423

A Study on Spatial Characteristics of Residential Location and Resident's Level of Helping Behavior

SOO HYUN PARK & YOUNG OOK KIM

SEJONG UNIVERSITY, SEOUL, REPUBLIC OF KOREA

ABSTRACT

Social interactions with the neighbors lead to a sense of community. Sense of community is an important part of the quality of life in a residential area and is considered a crucial issue in neighborhood planning. Several researchers have focused on examining the relationship between physical characteristics of residential environment and the residents' helping behaviors. In the field of space syntax, the characteristics of spatial configuration in residential space have been reported to be closely related to the pattern of social interactions among residents (Kim and Kim, 2020; Cho and Kim, 2013). Given the link between social interaction and helping behavior discussed in previous research, a hypothesis can be posited that there is also a relationship between the characteristics of spatial configuration in a residential area and patterns of helping behavior.

In this context, this study examined the relationship between the spatial characteristics of residential locations in a residential complex and the difference in the level of helping behavior. The study was conducted in public rental apartments in Bundang District in the City of Seongnam. The research 1) analyzed the spatial configuration of the study site using space syntax methodology, 2) conducted "lost letter" experiment and recorded residential locations (addresses) of the subjects, and 3) derived behavioral characteristics of the residents depending on spatial characteristics of their residential locations. Based on this data, varying levels of helping behaviors are explained.

The results of this study indicate that there is a negative correlation between the floor level of the residential location, the building's spatial configuration accessibility and the level of helping behavior displayed by the residents. This study empirically demonstrated that the possibility of social interactions derived from the spatial configuration of the residential space is related to the sense of community represented by the helping behavior of the residents.

KEYWORDS

Helping Behavior, Spatial Characteristics, Residential Complex, Residential Location, Spatial Configuration

1 INTRODUCTION

A sense of community in a residential area has been accepted as a positive force that can alleviate social pathology, restore local vitality, and improve residents' lives. In the fields of architecture, urban planning, and sociology, a residential community has been presupposed locality, and communal living and communal areas are essential to forming the community (MacIver, 1917). However, conflict within the residential area that can trace its roots to the degradation of a sense of community is becoming an important social issue, and a number of recent studies point to the restoration of a sense of community as the starting point for addressing this issue (Lee and Shin, 2009; Yun and Oh, 2014). In this context, the relevant studies pay attention to 'altruism' as a factor closely related to a sense of community, and examine helping behavior from a behavioral perspective. These studies argue that interactions in which individuals help each other mutually improve satisfaction within group and make the community more actively (Jin et al., 2018; Park, 2010). As such, a sense of community for the membership group is related to the helping behavior that manifests itself in social relationships. In particular, the sense of community within a person's residential space where one spends a substantial amount of time on a daily basis is directly connected the person's quality of life (Lee, 2009). Hence, the altruism of the residents is an important subject, and this study will examine the helping behavior of residents in their residential space.

A number of studies have examined the relationship between interactions and helping behaviors. Interactions in social relationships have been shown to be related to altruism (Kim and Kim, 2015), and the act of helping each other mutually in proximity has been linked to a positive impact on the decision-making process to help others (Lee, 2006). These research results suggest that interaction between residents in their residential area is related to the manifestation of helping behaviors. On the other hand, space syntax explains interactions from a spatial configuration perspective, and showed that there exists a close relationship between individuals' interactions that lead to the formation of relationships and spatial characteristics (Hillier, 1996; Hillier and Hanson, 1984). In particular, interactions between residents are closely related to spatial characteristics such as an apartment complex or dense residential area. In addition, Baum et al. (1975), Kim and Kim (2020) studied how the spatial layout of residential space can lead to different level of attitudes toward interactions with other residents. In sum, the spatial configuration of residential space is an important factor that can predict movement of individuals and influence social interactions. Finally, there are additional studies that observed the relationship between physical characteristics such as the floor on which residents live and the helping behavior. Given the influence of space on interactions between individuals, more

emphasis should be placed on the relationship between 'spatial characteristics of residential location' and 'resident's helping behavior'. However, there are few studies that focus on the factors behind altruism of residents in apartment complexes by examining the relationship between the spatial configuration (which is closely related to interactions of individuals) and the helping behaviors.

Using the 'lost letter technique'[1], this study investigates the difference in the level of helping behaviors of individuals depending on the spatial characteristics of their residential locations. The public rental apartments in Bundang District in the City of Seongnam were studied, with the individual residents serving as the unit of analysis. Specifically, the floor level of the residence and quantitative analysis of spatial configuration for the building location were examined to determine how the level of helping behavior varied.

This study proceeded as follows. First, the physical and environmental characteristics of the study area were surveyed, and the spatial configuration of the apartment complex was quantitatively analyzed using the space syntax. Second, the 'lost letter experiment' was conducted and the residential locations of the subjects were determined. Third, the spatial characteristics of the individual residents within the complex were analyzed, and the level of helping behavior depending on the spatial characteristics of their residential locations were examined. Based on the findings, housing complex planning strategies for improving the sense of community and promoting interactions among residents are presented.

2 LITERATURE REVIEW

2.1 Studies on the Spatial Configuration of Residential Area and Interactions among Residents

A number of studies have shown that there exists a relationship between the spatial configuration of residential location and interactions among residents. In particular, the characteristics of spatial configuration in apartment complexes or dense residential areas have been shown to be closely linked to interactions between residents (Kim and Kim, 2020; Cho and Kim, 2013). Other studies have focused on the relationship between the level of attitudes toward interaction and the spatial configuration of residential areas. After examining the relationship between the level of trust among residents and accessibility to residential space of individuals in low-rise residential area, Jang (2019) reported that the level of trust declined in areas with better accessibility. Individuals who lived in locations with lower accessibility showed higher level of trust and also had more willingness to engage in more personal interactions.

[1] The Lost Letter Experiment, first tried by American psychologist Stanley Milgram (1933~1984), is a methodology used to measure how helpful people are to strangers and their attitudes (e.g. Bickman et al., 1973; Amato, 1983; Holland et al., 2012; Hellmann et al., 2015).

These results indicate that the spatial layout of residential space can influence the level of attitudes toward interactions with other residents, which has also been confirmed in other studies. For example, Kim and Kim (2020) analyzed the social networks of individuals depending on accessibility of their residential space in a permanent rental apartment complex. It concludes that people who live in space with better accessibility experiences more unnecessary contact with other residents, and as a result, tend to avoid interactions with others. On the other hand, individuals who live in space with lower accessibility experience feelings of isolation and alienation, and often seek interactions with other residents intentionally. In a similar context, Baum et al. (1975) analyzed the relationship between accessibility and interactive behavior of university dormitory residents. Again, students who lived in space with higher level of accessibility experienced more frequent encounters with other residents and a violation of privacy. They tended to avoid interaction with others, maintain distance with others, and participate in collaborative activities at a lower level. These studies have confirmed that the spatial configuration of residential space, which is an important factor influencing social interactions, determines the movement of the individuals, and is related to attitudes of the residents toward interaction with others.

2.2 Studies on the Physical Characteristics of Residential Area and Interactions

While high-rise residential buildings have advantages such as better protection of privacy and a quiet environment away from the street noise outside, more attention needs to be paid to the negative impact on the residents - including the weakening of social relationships and interactions with others (Gifford, 2007). Multiple studies show that, when compared to lower-floor residents, upper-floor residents of high-rise buildings are less interested in social relationships (Ginsberg and Churchman, 1985), have a more negative attitude (Korte and Huismans, 1983), and tend to interact with people outside the residential complex rather than with neighbors inside the complex (Sinnett et al., 1972). In the same context, the residents of the lower floors enjoy more outside activities and more active social relationships, and gain psychological calm from interactions with the outside environment. Kim et al. (2015) reported that the residents of the lower floors had a broader definition of ‘neighbors’, were more psychologically stable, and expressed high satisfactions about interactions with neighbors in the complex.

In addition, a number of studies have been conducted to examine the relationship between physical characteristics of the residential environment and the helping behavior (Nadler et al., 1982; Bickman et al., 1973). In a dormitory environment, it was found that low-rise buildings in low-density residential setting have a positive effect on the residents’ interactions with others and also the helping behavior. Nadler et al. (1982) conducted a survey of students who live in the dormitory, asking about their willingness to either help other students themselves or call others to help in various realistic situations. They discovered that the students on the lower floors tended to help each other more frequently than students on the upper floors. The same results were

confirmed in Bickman et al. (1973)'s study, in which the 'lost letter experiment' was conducted. Letters were dropped in various locations throughout the dormitory, and students who lived on the lower floors and in the low-density dormitory demonstrated more helping behaviors.

As such, it was shown that the physical environment characteristics such as the floor on which a person lives can affect the helping behavior. However, while previous studies primarily focused on university dormitories, there is a need to examine the characteristics of helping behavior in a residential complex. In particular, the direct relationship between the spatial characteristics and the helping behavior in a residential complex has rarely been reported.

3 METHODOLOGY

3.1 Study Area

The study area is public rental apartment complexes, whose residents are mostly economically vulnerable population. Specifically, four public rental apartment complexes were selected in Bundang District, Seongnam City. They were all constructed in the 1990s and display similar housing forms and external environments. The first residents moved into the complexes between 1993 and 1996. Each complex includes 9 to 14 buildings, accommodating approximately 1,250 to 1,700 households. The highest buildings are between 15 and 21 stories, and the planned FAR (floor area ratio) is approximately 120% to 170%. The units are either permanent or 50-year public rental housing stocks.

3.2 Measuring the Helping Behavior of Residents: On-site 'Lost Letter' Experiment

The helping behavior of a resident is defined as an action taken by a resident to benefit others, without anticipating profit or reward for that action. To observe the 'helping behavior' of residents, a 'lost letter' experiment was conducted on-site, during which 'actions taken to pick up a letter on the ground in the residential complex to benefit a neighbor' were observed. These actions were measured according to the 5-level[2] helping behavior definition (Table 1). Level 5 demonstrates the highest level of helping behavior.

On-site experiment took place between June and August, 2021. To minimize the effect of any specific day of the week or time, the experiment was conducted throughout the morning and afternoon hours (outside peak commuting hours) on weekdays and weekends. The experiment was only conducted on non-rainy days with similar weather conditions. An equal number of experiments was conducted in the four apartment complexes in turn, and one observer was assigned to one site at a time.

[2] In an experiment that measured various pro-social behavior, Amato (1983) adopted a 6-point scale for evaluation based on the behaviors of test subjects when asked to participate: for example, stopping walking, participating in the experiment, and the level of conversation with the experimenter. In this study, 5-level evaluation criteria are used, defined by actions taken by the resident on the letter after perceiving it.

Table 1: 5-Level Helping Behavior of Residents

Level Definition		Behavior Description
Level 1	Perception Only	Perceives letter, but does not show interest in the letter. Passes by without stopping.
Level 2	Perception & Interest	Perceives letter, shows interest and stops to read the letter. But eventually passes by without picking up the letter.
Level 3	Perception & Indirect Response	Perceives letter, asks for assistance from other residents nearby, then leaves the letter on the ground and passes by.
Level 4	Perception & Passive Direct Response	Perceives letter, picks up the letter and places it in a nearby place where it could be safely found then passes by.
Level 5	Perception & Active Direct Response	Perceives letter, picks up the letter and head toward the management office to find the owner of the letter.

The experiment is conducted by dropping a 'lost letter,' an A4-size document envelope at the experiment location. The experiment observer stays away from the experiment location while observing the actions of the subject. Given that the experiment requires observation of the reaction of the subject, not everyone who passes by the experiment location during the same observing period can be included in the experiment. In other words, the unit of observation in this experiment is one person, recorded in discontinuous time coverage. For accurate measurement, only one person can participate in the experiment at a time.

First, the action of the subject toward the 'lost letter' is reviewed to determine if he/she perceived the letter on the ground. The attitude toward the letter is observed and carefully recorded only for those subjects who perceived the letter. In sum, a total of 1,416 experiments was conducted, and there were 1,089 valid experiments in which the subject perceived the 'lost letter'.

In the next step, the helping behavior of the subjects were measured and their residential locations (building number and floor level) were surveyed. Out of 1,089 residents, 138 provided their residential locations, and ultimately 120 residents were analyzed as part of valid sample.

3.3 Method of Spatial Configuration Analysis: Space Syntax

This study utilizes space syntax to analyze spatial configuration. First, a spatial configuration model is created for entire external space of the apartment complexes including the surrounding roads and the building entrances. The spatial configuration values for building entrances are calculated, which represent the spatial configuration characteristics of the residential location of a test subject. Specifically, this study uses segment angular analysis[3], a methodology based on space syntax theory. To conduct segment angular analysis, a segment map was created and analyzed. This allowed the analysis of each street segment.

Among various spatial configuration indicators from the analysis, the integration values were reviewed in detail. The integration values represent the accessibility and the activeness of space,

[3] Space Syntax Methodology (Al-Sayed et al., 2014) p.71

and multiple previous studies indicate that the integration values can serve as a good proxy for social interactions (Cho and Kim, 2013; Kim and Kim, 2020). Specifically, 'normalized angular integration (NAIN)'[4] values were utilized, calculated using segment angular analysis. They are then calibrated so that different sites can be directly compared.

4 RESULTS

4.1 The Helping Behavior of the Residents

To measure the helping behaviors of the residents, on-site experiment was conducted using the 'lost letter technique'. The characteristics of the helping behaviors of 120 valid samples are presented in Figure 1.

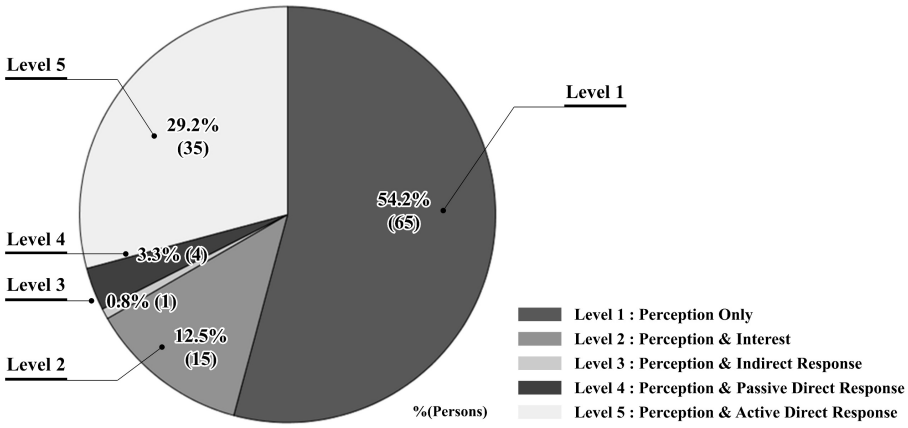


Figure 1: Characteristics of Helping Behavior of Residents: Ratio (Freq.)

More than half displayed helping behavior at very low level (Level 1: Perception Only), at 54.2%. These residents perceived the letter on the ground, but did not show interest and passed by without stopping. This was followed by a very high level of helping behavior (Level 5: Perception & Active Direct Response), at 29.2%. In this case, the residents picked up the letter on the ground, then headed to the management office to benefit a neighbor by finding the owner of the letter. 12.5% of the residents showed helping behavior at relatively low level (Level 2: Perception & Interest Only), and only 3.3% and 0.8% acted in response at Level 4 (Perception & Passive Direct Response) and Level 3 (Perception & Indirect Response), respectively. The observation of helping behaviors revealed that some residents who acted most actively and picked up the letter to help actually had difficulties with their own mobility, or had bicycle or heavy baggage with them but still chose to help.

[4] In order to enable cross scale comparisons between different parts of a city or between different cities, Hillier et al. (2012) suggested a normalization procedure for angular weighted graph distance considering a relationship between the tendency of an urban system to optimise travel distance from all origins to all destinations and the cost of segregation that is an effect of the system size (Al-Sayed et al., 2014, p.117).

4.2 The Spatial Characteristics of the Case Study Areas

The results of analyzing the spatial configuration of the entire Bundang District including four public rental apartment complexes are shown in Figure 2. A road extending in the north-south direction appears as the central axis of the city, along which subway stations and major transportation are planned. On the east side, apartment complexes are mostly located in block units. Among these, complexes B, C, D are located relatively close to the axis of high accessibility, but complex A is located in the north side with low accessibility and away from the city center. The integration (NAIN) value ranged from minimum of 0.64 to maximum of 1.68, with an average of 1.08. The average integration value for the access roads at each complex was found to be the lowest (1.03) for Complex A and the highest for Complex D (1.23) among the four complexes.

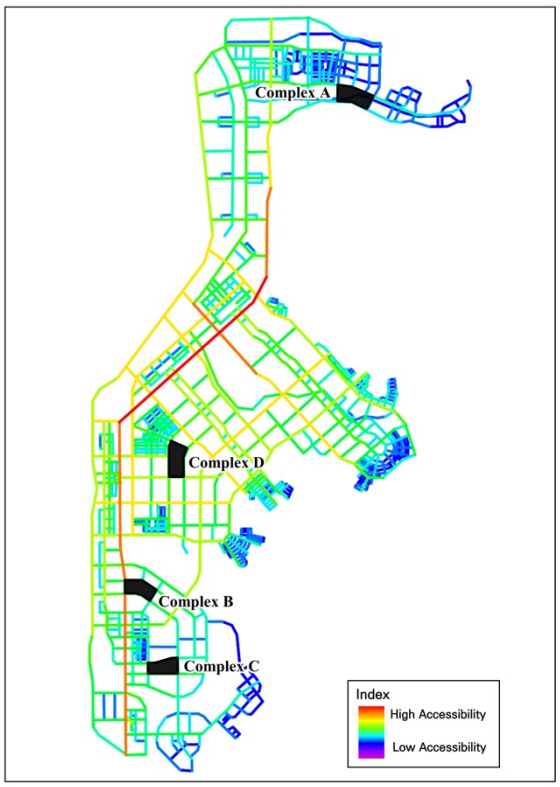


Figure 2: Urban Spatial Configuration of the Study Area

The spatial configuration analysis was conducted for the buildings (Figure 3). The integration (NAIN) values ranged from minimum of 0.60 to maximum of 1.25. They were divided into three categories using Jenks natural break[5] classification method: low accessibility, medium accessibility, and high accessibility. The residential locations with low accessibility ranged from 0.60 to 0.82; locations with medium accessibility ranged from 0.82 to 1.04; and finally, the values in locations with high accessibility were above 1.04. The ratio of residential locations with

[5] Natural Break(Jenks) algorithm is the mostly commonly used method to classify data into specific number of groups in GIS software (North, 2009).

low accessibility was 30.0%; with medium accessibility, 55.8%; and with high accessibility, 14.2%.

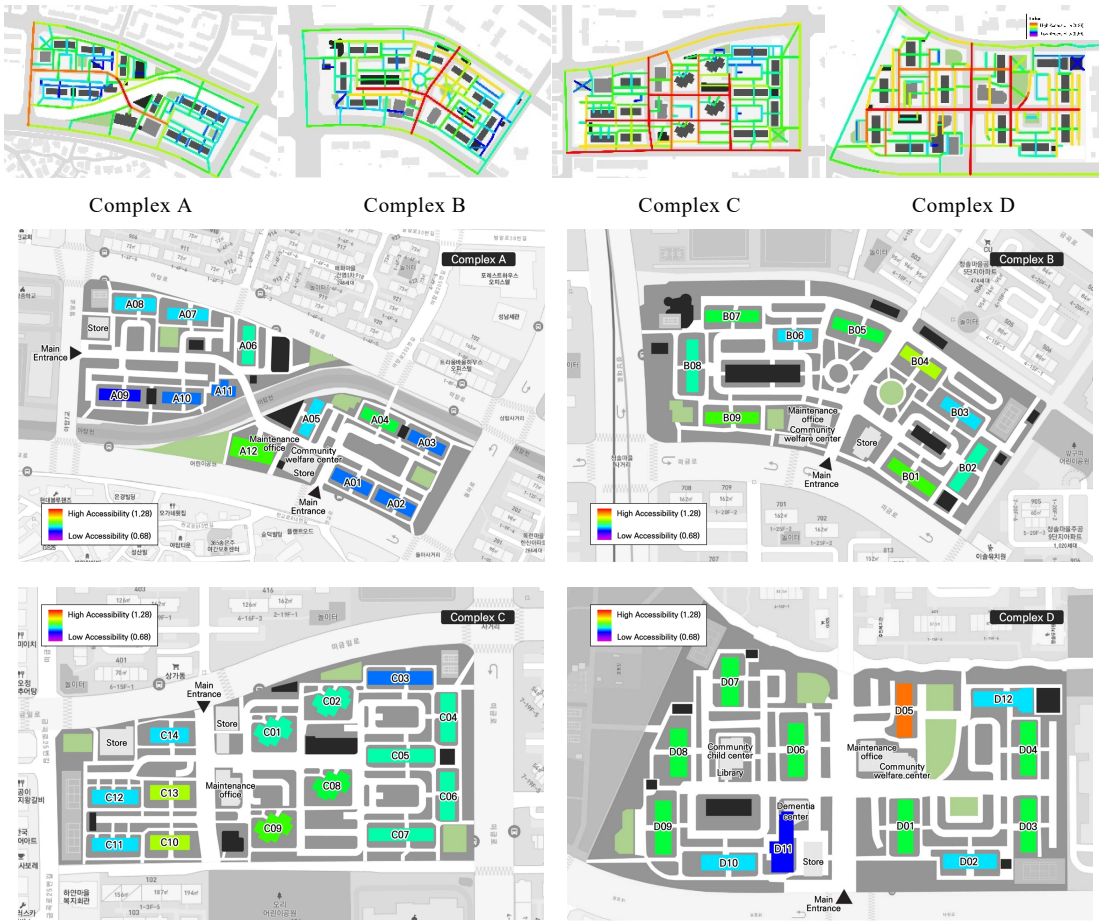
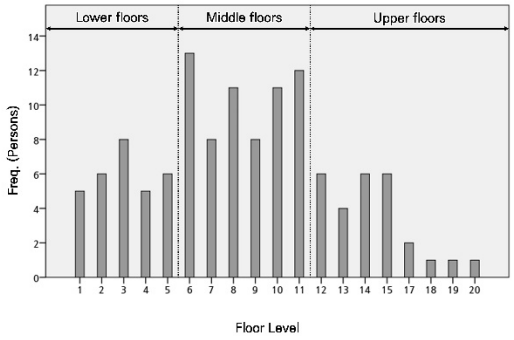
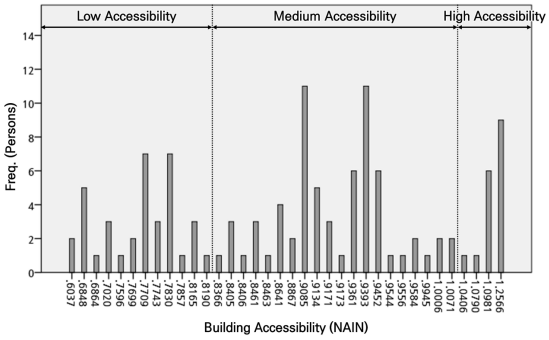


Figure 3: Distribution of Building Spatial Configuration Values (NAIN)

The apartment complexes in the study area include 5-story to 20-story buildings. Out of 47 buildings in the four complexes, 45 buildings are higher than 10 stories. The average number of stories was 14. The residential locations of the respondents ranged from 1st to 20th floor, and the average number of floors was 8. Based on previous research, the buildings were classified into three groups: lower floors (1st to 5th floors), middle floors (6th to 11th floors), and upper floors (above 12th floor)[6]. The ratio of respondents who lived in the lower floors (1st to 5th floors) accounted for 42.5%, and the ratio for the upper floors (above 12th floor) was 32.5%.

[6] The study area included 5-story buildings without elevators, and for this reason buildings up to five stories are classified as low-rise (Kim et al., 2019). Also, most buildings on site were built as 12 to 15 stories. In sum, this study defines 1st to 5th floors as lower floors; 6th to 11th floors as middle floors, and 12th floor and above as upper floors.

Table 2: Group Classification & Spatial Characteristics by Residential Locations

<table>
<tr><th colspan="8">Distribution and Group Classification</th></tr>
<tr><th colspan="4">Floor Level</th><th colspan="4">Building Accessibility</th></tr>
<tr><td colspan="4"> 
</td><td colspan="4"> 
</td></tr>
<tr><td>Min</td><td>max</td><td>ave</td><td>s.d.</td><td>min</td><td>max</td><td>ave</td><td>s.d.</td></tr>
<tr><td>1.0</td><td>20.0</td><td>8.46</td><td>4.32</td><td>0.60</td><td>1.25</td><td>0.90</td><td>0.14</td></tr>
<tr><td colspan="2">Classification</td><td>Freq. (Persons)</td><td>Ratio (%)</td><td colspan="2">Classification</td><td>Freq. (Persons)</td><td>Ratio (%)</td></tr>
<tr><td colspan="2">Lower floors (1 to 5)</td><td>30</td><td>25.0</td><td colspan="2">Low Accessibility</td><td>36</td><td>30.0</td></tr>
<tr><td colspan="2">Middle floors (6 to 11)</td><td>63</td><td>42.5</td><td colspan="2">Medium Accessibility</td><td>67</td><td>55.8</td></tr>
<tr><td colspan="2">Upper floors (Above 12)</td><td>27</td><td>32.5</td><td colspan="2">High Accessibility</td><td>17</td><td>14.2</td></tr>
<tr><td colspan="2">Total</td><td>120</td><td>100.0</td><td colspan="2">Total</td><td>120</td><td>100.0</td></tr>
</table>

4.3 The Helping Behavior of Residents by Building Accessibility, Measured Using Spatial Configuration Analysis

An examination of the helping behavior of residents by building accessibility indicates that based on spatial configuration analysis approach, the average value of the group with low accessibility is 2.94, while medium accessibility group average was 2.34 and high accessibility group average was 1.53. The results suggest that the level of helping behavior increases in buildings with lower accessibility.

One-way ANOVA was used to test if the average value of helping behavior showed significant difference. The results are presented in Table 3. It shows that there is a significant difference in the average value of resident's helping behavior ($F=3.936$, $p<.05$). When Scheffe's post-hoc test was used to test variables with significant difference, the level of resident's helping behavior increased for residents in buildings with low accessibility as compared to buildings with high accessibility. This suggests that when a neighbor needs help, the residents in buildings with lower accessibility are more likely to be active in taking actions to help.

This result demonstrated the difference in interactions between residents depending on the characteristics of spatial configuration of buildings. The characteristics of spatial configuration in apartment complex determines the movements of the residents, and there is a lower level of movement and encounters in space with lower accessibility. The probability of residents in buildings with low accessibility interacting with other residents is relatively low, given low accessibility to their residential locations. This leads to a phenomenon where residents display an

increase in their willingness to interact with other residents in order to maintain communal relationships. In other words, as the accessibility to a residential location decreases due to low building accessibility, there is a tendency to pursue more interactions with neighbors at individual level. This has a positive effect on manifestation of helping behaviors.

Table 3: Level of Helping Behavior of Residents by Building Accessibility (ANOVA)

Dependent variable	Classification	#Sample	Average	s.d.	F	*p*
Level of Helping Behavior of Residents	Low Accesibility	36	2.94[b]	1.90	3.936*	0.022
	Medium Accesibility	67	2.34[ab]	1.76		
	High Accesibility	17	1.53[a]	1.18		
	Total	120	2.41	1.78		

* p<.05, ** p<.01, *** p<.001, Post-hoc analysis: a<b

4.4 The Helping Behavior of Residents by Floor Level of Residential Space

The average level of helping behavior shown by residents, classified by floor level of their residential space, ranges from 2.93 for residents in the lower floors, while it was 2.44 for residents in the middle floors and 1.74 for the upper floors. The level of helping behavior was higher in the lower floors.

One-way ANOVA was used to test if the average value of helping behavior by the floor level of residential space showed significant difference. The results are presented in Table 4. It shows that there is a significant difference in the average value of resident's helping behavior by the floor level of residential space (F=3.344, p<.05). When Scheffe's post-hoc test was used to test variables with significant difference, the level of resident's helping behavior was higher for residents in the lower floors as compared to residents in the upper floors. This suggests that when a neighbor needs help, the residents in the lower floors are more likely to be active in taking actions to help.

This result suggests that the residents in the upper floors place higher value in privacy and do not actively seek relationships with neighbors or take actions to help them. On the other hand, the residents in the lower floors with higher level of psychological calm compared to the residents in the upper floors have more chances to encounter and interact with neighbors. Hence, it can be interpreted that the residential environment of the lower floors promotes social interactions that encourage manifestation of actions to actively help neighbors.

Table 4: Level of Helping Behavior of Residents by Floor Level (ANOVA)

Dependent variable	Classification	#Sample	Average	s.d.	F	*p*
Level of Helping Behavior of Residents	Lower floors	30	2.93[b]	1.84	3.344*	0.039
	Medium floors	63	2.44[ab]	1.82		
	Upper floors	27	1.74[a]	1.43		
	Total	120	2.41	1.78		

* p<.05, ** p<.01, *** p<.001, Post-hoc analysis: a<b

5 CONCLUSION & DISCUSSION

This study examined the level of helping behavior in relation to spatial characteristics of residential location. To this end, the 'lost letter' experiment was conducted in public rental apartment complexes in Bundang, Seongnam City, to assess and evaluate resident's helping behavior, which was then followed by matching of individual behaviors to their residential locations. The spatial characteristics of residential locations include the floor level of residential locations and building accessibility which was analyzed using the space syntax. The characteristics of the residents, the level of residents' helping behaviors in relation to spatial characteristics were analyzed using frequency analysis, descriptive statistics, and one-way ANOVA. Based on the results, the following are the key conclusions.

First, the level of the helping behavior of the residents was higher for the residents in the lower floors with lower accessibility. This result is consistent with previous studies that individuals who live in space with better accessibility experience more unnecessary contacts with other residents, and as a result, tend to avoid interactions with others. On the other hands, individuals who live in space with lower accessibility often actively seeks interactions with their neighbors. The probability of residents living in space with low accessibility interacting with other residents is relatively low, which then increases their willingness to interact with other residents.

These results support Kim and Kim (2020)'s previous study which examined the inverse relationship between the accessibility to residential location and the willingness to interact with neighbors. At the same time, it demonstrates the significance of the attempt to investigate the relationship between the accessibility within residential complex and the altruism of residents, as manifested by the helping behavior of the residents. Therefore, it is reasonable to infer that the residents in locations with lower accessibility exhibit more willingness to interact with their neighbors, and such conditions can have positive influence on residents' altruism and subsequently a sense of community.

Second, an examination of the level of helping behavior by the residents showed statistically significant difference by the floor level of residential space. Using the 'lost letter' experiment - a technique which has been verified many times in previous research across many fields - this study attempted to measure the helping behavior of residents in apartment complexes. Our results are supported by more recent studies that argue how the residents of the lower floors gain psychological calm from their interactions with the outside environment and enjoys more active social relationships (Kim et al., 2015). Therefore, it demonstrates how the higher level of helping behavior exhibited by the residents of the lower floors compared to the residents of the upper floors is in fact a manifestation of action, an outcome of the positive interest and attitude towards social relationships to help a neighbor in the same residential complex.

This study makes a meaningful contribution by expanding the scope of research on the helping behavior of residents to include the floor level and other factors calculated from spatial

configuration analysis, and deriving noteworthy conclusions. A new perspective on social interactions taking place in a residential setting is presented by examining the relationship between the residents' willingness to interact with their neighbors and manifestation of helping behaviors.

REFERENCES

Al-Sayed, K., Turner, A., Hillier, B., Iida, S., & Penn, A. (2014) 'Space syntax methodology', Bartlett School of Architecture, UCL: London, UK.

Amato, P. R. (1983) 'Helping behavior in urban and rural environments: Field studies based on a taxonomic organization of helping episodes', *Journal of Personality and Social Psychology*, 45(3), pp. 571-586.

Baum, A., Harpin, R. E. & Valins, S. (1975) 'The role of group phenomena in the experience of crowding', *Environment and Behavior*, 7(2), pp. 185-198.

Bickman, L., Teger, A., Gabriele, T., McLaughlin, C., Berger, M. & Sunaday, E. (1973) 'Dormitory density and helping behavior', *Environment and Behavior*, 5(4), pp. 465-490.

Gifford, R. (2007,) 'The consequences of living in high-rise buildings', *Architectural science review*, 50(1), pp. 2-17.

Ginsberg, Y. & Churchman, A. (1985) 'The pattern and meaning of neighbor relations in high-rise housing in Israel', *Human Ecology*, 13(4), pp. 467-484.

Hillier, B. (1996) 'Space is the machine: a configurational theory of architecture', Space Syntax.

Hillier, B., & Hanson, J. (1984) 'The social logic of space', Cambridge university press.

Hillier, B., Yang, T., & Turner, A. (2012) 'Normalising least angle choice in Depthmap-and how it opens up new perspectives on the global and local analysis of city space', *Journal of Space syntax*, 3(2), pp.155-193.

Jang, S.H. (2019) 'A Study on the Relationship between Spatial Characteristics and Personal Level Social Capital -Yongsan-gu, Seoul, Republic of Korea -', MA thesis, Sejong University.

Jin, J. K., Lee, S. G., Kim, J. S., Kim, J. W. (2018) 'The Effects of Spatial Environments of Public Rental Housing on Residents' Satisfaction - Based on Multi-level Model –', *Journal of Real Estate Analysis*, 4(1), pp.15-31.

Jo, H. E., Kim, Y. O. (2013) 'A Research on the Relations between Spatial Structures and Social Networks in Urban Squatter', In *Autumn Conference Urban Design Institute of Korea*, pp.189-195.

Kim, H. O., Kim, S. J. (2015) 'Cultural differences in the stability of self-report measures: A comparison of Korean and German students', *The Korean Journal of Social and Personality Psychology*, 29(3), pp.67-83.

Kim, J. Y., & Kim, Y. O. (2020) 'The association of spatial configuration with social network for elderly in social housing', *Indoor and Built Environment*, 29(3), 405-416.

Kim, S. K., Lee, Y. M., Lee, Y. J. (2015) 'A Study on Residents' Satisfaction Regarding the Communal Space as a Place of Interactions among Neighborhood in Multi-family Housing - Focusing on Comparisons between Low-rise and High-rise Housing in Ilsan -', *Journal of the Regional Association of Architectural Institute of Korea*, 17(5), pp.11-20.

Kim, Y. O., Ji, B. G., Kim, J. Y. (2019) 'A Comparative Study on Suicide Rates of Upper and Lower Floors of High-rise Apartment', *Journal of the Architectural Institute of Korea Planning & Design*, vol.35, no.8, pp.57-64.

Korte, C. & Huismans, S. (1983) 'Sources of assistance among residents of a Dutch high-rise development', *American journal of community psychology*, 11(6), pp. 751-755.

Lee, J. Y. (2006) 'The Effects of Social Support on Psychological Well-Being and Altruism', *The Korean Journal of Social and Personality Psychology*, 20(1), pp.55-75.

Lee, R. Y. (2009) 'A sense of Community and Its Relationship with Exterior Spatial Composition in Apartment Complex', PhD thesis, Chonnam National University.

Lee, R. Y., Shin, N. S. (2009) 'A Study of the Influence of the Physical Structure in the Apartment Complex on Sense of Community - Focusing on Apartment Complex in Gwangju Metropolitan City -', *Journal of the Architectural Institute of Korea Planning & Design*, 25(3), pp.235-246.

MacIver, R. M. (1917). Community: Being and Attempt to Set Out the Nature and Fundamental Laws of Social Life. Macmillan.

Nadler, A., Bar-Tal, D., & Drukman, O. (1982) 'Density does not help: Help-giving, help-seeking and help-reciprocating of residents of high and low student dormitories', *Population and Environment*, 5(1), pp. 26-42.

Park, K. O. (2010) 'Establishment of the Social Environment to Active Communities in Apartment Housing', *Journal of the Korean Housing Association*, 21(1), pp.141-150.

Sinnett, E. R., Sachson, A. D., & Eddy, G. (1972) 'The influence of living units on the behavior of college students', *Journal of college student personnel*.

Yun, K. S. & Oh, Y. J. (2014) 'An Analysis of the Importance of the Sense of Community Activation Program in Apartment Housing and its Implication', *Journal of The Korean Regional Development Association*, 26(3), pp.125-138.