INTERRELATION BETWEEN LEGIBILITY ATTRIBUTES AND PARK UTILIZATION AS DETERMINANTS FOR RESPONSIVE NEIGHBORHOOD PARKS

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Keywords

- Park utilization
- Social interaction
- Legibility
- Neighborhood park
- Quality of life

Abstract

The rising need for social interaction is evident particularly in urban areas due to a stressful urban life and social isolation. In residential areas, neighborhood parks have an important function in supporting social integration and social bonding. Nevertheless, studies have indicated that these parks are not fully utilized for the benefits of residents, which could be due to the lack of parks’ legibility. This paper investigates the interrelationship between park utilization and legibility of three neighborhood parks within new residential developments in Malaysia. The research findings are based on field observations and a questionnaire survey conducted with 387 residents of the areas. Results indicate a significant correlation between park utilization and park legibility, implying the potential for social interactions among residents within a legible park setting. The level of the park visual obstruction and the clarity of its structure were found to be strongly linked with park utilization and the intensity of outdoor activities. However, certain critical physical characteristics including the critical density of population and gated neighborhoods may decrease the positive effect of park’s legibility. The findings inform the crucial role of legible environment in the design and planning of neighborhood parks to afford socially responsive public spaces thus enhances the social life of urban dwellers.

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INTRODUCTION

Within cities, the transition from an integrated community to the anonymous society (Aelbrecht, 2016) was accompanied by weak social cohesion reflected in the lack of social interaction among dwellers in urban areas. This scenario persists despite constant efforts to improve the quality of public places such as parks in residential areas (Moulay et al., 2017; Ujang, 2014). In this regard, neighborhood parks are one of the most important social spaces that exist in residential areas, considered as crucial social facilities that improve the social values and residents' quality of life by offering open areas for interaction (Yuliastuti et al., 2018; Carmona et al., 2010; Özdemir et al., 2008). They provide opportunities for contact, proximity, recreation, congregation, relaxation, and foster social interaction among residents from all walks of life (Cohen et al., 2016).

Emphasizing on the general well-being of individuals and societies (Buta et al., 2014; Abdel-Hadi, 2012), Quality of Life (QOL) is closely linked to the interaction between people and the surrounding environment where one of its measures is their ability to access green spaces (Nasution & Zahrah, 2012; Colantonio, 2010). QOL is mainly discussed in the context of the perceptual and environmental qualities. The earlier quality focuses on life satisfaction with self, others, and health, while the latter quality concerns place attractiveness, ambience, and amenities, which help to uplift, enrich and stimulate people’s spirit, health, and well-being (Carmona, 2016; Peschardt & Stigsdotter, 2014). This paper posits that neighborhood parks are crucial places to provide basic needs for active urban living, by offering spaces for a variety of social and physical activities. In addition, within the context of improving social life, neighborhood parks help to fill up the existing knowledge gap in the built environment studies by moving the focus from city centres to residential areas (Farahani & Lozanovska, 2014).

However, in many situations, these parks are underutilized and do not attract many users (Moulay & Ujang, 2016; Karuppannan & Sivam, 2012; Azmi et al., 2012; Moser, 2010). Despite being planned as an attractive and inclusive residential park, several researches have revealed a lack of social interaction among users with very limited social contacts, resulted in people losing bonds with their neighborhoods and communities (Feng & Astell-Burt, 2016; Matthew, 2011; Leyden, 2003). Considering parks as the key element in the neighborhood’s social networks, it is important to improve the legibility and accessibility of the parks (Montgomery, 2013) to effectively function as social binders. To understand the impact of the physical attributes of neighborhood parks on the intensity of social interaction, this paper examines the influence of legibility attributes on park utilization. The study covers several urban residential areas in the Kuala Lumpur Metropolitan Region, Malaysia.

LEGIBILITY OF NEIGHBORHOOD PARK

Neighborhoods are the spatial units where residents live and meet the majority of their daily requirements such as public facilities, retail shops, elementary school, and adequate common play spaces (Ivory et al., 2015; Wolf & Wohlfart, 2014). Neighborhood parks, with large open space, are utilized within walking distances from residents' home (400 to 800 meters) for recreational purposes (Moulay & Ujang, 2016; Hultsman et al., 1987). They are considered the most important social network within neighborhoods and provide significant areas for residents from all walks of life to connect with each other, to support physical and leisure activities, and to escape from the tension of the city (Cohen et al., 2016; McCunn & Gifford, 2014). They provide facilities such as green spaces, picnic tables, walking, jogging
and biking tracks, shade trees, and playgrounds to encourage social interaction and contacts (Wolf & Wohlfart; 2014; Brown et al., 2014; Azmi & Karim, 2012).

The quality of the physical environment influences how people use the parks while the length of outdoors stay determines the intensity of social interaction (Gehl, 2011; Alexander et al., 1977). Legibility as a crucial determinant of the quality of physical environment refers to the clarity of structure and how easily the reader can understand it (Lynch, 1960). Defined as “the ease with which its parts can be organized into a coherent pattern” (Lynch, 1960, p. 2-3), legible places clarify observers’ perception and cognition of public realms (Ghoomi et al., 2015; Bounds, 2008). Therefore, the legible environment provides people with a deep sense of emotional security because of the harmonious relationships between them and the surrounding physical environment (Gehl, 2013). Furthermore, Cullen (2012) points out the fact that characteristic of visual expression or quality of the built environment contributes to generate a feeling of sense of place, thus, attract people to go outside and visit these places.

Based on imageability study on a few American cities conducted by Lynch (1960, p.46), he claimed that “our image of the city is defined by paths, edges, districts, nodes and landmarks” (p. 46) suggesting that users recognized the city structure in their minds through these five elements. With the clarity of structure and visual cues, a legible place allows people to find their ways and destinations with ease, while the edges are crucial in regenerating urban spaces (Salama & Grichting, 2015; Gehl, 2011; Carmona et al., 2010; Alexander et al., 1977). In this regard, this study examines legibility attributes of neighborhood parks in relation to the intensity of social interaction, which allows understanding of the way people relate to parks' elements that are socially responsive.

**PARKS’ CHARACTERISTICS AND PARK UTILIZATION**

Parks in general, especially well-designed neighborhood parks within planned residential areas, create spaces for social interaction. In turn, these spaces help residents to participate in their society and create a feeling of acceptance (Gehl & Svarre, 2013; Peters et al., 2010), while their legibility may enhance the neighborhood coherence (Bounds, 2008).

Alexander et al. (1977) outlined 253 patterns to obtain denser meanings for people that can be applied in urban design to enhance the character of public places. Among these patterns are the walkable distance between home and parks; decreasing the long distance between home and workplace to provide more leisure time for people, and an appropriate population density to improve the intensity of life outdoors. Other patterns prescribed by him also include favoring the position of public places within a junction area between several neighborhoods and surrounding these public places with different community facilities to attract more people outdoors. Also, the edges should be treated as places rather than a simple line or boundary. He noted that to integrate the different parks' activities, these patterns should not be strung out and kept separate. The coherence among the elements that make up the pattern should support human activities and enhanced space utilization.

Public open spaces are created to satisfy the human need for social interaction (Cacioppo & Patrick, 2008). It concerns with the necessity to move from one place to another with ease and comfort. These include opportunities to walk, to sit outdoors, to stand, to stay, to talk and listen, and to play and exercise (Gehl, 2011). Beyond these functional needs, there must be opportunities to participate in meaningful activities that give identity to individuals and groups to foster place attachment. The longer the people are attached to a place, the stronger the attachment becomes (Moulay et al., 2017). Urban dwellers should have equal opportunities
to participate in city activities. Inclusiveness enhances community feelings, the sense of ownership, and the sense of belonging to a place (Mehta, 2014).

Public places are social spaces. Carmona et al. (2010) highlighted urban design principles and characteristics to be considered in designing responsive public places and spaces. Among them are, integrating people’s perception and experience of place in the design process; understanding the context where different places and cultures should have different design answers, and planning how the different human activities should better be performed. He stressed the need to consider the perceived security and safety; the visual aesthetic of the setting and the importance of creating order, coherence, legibility, and clarity in the urban structure. This paper discusses the effect of legibility attributes of the parkscape and the apparent clarity of its physical components on the intensity and diversity of social interaction within the selected public parks in Malaysian residential neighborhoods.

SOCIAL INTERACTION

Social interaction is an important aspect of social life. It refers to the different manners in which people act and react with others (Krellenberg et al., 2014) indicating a process of reciprocal incitement and interactivity between minimum two persons (Feng & Astell-Burt, 2017; Hari & Kujala, 2009). Social interaction can be strengthened with the presence of three conditions: an existing opportunity for contact, appropriate distance in terms of proximity to others, and a suitable and effective space to interact (Abu-Ghazzeh, 1999; Fleming et al., 1987). Social interaction takes place naturally as a result of people gathering and moving in a setting. A neighborhood park can be regarded as a convenient setting for social interaction within close proximity to the residence. Furthermore, social interaction can be observed in four types of behaviors: attitude or expression, verbal, action, and gesture (Kampmann et al., 2016; Hari & Kujala, 2009). Social interaction is more vibrant when the public spaces fulfill the users’ psychological needs for contact, knowledge, and stimulation (De Dominicis et al., 2015; Gehl, 2011).

The duration of time people pass in a particular setting is the principal measurement of social interaction. It reflects both the intensity of contact and their engagement with a public place (Gehl, 2011; Carmona et al., 2010). According to the sociological theories there are two types of social interactions (Jessop & Sum, 2016; Bukodi et al., 2015; Lofland, 1998; Oldenburg 1989; Goffman, 1983): Passive social interaction involves the act of seeing and being seen by others, and active social interaction is reflected in the quasi-primary relationships such as talking, gathering and playing with others; fleeting and chance encounters such as meeting strangers or neighbors. These types of actions and reactions shape the intensity of social interaction that generates lively public places (Gehl, 2011). Thus, this study seeks to find how these scenarios occur in a neighborhood park, which has its particular spatial configuration and ambiences, and how it may influence park utilization.

PLANNING AND DEVELOPMENT OF PUBLIC PARKS IN MALAYSIAN RESIDENTIAL AREAS

Within Malaysia, one of the planning principles outlined by the Department of Urban and Country Planning (JBPD) under the Community Facilities Planning Guidelines (JBPD, 2006) is to encourage social interaction within the community. The aim is to benefit and service local population toward sustainable living. In addition, the National Landscape Policy (NLP, 2011) realizes the Nation’s strategy towards Vision 2020, through focusing on the well-being
of the citizen by providing adequate landscape spaces for recreation and social interaction among Malaysian multi-cultural society. A more detailed and emphasized guideline for any recreational and open spaces development in Malaysia can be referred to the National Landscape Guideline (JLN, 2008). The aim is the development of Malaysian recreational and green open spaces which include developing neighborhood parks in residential housing developments. In that regards, along with the persisting issue of underutilized parks, this study claims that park’s legibility is a key issue in developing a livable residential neighborhood.

METHODOLOGY

This study involved three neighborhood parks, in planned residential areas in selected cities. The parks are located in Putrajaya, a Federal Territory; Bandar Baru Bangi and Puchong in the state of Selangor. The city of Putrajaya has become the third federal territory of Malaysia in 2001, after Kuala Lumpur and Labuan (Moser, 2010). Selangor is the most populated state in Malaysia; the population is about 5.46 million (Department of Statistics, Malaysia, 2013). The choice of Selangor subscribes to the UN Sustainable Development Strategy Action Plan, known as Agenda 21, which emphasizes on the environmental, social and economic development strategies of the state (Planning Malaysia, 2015). As a new federal government administrative center for Malaysia, Putrajaya demonstrates a potent symbol of the nation’s ambitious modernization agenda and its new ‘progressive Muslim’ identity. The green city was conceptualized as a model for prospective Malaysian and foreign sustainable cities, emphasizing on the establishment of a healthy and friendly urban environment (Putrajaya Corporation, 2002). The estimated population is 86 000, and the city is situated 25 kilometers south of the capital Kuala Lumpur (Department of Statistics, Malaysia, 2013). Each neighborhood park serves different types of residential areas providing complete public facilities. Bandar Baru Bangi Park serves mainly semi-detached housing and detached housing; Puchong Park serves mainly rise apartments, and semi-detached housing; and Putrajaya Park serves mainly semi-detached housing and high-rise apartment neighborhoods. The context of this study allows understanding from a local context and residents’ perspective what aspect of legibility attributes influence residents’ engagement with parks for enhanced social interaction.

A questionnaire survey method was conducted to examine how legibility attributes relate to the intensity of social interaction. Lynch’s elements of legibility: path, edge, district, node, landmark and the visual obstacles were analyzed to determine the legibility of the parks. The levels of interaction and engagement patterns were observed and measured to determine the level of social interaction occurred in the parks. Primary data were collected using a close-ended questionnaire format, and the survey was self-administered. The ease with which the users recognize the landmarks, districts, edges, paths, and nodes determine the clarity of the parks’ structure. The visual obstacle is measured in terms of the quality of views, the existence of elements of obstructions, and the distance between activities. For social interaction, the levels of interaction and engagement pattern are measured based on the intensity of interaction from passive to active and the residents’ frequency of visits and participation in the parks’ activities.

The study conducted a systematic field observation to figure out how events happened in reality rather than how the researcher thought it happened (PPS, 2001). Both survey and observation methods have been adopted in various studies to investigate relationships between variables and to examine the effect of legibility attributes on quality of life, their
value for citizens, and social bonds (Moulay & Ujang, 2016; Rasidi et. al., 2012; Talen, 2010; Lynch, 1960). The survey gathered residents’ feedback on the intensity of social interaction covering both passive and active interactions, and the level of parks’ legibility, using a 5-point Likert- Scale format, from strongly disagree “1” up to strongly agree “5”. The data collection was conducted from 15th August to 10th October 2016, involving 400 respondents. To collect an optimal sample size, this study referred to the Morgan table instructions (Krejcie and Morgan, 1970). This table suggests the minimum reliable sample size that provides an accepted margin of error (5%) according to a particular population size. The participants were randomly selected from BG, PJ and PH neighborhoods. The observations cover weekends and weekdays from 9.00 am to 7.00 pm, to record the types and pattern of activities that took place in the parks. To identify the levels of social interaction and the legible elements of the parks, data from the survey questionnaire were categorized and classified into four groups, based on the description of Bernard (2011) on the Likert scale, and using an equal range m=1.0 (Table 1). Further, Cronbach’s Alpha was computed to determine the questionnaire items’ level of reliability. The reliability coefficient was 0.771. Afterward, descriptive analysis was performed using crosstab computing methods. Which include computing means (M), standard deviation (SD), and standard errors (SE). Then, to determine the direction and strength of the linear relationship between independent (legibility & visual obstacles) and dependent (intensity of interaction & engagement patterns) variables, a Pearson correlation, and partial correlation analysis were performed.

Table 1: Measurement scale for Legibility and Social Interaction (Source: Field data - Authors, 2016).

<table>
<thead>
<tr>
<th>Means (m)</th>
<th>Scale</th>
<th>Legibility</th>
<th>Social Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 – 2.0</td>
<td>Strongly Disagree</td>
<td>Unrecognizable</td>
<td>None SI</td>
</tr>
<tr>
<td>2.1 – 3.0</td>
<td>Disagree</td>
<td>Poorly recognizable</td>
<td>Weak SI</td>
</tr>
<tr>
<td>3.1 – 4.0</td>
<td>Agree</td>
<td>Moderately recognizable</td>
<td>Moderate SI</td>
</tr>
<tr>
<td>4.1 – 5.0</td>
<td>Strongly Agree</td>
<td>Highly recognizable</td>
<td>Strong SI</td>
</tr>
</tbody>
</table>

**DATA ANALYSIS AND FINDINGS**

**Demographic Information**

Among the 400 questionnaire surveys distributed, 387 were gathered, reflecting a completion rate of 97%. Females number (49.9%; n=193) that participated in the survey was marginally higher than males (47.5%; n=184). The greater number of respondents were between 18 and 25 years old (35.4%; n=137), followed by 26 and 35 years old (22.2%; n=86). Respondents between 46-55 and 36-45 years old were almost the same number (18.6%; n=72) and (17.1%; n=66), while the elderly group aged above 55 years old was the lowest (4.4%; n=17). In terms of income, the greater number of respondents (65.8%; n=255) earned monthly less than RM4000. As for education, secondary school degree holders were the greater number (37.2%; n=144), followed by diploma and bachelor degree holders (30.5%; n=118 and 24%; n=93), and only 3.4%; (n=13) were Master’s and above degree holders. Reflecting the multi-ethnic diversity of the Malaysian society, Malays (82.2%; n=318), Indians (4.9%; n=19) and Chinese (4.7%; n=18) were represented in the study. The majority were married (54.8%; n=212), and had children (53.7%; n=208).
Legibility of the Neighborhood Parks

To determine whether legibility differences among the studied parks exist, a cross-tabulation was performed. Table 2 shows the participants' feedback on the parks' legibility. The measurement is based on both the clarity of parks' structure: i.e. edges, landmarks, nodes, districts, and paths; and second the visual obstacles. The outcomes point out that nodes and edges were highly recognizable for the Bangi Park (BG) with mean score (m = 4.11) and (m= 4.10) respectively, and moderately recognizable for Putrajaya Park (PJ) with mean score for path (m = 3.93) and nodes (m= 3.62), followed by Puchong Park (PH) with mean score for path (m= 3.36) and nodes (m= 3.17). Nevertheless, there was a significant difference in the visual obstacles, where PH Park recorded the highest mean score (m=4.27) therefore has highly recognizable elements, compared to BG Park (m= 3.78) and PJ Park (m= 3.68) reflecting moderately recognizable elements. These differences could be contributed by the closeness of activity areas from each other and the lack of trees within the PH park. It is observed that the shape of PH park is circular and more regular than those of BG and PJ parks. As a result, PH Park is highly visible when viewed from within the park.

Furthermore, the outcomes revealed a significant difference concerning the clarity of structure. Landmarks and district recorded the lowest mean score for PH park, (m= 2.68) and (m= 2.79) respectively reflecting a poorly recognizable elements, while BG park recorded (m= 3.18) for landmarks and (m= 3.50) for district, and PJ park recorded (m= 3.19) for landmarks and (m= 3.56) for district, reflecting a moderately recognizable elements. Paradoxically results indicate that PH Park has significantly lower scores regarding the clarity of structure and scored the highest mean value for visual obstacles, suggesting that the physical layout or the structure of PH Park is not clearly defined despite having fewer visual obstacles compare to BG and PJ parks. Table 2 indicates results on the legibility of PJ, PH and BG parks generated from the survey.

Table 2: Legibility of PJ, PH and BG Parks based on the questionnaire survey (Source: Field Survey, 2016).

<table>
<thead>
<tr>
<th>Construct Variables</th>
<th>Items</th>
<th>Putrajaya Park (PJ) N= 131</th>
<th>Puchong Park (PH) N= 126</th>
<th>Bangi Park (BG) N= 130</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paths (clarity of structure)</td>
<td>The paths allow me to move around the park very comfortably</td>
<td>Moderately recognizable</td>
<td>Moderately recognizable</td>
<td>Moderately recognizable</td>
</tr>
<tr>
<td></td>
<td>The paths allow me to observe all activities in the park while walking</td>
<td>3.93 0.71 0.62</td>
<td>3.36 1.05 0.70</td>
<td>4.02 0.56 0.51</td>
</tr>
<tr>
<td></td>
<td>Along the paths, I could connect with all activities in the park</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The path has unique landscape character</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edges (clarity of structure)</td>
<td>The park and the housing area are well connected</td>
<td>Moderately recognizable</td>
<td>Moderately recognizable</td>
<td>Highly recognizable</td>
</tr>
<tr>
<td></td>
<td>Park’s activities can be seen from outside clearly</td>
<td>3.98 0.62 0.55</td>
<td>3.39 1.00 0.99</td>
<td>4.10 0.71 0.06</td>
</tr>
<tr>
<td></td>
<td>The park’s boundaries are attractive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>District (clarity of)</td>
<td>This park is highly identifiable because of its unique character</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure (Texture, space, form...)</td>
<td>Moderately recognizable</td>
<td>Poorly recognizable</td>
<td>Moderately recognizable</td>
<td></td>
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<td>-----------------------------------</td>
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<td></td>
</tr>
<tr>
<td>Being inside the park allows me to have different experiences compared to the rest of the neighborhood</td>
<td>M: 3.56, SD: 0.79, SE: 0.06</td>
<td>M: 2.79, SD: 1.04, SE: 0.09</td>
<td>M: 3.50, SD: 0.74, SE: 0.06</td>
<td></td>
</tr>
<tr>
<td>This park is different from the rest of the neighborhood</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nodes (clarity of structure)</th>
<th>Moderately recognizable</th>
<th>Moderately recognizable</th>
<th>Highly recognizable</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are many spots in the park for social gathering</td>
<td>M: 3.62, SD: 0.81, SE: 0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>There are many resting places in the park</td>
<td>M: 3.17, SD: 1.04, SE: 0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The boundaries of the park are well identified</td>
<td>M: 4.11, SD: 0.61, SE: 0.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Landmarks (clarity of structure)</th>
<th>Moderately recognizable</th>
<th>Poorly recognizable</th>
<th>Moderately recognizable</th>
</tr>
</thead>
<tbody>
<tr>
<td>The landscape elements in the park are very dominant as landmarks (Art viewing points, bridges, seating areas, shelters...)</td>
<td>M: 3.19, SD: 0.84, SE: 0.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The different landmarks can be seen from different angles and distances</td>
<td>M: 2.68, SD: 1.04, SE: 0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The landmarks can be seen from outside the park</td>
<td>M: 3.18, SD: 0.89, SE: 0.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Visual Obstacles</th>
<th>Moderately recognizable</th>
<th>Highly recognizable</th>
<th>Moderately recognizable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity areas in the park are not far from each other (play area, games, instruments, seats, shelters...)</td>
<td>M: 3.68, SD: 0.53, SE: 0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can view the whole park from where I sit</td>
<td>M: 4.27, SD: 0.61, SE: 0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The seating arrangement allows me to talk with other visitors</td>
<td>M: 3.78, SD: 0.37, SE: 0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The park has direct views from one activity area to another</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: standard deviation; SE: standard error and M: mean

The researcher has captured the pattern of users’ activities and the way they used the parks. The physical setting and the characteristics of the elements within the parks were observed and identified to understand the extent to which these elements support users’ activities and interaction. The study found that in addition to being located in a gated neighborhood, BG park is raised approximately one meter above the level of the residential area which makes it somehow isolated from the streets and pedestrian walkways of the residential area. This condition has indirectly influenced the users not to regard the park as a crossing area to reach other parts of the neighborhood. Residents around BG park are naturally inclined to surround and access the park for specific activities, which is not the case of PH and PJ parks (see Figure 1). Besides, the researchers have noticed that BG park was often empty even during the weekends.

In terms of park use, the number of park users on weekdays is higher in the PH park compared to BG and PJ parks (see Figure 2). It may have a direct relationship with the neighborhoods’ population density which is higher in PH due to the presence of mainly rise-apartments, compare to individual and semi-detached housing in BG and PJ. In addition, the semi-detached housing affords more family and social activities within the house compound compared to rise-apartments.
Social Interaction and Park’s Use

The mean scores for social interaction range from 2.55 to 3.94, which indicate a weak to moderate social interaction within the PJ, PH and BG parks (Table 3). The PH park scored the highest mean value in terms of engagement patterns (m= 3.94), which indicates a moderate social interaction. On the other hand, BG park scored the lowest mean value for engagement patterns (m=2.55), reflecting a weak social interaction. This difference could be associated with the availability of more resting places, a variety of recreational interests, and more appealing elements in PH park compared to BG park. Paradoxically, even though the three parks scored a moderate intensity of interaction, ranging from 3.14 to 3.87, the BG park recorded the highest mean value (m = 3.87) followed by PJ park (m= 3.39) while PH park scored the lowest value (m = 3.14). These results might be related to the residents’ ethnicity factor. It was observed that the main users of BG park and PJ park are the Malays while the users of PH park were multiethnic (Malay, Chinese and Indian). This probability is confirmed by the higher mean scores recorded for passive interaction in PH park (m = 3.54) and the lowest active interaction (m = 2.74) compared to the other two parks, where active interaction is more natural among the same ethnic group. Another possibility that may influence the lower intensity of interaction within PH park in comparison to PJ and BG parks could be influenced by the much larger size of PH park (3.2 ha) compared to BG park (1.8 ha) and (PJ) park (1.5 ha).
Table 3: Social interaction in the neighborhood parks based on the questionnaire survey 
(Source: Field Survey, 2016).

<table>
<thead>
<tr>
<th>Construct Variables</th>
<th>Items</th>
<th>Putrajaya Park (PJ) N= 131</th>
<th>Puchong Park (PH) N= 126</th>
<th>Bangi Park (BG) N= 130</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOCIAL INTERACTION</td>
<td>Intensity of Interaction</td>
<td>Moderate social interaction</td>
<td>Moderate social interaction</td>
<td>Moderate social interaction</td>
</tr>
<tr>
<td>Active</td>
<td>Observing other people</td>
<td>M</td>
<td>SD</td>
<td>SE</td>
</tr>
<tr>
<td></td>
<td>Facial expression (smile, shaking head, blink of eye...)</td>
<td>3.39</td>
<td>0.58</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Gesture attitude expression (Shaking hands, helping aged people and kids...)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>An occasional discussion (Occasional acquaintance with other individual/groups)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A friendly discussion (with friends)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A warm discussion (with boy/girl friend or family member)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engagement patterns</td>
<td>How often do you participate in the park’s activities?</td>
<td>Moderate social interaction</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>How frequent is your visit to this park?</td>
<td>3.08</td>
<td>0.74</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>There are variety of recreational interests in the park</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>When is the last time you visit this park?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD: standard deviation; SE: standard error and M: mean

The study found that nodes and edges are the most recognizable elements that contribute to the clarity of park structure. The next section through inferential analysis will confirm whether visual obstacles and clarity of structure influence the level of social interaction or not.

Correlation between Legibility and Social Interaction

A Pearson product-moment correlation analysis (r) was performed to find whether there is a positive or a negative correlation between the legibility variables (visual obstacles and clarity of structure) with social interaction variables (intensity of interaction and engagement patterns) across the neighborhood parks. Based on the conventional definition of effect size for correlations [with absolute value], where 0.10-0.29 is small [weak correlation], 0.30-0.49 is medium [moderate correlation], and 0.50 to 1.0 is large [strong correlation] (Cohen, 1990, 1994), the correlation was significant between social interaction and parks’ legibility variables. Intensity of interactions was moderately correlated with clarity of structure \( r(387) = 0.35, p < .001 \), and visual obstacles \( r(387) = 0.48, p < .001 \). While the engagement pattern was strongly correlated with visual obstacles \( r(387) = 0.51, p < .001 \), and clarity of structure \( r(387) = 0.50, p < .001 \).

From the results of the Pearson correlation test, the outcomes demonstrate a significant correlation between social interaction and parks’ legibility, with a strong correlation between engagement patterns and parks’ legibility compared to a moderate correlation with the intensity of interaction.
Table 4: Correlation between social interaction and park’s legibility (Source: Authors).

<table>
<thead>
<tr>
<th></th>
<th>Clarity of structure</th>
<th>Visual obstacles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intensity of interactions</td>
<td>0.353***</td>
<td>0.483***</td>
</tr>
<tr>
<td>2. Engagement pattern</td>
<td>0.501***</td>
<td>0.509***</td>
</tr>
</tbody>
</table>

*p < .05. ** p < .01. *** p < .001

In summary, parks’ legibility has a significant correlation with social interaction. When the highest score is the clarity of structure, and the lowest score is the visual obstacles, it is likely that the level of social interaction will be increased. However, to elucidate the paradoxical results in PH park, concerning the lowest score on the clarity of structure (legibility) and the corresponding highest score on the engagement pattern (social interaction), the next section will explore the impact of the population density on the level of social interaction.

Correlation between the Population Density and the Level of Social Interaction

To describe the strength and direction of the linear relationship between the population density in the neighborhoods and social interaction within the parks, a partial correlation test was performed.

Table 5 shows that park’s legibility and the population density are positively correlated with social interaction. The bivariate correlations between first, the population density and intensity of interaction \( r(387) = .66, p < .001 \) and second, the population density and engagement pattern \( r(387) = .76, p < .001 \), are statistically significant. Then a partial correlation was performed between social interaction and the population density, holding constant for park’s legibility variables (visual obstacle and clarity of structure).

It is assumed that if park’s legibility attributes are the primary causal factor of social interaction, the partial correlation between social interaction and the population density should not be significant. However, the results indicate that there is a substantial, significant and positive correlation between social interaction and the population density, even after removing the influence of park’s legibility’ variables, results were as follow: engagement pattern \( r(387) = .68, p < .001 \), and intensity of interaction \( r(387) = .57, p < .001 \).

Table 5: Partial correlation between density of population and social interaction (Source: Authors).

<table>
<thead>
<tr>
<th></th>
<th>Clarity of Structure</th>
<th>Visual Obstacles</th>
<th>Density of population</th>
<th>Partial correlation for Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Intensity of interaction</td>
<td>.353***</td>
<td>.483***</td>
<td>.657***</td>
<td>.573***</td>
</tr>
<tr>
<td>2. Engagement pattern</td>
<td>.501***</td>
<td>.509***</td>
<td>.764***</td>
<td>.684***</td>
</tr>
</tbody>
</table>

*p < .05. ** p < .01. *** p < .001

conventional definition (> .500 = strong correlation)
These results suggest that although the presence of significant positive correlation between parks’ legibility and social interaction, a minimum density of the population within the neighborhood is vital for social interaction to occur.

**DISCUSSION**

The present research examines the impact of legibility attributes and elements on the level of social interaction within neighborhood parks in the context of Malaysian residential areas. The parks demonstrate different characteristics of setting utilized by residents from different socio-cultural and economic backgrounds. Hence, the physical attributes of the parks and an acceptable level of population density are thought to influence the pattern of use and interaction among park users.

This study found that the legibility of the parks is influenced by a few identifiable and recognizable physical elements, such as nodes, paths, and edges. These elements strongly contribute in creating a clear and legible park structure. The park structure relates to the setting quality that affects the way users utilize the parks. Nodes are found in many spots in the parks where people gather and rest. Park users relate the existing paths with their unique landscape character and their ability to connect users to the various events and activities with ease and comfort. Edges, define the physical and visual boundaries between spaces within the parks and the immediate residential areas while creating attractive spatial boundaries. Furthermore, the amount of visual obstacles is found to be a crucial determinant of park legibility. It is linked to the distance between the different park’s activities areas, and the ability of users to see the whole park setting without physical or visual barriers.

Results in Table 2, indicate that BG and PJ parks recorded a relatively higher clarity of structure compared to PH park, especially for edges, paths, and nodes. This might be due to many reasons. The park’s structure is clearer when users can understand its layout with ease and comfort. As such, the PH park is much larger compared to PJ and BG parks, which may undermine the clarity of the park structure. This is in accordance with Gehl (2011) who stated that people are much more inclined to use compact public places rather than large and impersonal ones. In terms of edges, the PH park is less attractive compared to BG and PJ parks. Gehl (2009) described this scenario as “the edge effect” or how the boundaries of public places can attract and invite users. This finding is in line with Alexander et al. (1977) who stipulated that users of public places are naturally attracted to the edges. Therefore, if edges in public spaces do not provide places for users to linger, they will not be considered attractive. This condition could weaken the park’s legibility. Thus, the edges should be treated as places that have senses and meaning to the users rather than a simple line or boundary.

The findings indicate a major difference concerning the visual obstacles of the PH park compared to the PJ and BG parks. This might be influenced by several factors. First, the activity areas such as playgrounds, games, seats, and shelters are much closer to each other in PH park and less so in PJ and BG parks. Thus, activity areas in PH park are more integrated rather than segregated, which allow lesser visual obstacles between the parks’ users. Therefore, the distance between activities within parks ought to be closer and visually linked to involve the parks’ users in either active or passive interaction. In this regards, people are affected by the physical environment through the perception process, which starts with the stimuli of sensation through the vision (Carmona, 2014). Thus, the closer the activities area to each other, the stronger is the users’ sensation of vision, as the legibility reinforced. The presence of huge trees around and within PJ and BG parks obstruct the
views mentioned. It is suggested that a balanced and carefully distributed area of grassy fields and trees are planned to ensure visual connection and continuity to promote contact, as suggested by Gehl & Svarre (2013).

The study further examined the level of social interaction within the parks by understanding the engagement patterns and the intensity of passive and active interaction. The significant positive correlation between parks’ legibility (visual obstacles and clarity of structure), and social interaction (intensity of interaction and engagement patterns) means that the more legible is the park the stronger is the social interaction. However, two discrepancies were noticed in the results. Although PH park recorded the highest level of engagement patterns, it has the lowest level of the intensity of active interaction. Furthermore, although BG and PJ parks recorded the highest level of clarity of structure, they have the lowest level of engagement patterns. To explain these confusing results, these hypotheses are advanced.

First, for PH park it is argued that the highest density of population of the neighborhood has much to do with increasing the level of social interaction. Thus, legibility variables are not the primary determinant of social interaction. This finding is in accordance with a study on neighborhood parks in the USA conducted by Cohen et al. (2016). Their study highlighted the crucial role of an acceptable level of population density as essential for animation and vitality, and for providing and sustaining livable mixed use of public places (Carmona, 2014; Neutens et al., 2012; Argent, 2008). On the other hand, the low level of intensity of active interaction in PH park is probably associated with the users’ multiethnic background (Malay, Chinese and Indian) showing the dominance of Malay ethnic users in BG and PJ parks. Relating this issue with the level of interaction, a large survey data sampled from Canada and the USA undertaken by Stolle et al. (2008), indicated a significant negative correlation between interpersonal trust and ethnic diversity within neighborhoods, where the lack of trust is considered as valuable indicator of park users interaction (Latinopoulos et al., 2016; Kazmierczak, 2013). This pattern suggests that in planning socially responsive public parks for multiethnic groups living in the same area, the parks should provide common areas that fit with the different cultural backgrounds, to facilitate active interaction between the different groups.

In terms of engagement pattern, the lesser level of engagement and participation in BG park can be linked to its location within a gated neighborhood, where neighbors are mostly isolated from the rest of the wider population. This type of residential setting may be a logical solution to ensure safety and security of the community, but maybe discouraging for social interaction. Miao (2013) has described the gated neighborhood as the cancer of urban life, i.e. closed places with guarded entrances, usually inhabited by homogeneous residents (Low, 2003; Harvey, 1996). Another factor that may decrease the engagement level in both BG and PJ parks is the presence of mainly lower density bungalow and semi-detached housings equipped with private compounds for social activities. This could be the deterrent factor in attracting the residents to use and visit the parks.

CONCLUSION

This study addresses the function of legibility in making public places such as neighborhood parks more usable as social spaces. Their social value of generating contact and outdoor activities will be strengthened if the neighborhood parks are legible, accessible and appealing to the residents. Less visual obstacles within the parks and improved clarity of structure in terms of smooth edges with meaning to residents, integrating the different activities and connecting them with well-designed and comfortable paths are critical
characteristics for a better park utilization. Other considerations include having a certain critical level of population density to boost park utilization. In that regard, higher density apartments close to the parks allow for potentially greater social interaction. Also, it is crucial to avoid gating neighborhoods, which could discourage social interaction. In addition, a mixed typology of residential housing could provide the diversity needed to generate more activities within public places with legible elements to support greater interaction among park users. Finally, in terms of planning socially responsive parks, the characteristics of multi-ethnic groups living in the same neighborhood should be taken into account in designing and managing neighborhood parks. The finding is a step further in the field of urban design, to improve the planning and design of neighborhood parks for enhanced residents’ quality of life and well-being.

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