review of relevant literature, a survey of experts in related fields, and a pilot study. The statistical analysis, the operational definitions of target behaviors, and recording formats were addressed in detail. A final list of 27 behaviors was grouped into seven categories on the basis of their underlying common themes such as disengagement, withdrawal, comfort, affection, happiness, sociability, and active attention. The final version of the Elder-Child Social Interaction (ECSI) observation instrument was used to measure the level of social interaction between impaired older adults and preschool-aged children in the main study.

Using a quasi-experiment and semi-structured interviews, the main study investigated the relationship between spatial enclosure and the nature of elder-child social interaction during physical exercise. The experiment was intended to examine how design interventions affect the social interaction of young children and older adults. Design interventions were made in an activity room of Freedom House in San Antonio, Texas. Twelve residents with Alzheimer's disease and five young children participated in the study. The amount of spatial enclosure in the activity room was modified to create three types of spatial plans: an open spatial plan with no curtain, a semi-enclosed spatial plan with a three-foot high curtain along the boundaries of the activity room, and a fully enclosed spatial plan with a full-length, floor-to-ceiling curtain along the perimeter of the room. The research design for the intervention used a multiple treatment reversal design involving the A-B-A-B-C-B-C pattern (A=non-intervention, B=semi-enclosed plan, C= fully enclosed plan). Each intervention phase took one week and all design interventions were carried out over eight weeks. A total of 22 observation sessions were videotaped in order to measure the occurrence of pre-categorized behaviors in a 10-second time interval over a 15-minute activity period. The videotaped observations were also used to map the locations and movement of participants. Recording all videotaped segments took nine weeks and resulted in 215 observation records and 215 behavior-mapping records.

Finally, follow-up interviews were developed to explore the participants' experiences and preferences for the different degrees of spatial enclosure used in the design intervention. The interviews were conducted with eight residents and three children who had participated in the experiment and were capable of giving meaningful responses to the interview questions. The semi-structured interview consisted of three major sections including intergenerational experience in their family, elder-child interaction experiences during the experiment, and preference for each area of the activity room. The sentence structure and words of the interview questions were modified to better suit the preschoolers' level of comprehension and the cognitive ability of residents. As an aid for informed decision making, a photographic simulation exercise was used. Four simulated photos were carefully produced of the different spatial enclosures (i.e., fully closed plan, column plan, 3-foot high partition plan, open plan). Staging of these photographs considered several factors such as views of the activity room from a participant's perspective (i.e., photos taken at eye level from a seated position), elimination of possibly confusing features (i.e., color, decor), and high visual quality (i.e., 400 dpi). To put participants at ease during the interview, the interviewer was a person familiar to the interviewee; interviews were conducted in comfortable settings (i.e., resident's room, chapel); and, there were flexible interview times (i.e., personalized schedule). The simulated photos were arranged randomly.

The combination of qualitative and quantitative methods enriched the findings and fostered an in-depth understanding of impaired elder-child social interaction in relation to spatial enclosure. The observation instrument allowed for systematic and reliable data measurement which provided a strong basis for making credible interpretations. The results of the design intervention experiment, using a multiple reversal design format, demonstrated the logical and sequential effect of these design interventions on behavior. The interviews with participants provided their perceptions of and experiences with the different levels of spatial enclosure. Taken as a whole, the triangulation approach in data collection and analysis was useful for increasing the trustworthiness of the data collected and reliability of the interpretation of the research findings.

7.2 SUMMARY OF FINDINGS

The findings of the study, based on the experiment and interview research methods, were summarized. This study examined the effects of spatial enclosure on elder-child social behavior, as well as spatial usage patterns. Different research techniques allowed the findings to be reliably substantiated and thereby provide a more in-depth understanding on the what, how, and why the research participants acted the way they did. The findings of the study are classified into three main themes: (1) elder-child social interaction, (2) use of social spaces, and (3) social affordance of programs.

7.2.1 Elder-Child Social Interaction

Findings of the experiment have shown that the level of spatial enclosure influenced elder-child social behavior. Both elderly residents and children were more prosocial in the semi-enclosed spatial plan than in the open spatial plan. Residents observed children more often, were slightly more physically active, and laughed with children more often in the semi-enclosed spatial plan than in the other two spatial plans. Similarly, in the semi-enclosed spatial plan children were more likely to observe, smile at, and be active with residents. The increase in these prosocial behaviors was likely related to specific design features created by the semi-enclosed spatial plan such as adequate personal space, the perception of openness and possible spaces of refuge. According to the results of the interview, these environmental features provided a sense of spaciousness and perceived control. These findings support and add to the results of similar studies done previously in preschool settings (see Section 1.3.2). According to several studies reviewed, young children exhibited an increase in prosocial behavior (i.e., exploratory, cooperative) and a decrease in antisocial behavior (i.e., disruptive, aggressive) when several activity regions in a classroom had a moderate degree of enclosure (e.g., partitions approximately three feet high).

Regarding elder-child neutral behaviors, findings from the multiple analysis approach (i.e., sequential analysis, non-parametric statistical analysis) showed only a partial correlation between behaviors exhibited and the degree of spatial enclosure. A sequential test found there was some influence of the semi-enclosed spatial plan on elderly residents' neutral behavior, but the statistical analysis did not find a significant relationship between these two factors. For the children, being in the semi-enclosed spatial plan caused them to display more neutral behavior compared to when they were in either the open, or enclosed spatial plans. In the semi-enclosed spatial plan, residents more often sat with folded arms or fingers, while the children tended to avoid the elders and also sat with folded arms more often. The greater frequency of elder-child neutral behavior in the semi-enclosed spatial plan could be explained by the low level of stimulation generated by the ambiguous boundary. One female resident liked the photo of the semi-enclosed spatial plan the least because, in her words, “The half curtain is confining more and it isn’t open or it isn’t closed” (R.F.4.c72, c73). In the absence of environmental variation, neutral behavior can become an undesirable response for both older adults and young children.

It was evident that the spatial enclosure had an influence on the antisocial behavior of elderly residents, but not the children. The sequential analysis indicated that elderly residents’ exhibited more antisocial behavior in the open spatial plan than in either of the other two spatial plans. However, the statistical analysis showed that the semi-enclosed spatial plan produced more antisocial behavior from elderly residents than they did in the enclosed spatial plan. This finding of non-significance was likely associated with the perceived lack of control over passersby during the experiment. The number of people passing by the activity room was greater for the semi-enclosed (n=159) than for the open (n=130) spatial plan. Distraction was the elderly residents’ most frequently observed antisocial behavior in the semi-enclosed spatial plan. Visual and acoustic distraction was the main complaint against the open and semi-enclosed spatial plans. The importance of regulating visual and audible distraction is evident from Neill’s (1982b) study in a preschool setting (see Section 1.3.2). The use of both screens (i.e., 1.2m high screens) and carpets caused teachers to have more educational and social talks with the children, and it also encouraged the children to engage in more educational interaction with their peers and adults.

In conclusion, the multi-method approach of this study demonstrated the impact of the degree of spatial enclosure on impaired elder-child social interaction. Table 7.1 summarizes the findings associated with elder-child social interaction using the various research techniques.

TABLE 7.1
Conclusions of Findings on Elder-Child Social Interaction

Research Method	Findings
Experiment	• Elderly residents and children behaved more prosocially in the semi-enclosed spatial plan than in the open spatial plan. • Even though visual analysis showed that elderly residents and children behaved more neutrally in the semi-enclosed spatial plan than in the open spatial plan, the behavior change was not statistically significant. • Elderly residents were more antisocial in the semi-enclosed than in the enclosed spatial plan. • Children were more antisocial than elderly residents across all three spatial plans. • Elderly residents behaved in a more prosocial manner than children did in the open spatial plan.
Interview	• The open spatial plan provided adequate space and openness, although it allowed less group privacy and more external distractions. • The semi-enclosed spatial plan gave the perception of spaciousness, the prospect of refuge, and group privacy. At the same time, monotonous boundaries around the room meant this spatial layout offered less visual stimulation. • The enclosed spatial plan provided more group privacy and control over distractions outside the room, but failed to provide much personal space.

7.2.2 Use of Social Spaces

The findings of this experiment have shown that the visual and physical boundaries did not significantly influence the usage of space by the elderly residents or the children. The elderly residents limited their abilities to the activity area assigned for seating during all phases of the experiment. Even though it was a small sample (n=4), the difference in the children's spatial usage patterns was not significant, the interview findings suggested that, for a larger sample, there could be a significant impact in the degree of spatial enclosure on persons' use of social space. Results of the interview showed that visual and physical boundaries could foster, as well as inhibit children's use of miscellaneous areas. In the open and semi-enclosed spatial plans children moved through the miscellaneous areas (i.e., hallways, restrooms) more often than in the enclosed spatial plan (see Section 6.3.3.2). The conclusion being that the level of spatial enclosure did not significantly influence the patterns of space usage for elderly residents and children. Table 7.2 summarizes the findings associated with the patterns of space usage based on the design intervention experiment and interviews.

TABLE 7.2
Conclusions of Findings on Use of Social Spaces

Research Method	Findings
Experiment	• There was no statistical significance in space usage across three experimental conditions among elderly residents and children.
Interview	• The open and semi-enclosed spatial plans allowed children to easily move around the miscellaneous areas (i.e., hallways, restrooms), while the enclosed spatial plan inhibited movement in and out of the activity room during exercise.

7.2.3 Social Affordance

Findings from the interviews provided evidence about important aspects of physical and social environments that promote elder-child social interaction during physical exercise. An alternating child-resident seating arrangement encouraged more visual, tactile, and verbal interaction between the elderly residents and the children. Visual interaction at a distance was also possible in a circular seating arrangement. Freedom to participate in activities and to sit in a favorite spot produced a feeling of comfort and led to an increase in positive elder-child interaction. Moreover, findings from the interview indicated the importance of access to a compatible child or a favorite resident (see Section 6.3.2.3). The researcher concluded that programmatic and architectural features can facilitate interaction-building conditions leading to greater social interaction between older adults and young children. Table 7.3 presents the findings associated with social affordance.

TABLE 7.3
Conclusions of Findings on Social Affordance

Research Method	Findings
Interview	• The circular, age-integrated seating arrangement influenced elder-child social interaction. • Freedom of choice in participation and seating were associated with positive interactions between older adults and young children. • Residents preferred to sit closer to children who were attentive, sociable, and active (rather than those who were out of control). • Children liked to sit next to their favorite residents during activities.

7.3 SUMMARY OF RECOMMENDATIONS

Apart from the main conclusion that the semi-enclosed spatial plan significantly influenced positive interactions between older adults with Alzheimer's disease and preschool-aged children, it is not possible to statistically support any of the other recommendations. There are several design recommendations, however, that appear to be appropriate. These design recommendations are based on empirical findings from the literature review in Chapter I, findings from the individual interviews, and the researcher's observations during the experiment. These design recommendations serve as potential research topics for creating evidence-based intergenerational environments.

The recommendations suggest that environments conducive to impaired elder-child social interaction require a balance between the levels of openness and enclosure in the architectural elements of visual and physical boundaries. Recommendations based on design concepts identified from the individual interviews include the perception of adequate personal space, unobtrusive movement into and out of the area, the prospect of some area of refuge, group privacy, regulated exposure to stimulation, harmonious coordination of design elements, and arranged seating. These design recommendations are also related to the height, permeability, transparency, and flexibility of the area's boundaries. Table 7.4 summarizes the recommendations for elder-child social interaction.

TABLE 7.4
Recommendations for Elder-Child Social Interaction

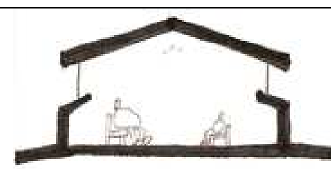
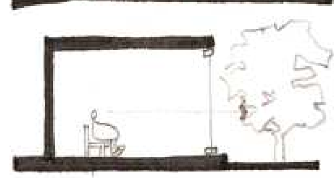
Recommendations	Diagrams
• Perceived spaciousness can be maintained by using variation of height in the room.	
• A view to the outside through windows can also provide a sense of spaciousness.	

TABLE 7.4 (Continued)

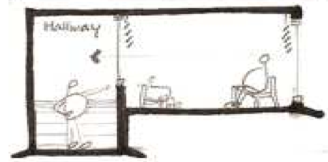
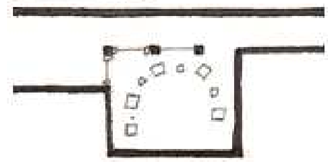
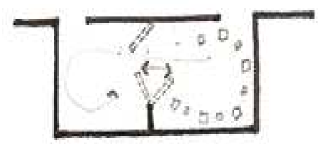
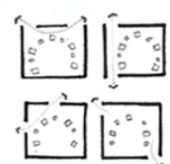
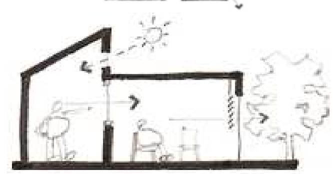
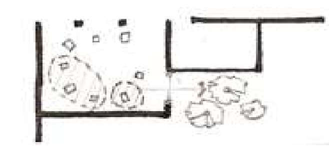
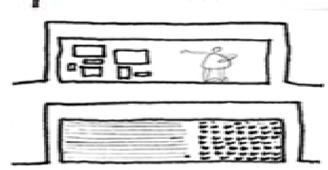
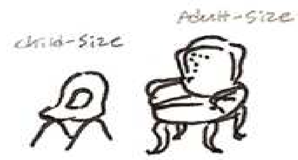
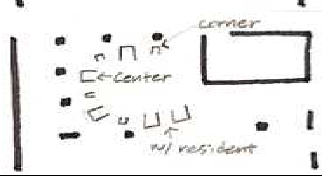
Recommendations	Diagrams
• The activity room should provide pleasant views through windows.	
• Using different levels between hallways and an activity room allows for passersby to be visible but not able to interrupt any activity in the proscribed area.	
• Recessing an activity room away from hallways would mean less visual and auditory distractions from passersby.	
• The use of glass blocks would provide a sense of spaciousness as well as a certain amount of group privacy during activities.	
• The activity room should accommodate different activities by being equipped with movable partitions to further divide spaces within the room.	
• Careful positioning of the door can provide ease of movement without disrupting others involved in on-going activities.	
• A greater sense of spaciousness can be achieved by having a view to the outside and hallways.	
• The provision of sitting and viewing locations in a corner can provide a sense of peaceful refuge.	
• Varied textures and a range of design elements can help minimize the sparseness of a room. For example, fabric texture, books and wall displays differentiate spaces and provide visual and mental stimulation.	

TABLE 7.4 (Continued)

Recommendations	Diagrams
• A child-resident seating arrangement encourages the development of interpersonal relationships.	
• A mixture of child-resident and resident-resident seating arrangements can allow greater freedom of choice in seating preferences.	
• The provision of child and adult-sized furniture would help to create a comfortable and friendly environment.	
• Enough space for wheelchairs and walking aids in the activity room would allow for greater ease of access to the activity area shared with children.	
• Being able to reserve a favorite spot for a certain person can provide a feeling of comfort and control.	

7.4 LIMITATIONS OF THE STUDY

Although efforts were made to make this study as reliable and valid as possible, there are several limitations in generalizing the results. First, any conclusions are limited by the characteristics of the participants. The population and setting of this study are unique. Because this study focused on preschoolers and older adults with Alzheimer's disease at an assisted living facility co-located with a childcare center, there needs to be caution in generalizing these results to other children and elderly residents whose age, cognitive level, and care setting are different. In addition, the relatively few participants (8 older adults, 4 children) in the study limited the broad application of the conclusions. Due to the small sample size of children, no tests of statistical significance could be legitimately run and sequential analysis was the only alternative. Therefore, the findings on the impact of spatial enclosure on children's behavior toward older adults may not be comprehensive compared to other findings extracted from the multiple data analyses.

Another limitation of the study is the lack of personal competence of the subjects which may have impacted the participants' social behavior. The conceptual model of this study covers three context-specific aspects such as environmental stimuli, personal competence, and individual responses. The variable of personal competence involves physical health, sensation, motor function, and cognition. The researcher was unable to collect all of the types of data necessary to fully test the conceptual model. If all these factors could be overcome, then it would be possible to draw more precise, valid, and consistent conclusions. Additionally, other variables may be clarified to help to refine the observed behaviors. These variables are the overall quality of the setting, the philosophy of care, and other physical and atmospheric attributes (i.e., noise, lighting, color).

The maturation of children is associated with their competence level. The development of children is an uncontrollable variable. Among the four children involved in this study, one child (aged 31 months) was younger than preschool-age at the time of the experiment. Even though an effort was made to recruit only preschool-aged children, the participation of a younger child necessarily meant that some of the experiment's requirements might be beyond his developmental stage. This child's developmental level could have some impact on the results of this study. The 3 to 5 year old children may have felt more comfortable during physical activities with residents, while this younger child may have been more reserved in his behavior.

The duration of each treatment in the experiment limited the ability to follow the natural occurrence of behaviors observed. Although the researcher conducted a pilot study prior to beginning data collection, three observation sessions for each treatment may not have been sufficient to control the variability of data. In fact, the second B treatment (3 foot high curtain) was conducted for only two days due to scheduling conflicts. Additionally, there was some variation in the activity time because it coincided with other special events at the research setting. The last three observation sessions started 15 minutes earlier or 10 minutes later than the regular time of 11:00 a.m. Insufficient data points before the implementation of design interventions and changes in the activity time may have had some impact on the findings of this study.

Further, the Elder-Child Social Interaction (ECSI) observation instrument developed by the researcher has two limitations. The first concern involves how many categories can be effectively processed by two observers. Of the 27 categorized behaviors in the ECSI instrument, 14 behaviors were never recorded during the study although they were observed during the pilot study and naturalistic observations. Instead of deleting these categories as not being representative, it is feasible to use this instrument with larger study samples. The second area of concern is observer drift which is associated with the interpretation of the categorized behaviors. Although the researcher attempted to provide detailed explanations of the behaviors in the ECSI instrument, there was still some misinterpretation. According to the two observers' comments, they became more familiar with the definitions and criteria for the behaviors and understood the interpretations for behaviors (i.e., exhibits restlessness, gets distracted) more precisely over time. Even though four weeks of observer training led to 90 % agreement between observers, the medium level agreement scores may have been affected by the many categories (27) of behaviors being observed, the long time for recording (135-205 minutes), as well as different interpretations by the two observers.

The introduction of the mock-up observation room may have also impacted data collected during the first few weeks. Although the mock-up was similar to the conditions of the research setting, and was put in place prior to the beginning of the study, the presence of the new object may have diverted the children's attention to the mock-up. Less attentive children may have exhibited some antisocial behavior (i.e., restlessness, disinterested, distracted) more in reaction to the presence of the new structure, in addition to their short attention span. In addition, the mock-up was incorporated into the study area in order to mask the two observers from the experimental manipulation. However, it would not be possible for the observers in the study to be completely blind to the purpose of the experiment since the design intervention were recorded every week on the videotapes. The observers might have guessed what the impact of the environmental manipulation might have been on the elder-child social interaction. Taken as a whole, further replications are needed to determine the generality of findings from this study. These limitations notwithstanding, the study provides some evidence of the important relationship between the degree of spatial enclosure and impaired elder-child social interaction during physical activity.

7.5 SUGGESTIONS FOR FUTURE RESEARCH

Using recommendations outlined in section 7.3, future research, using a larger sized sample, needs to address the kinds of design standards needed to achieve a satisfactory balance between the level of openness and enclosure most conducive to elder-child social interactions. Since the current study found that openness with no distraction is most desirable, it may be valuable to examine how features of the boundaries used (i.e., height, permeability, transparency) can be used for controlling environmental stimuli. In addition, other physical attributes (i.e., color, lighting, noise) may be considered in future studies because these design elements serve as areas of possible confusion which may lead to inconclusive findings on the phenomena being studied. A better understanding of these elements can enable designers to more consciously create developmentally and therapeutically appropriate physical environments for intergenerational activities.

This study is an initial step in research on the impact of architecture on intergenerational interaction. It is important to address the issues of person-environment interaction for intergenerational shared-site (IGSS) programs in future studies. Further studies could involve different age groups, types of spaces, facilities, geographical regions, cultures, and countries. Considering the fact that IGSS programs serve all age groups from infants to older adults, it may be worthwhile to examine the relationship between spatial enclosure and social interaction for particular groups at particular spaces in particular facilities[77]. For instance, intergenerational activities can take place in a wide variety of spaces such as in a lobby, dining room, art and craft room, as well as in outdoor spaces. Different spaces serving different functions may require different degrees, or varieties of visual and physical boundaries. In addition, IGSS programs are now being proliferated across eastern and western cultures (Giles et al., 2002). A cross-cultural study on this research topic may provide valuable insight of how different cultures or countries perceive and use space. This is important because human perception comes from a constant interaction between nature (i.e., genetic influences) and nurture (i.e., cultural learning).

Naturally, this type of study requires interdisciplinary knowledge and collaboration with professionals in fields with similar interests, such as psychology, gerontology, environmental psychology, and architecture. The assessment of the developmental level of children or the cognitive level of older adults with Alzheimer's disease is yet another area that can be investigated under a similar research topic. Evidence-based spatial design using a multi-disciplinary research approach can provide a broader evaluation of the same research topic. The application of interdisciplinary studies to architectural design sheds new light on design considerations and allows designers to create intergenerational environments that enhance the quality of the physical environment for young children and older adults.

[77] Intergenerational shared-site programs have been implemented using seven common models: (1) nursing homes with a childcare center, (2) adult day facilities co-located with childcare centers, (3) adult day centers with multi-level childcare, (4) adult day centers with an early childhood facility, (5) nursing homes with multi-level childcare, (6) senior centers with before and after school care, and (7) senior centers with early childhood programs (Goyer & Zuses, 1998).

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APPENDIX A

INSTITUTIONAL REVIEW BOARD OF TEXAS A&M UNIVERSITY

Office of the Vice President for Research
Texas A&M University

March 2, 2005

MEMORANDUM

TO: Min-Young Seo
Architecture
MS 3137

FROM: Dr. J. Steven Moore, Chair
Institutional Review Board
MS 1186

SUBJECT: IRB Protocol Review

Title: The Therapeutic and Developmental Design: The Relationship Between Spacial Enclosure and Impaired Elder-Child Social Interaction

Protocol Number: 2005-0091
Review Category: Full Review
Approval Date: March 2, 2005 to March 1, 2006

The approval determination was based on the following Code of Federal Regulations:

The research involves children and was, therefore, examined against provisions of Subpart D of 45 CFR 46, particularly 46.404 (Research not involving greater than minimal risk) and 46.408 (Requirements for permission by parents or guardians and for assent by children), as well as the current guidelines for inclusion of children in research. The IRB found the research to be of minimal risk to the child, and after considering the age, maturity and psychological state of the children to be enrolled in this study, determined that adequate provisions are made for soliciting the assent of the child and permission of a parent or legally authorized guardian who has been granted authority to consent for medical care including research. The IRB further determined that all children age 7-11 must be asked to verbalize their assent/dissent to participate, and children age 12-18 must indicate their assent in writing.

Remarks: NOTE: IRB contact information on consent documents must be changed to reflect the new IRB Director of Research Compliance, Ms. Angelia M. Raines, (979)458-4067, araines@vprmail.tamu.edu.

The Institutional Review Board - Human Subjects in Research, Texas A&M University has reviewed and approved the above referenced protocol. Your study has been approved for one year. As the principal investigator of this study, you assume the following responsibilities:

Renewal: Your protocol must be re-approved each year in order to continue the research. You must also complete the proper renewal forms in order to continue the study after the initial approval period.

Adverse Events: Any adverse events or reactions must be reported to the IRB immediately.

Amendments: Any changes to the protocol, such as procedures, consent/assent forms, addition of subjects, or study design must be reported to and approved by the IRB.

Informed Consent/Assent: All subjects should be given a copy of the consent document approved by the IRB for use in your study.

Completion: When the study is complete, you must notify the IRB office and complete the required forms.

APPENDIX B

AGREEMENT TO USE FREEDOM HOUSE IN A RESEARCH PROJECT

AIR FORCE VILLAGE
FOUNDATION

AIR FORCE VILLAGE II

ALZHEIMER'S CARE and RESEARCH CENTER
FOUNDATION
FREEDOM HOUSE

Institutional Review Board
Texas A & M University
MS 1112
Re: Min-Young Seo

January 24, 2005

To Whom It May Concern;

Please accept the following as a written letter of agreement between the Alzheimer's Care and Research Center, Freedom House, and The College of Architecture, Texas A & M University to conduct a research study at Freedom House.

The research study titled The therapeutic and developmental design: The relationship between spatial enclosure and elder-child social interaction has been approved by the Air Force Villages Medical Committee to be conducted at Freedom House by graduate student Min-young Seo. The facility houses an Alzheimer's residential unit as well as an on-site child care center. The Medical Committee has requested, received and approved consent forms which will be used for all participants in the study. These consent forms will be completed by legal guardians and on file. Neither child nor resident will be able to participate in the study without prior approval.

Freedom House is delighted to take part in this research program and looks forward to the relationship that will be built between our organization and Texas A & M University.

If there is any need for any further clarification, please do not hesitate to contact Wendy Hazel, Freedom House Director, at 210-838-6300.

Sincerely,

Ron Jennette, C.M.A.
CFO & Treasurer
Air Force Villages
12455 Freedom Way
San Antonio, TX. 78245

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2455 Freedom Way
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APPENDIX C

INFORMED CONSENT FOR PARENT

The Therapeutic and Developmental Design: The relationship between spatial enclosure and impaired elder-child social interaction

My child has been asked to participate in this research study, which examines the impact of the physical environment on elder-child social behaviors while doing intergenerational activities. My child was selected to be a possible participant because he/she is cared for by the participating facility and is involved in physical exercise programs. A minimum of 18 children and older adults have been asked to participate in this study.

The researcher would like to use two data collection methods: observation with experiment and follow-up interviews with the same participants. The researcher will observe and videotape elder-child social interactions with a video camera behind a window of a room adjacent to an activity room during physical exercise. Observations will be carried out at 11 am for 30 minutes, three times (Monday, Wednesday, Friday) per week over a nine-week period. The perimeter of the activity room will be modified by partitions (3 feet high, ceiling height) every other week, and all the other physical components of the activity room will be kept identical. Older adults sitting on a chair and young children sitting on a chair or standing up will follow directions from a cassette tape such as stretching, clapping, tapping toes, and the like. The researcher will also conduct follow-up interviews with participants who will be asked how they felt in each of the 3 types of spatial arrangements (current, 3 feet high, ceiling height). This study will take a total of ten weeks, beginning in March 2005 and concluding in May 2005. The risk associated with this study may be a feeling of discomfort associated with the presence of an unknown observer during exercise programs. The benefits of this study include opportunities to interact older adults and an understanding about normal aging by participating in intergenerational activities. The presence of staff from this participating facility will prevent any harmful situation to my child.

I understand that videotaped behaviors and interviews of my child will be recorded confidentially. For confidentiality, the researcher will use pseudonyms of individual residents and children to analyze observations and interviews of participants. No information about his or her participation in this study will be released. I understand that if child abuse or neglect is detected, the researcher is required by law to report this abuse to the appropriate authorities. The videotapes and interview data will be kept in a locked-secure cabinet for 3 years after the completion of the study and then be destroyed. My child's participation is strictly voluntary. I understand that my decision to allow him or her to participate or not will have no impact on services and care in the child care center where he or she goes. Upon completion of the study, I understand that I may request a copy of the results.

This research study has been reviewed and approved by the Institutional Review Board-Human Subjects in Research, Texas A&M University. For research-related problems or questions regarding subjects' rights, I can contact the Institutional Review Board through Dr. Michael W. Buckley, Director of Research Compliance, Office of Vice President for Research at (979) 458-4067 (mwbuckley@tamu.edu).

I have read above information. I have received satisfactory answers to any questions that I have asked. I understand that I may withdraw my consent for my child at any time and discontinue participation without penalty, and that I am not waiving legal claims or rights. I also understand that my signature on this form gives my child permission to participate and to be videotaped in the current study. I have been given a copy of this consent form.

Signature of Parent	Printed Name	Date

Printed Name of Child

Min-Young Seo (Principal Investigator)	Date

College of Architecture
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College Station, TX 77843-3137
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College of Architecture
Texas A&M University
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I would appreciate a copy of a summary of the results when the study is completed.

☐ Yes   Address: Number and Street

City and State   Zip Code

APPENDIX D

INFORMED CONSENT FOR FAMILY MEMBER OR GUARDIAN

The Therapeutic and Developmental Design:
The relationship between spatial enclosure and impaired elder-child social interaction

My relative or dependent has been asked to participate in this research study, which examines the impact of the physical environment on elder-child social behaviors while doing intergenerational activities. My relative or dependent was selected to be a possible participant because he/she is a resident in the participating facility and is involved in physical exercise programs. A minimum of 18 children and older adults have been asked to participate in this study.

The researcher would like to use two data collection methods: observation with experiment and follow-up interviews with the same participants. The researcher will observe and videotape elder-child social interactions with a video camera behind a window of a room adjacent to an activity room during physical exercise. Observations will be carried out at 11 am for 30 minutes, three times (Monday, Wednesday, Friday) per week over a nine-week period. The perimeter of the activity room will be modified by partitions (3 feet high, ceiling height) every other week, and all the other physical components of the activity room will be kept identical. Older adults sitting on a chair and young children sitting on a chair or standing up will follow directions from a cassette tape such as stretching, clapping, tapping toes, and the like. The researcher will also conduct follow-up interviews with participants who will be asked how they felt in each of the 3 types of spatial arrangements (current, 3 feet high, ceiling height). This study will take a total of ten weeks, beginning in March 2005 and concluding in May 2005. The risk associated with this study may be a feeling of discomfort associated with the presence of an unknown observer during exercise programs. The benefits of this study are opportunities to interact with children and a feeling of happiness from participating in exercise programs. The presence of staff from this participating facility will prevent any harmful situation to my relative.

I understand that videotaped behaviors and interviews of my relative or dependent will be recorded confidentially. For confidentiality, the researcher will use pseudonyms of individual residents and children to analyze observations and interviews of participants. No information about his or her participation in this study will be released. I understand that if elder abuse or neglect is detected, the researcher is required by law to report this abuse to the appropriate authorities. The videotapes and interview data will be kept in a locked-secure cabinet for 3 years after the completion of the study and then be destroyed. My relative or dependent's participation is strictly voluntary. I understand that my decision to allow him or her to participate or not will have no impact on services and care in the facility where he or she lives. Upon completion of the study, I understand that I may request a copy of the results.

This research study has been reviewed and approved by the Institutional Review Board-Human Subjects in Research, Texas A&M University. For research-related problems or questions regarding subjects' rights, I can contact the Institutional Review Board through Dr. Michael W. Buckley, Director of Research Compliance, Office of Vice President for Research at (979) 458-4067 (mwbuckley@tamu.edu).

I have read above information. I have asked questions and have received answers to my satisfaction. I understand that I may withdraw my consent for my relative or dependent at any time and discontinue participation without penalty, and that I am not waiving legal claims or rights. I also understand that my signature on this form gives my relative or dependent permission to participate, to be videotaped, and to be interviewed in the current study. I have been given a copy of this consent form.

____ _______________

Signature of Family Member or Guardian Date

____

Printed Name

____ _______________

Min-Young Seo (Principal Investigator) Date

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mardelle@archone.tamu.edu

I would appreciate a copy of a summary of the results when the study is completed.

☐ Yes ____

Address: Number and Street

______________________________________ _______________

City and State Zip Code

APPENDIX E

STUDIES OF DESIGN SPACE AND OLDER ADULTS WITH DEMENTIA

Reference	Methods	Intervention	Findings
1. Group Size			
Annerstedt, 1993	-Longitudinal study	Group living units: small group size, private living/bedroom, shared living area with a small kitchenette	-Increase in physical activity and less negative behavior for residents -Less emotional strain for relatives -Satisfaction among staff
Annerstedt, 1994	-Quasi-experiment	Group living units: small group size, private living/bedroom, shared living area with a small kitchenette	-Decrease in negative aspects of dementia for residents
Annerstedt, 1997	-Quasi-experiment	Group living units: small group size, private living/bedroom, shared living area with a small kitchenette	-Effective for mental and motor skills -Decrease in behavioral problems -Less use of tranquilizers -Less stress and greater satisfaction among relatives
Bianchetti et al., 1997	-One group: pretest/posttest	Special care units: 10 two-bedrooms, a large wandering area, a dining room, an activity area, locked doors, wayfinding cues	-Significant decrease in behavioral problems -No improvement in functional or cognitive abilities
McCracken & Fitzwater, 1989	-One group: pretest/posttest	Open vs. closed dementia unit	-Improvement of functional abilities in small closed unit -Positive staff-resident interaction
Morgan & Stewart, 1998	-Quasi-experiment	Special care units: low density, private rooms	-Great improvement in disruptive and non-disruptive behavior in an experimental group who were moved from high to low density units
Netten, 1993	-Longitudinal study	Access to outdoors, private space, bright light, quiet, private rooms	-Better orientation, less social disturbance, and apathy among residents
Saxton et al., 1998	-Longitudinal study	Special care units (SCUs): small group clustered design, wandering paths	-Less decline in mobility in SCUs
Skea & Lindesay, 1996	-Quasi-experiment	Group living units: small group size, private rooms and bathrooms, shared common spaces, control	-Significant increase in staff-resident interaction -Decrease in depression; communication skills enhanced -No effect on cognitive ability
Sloane et al., 1998	-Cross-sectional survey	Special care units (SCUs): general design, maintenance,	-Less agitation and wandering among residents in facilities

	-Observation	space and seating, lighting, lower noise levels, resident rooms include visual and tactile stimuli in 53 SCUs in four states	with enhanced environmental quality
2. Residential Character			
Cohen-Mansfield & Werner, 1998	-Quasi-experiment	Enhanced nursing home environment: visual, olfactory, and auditory stimuli with elements of home and access to the outdoors	-Longer stay; less trespassing, exit-seeking, agitated behavior -Greater interest in others and pleasure in surroundings
Elmståhl et al., 1997	-Quasi-experiment	Group living units: small group size, private rooms and bathrooms, shared common spaces. Building layout: control of noise levels, layout of hallways, different lighting levels	-Less disorientation among residents in an L-shaped design -More disorientation among residents in a straight corridor design
Kihlgren et al., 1992	-Interviews with staff and relatives -Assessment	Collective living home: separate apartment with own furniture and other personal belongings, rooms for common activities	-Improved social abilities, more alert, residents less depressed in a collective living home than in a nursing home
3. Sensory Stimulation			
Cleary et al., 1988	-Quasi-experiment	Special care units (SCUs) with reduced stimulation: shared rooms, tables for dining in resident rooms, neutral wall colors, no TVs/radios	-Improvement in resident's functioning; agitation decreased from 1.7 to 0.8 (4-point scale) -Less weight loss, restraint use, wandering; greater satisfaction for family and staff
Lawton et al., 1984	-Post-occupancy evaluation		-Decrease in pathological behaviors and better self-maintenance behaviors among residents, increased visits from relatives, difficult surveillance for staff
Meyer et al., 1992		Quiet week in a boarding home for Alzheimer's patients: no TV/radio, staff spoke softly and moved about slowly	-Significant decrease in agitated behaviors
Paire & Karney, 1984	-Quasi-experiment	Sensory stimulation	-Significant improvement in and maintenance of personal hygiene -Increased interest in group activities
4. Safety			
Bird et al., 1995	-Quasi-experiment	Use of cued recall	-Decrease in inappropriate entries
Hussian, 1988	-Quasi-experiment	Enhanced stimuli: yellow restroom doors, signpost w/ bright color, tape, color cue,	-Significant decrease in problem behaviors (exit attempts, disorientation,

		grid pattern	invading other's rooms)
Hussian & Brown, 1987	-Quasi-experiment	Strips of beige tape on a brown floor near an opaque door	-Significant decrease in potentially hazardous movement
Mayer & Darby, 1991	-Quasi-experiment	Mirrors in front of exit doors	-Fewer exit attempts by residents
Chafetz, 1990	-Quasi-experiment	Black tape on a white floor at both glass exit doors	-No effect
McMinn & Hinton, 2000	-Quasi-experiment	Released from mandatory confinement indoors	-Decrease in verbal and physical aggression
Namazi & Johnson, 1992	-Quasi-experiment	Unlocking door to secure outdoor area	-Decrease in agitated behaviors
5. Orientation			
Cernin et al., 2003	-Quasi-experiment	Color-form discrimination	-Affected short-term memory recall ability
Gibson et al., 2004	-Quasi-experiment -Structured interview with nurses	Color, texture, structure	-Effectiveness of color and use of name plates to improve spatial orientation
Gross et al., 2004	-Quasi-experiment	Environmental signage (written names, photographic images)	-Effective for identify their rooms and belongings -Capable of identifying their own name and fellow residents' names in print after training
Netten, 1989*	-Survey with nurses	Wayfinding ability: building complexity, decision points, number of zones, color coding, signage, noise and lighting levels	-Association between building configuration and resident's orientation, disorientation attributed to noise and dim lighting
Passini et al., 1998	-Observation -Structured interview	Wayfinding	-Substantial help from highlighting building entrances, identifiable zones, landmarks
Wijk & Sivik, 1995	-Quasi-experiment	Color naming, color discrimination, color preference	-Substantial help from color cues
6. Lighting			
Garce, 2002	-Quasi-experiment -Observation	Changes in color, angles, light intensity (110 foot-candle)	-Decrease in disruptive behaviors
Koss & Gilmore, 1998	-Quasi-experiment	Increased light intensity at dinnertime	-Decrease in agitated behaviors -Greater food intake
Lovell et al., 1995	-Quasi-experiment	Bright-light therapy	-Decrease in agitated behaviors
Lyketsos et al., 1999	-Quasi-experiment	Bright-light therapy	-No effect
McDaniel et al., 2001	-Quasi-experiment -Observation	Increased light intensity during mealtime	-Increase in food and fluid intake
Mishima et al., 1994	-Quasi-experiment	Morning-light therapy	-Decrease in problem behaviors

Okawa et al., 1991	-Quasi-experiment	Phototherapy w/ illumination of 3000 lux in the morning	-Increase in nocturnal sleep -Effective for sleep-wake rhythm -Decrease in disorderly behavior
Satlin et al., 1992	-Quasi-experiment	Bright-light therapy (1500-2000lux)	-Effective for sleep-wake rhythm throughout the day -Decrease in nighttime activity -No effect on agitated behavior and use of restraints
Thorpe et al., 2000	-Quasi-experiment	Day-light therapy	-Decrease in agitated behavior

* Those studies with an asterisk have multiple findings which are included under other topics.

APPENDIX F

STUDIES OF ENVIRONMENTAL DESIGN ON YOUNG CHILDREN

Reference	Methods	Intervention	Findings
1. Density			
Dettling et al., 2000	-Cross-sectional survey	Group size, child/caregiver ratio, quality of caregiver's attention	-Cortisol increases among children who have a lower quality of attention from caregivers and less stimulation
Field, 1980	-Observation	Teacher/child ratio (high vs. low), partitions (1½-2 meters high)	-Increased peer interactions and fantasy play with low teacher/child ratio and partitioned special play areas -Increase in unoccupied play, teacher disruptions of peer interaction in high ratio conditions and no partitions
Holloway & Reichart-Erikson, 1988	-Structured test -Observation	Group size	-Less social competence and more antisocial behavior with larger group size
Howes, 1988	-Adult questionnaire	Group size	-Fewer later behavioral problems (e.g., first grade) for children in a low group size environment -Social maladjustment among children in larger group size
Howes et al., 1992	-Observation	Group size	-Improved social orientation and social competence in smaller group size
Kantrowitz & Evans, 2004	-Observation	The child/activity area ratio	-More unoccupied behavior and lower engagement in constructive play with higher child/activity area ratio -Longer play in spaces with more play resources and low density
Larson et al., 1990	-Observation	Play-unit complexity: simple unit having one play material, complex unit having two play materials, super unit having three or more play materials	-Longest complete activity segments at complex units -Group play at complex and super units -Solitary play at simple units -Less disruptive, aggressive contact between children with partitioned play spaces
Legendre, 2003	-Cross-sectional survey	Group size, child-to-caregiver ratio, spatial resource	-Increase in hormone cortisol in large group size (n>15), less space per child in playrooms (<5m²), and large number of caregivers available (>4 adults)

Li, 1984	-Observation	High-density classroom	-Decrease in peer interaction
Maxwell, 1996	-Observation	Density of homes and classrooms (high or low)	-Behavioral problems among children from high-density homes and classrooms -Lower score on cognitive ability test for children from high-density classrooms
Smith & Connolly, 1986	-Observation in field	Class size, spatial density, amount of play equipment	-Less cooperation and more aggression in crowded conditions -Less movement in spaces with more play equipment -More verbal interaction with adults and more object exchange in smaller classes (about 10 children) -More unoccupied behavior in larger classes (15-20 children)
2. Spatial Organization			
Campos-de-Carvalho & Rossetti-Ferreira, 1993	-Quasi-experiment -Observation	Spatial arrangements (i.e., (1) open plan with empty central space, (2) open plan with shelves on the sides of room, (3) semi-open plan with shelves creating two separate zones) *Note: 19 to 35 months*	-Greater use of the adult's zone in fully open arrangement -More use of areas around the shelves in the room or in the separate zones
Gehlbach & Partridge, 1984	-Quasi-experiment (ABAB design- A: open table, B: partition allowing only visual contact) -Observation	Partition (i.e., between adjacent players)	-Significant increase in using visually-independent verbal forms (i.e., the yellow tractor, the blue block next to your elbow) with the use of partitions
Laike, 1997	-Observation	-Physical environmental features (i.e., pleasantness, complexity, potency, affection, originality) -Social environmental features (i.e., social intensity, interpersonal stability, familiarity, coherence, friendliness)	-Higher level of positive behavior in a well-organized space -Effectiveness of intensity (i.e., liveliness of contacts) and familiarity (i.e., usual and well-known social situations) in children's social behavior
Legendre, 1989	-Quasi-experiment	Closed spatial arrangements (i.e., furniture forming major visual and physical boundaries) *Note: 24 to 37 months*	-Higher social density in the adult-proximal space -Restricted use of space for children with low interactive competence -Better adaptation to spatial constraints for children with high interactive competence
Legendre, 1995	-Quasi-experiment	Visual connection between activity areas in a room (i.e., furniture forming visually	-Increased positive interaction and decreased negative interaction with peers in a

		restricted vs. open) *Note: 21 to 35 months*	visually open arrangement
Legendre, 1999	-Quasi-experiment	The degree of visual connection (i.e., furniture creating a visual barrier vs. an open setup) *Note: 21 to 37 months*	-More use of intermediary area with the use of a visual boundary -Less use of adult-distant area with the use of a visual boundary -Higher peer interaction in a visually open arrangement -Greater amount of positive peer interaction in the visually open arrangement
Legendre & Fontaine, 1991	-Quasi-experiment	Visual connection within play spaces (i.e., furniture creating closed zone spatial arrangements: closed with visual and physical boundaries, zoned with no boundaries) *Note: 21 to 37 months*	-Reduced use of adult-distance spaces with the use of visual barriers -More self-centered behavior and conflict in a closed arrangement -More socially oriented behavior with easy visual connection with adults
Lowry, 1993	-Observation	Degree of enclosure (open vs. closed play structure- 30"x30")	-Both solitary and interactive play in closed play structure -More solitary play using both open and closed play structure in a high density setting -Children's desire for privacy in crowded settings
Moore, 1986	-Quasi-experiment (post-test only)	Spatial arrangements using walls or partitions (i.e., (1) well-defined, (2) moderately defined, (3) poorly defined)	-Higher level of exploratory behavior, social interaction, and cooperative behavior in spatially well-defined settings -More engaged behavior in spatially well-defined settings
Nash, 1981	-Observation (over a three-year period)	Spatially organized classrooms vs. randomly organized classrooms (i.e., 5 sub-divisions of the classroom space)	-More creative skills, science and number activities, and language use in spatially organized classrooms -Promoted transfer of skills with closer proximity of learning centers
Neill, 1982a	-Observation	Playroom openness, space per child (social density), room group size	-Less staff contact, more time moving around and doing nothing, increased aggression levels in the more open units -Lower attention span with greater room group size
Neill, 1982b	-Quasi-experiment -Interview with staff	Visual openness (i.e., screens: a single layer of fabric 1.2m high), noise (i.e., carpets)	-Increase in educationally valuable behavior and adult-child social interaction the use of screens and carpets -More education and social

			talk with children in the carpeted settings (i.e., carpets only, screens and carpets)
Neill & Denham, 1982	-Observation -Semi-structured interviews with staff	Playroom openness, density, group size	-Increase in negative social behaviors (i.e., aggression, withdrawal, wandering) in open units -Small divided spaces inhibit negative behavior -Encouragement of 'social group' formation in small quiet areas -Higher noise levels in open units (a peak of 98 dBA) -More frequent interaction between teacher and new children in the less open spaces
3. Furnishings			
Boyatzis & Varghese, 1994	-Color test	Color preference (i.e., nine colors: pink, red, yellow, black, gray, green, blue, purple, brown)	-Positive reactions to bright colors (e.g., pink, blue, red) and negative responses to dark colors (e.g., brown, black, gray) -Girls: especially positive toward bright colors and negative toward dark colors -Favorite color: boys cited blue followed by red, girls preferred pink, followed by purple. -None of the children chose yellow, brown, or gray as their favorite color.
Hamid & Newport, 1989	-Quasi-experiment (ABACAB design) -Painting test for mood assessed by two judges	-Warm (i.e., pink) and cool (i.e., blue) colored environments	-Increase in physical strength and positive mood in pink-colored room -Greater physical strength in pink, gray, blue, respectively -More positive mood paintings in the pink setting -Negative mood painting in the blue setting. -The results were interpreted as supporting the differential arousal function of colors.
Hendrickson & Strain, 1981	-Observation	Play resources	-More solitary activity and no parallel type activity when too many materials available
Herrera et al., 2005	- Cross-sectional survey assessed by ECERS (Early Childhood	- Childcare quality	-The most important physical features: relaxation and comfort, sand and water, space to be alone.

	Environment Rating Scale)		-Strong correlation between childcare quality and child development (i.e., vocabulary, social development, and adaptive behavior)
Pellegrini, 1984	-Observation	Presence in different learning centers, the number of children and adults present	-Lower quality of social-cognitive behavior in art centers than in blocks and housekeeping centers -Less mature forms of play in relation to adult presence -More mature forms of play in the presence of peers
Read et al., 1999	- Quasi-experiment (mock-up) -Observation	-Ceiling height (i.e., size of a room: 15’4” long x 6’11” wide x 9’ or 5’6” high) -Wall color (i.e., neutral vs. red)	-Higher level of cooperative behavior when differentiating either ceiling height (5’6”) or differentiated wall color (red) only
Zentner, 2001	-Photo simulation	-Color preference task (red, yellow, dark blue, bright blue, dark green, bright green, pink, brown, black) -Color-emotion matching task	-Preferred colors were red, pink, dark blue, yellow, bright green, bright blue, dark green, brown, black, from most to least preferred. -Red was the preferred color for both girls and boys -Bright colors (yellow, red, green) associated with a happy emotional state -Dark colors (blue, brown, or black) associatede with a sad emotional state

APPENDIX G

ABSTRACTS OF OBSERVATION INSTRUMENTS

Author(s)	Instruments*	Abstracts
1. Ladd & Profilet (1996)	The Child Behavior Scale (CBS)	This scale was developed to assess young children's behaviors with peers in school settings, along with three strategies of peers' perceptions, observations, and teacher-reports. This instrument consists of six interactive categories of 35 items: aggressive (7 items), prosocial (7 items), asocial (6 items), excluded (7 items), anxious-fearful (4 items), and hyperactive-distracting (7 items).
2. Schroeer & Flapan (1971)	Schroeer-Flapan System	Focusing on the relationship between aggressiveness and friendliness of young children, this narrative-recording system has three dimensions: aggressive-friendly, physical-verbal, and direct-indirect interaction.
3. Cohen-Mansfield, Werner, & Marx (1989)	The Agitation Behavior Mapping Instrument (ABMI)	The Agitation Behavior Mapping Instrument (ABMI) and its companion instrument, the Cohen-Mansfield Agitation Inventory (CMAI) were developed to assess agitation in elderly persons with dementia in nursing home settings. The ABMI and CMAI lists eight identical items of agitated behavior: attention, screaming, cursing, complaining, pacing, repetition, exit-seeking, and physical aggression. The ABMI records 14 behavioral (physical and verbal/vocal) and 7 environmental characteristics. The ABMI also assesses level of agitation and disruptiveness, which is rated on a five-point scale (from 1 'not at all' to 5 'extremely').
4. Moustakas, Sigel, & Schalock (1956)	Moustakas-Sigel-Schalock System	This system is designed to record child-adult interaction, including child-parent and child-therapist social interaction. The primary focus of this system is to assess the social and emotional components of interaction. There is a wide range of factors such as attention, stimulus, orienting, criticism, approval, cooperation, and interpretation. This system provides very detailed recording of the child-adult interaction behaviors mentioned above.
5. Stover, Guerney, & O'Connell (1971)	Stover-Guerney-O'Connell System	Focusing on adult behavior only, this system measures empathic behavior in spontaneous play with a child. It is made up of three dimensions (acceptance, self-direction, and involvement). Each dimension is rated on a five-point scale ranging from a high, positive rating of 1 to a low, negative rating of 5.
6. Angersbach & Jones-Forster (1999)	Modified Elder-Child Interaction Analysis (ECIA)	A modified system of the Elder-Child Interaction Analysis (ECIA), this system was designed to record interactive behavior between healthy older adults and preschool-aged children. Dealing with social interaction between young children and older adults, the specific categories of this system were revised by deleting more complex activities (i.e., writing, reading) and including more developmentally appropriate behaviors (i.e., hugging, lap-sitting).
7. Newman, Morris, & Streetman (1999)	Elder-Child Interaction Analysis (ECIA)	This system is designed to record interaction between third and fourth-grade children (prodigy) and healthy older adults (mentors) in school settings. This instrument lists 32 behavioral items of both verbal/nonverbal and social/academic behaviors.

		Of interest is that coding is done on special forms designed for five 1-minute intervals of dyadic interactions. On the basis of the relationship between participation in the mentoring program and behavioral change, this instrument also uses a teacher interview questionnaire to assess teachers' perceptions of the effects of the mentoring program.
8. Ward, Kamp, & Newman (1996)	Ward-Kamp-Newman System	This system was designed to examine the relationship between participation in an intergenerational program and positive behavior. Focusing on behaviors of older adults with dementia only, this system studied nine positive behaviors observed during group music and movement activities. These included: eye contact, smiling, verbal expression, rhythmic hand movement, touching, extending hands, head nodding, laughing, and paying attention to a child.
9. Hayes (2003)	Hayes System	This narrative-recording system was designed to evaluate intergenerational activities and interactions between preschool children and older adults with dementia in intergenerational care settings. Of interest is that this system required data-collection using video-recordings and natural observational field notes. Data from videotapes and observational notes were analyzed in written statements with the following themes: participation in the activity, enthusiasm for the activity, affection, agitation, withdrawal, and watching.
10. Xaverius & Mathews (2003)	Xaverius-Mathews System	Using time-sampling technique, this system measured elderly participants' interaction with their environment (engagement) as well as their level of expressiveness. This system focused on the behavior of cognitively impaired elders during activities with children aged six to ten. Items of expressiveness were: smiling, laughing, nodding head, and leaning forward. Examples of appropriate engagement behavior were listed as: walking, reading a magazine or book, drawing or painting, knitting, watching television, putting together a puzzle, conversing or singing, or reading with eyes moving.

* For identification, the researcher labeled several observation instruments by the authors' surnames.

APPENDIX H

ELDER-CHILD SOCIAL INTERACTION (ECSI) SURVEY

The purpose of this study is to investigate social interaction between older adults with Alzheimer's disease and children during intergenerational activities. This study is performed in preparation for the researcher's doctoral dissertation, which examines the impact of the physical environment on elder-child social behaviors while doing intergenerational activities. This study will help increase the reliability and validity of elder-child interaction research by conducting the expert review process on developing observational measurement of the elder-child social behaviors.

This web-survey of observational measurement contains four parts: (1) participants' information, (2) identification of frequently observed elder-child social behaviors, (3) evaluation of elder-child social behaviors, and (4) comments. This study will TAKE ABOUT 20 MINUTES to complete. If you agree to participate in this study, I would appreciate you completing the online survey at:

I UNDERSTAND THAT:

- Participation is strictly voluntary. I can refuse to answer any survey questions that may make me feel uncomfortable.
- The researcher will not individually evaluate me in any way.
- The data gathered will only be used for the purpose of this research. Only the researcher will have access to the completed forms whether hardcopy or electronic. The raw data will be kept in a locked-secure cabinet for 3 years after the completion of the study and then be destroyed.
- The information gathered will be confidential.
- I may discontinue participation at any time without penalty.

If you have any questions or concerns, please contact:

Min-Young Seo, Principal Investigator
College of Architecture
Texas A&M University
College Station, TX 77843-3137
(979) 862-9637 mseo1@neo.tamu.edu

Mardelle M. Shepley, Advisor of Investigator
College of Architecture
Texas A&M University
College Station, TX 77843-3137
(979) 845-7877 mardelle@archone.tamu.edu

This research study has been reviewed and approved by the Institutional Review Board-Human Subjects in Research, Texas A&M University. For research-related problems or questions regarding subjects' rights, I can contact the Institutional Review Board through Dr. Michael W. Buckley, Director of Research Compliance, Office of Vice President for Research at (979) 458-4067 (mwbuckley@tamu.edu).
Please print this information sheet and retain for your records. By completing the online survey, you are voluntarily consenting to participate in this survey.

Elder-Child Social Behavior

The purpose of this questionnaire is (1) to identify frequently observed and important social behaviors between older adults with **cognitive and physical disabilities** and preschoolers during intergenerational activities such as **physical exercise** and (2) to evaluate the elder-child social behaviors in a continuum of scale values. The focus of this observational measurement is to assess social behaviors between young children and older adults, and not child-child nor elder-elder relation. I appreciate your participation in this survey.

PART I: PARTICIPANTS' INFORMATION

1. What is your name?

2. What is your specialized field (i.e., intergenerational programs, elderly/gerontology, children)?

3. How long have you been involved in the field you mentioned above? (years)

PART II: IDENTIFICATION OF FREQUENTLY OBSERVED BEHAVIORS

The following is a list of the items that are likely to be related to elder-child social behaviors from previously available scales and observations.

Please, identify the elder-child social behaviors that will be frequently observed and mark the number that best represents your opinion based on a scale of 1 to 5.

Items	Not frequently				Very frequently
	1	2	3	4	5
1. Smiles at child/elder					
2. Laughs at child/elder					
3. Nods head					
4. Stares blankly into space					
5. Looks down					
6. Appears drowsy					
7. Shows anger toward child/elder					
8. Acts disinterested					
9. Exhibits restlessness					
10. Touches child/elder					
11. Leans forward in chair					
12. Hugs with child/elder					
13. Claps					
14. Imitates child/elder					
15. Places a child in lap					
16. Consoles a child					

17. Comforts upset child					
18. Clowns around in play					
19. Sits/stands with folded arms					
20. Observes child/elder					
21. Wanders away from groups					
22. Shows aggressive actions					
23. Grabs child/elder					
24. Pushes child/elder					
25. Acts fearful					
26. Be physically active with child/elder					
27. Runs (skips, hops, jumps) a lot					
28. Invites child/elder into activity					
29. Leads activity					
30. Plays alone					
31. Avoids child/elder					
32. Plays with only child					
33. Withdraws from child/elder					
34. Praises child/elder					
35. Sings while playing					
36. Talks while playing					
37. Initiates conversation					
38. Asks questions to child/elder					
39. Answers questions					
40. Talks calmly to child/elder					
41. Talks to self					
42. Cries					
43. Makes strange noises					
44. Screams					

PART III: EVLUATION OF ELDER-CHILD SOCIAL BEHAVIORS

Please, evaluate the nature of elder-child social behaviors below and mark the number that best represents your opinion based on a scale of 1 to 11. (1- the most antisocial, 6- neutral, 11- the most prosocial)

Items	Antisocial					Neutral				Prosocial	
	1	2	3	4	5	6	7	8	9	10	11
1. Smiles at child/elder											
2. Laughs at child/elder											
3. Nods head											
4. Stares blankly into space											
5. Looks down											
6. Appears drowsy											
7. Shows anger toward child/elder											
8. Acts disinterested											
9. Exhibits restlessness											
10. Touches child/elder											
11. Leans forward in chair											
12. Hugs with child/elder											
13. Claps											

14. Imitates child/elder											
15. Places a child in lap											
16. Consoles a child											
17. Comforts upset child											
18. Clowns around in play											
19. Sits/stands with folded arms											
20. Observes child/elder											
21. Wanders away from groups											
22. Shows aggressive actions											
23. Grabs child/elder											
24. Pushes child/elder											
25. Acts fearful											
26. Be physically active with child/elder											
27. Runs (skips, hops, jumps) a lot											
28. Invites child/elder into activity											
29. Leads activity											
30. Plays alone											
31. Avoids child/elder											
32. Plays with only child											
33. Withdraws from child/elder											
34. Praises child/elder											
35. Sings while playing											
36. Talks while playing											
37. Initiates conversation											
38. Asks questions to child/elder											
39. Answers questions											
40. Talks calmly to child/elder											
41. Talks to self											
42. Cries											
43. Makes strange noises											
44. Screams											

PART IV: COMMENTS

Please, (1) list elder-child behaviors that will be frequently observed but are not described on the lists above and (2) recommend the number of behavior items that would be appropriate to minimize observational and recording errors.

APPENDIX I

AN E-MAIL COVER LETTER FOR THE WEB SURVEY

Date: Friday, February 18 2005 08:32am
From: Minyoung Seo <mseo1@neo.tamu.edu>
To: jhughes@tamu.edu
CC: whollis@coe.tamu.edu
Reply-To: Minyoung Seo <mseo1@neo.tamu.edu>
Subject: Web-Survey
Full Headers: Display Headers

Dear CYF members,

"*A journey of a thousand miles begins with one step*" – this ancient Chinese proverb means that even minor contributions will lead to greater results. So your input will actually help create healthy environments for all of us. I would like to invite you to this web-survey which is intended to develop a valid and reliable observational method for measuring social interactions between preschool children and older adults with Alzheimer's disease.

The sample Elder-Child Social Interaction Survey is available online at: http://people.tamu.edu/~hjk6573/survey. It is intended to help me identify frequently observed patterns of elder adult-child social interactions. Based on the results of this survey I can develop an appropriate observational tool.

The survey takes about 20 minutes to complete. Results of the survey will be collected on Friday, March 11, 2005.

Your support in completing this survey is greatly appreciated. Responses to the survey remain confidential. The data will be used solely for the purposes of this research project.

Sincerely,

Min-Young Seo
Ph.D Candidate
Texas A&M University
College of Architecture
College Station, TX 77843-3137
979-862-9637
Email: mseo1@neo.tamu.edu

APPENDIX J

A MONTHLY NEWSLETTER ISSUED BY SHERIDON OF BRYAN

Upcoming Activity Events…

Worship with Houston Dirickson (every Tuesday at dinner)–Come hear and sing the old hymns we remember and enjoy.

First United Methodist Church Sermon Video (every Sunday) – We will be showing a taped sermon from the previous week in the activity room.

Rev. Karl Schrader of Faith United Church (every Sunday) – Offering Protestant church services/devotionals throughout the month.

His Loving Arms Ministry (7th) (first Sunday of every month)– Husband and wife team provide various forms of ministry to residents during lunch.

Family Council Meeting (2nd) (first Tuesday of every month)–Family members or responsible parties meet to discuss concerns & share ideas.

Field Trip to the Brazos Valley Museum of Natural History (3rd)

VIP (Visually Impaired Persons) Support Group (5th)- Meeting for residents and family members. This will be held the first Friday of every month in our building at 2pm. See advertisement.

Smokey the Miniature Horse (5th)- rescheduled from last month. This may be his last visit (until the spring) with cold weather approaching.

Don Hancock (8th)- He blesses us with his music and ministry.

Dining Out with the Lunch Bunch (9th)–The residents go out to eat in the community at the place of their choice.

Veteran's Day Celebration (11th)- Come join us in honoring our veterans at 2:30pm. Members of the American Legion will be attending.

A&M Garden Club (12th)- Members of the club will be visiting and educating us on different types of herbs, etc.

Ballet Dancing by the Nutcracker Bon-Bons & Angels (13th)- Entertainment by local ballet dancers, age 8-14, who will be performing in The Nutcracker.

Catholic Mass with St. Joseph's Catholic Church (15th) – Mass will be held every 3rd Monday of each month.

Residents Council (17th)–Residents meet to discuss concerns & share ideas. This is for residents only – family members can attend the family council meeting.

Thanksgiving Dinner (18th)- at 5:30pm. Please join your loved ones for a traditional turkey dinner!

Shopping Trip (19th) – to Super Wal-Mart.

Residents Birthday Party (22nd)–to celebrate Nov. birthdays. Bernadette Jochec will play the keyboard.

Intergenerational Study (30th)- possible start date (see above ad).

Family Orientation (30th) –For family members of new residents at 6:00pm in the Activity room.

Jack & Mildred Mitchell are always out & about!

Bernadine Cemino poses for the camera!

In Loving Memory

Davis McGill
Twyla Dickinson
Dale Lacewell
Lura Harrison
August Nowak

Members of the Brazos Valley Troupes & Willie Moore

Intergenerational Study

In cooperation with Min-Young Seo, a graduate student from A&M, we will be involving voluntary residents in an intergenerational study. The purpose of the study is to observe the interactions between our residents and young children. Jack & Jill Preschool will be bringing 4-5 year olds to our facility once a week for 3 weeks. The children will be doing exercises with the residents. However, a signed informed consent must be obtained from each resident in order to participate. If you have a family member who is not able to give consent for themselves, but feel they would benefit from interacting with children, please contact Carrie Burkett for more information. We would like to be able to obtain permission from 30 residents by Nov 19th in order to begin the study on Nov 30th.

SPECIAL THANKS!

To Carol Evans for making the beautiful centerpieces that adorn the dining room tables!
To Nelda Wade for donating the birthday cake that everyone enjoyed at the birthday party!

APPENDIX K

OPERATIONAL DEFINITIONS OF ELDER-CHILD SOCIAL INTERACTION

Items	Definitions & Examples
Category 1: Disengagement As an antisocial mode, the disengaged behavior category is defined as socially-inattentive action that is impulsive, hyperactive, or inactive. A child/elder gradually stops being involved in or paying close attention to the activity or social interactions. Behaviors include getting distracted, appearing drowsy, acting uninterested, and exhibiting restlessness.	
D1. Exhibits restlessness	• Definition: A child/elder moves nervously and appears uncomfortable in activity or interaction. Restless behavior is distinguished from uninterested behavior as exhibiting greater activity (e.g., hyperactivity). If a target child/elder appears hyperactive, the code, "Exhibits restlessness", should be used. • Examples: -quickly and repeatedly shifting/fidgeting in seat. -getting up and down constantly. -sliding foot back and forth over floor while sitting. -moving arms and legs in short, rapid motions. - swinging from the back of a chair. -sliding his/her chair back and forth. -repetitively pulling the legs close to the chest while in a seat. -walking aimlessly and leaving the activity room. - becoming involved in his/her own hyperactive activity. - scratching nervously. -twirling one's hair nervously.
D2. Acts uninterested	• Definition: A child/elder shows indifferent behavior verbally or physically that is related to getting bored with the activity. The uninterested behavior is passive, negative, and slow in characteristic. The behavior, "Acts uninterested" can occur as negative responses to social overtures (e.g., saying "No" when a toy is presented to a child). • Examples: -following the activity with squirmy, uneasy facial expressions. -repeatedly pursing or pouting lips. -sitting slouched forward. -fidgeting while seated or while participating in activity. -stopping the activity to fiddle with his/her body, clothing, etc. for a minimum of two seconds. -asking when the activity will end (e.g., "How many more? This many?"). -putting his/her arms behind the head to rest. -glancing at watch several times. -constantly talking to people present in the activity because he/she is bored with the activity. -showing signs of boredom while engaged in an activity (e.g., yawning with bored gestures). -saying "No" when asked to participate an activity.
D3. Gets distracted	• Definition: A child/elder constantly turns his/her attention to something of momentary interest that is not a part of the activity

	<u>or interaction</u> with people present in the activity. The distracted behavior is not related to the ongoing activity and people present in the activity. Distracted behavior can last either for a few seconds or even for the whole 10-second coding interval. • Examples: -looking or glancing around. -paying attention to other interests such as passersby or pets, “Hello! Donna” or “Freedom! Come here.” -talking about a remembrance that happens to come to mind. -becoming involved in conversation irrelevant to the activity as long as he or she is not actually playing. -self-entertaining with his/her body or playing with objects (e.g., toys).
D4. Appears drowsy	• Definition: A child/elder appears to be half asleep. In order to code, “Appears drowsy”, the target child/elder must <u>stop doing the activity</u>. If child/elder is yawning but still participating to some degree, then the behavior “Acts uninterested (C3)” should be coded. • Examples: -yawning repeatedly in the absence of activity. -dozing off. -eyes look sleepy.
Category 2: Withdrawal As a neutral mode, the withdrawal behavior category is defined as socially-inhibited action that is self-absorbed and not engaged with others. A child/elder does not overtly enter into an activity or social interactions. Characteristic behaviors include staring blankly into space, sitting with folded arms or fingers, avoiding child/elder, and talking to self. In order to code, “Withdrawal”, a child/elder <u>must not be engaged</u> in an ongoing activity with others. If an elder is watching a child as well as joining in the activity, the code, “Observes child/elder” should be used.	
W1. Avoids child/elder	• Definition: A child/elder does not participate in the activity or interaction overtly. The behavior of avoidance is distinguished from uninterested behavior by <u>neutral</u> responses to social overtures (e.g., stepping aside when a toy is presented to a child). If a child displays negative responses (e.g., saying “No”) from social overtures, the code “Acts uninterested (C3)” should be used. • Examples: -withdrawing from another child’s/elder’s social overture. -having fearful or tense look on face in response to physical- or object-mediated contact. -avoiding eye contact. -shrinking from activities. -backing off when asked to participate in the activity.
W2. Stares blankly into space	• Definition: A child/elder looks at no specific target with a steady, often wide-eyed gaze, for several seconds. The target child/elder <u>must not look at</u> another child/elder present in the activity. • Example: -looking vacantly into space in a seat.
W3. Talks to self	• Definition: A child/elder mutters to him/herself. • Example: -stop participating in the activity and talking to him/herself.
W4. Sits with folded arms or fingers	• Definition: A child/elder occupies himself/herself in watching the activity or interaction, but appears <u>unwilling</u> to engage in the

	activity. If a child/elder engages in the activity, the category either "Sociableness" or "Active Attention" can be used in consideration of certain evidence related to any one of the behaviors in those codes. • Example: -watching others participation (e.g., activity, child, elder) but not entering into the activity or interaction.
Category 3: Comfort As a prosocial mode, the comfort behavior category is defined as sympathetic action that is caring, soothing, and supporting. An elder displays considerate action physically or verbally. Comfort-related behaviors include placing a child in the lap and consoling a child. The emotional status of a child is important to distinguish the comfort behavior from the affection behavior. If a sympathetic action is given to a child who is uncomfortable or nervous, the code "Consoles a child" should be used. On the other hand, the Affection behavior should be coded when friendly physical contact without speech is given toward a child who seemingly is not sad or nervous. However, the behavior "Places a child in lap" can occur regardless of emotional status of a child.	
C1. Places a child in lap	• Definition: An elder holds a child in his/her lap as an expression of caring. • Example: -holding a child in lap.
C2. Consoles a child	• Definition: An elder makes a child feel less sad, disappointed, or upset by comforting verbally or physically. The target child must show some evidence of nervousness or unhappiness. • Examples: -patting on the shoulder of a sad child. -soothing a crying child. -wiping a child's tears. -saying kind things to a child (i.e., "It is going to be fine.").
Category 4: Affection As a prosocial mode, the Affectionate behavior category is defined as socially- emphatic action that can be interpreted as friendly. A child/elder displays positive physical contacts. Behaviors in the Affectionate category include touching a child/elder and hugging with a child/elder. Affectionate behavior is distinguished from the Sociable behavior category by the absence of verbal expressions. Affectionate behavior involves physical contact, but must not be accompanied by speech. If a target child/elder speaks or is spoken to in addition to, then the behaviors related to the "Sociable category" should be coded. The emotional state of a target child/elder is important in distinguishing Affectionate behaviors from the behavior, Consoling a child (C12). In order to code Affectionate, the target child cannot appear nervous or sad.	
A1. Touches child/elder	• Definition: A child/elder comes into physical contact with another child/elder through the use of the hand or fingers, expressing gentle and loving feelings. Tapping is an attention seeking behavior so that the code "Invites child/elder into activity or interaction (C17)" should be used. • Examples: -friendly patting on the shoulder or the back. -holding hands tenderly. -friendly touching child/elder's hand without speech.
A2. Hugs with child/elder	• Definition: A child/elder embraces arms around and holds closely with affection. • Example: -giving a big hug to a child in a friendly manner.
Category 5: Happiness	

As a prosocial mode, the happiness behavior category is defined as joyful affect behavior that occurs as exchanges of social interaction. A child/elder displays pleased facial or vocal behavior and/or gestures. Characteristic behaviors include smiling at child/elder, laughing with child/elder, clapping, and singing.	
H1. Smiles at child/elder	• Definition: A child/elder expresses pleasure, favor, amusement, or joy, characterized by an upward curving of the corners of the mouth. This must be in the absence of vocal expressions.
H2. Laughs with child/elder	• Definition: A child/elder expresses mirth or joy by a series of inarticulate sounds, with the mouth open in a wide smile. This must be accompanied by vocal expressions.
H3. Claps	• Definition: A child/elder strikes the palms of the hands together as in applauding.
H4. Sings	• Definition: A child/elder makes a series of sounds or words in musical tones.
Category 6: Sociableness As a prosocial mode, the sociableness behavior category is defined as socially-inclusive action that is friendly and encouraging. A child/elder initiates, suggests, or directs activity or interaction as expressions of befriending and exploring. Sociable behaviors include inviting child/elder into activity/interaction, leading activity/interaction, praising child/elder, asking questions to child/elder, and answering questions. The sociable behavior can occur either as social overtures before an interaction starts or as social responses to a social target (e.g., child or elder).	
S1. Invites child/elder into activity or interaction	• Definition: A child/elder appeals or requests the presence or participation of child/elder into the activity and/or interaction verbally or physically. For example, if a child/elder initiates the conversion (not question), the invitation behavior should be coded. The behavior "Invites child/elder into activity or interaction" is social overture which must occur either before an interaction starts, as an introduction, or after the interaction stops, as a continuation. In the latter case, there must be some apparent evidence that a previous interaction stops. The invitation behavior can elicit three types of response; positive, neutral, and negative. Typical samples of the three types are "Is physically active with child/elder (C26)", "Avoids child/elder (C7)", and "Acts uninterested (C3)" respectively. • Examples: -attempting physical- or object-medicated contact (i.e., offering a toy to an elder). -tapping on a child's shoulder in order to get attention with speech. -giving a child a friendly tap on head in joyful manner without speech. -inviting a child to sit down on his/her seat in order to participate in the activity. -giving a positive engagement/invite into exercise toward a child (i.e., "Come on, play with us" or "Join exercise with us"). -giving a child a mild shushing in order to draw the child's attention into the ongoing activity. -attempting to joke around or to play around with child/elder.
S2. Asks questions to child/elder	• Definition: A child/elder uses words in seeking an answer. There must be question-typed verbal expressions. • Examples: -pointing out an object, saying "What is this?" -questioning with curious facials "Why do you sit in wheelchair?"

	or "Why do you have this?"
S3. Answers questions	• Definition: A child/elder responds in a spoken exchange of opinions, thoughts, and feelings. This behavior occurs after a social overture begins. • Example: -replying to a child, "I fell on the floor last night so that I need a wheelchair".
S4. Praises child/elder	• Definition: A child/elder expresses verbal encouragement and makes a social target child/elder feel cheerful. • Example: -verbally expressing positive affection toward a child on his/her behavior (i.e., "You did a good job" or "You are doing very well").
S5. Leads activity or interaction	• Definition: A child/elder guides an activity or mediate conflicts between children in a group. • Examples: -demonstrating taped instructions to child/elder. -preventing two children from having a severe conflict when one child showed an aggressive manner toward the other in an argument.
Category 7: Active Attention As a prosocial mode, the active attention behavior category is defined as mutual social behavior in positive exchanges of interactions. A child/elder displays positive interactions verbally or physically. Actively attentive behaviors include nodding head, leaning forward in a chair, imitating child/elder, observing child/elder, being physically active with child/elder, and acting exuberantly. In order to code, "Active Attention", mutual social behaviors occur positively after a social overture occurs. For example, if an elder accepts a toy presented by a child, the code "Active Attention" should be given to the elder.	
AA1. Observes child/elder	• Definition: A child/elder looks at a social target child/elder for a minimum of more than two seconds. • Examples: -watching attentively as a child is exercising. -observing particular groups of children and paying attention to something that takes place with them.
AA2. Nods head	• Definition: A child/elder lowers and raises the head as in a response from social overtures and agreement. • Example: -nodding the head when given a positive invite into the activity.
AA3. Leans forward in chair	• Definition: A child/elder bends upper body toward a social target (e.g., object, child, elder) by showing a feeling of interest, concerns, or curiosity. • Examples: -bending toward something interesting. -turning one's upper body toward a child.
AA4. Imitates child/elder	• Definition: A child/elder models himself/herself after the behavior, words, or actions of a social target child/elder. The imitated behavior must be related to a social target child/elder. • Examples: -copying someone's gestures in a friendly manner. -imitating someone's way of talking.
AA5. Acts exuberantly	• Definitions: A child/elder physically shows excessive behavior with full enthusiasm and joy. The exuberant behavior is

	distinguished from the "Active behavior (C26)" by independence and the degree of activeness. A child spontaneously shows joyful gestures as a part of the activity. Different children independently make similar joyful gestures. • Examples: -following instructions with one's own fun trying to see who works out the hardest and fastest. -showing joyful/excited behaviors which are self-authorized motions towards related activity (i.e., pretending to blow a trumpet when a sound of a trumpet is heard from a cassette tape). -diligently following instructions.
AA6. Is physically active with child/elder	• Definition: A child/elder gets involved in the activity and/or interaction with child/elder physically. In order to code, "Is physically active with child/elder", there must be some evidence of cooperative interaction (e.g., playing together with same toys) and the behavior can be accompanied by verbal expressions but not question-typed. • Examples: -stretching arms face-to-face in a friendly manner when an elder stretches his/her arm toward a child. -giving the same toy back and forth to each other continually after a child offers the toy to an elder.

APPENDIX L
OBSERVER TRAINING WORKSHEET

Observation Training Worksheet 1 Date:________________

Observation is an important means of answering specific questions related to human behavior. If you notice that a child spends most of his/her time wandering around talking to others, then observation is helpful in understanding the child's behavior in a given situation. To become a keen observer is to start looking carefully at what happens around you. In order to help you become more alert and accurate when you observe a given situation, try this task:

Part I: Observations of your present setting

> Procedure: Observe the setting where you are now and describe the scene as it is. Limit the time for this task to 5 minutes.

Setting: ___________________________________ Observer: ____________________

Observations

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

Part II: Reflection of your own observations

- How did you choose what to view?

Part III: Observations of a child and adult day care center

Procedure: View the photograph of an indoor scene in an intergenerational day care center. Make your observations, attempting to take the point of view of an older adult and then that of a teacher. Limit the time for the task to 5 minutes.

An older adult	A teacher
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

Observation Training Worksheet 2 Date:________________

In terms of observational techniques, time sampling and behavior mapping are major methods used to increase the reliability of observations. *Time sampling* is a technique which allows an observer to count the presence or frequency of certain behaviors listed in a checklist within a given time frame. The advantage of time sampling is to minimize both recording time and coding time by using predetermined behavioral categories. *Behavior mapping* is a useful technique for recording people's locations, movements, and patterns of space usage. To help you become familiar with these two observational techniques, try the series of tasks below.

Part I: Time Sampling Observation

Procedure: Select a child or a resident to observe in an exercise activity from the video. Observe what kinds of categorized behaviors occur and where the person moves within a 10-second time interval. Then, (1) use one tally mark on a given sheet for each time the categorized behaviors occur and (2) mark the person's location on the floor plan given during the next 10-second break. For example, if the resident you are watching talks to a child once and touches a child within the 10 seconds, give one tally mark (/) for each behavior.

Operational Definitions:

Items	Definitions
D1. Exhibits restlessness	A child/elder moves nervously and appears uncomfortable in activity or interaction.
D2. Acts disinterested	A child/elder shows verbally or physically indifferent behavior that can be interpreted as being bored with the activity.
D3. Get distracted	A child/elder constantly turns his/her attention to something of momentary interest that is not a part of the activity or interaction with other in the activity.
D4. Appears drowsy	A child/elder appears to be falling asleep/ sleepy.
W1. Avoids child/elder	A child/elder does not overtly participate in the activity or interaction.
W2. Stares blankly into space	A child/elder looks at no specific target with a steady, often wide-eyed gaze, for several seconds.
W3. Talks to self	A child/elder mutters to him/herself.
W4. Sits with arms or fingers folded	A child/elder occupies himself/herself watching the activity or interaction, but appears unwilling to engage in the activity.
C1. Places a child on lap	An elder holds a child on his/her lap as an expression of caring.
C2. Consoles a child	An elder makes a child feel less sad, disappointed, or upset by offering verbally or physically comforting actions.
A1. Touches child/elder	A child/elder comes into physical contact with another child/elder through the use of the hand or fingers, with gentle and loving touches/gestures.
A2. Hugs child/elder	A child/elder comes into physical contact with another child/elder through the use of the hand or fingers, with gentle and loving touches/gestures.
H1. Smiles at child/elder	A child/elder expresses pleasure, favor, amusement, or joy, characterized by an upward curving of the corners of the mouth.

H2. Laughs with child/elder	A child/elder expresses mirth or joy by a series of articulated sounds, with the mouth open in a wide smile.
H3. Claps	A child/elder strikes the palms of both hands together as in applauding.
H4. Sings	A child/elder makes a series of sounds or words in musical tones.
S1. Invites child/elder into activity or interaction	A child/elder verbally or physically appeals or requests the presence or participation of child/elder into the activity and/or interaction.
S2. Asks child/elder questions	A child/elder uses words in seeking an answer.
S3. Answers questions	A child/elder responds in a spoken exchange of opinions, thoughts, and feelings.
S4. Praises child/elder	A child/elder expresses verbal encouragement and makes a socially- targeted child/elder feel cheerful.
S5. Leads activity or interaction	A child/elder guides an activity or mediates a conflict between children in a group.
AA1. Observes child/elder	A child/elder looks at a socially targeted child/elder for a minimum of two seconds.
AA2. Nods head	A child/elder lowers and raises the head in response to social overtures and also to indicate agreement.
AA3. Leans forward in chair	A child/elder bends upper body toward a social target (e.g., object, child, elder) and exhibits interest, concern, or curiosity.
AA4. Imitates child/elder	A child/elder models himself/herself after the behavior, words, or actions of a socially targeted child/elder.
AA5. Acts exuberantly	A child/elder physically shows excessive behavior with much enthusiasm and joy.
AA6. Is physically active with child/elder	A child/elder physically takes part in the activity and/or interaction alongside child/elder.

The list of codes for this measurement is as follows:

Gender	With Whom	
B-Boy	BC-Between Children	R-with a Resident
G-Girl	BR-Between Residents	
FR-Female Resident	CR-between a Child and a Resident	
MR-Male Resident	C-with a Child	

Observer:_________________________ Activity Date:_____________ Interval:____________
Child/Elder's Name:________________ Gender: B G FR MR
Seat Number:______________________ With Whom: BC BR CR C R

Behavioral Categories	**1st 5min**	**2nd 5min**	**3rd 5min**	**Total**
D1. Exhibits restlessness				
D2. Acts disinterested				
D3. Get distracted				
D4. Appears drowsy				
W1. Avoids child/elder				
W2. Stares blankly into space				
W3. Talks to self				
W4. Sits with arms or fingers folded				
C1. Places a child on lap				
C2. Consoles a child				
A1. Touches child/elder				
A2. Hugs child/elder				
H1. Smiles at child/elder				
H2. Laughs with child/elder				
H3. Claps				
H4. Sings				
S1. Invites child/elder into activity or interaction				
S2. Asks child/elder questions				
S3. Answers questions				
S4. Praises child/elder				
S5. Leads activity or interaction				
AA1. Observes child/elder				
AA2. Nods head				
AA3. Leans forward in chair				
AA4. Imitates child/elder				
AA5. Acts exuberantly				
AA6. Is physically active with child/elder				
Total				
Comments (other behaviors, special circumstances, distractions, etc)				

Observation Training Worksheet 3 Date:________________

An important aspect of time sampling is how reliable data can be established. *Reliability* refers to the extent of agreement between two or more observations made by different observers. Inter-rater reliability is measured when two or more observers record behaviors of the same child in the same situation and check to see how much their recordings match. It is very important that inter-rater reliability be high (80% or above) in time sampling.

Part I: Time-Sampling Reliability

Procedure: Follow these steps.

1. Count the total tallies in a category
2. Count the number of agreements in the tallies
3. Divide the number of agreements by the total number of tallies
4. Multiply the result by number of observers

Behavioral Categories	**Observer 1**	**Observer 2**	**Agreement**
D1. Exhibits restlessness			
D2. Acts disinterested			
D3. Get distracted			
D4. Appears drowsy			
W1. Avoids child/elder			
W2. Stares blankly into space			
W3. Talks to self			
W4. Sits with arms or fingers folded			
C1. Places a child on lap			
C2. Consoles a child			
A1. Touches child/elder			
A2. Hugs child/elder			
H1. Smiles at child/elder			
H2. Laughs with child/elder			
H3. Claps			
H4. Sings			
S1. Invites child/elder into activity or interaction			
S2. Asks child/elder questions			
S3. Answers questions			
S4. Praises child/elder			
S5. Leads activity or interaction			
AA1. Observes child/elder			
AA2. Nods head			
AA3. Leans forward in chair			
AA4. Imitates child/elder			
AA5. Acts exuberantly			
AA6. Is physically active with child/elder			
TOTAL			

(1). Total tallies
(2). Agreement
(3). Divide (2) by (1)
Multiply (3) by # of observers

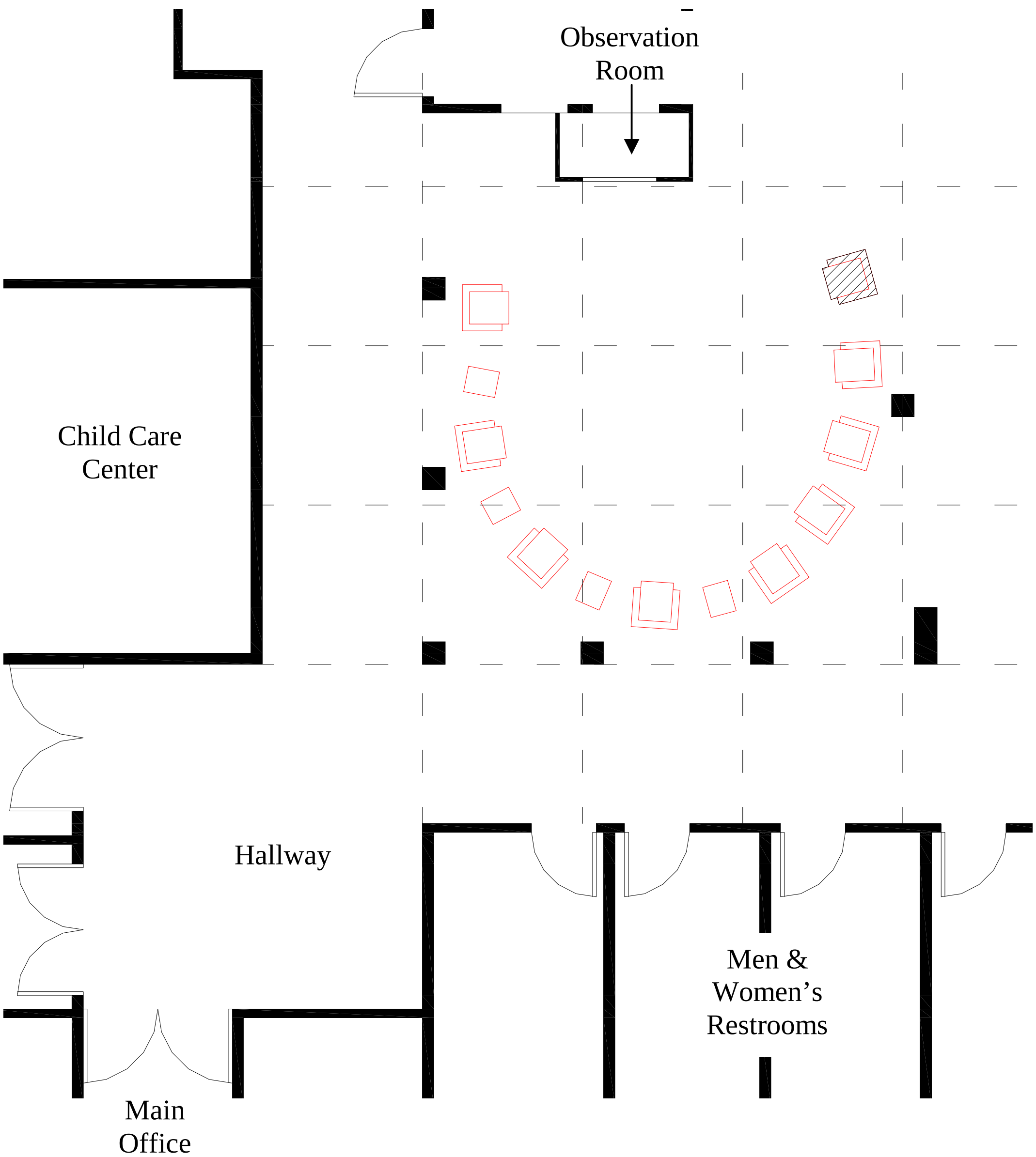
Part II: Reflection of your time-sampling

- If inter-rater reliability is not high enough (80% or above), let's find the reason and solutions for the problem.

Part III: Behavior Mapping

Observer:_______________________________ Date:________________ Time:________________

Name of a Participant:____ Gender:_______________



APPENDIX M

RESIDENT INTERVIEW PROTOCOL

Introduction:
I would like to ask you about yourself and your life at Freedom House, especially about how you get along with children.

Name of Interviewee: ______________________________ Date: ____________________

Intergenerational Experience in Family

1. Please list your family members for me. (note grandchildren)

2. Do you have grandchildren? If so, tell me something about your grandchildren. (What kinds of activities do they like? How old are they? Are they boys or girls? etc)

3. Are you close to your grandchildren?

Elder-Child Interactions

1. Do you like to play with a group of children? (or *If there were a group of children and people who live in Freedom House playing together, would you usually join them?*)

2. Do you like to talk to children during activity times? If so, where would the child (children) sit?

3. Are you very active in exercise programs with children? (Or *How active are you in exercise programs with children?*)

4. What type of child do you like to sit beside and play with? (note the number, gender, name, etc)

Activity Room Environment

1. (Showing 4 pictures) - Which of the following spaces would you prefer to play in with children? Please, put these in order from the one you like most to the least preferred. (Note the order of pictures)

2. (Pointing out the favorite picture) - What do you like most about this picture?

3. What is it about the space in this picture that would make you feel comfortable playing with children? (Or *Does it make it any easier for you to play with children?*) How so?

4. (Pointing out the least favorite picture) What do you **not like** about the space in this picture?

5. What is it about the space in this picture that would make it harder for you to play with children? How so?

6. Where is your favorite spot in the activity room to play with a group of children?

7. Why do you like that spot the most?

APPENDIX N

CHILD INTERVIEW PROTOCOL

Introduction:
I would like to ask you about yourself and your life at Freedom House, especially about how you get along with older adults.

Name of Interviewee: ______________________________ Date: ____________________

Intergenerational Experience in Family

1. Tell me about your family. (Or *Do you have brothers, sisters, or grandparents?*)

2. Tell me something about your grandparents. (What kinds of activities do they like, etc)

3. Do you get to see your grandparents every day or every week?

Elder-Child Interactions

1. Do you have fun playing with people that are the same age as your grandparents? If so, how many times a week?

2. Do you like to talk to people your grandparent's age when you are playing? If so, where would the older adult(s) sit?

3. Which of these people who are your grandparent's age do you like to sit beside and play with? (If so, please note the number, gender, name, etc)

Activity Room Environment

1. (Showing 4 pictures) - Which of the following rooms would you like to play in with older people? Please, put these in order from the one you like most to the least liked. (Or *Which one do you like the most? What is the next you like?*)

2. (Pointing out the favorite picture) - What do you like most about this picture?

3. What is it about the room in this picture that would make it easy to play with older people? How so? (Note observations)

4. (Pointing out the least favorite picture) What do you **not like** about the room in this picture?

5. What is it about the room in this picture that would make it hard to play with older people? How so? (Note observations)

6. Where is your favorite spot in the activity room to play with a group of people your grandparent's age?

7. Why do you like that spot the most?

APPENDIX O

ROTATED COMPONENT MATRIX WITH 28 ITEMS

	Component					
Items	1	2	3	4	5	6
Leads activity	0.887					
Invites child/elder into activity	0.841					
Runs (skips, hops, jumps) a lot	0.764					
Be physically active with child/elder	0.713				0.492	
Answers questions	0.695		0.454			
Sits/stands with folded arms	*0.580*					
Praises child/elder	0.551		0.540			
Imitates child/elder	0.420			0.407		
Appears drowsy		0.954				
Stares blankly into space		0.905				
Looks down		0.784				
Acts disinterested		0.731				
Exhibits restlessness		0.657				
Sings while playing			0.818			
Observes child/elder			0.726			
Laughs at child/elder			0.723			
Asks questions to child/elder			0.654			
Places a child in lap				0.808		
Consoles a child				0.774		
Comforts upset child				0.735		
Avoids child/elder				*0.561*		
Talks to self		0.436		*0.557*		
Claps				0.504		-0.503
Nods head					0.880	
Leans forward in chair					0.738	
Hugs with child/elder						0.746
Touches child/elder						0.711
Smiles at child/elder					0.532	0.590

Notes: 1. The output for variables is listed in order of the size of their factor loadings. Factor loadings less than 0.4 are not displayed. As a general rule of thumb, factor loadings greater than 0.4 represent significant values (Field, 2005).
2. The counter-intuitive behaviors listed under each factor are italicized.

APPENDIX P

RESULTS OF THE FACTOR ANALYSIS

Principal Component Factor Analysis for Set One: Disengagement

Correlation Matrix:

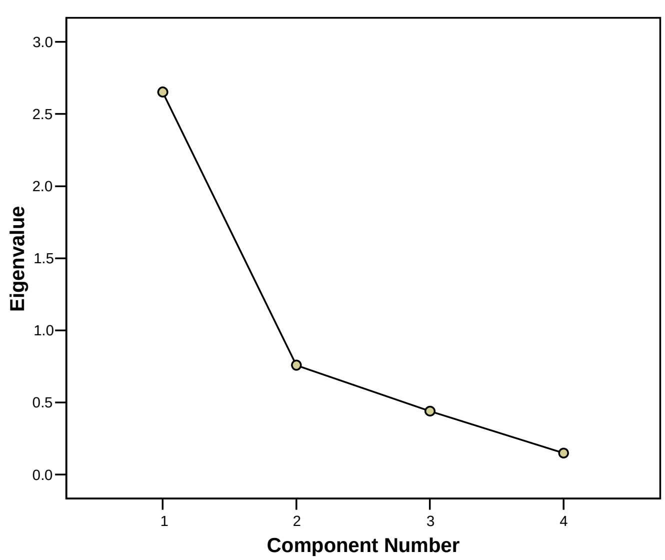
		Looks down	Appears drowsy	Acts disinterested	Exhibits restlessness
Correlation	Looks down	1.000	.751	.451	.283
	Appears drowsy	.751	1.000	.598	.627
	Acts disinterested	.451	.598	1.000	.562
	Exhibits restlessness	.283	.627	.562	1.000
Sig. (1-tailed)	Looks down		.000	.009	.077
	Appears drowsy	.000		.000	.000
	Acts disinterested	.009	.000		.001
	Exhibits restlessness	.077	.000	.001	

Total Variance Explained:

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.652	66.307	66.307	2.652	66.307	66.307
2	.759	18.970	85.278			
3	.440	10.995	96.272			
4	.149	3.728	100.000			

Extraction Method: Principal Component Analysis.

Scree Plot:



Component Matrix:

	Component 1
Appears drowsy	.924
Acts disinterested	.800
Looks down	.767
Exhibits restlessness	.754

Extraction Method: Principal Component Analysis.
a 1 components extracted.

Reliability Statistics:

Cronbach's alpha = .818 (for four items)

Item-Total Statistics:

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Looks down	10.33	19.462	.566	.811
Appears drowsy	10.33	19.308	.839	.692
Acts disinterested	10.85	19.285	.637	.773
Exhibits restlessness	10.26	21.046	.561	.807

Principal Component Factor Analysis for Set Two: Withdrawal

Correlation Matrix:

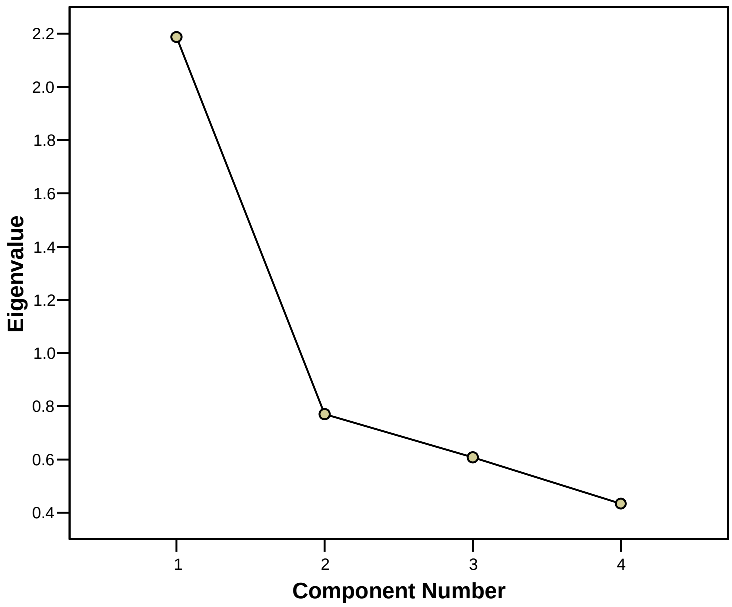
		Stares blankly into space	Sits/stands with folded arms	Avoids child/elder	Talks to self
Correlation	Stares blankly into space	1.000	.274	.393	.486
	Sits/stands with folded arms	.274	1.000	.261	.427
	Avoids child/elder	.393	.261	1.000	.503
	Talks to self	.486	.427	.503	1.000
Sig. (1-tailed)	Stares blankly into space		.083	.021	.005
	Sits/stands with folded arms	.083		.094	.013
	Avoids child/elder	.021	.094		.004
	Talks to self	.005	.013	.004	

Total Variance Explained:

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.188	54.699	54.699	2.188	54.699	54.699
2	.770	19.252	73.951			
3	.608	15.199	89.149			
4	.434	10.851	100.000			

Extraction Method: Principal Component Analysis.

Scree Plot:



Component Matrix:

	Component 1
Talks to self	.840
Avoids child/elder	.737
Stares blankly into space	.733
Sits/stands with folded arms	.634

Extraction Method: Principal Component Analysis.
a 1 components extracted.

Reliability Statistics:

Cronbach's alpha = .688 (for four items)

Item-Total Statistics:

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Stares blankly into space	14.63	18.088	.474	.621
Sits/stands with folded arms	10.89	14.641	.406	.712
Avoids child/elder	15.89	20.718	.480	.637
Talks to self	13.70	16.524	.627	.527

Principal Component Factor Analysis for Set Three: Comfort/Affection

Correlation Matrix:

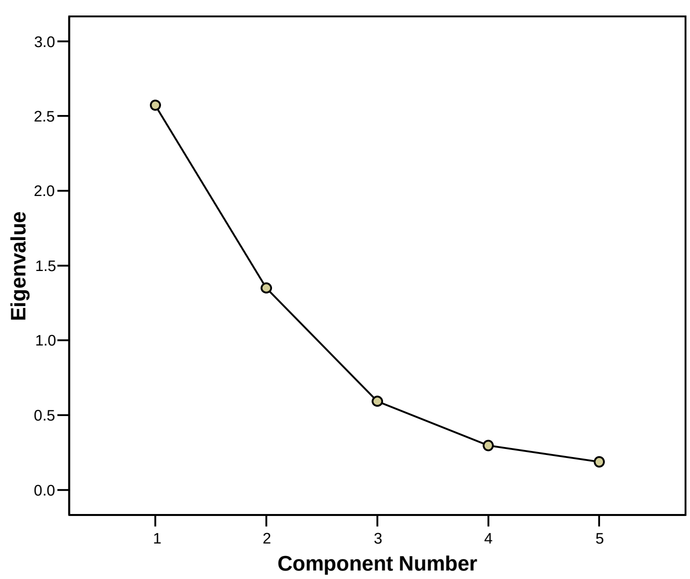
		Touches child/elder	Hugs with child/elder	Places a child in lap	Consoles a child	Comforts upset child
Correlation	Touches child/elder	1.000	.654	.218	.168	.018
	Hugs with child/elder	.654	1.000	.471	.379	.093
	Places a child in lap	.218	.471	1.000	.802	.446
	Consoles a child	.168	.379	.802	1.000	.488
	Comforts upset child	.018	.093	.446	.488	1.000
Sig. (1-tailed)	Touches child/elder		.000	.143	.206	.464
	Hugs with child/elder	.000		.008	.028	.326
	Places a child in lap	.143	.008		.000	.011
	Consoles a child	.206	.028	.000		.006
	Comforts upset child	.464	.326	.011	.006	

Total Variance Explained:

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.572	51.444	51.444	2.160	43.208	43.208
2	1.350	26.998	78.441	1.762	35.233	78.441
3	.593	11.856	90.298			
4	.297	5.934	96.232			
5	.188	3.768	100.000			

Extraction Method: Principal Component Analysis.

Scree Plot:



Rotated Component Matrix:

	Component	
	1	2
Consoles a child	.880	
Places a child in lap	.846	
Comforts upset child	.780	
Touches child/elder		.903
Hugs with child/elder		.881

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 3 iterations.

Reliability Statistics for 'Comfort' factor:

Cronbach's alpha = .810 (for three items)

Item-Total Statistics:

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Places a child in lap	19.00	9.692	.701	.720
Consoles a child	18.33	13.615	.792	.652
Comforts upset child	18.74	13.815	.556	.839

Reliability Statistics for 'Affection' factor:

Cronbach's alpha = .749 (for two items)

Item-Total Statistics:

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Touches child/elder	10.15	1.015	.654	.(a)
Hugs with child/elder	9.15	2.375	.654	.(a)

a The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Principal Component Factor Analysis for Set Four: Happiness

Correlation Matrix:

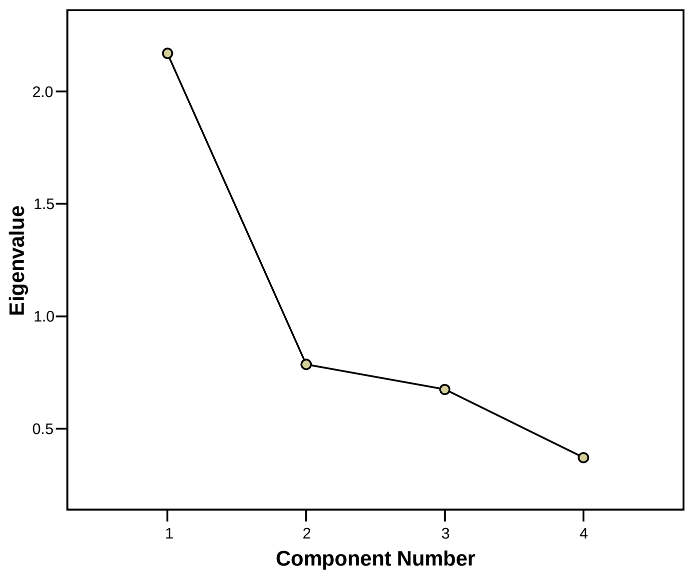
		Smiles at child/elder	Laughs at child/elder	Claps	Sings while playing
Correlation	Smiles at child/elder	1.000	.304	.230	.398
	Laughs at child/elder	.304	1.000	.398	.615
	Claps	.230	.398	1.000	.344
	Sings while playing	.398	.615	.344	1.000
Sig. (1-tailed)	Looks down		.000	.009	.077
	Appears drowsy	.000		.000	.000
	Acts disinterested	.009	.000		.001
	Exhibits restlessness	.077	.000	.001	

Total Variance Explained:

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.170	54.242	54.242	2.170	54.242	54.242
2	.785	19.637	73.879			
3	.674	16.851	90.730			
4	.371	9.270	100.000			

Extraction Method: Principal Component Analysis.

Scree Plot:



Component Matrix:

	Component 1
Sings while playing	.832
Laughs at child/elder	.819
Claps	.646
Smiles at child/elder	.623

Extraction Method: Principal Component Analysis.
a 1 components extracted.

Reliability Statistics:

Cronbach’s alpha = .711 (for 4 items)

Item-Total Statistics:

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Smiles at child/elder	25.48	23.567	.389	.714

Laughs at child/elder	26.81	14.926	.612	.571
Claps	27.04	18.575	.420	.699
Sings while playing	26.56	15.949	.619	.567

Principal Component Factor Analysis for Set five: Sociableness

Correlation Matrix:

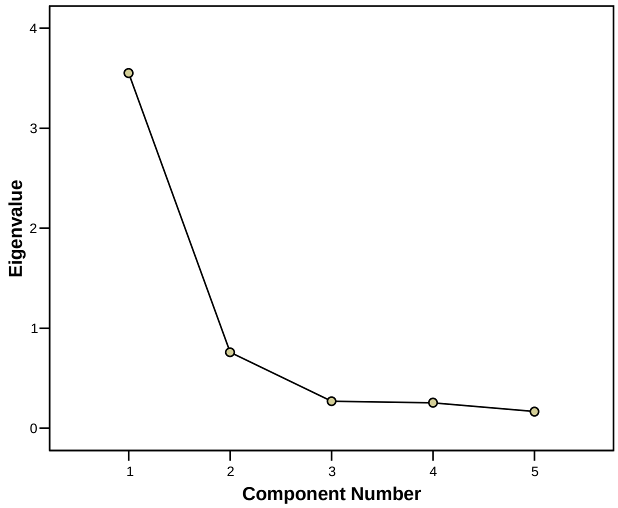
		Invites child/elder into activity	Leads activity	Praises child/elder	Asks questions to child/elder	Answers questions
Correlation	Invites child/elder into activity	1.000	.750	.546	.499	.558
	Leads activity	.750	1.000	.605	.487	.601
	Praises child/elder	.546	.605	1.000	.802	.749
	Asks questions to child/elder	.499	.487	.802	1.000	.764
	Answers questions	.558	.601	.749	.764	1.000
Sig. (1-tailed)	Invites child/elder into activity		.000	.002	.004	.001
	Leads activity	.000		.000	.005	.000
	Praises child/elder	.002	.000		.000	.000
	Asks questions to child/elder	.004	.005	.000		.000
	Answers questions	.001	.000	.000	.000	

Total Variance Explained:

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.550	71.009	71.009	3.550	71.009	71.009
2	.759	15.185	86.194			
3	.269	5.380	91.574			
4	.255	5.101	96.675			
5	.166	3.325	100.000			

Extraction Method: Principal Component Analysis.

Scree Plot:



Component Matrix:

	Component 1
Praises child/elder	.886
Answers questions	.878
Asks questions to child/elder	.850
Leads activity	.810
Invites child/elder into activity	.786

Extraction Method: Principal Component Analysis.
a 1 components extracted.

Reliability Statistics:

Cronbach's alpha = .893 (for 5 items)

Item-Total Statistics:

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Invites into activity	37.67	23.923	.690	.882
Leads activity	37.93	22.764	.720	.876
Praises child/elder	37.59	22.481	.789	.858
Asks questions to child/elder	37.30	25.986	.744	.873
Answers questions	37.52	23.875	.783	.861

Principal Component Factor Analysis for Set Six: Active Attention

Correlation Matrix:

		Nods head	Leans forward	Imitates child/elder	Observes child/elder	Be active	Runs a lot
Correlation	Nods head	1.000	.652	.383	.265	.467	.239

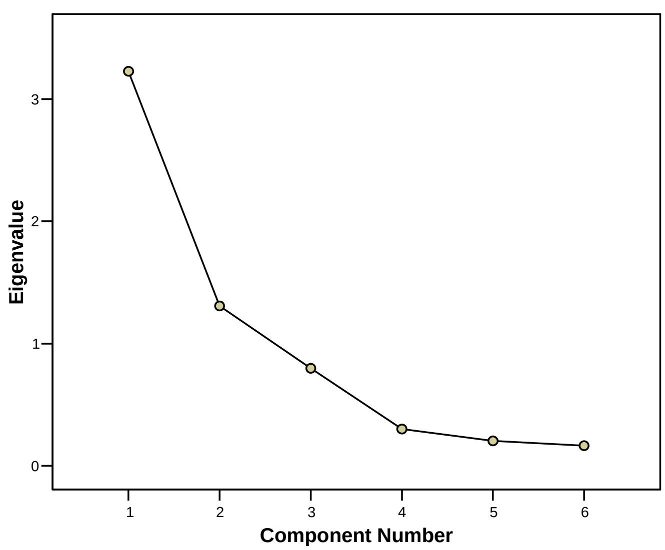
	Leans forward in chair	.652	1.000	.243	.046	.556	.322
	Imitates child/elder	.383	.243	1.000	.668	.583	.703
	Observes child/elder	.265	.046	.668	1.000	.211	.435
	Be physically active	.467	.556	.583	.211	1.000	.745
	Runs a lot	.239	.322	.703	.435	.745	1.000
Sig.	Nods head		.000	.027	.096	.008	.120
(1-tailed)	Leans forward in chair	.000		.116	.412	.002	.055
	Imitates child/elder	.027	.116		.000	.001	.000
	Observes child/elder	.096	.412	.000		.151	.013
	Be physically active	.008	.002	.001	.151		.000
	Runs a lot	.120	.055	.000	.013	.000	

<u>Total Variance Explained:</u>

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.227	53.790	53.790	3.227	53.790	53.790
2	1.307	21.784	75.575			
3	.798	13.292	88.866			
4	.300	5.003	93.870			
5	.203	3.382	97.252			
6	.165	2.748	100.000			

Extraction Method: Principal Component Analysis.

<u>Scree Plot:</u>



<u>Component Matrix:</u>

	Component 1
Imitates child/elder	.833
Observes child/elder	.580

Runs (skips, hops, jumps) a lot	.818
Leans forward in chair	.623
Nods head	.658
Is physically active with child/elder	.840

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 3 iterations.

Reliability Statistics:

Cronbach's alpha = .825 (for 6 items)

Item-Total Statistics:

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Nods head	39.54	46.178	.527	.810
Leans forward in chair	39.50	47.700	.475	.820
Imitates child/elder	40.23	39.465	.726	.767
Observes child/elder	41.35	47.595	.433	.829
Be physically active	40.00	39.680	.712	.770
Runs a lot	40.54	42.018	.691	.776

VITA

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2006	Doctor of Philosophy in Architecture, Texas A&M University
2001	Master of Architecture, University of Illinois at Urbana-Champaign
1994	Bachelor of Engineering, Gyeong-Sang National University, Korea

PUBLICATIONS & PRESENTATIONS

Strickland, C. (2003). *The annotated arch: A crash course in the history of architecture*. (S. Yang, M. Seo, N, Cho, & M. Kim, Trans. To Korean). Seoul, Korea: Yekyong. (Original work published 2001)

Seo, M. (2001). *The richness of the past and the promise of the future-Housing and child care center for the intergenerational family*. Unpublished master's design thesis, University of Illinois, Urbana-Champaign, IL.

Presenter, "Therapeutic and developmental design for intergenerational environments", AIA/AAH 2006 Fall Conference, Miami, FL (National).

Presenter (with M. Kaplan, V. Rosebrook, M. Layne, C. Murray), "Intergenerationally enriched environments: Insights from research and practice", Generation United 13th International Conference, Washington, DC, 2005 (International).

Presenter, "The therapeutic and developmental design: The relationship between spatial enclosure and elder-child social interaction", Environmental Design Research Association, Vancouver, 2005 (International).

AWARDS & LICENSE

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2002	AIA/Central Illinois Chapter Award, AIA/Central Illinois
2001-2002	Architecture Graduate Fellowship, University of Illinois
2001	2000-2001 Rotary Foundation Ambassadorial Scholarship, USA Rotary
1999-2001	Edwin A. Hornor Graduate Fellowship, University of Illinois
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WORK EXPERIENCE

2002-2005	Research Assistant, Texas A&M University
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