THE PHYSICAL ACTIVITY AFFORDANCES OF DIVERSE PARK BEHAVIOR SETTINGS IN ACCORDANCE TO GENDER

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THE PHYSICAL ACTIVITY AFFORDANCES OF DIVERSE PARK BEHAVIOR SETTINGS IN ACCORDANCE TO GENDER

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1 ABSTRACT

Urban parks can provide significant spaces for people to be involved in diverse physical activities while interacting and retreating with nature. However, there are few observational studies regarding the preference of different genders for diverse neighborhood park settings. Additionally, the concept of behavior setting and affordance can provide a basic foundation to understand the functional properties of the settings within parks based on the behavior of the users. This approach can contribute understanding the requirements of different users through the design process. To extend previous environment and behavior research, this case study explored the relationship between male and female park users and the afforded physical activity levels in behavior settings. Data collection was through behavior mapping of a neighborhood park within Cary, NC, USA. The examination of 474 data points indicated that most park users were engaged in sedentary and moderate physical activity levels. The results indicated a significant relationship between the existence of continuous, aesthetically pleasing, and safe hard pathways and female active behavior. Males were more engaged in vigorous physical activity in open lawn behavior settings that afforded various organized group activities. Additionally, the playgrounds afforded a variety of physical activity opportunities through the implication of safe surface for children and providing opportunities for adult supervision and socialization. The results of this study are important for understanding specific design characteristics in park environments that afford gross and moderate physical activity levels corresponding to gender abilities and interest.

1.1 Keywords
Gender, physical activity, park, behavior setting, affordance
2 INTRODUCTION

In recent years, the prevalence of obesity is becoming an increasing concern of public health. Current research shows that adults, adolescents and children in USA are confronting major health issues due to obesity (Ogden, Carroll, McDowell, Tabak, and Flegal, 2006). On the other hand, studies have suggested the correlates of habitual physical activity on health by reducing chances of heart disease, depression, weight, while maintain muscle, joint, and bone health (Saris, Blair, van Baak, et al., 2003; U.S. Department of Health and Human Services, 1996). Despite of its many benefits for health, only less than 40% of adults in western countries engage in physical activity (Seefeldt, Malina, and Clark, 2002). Evidence based research is pursued by governmental health organization to support designers in creating active lifestyles (Cosco, 2006). Indeed, environmental interventions are new methods to complement health education methods to increase individuals’ physical activity levels (Pate, Pratt, Blair, et al., 1995).

Previous research suggests outdoor environments (Salilis, Hovell, Hofstetter, Elder, Hackley, et al., 1990), and specifically parks, to be correlated with physical activity levels and obesity prevention through providing accessible, free opportunities for citizens chances for physical activity (Godbey and Mowen, 2003). However, there is a lack of empirical research on how the design features of park settings can associate with physical activity levels of users. One example is the study conducted by Cohen and colleagues (2006) on adolescent girls, indicating that the existence of several park facilities was significantly related to different levels of physical activity based on accelerometer measurements. The study conducted in Netherlands among 422 children of 6-11 years old and in ten different neighborhoods, indicated a positive correlation between paved playgrounds, sport fields, water, safe walking and cycling, heavy tragic, and dog waste and activity levels (de Vries, Bakker, van Mechelen, and Hopman-Rock, 2007). Furthermore, self reported results of studies (Brownson, Barker, Housemann, et al., 2001; Humpel, Owen and Leslie, 2002) recognize the influence of exercise facilities in promoting vigorous physical activity among various age groups.

Building on the literature, this research attempts to extend knowledge about how different behavior settings and zones in a diverse park setting can afford various levels of physical activity and activity types for different genders. The results are important for understanding specific design characteristics in park environments that afford gross and moderate physical activity levels corresponding to gender abilities and interest, proposing design proposals for developing healthy and active environments.

2.1 The concept of behavior setting and affordance

To identify the specific environmental changes to modify habits it is necessary to have a deep interpretation of the association between behavior and built environment. This research will apply the concept of affordance and behavior setting to analyze park attribute potentialities that actualize physical activity levels between genders. Based on the affordance theory suggested by Gibson (1979), when a structure in an environment supports a specific behavior, it affords that. The application of this theory provides a practical mythology for exploring the functional significance of environments for various users (Clarck and Uzzell, 2002).

Some researchers have implemented the affordance theory to explore the extent different outdoor environments can support specific behaviors for individuals. For example, Clark & Uzzell's (2002) research was intend to develop scales to measure affordances in home, neighborhood , school and town centers in terms of affordance in terms of two developmental needs: social interaction and retreat. Researchers explored the difference and similarities between affordances of these environments. They also examined how often these environments are utilized of the affordances. Additionally, age and gender difference in perception of affordances and the frequency environments were used to actualize these affordances were explored.

A study by Kytta (2002) investigated the actualization of affordances in various environments in Finland based on individual interviews with 8-9 year old children. The results indicated significant difference in the level of affordances (perceived, used, and shaped) and distribution of affordances within
the categories (urban, suburban, small town, and rural environments). The results of Moore and Cosco’s (2010) research on the affordances of outdoor childcare settings indicated that different characteristics of play areas may impact children’s behavior related to setting category, setting form and ground surface. Similarly, based on the concept of affordances, the study by Fjortoft and Sageie (2000) aimed to explore the variation and diversity of landscape corresponding with the diversity of play activities. The results indicated that natural landscapes afforded more functional play for instance gross motor activity and basic skills (running jump, throw, climb, crawl, roll, swing, or slide). From these findings, it is clear that the concept of affordance is a practical approach to investigate environmental-behavior relationships within park settings.

Our research design was also guided by the behavior setting perspective, developed by Barker (1976). The behavior setting concept recognizes the physical environments as subspaces that can predict the behavioral affordance (Moore and Cosco, 2007). This concept has been employed by some environmental design researchers. For instance, in a research conducted by Moore and Cosco (2007), a park with high quality activity setting was analyzed through the concept of behavior setting to interpret how a universally designed park was used and perceived. The researchers analyzed the amount of use in relation to the size of behavior setting to measure setting effectiveness. In conclusion, the application of behavior setting framework allowed comparing and analyzing each functional unit of the park.

In a more recent study by Moore and Cosco (2010), this concept was applied to compare two childcare settings. The results indicated that most activity occurred in the same settings in both childcare centers. However, distribution of activity within the same setting was different in each center (87% in 3 setting: open area, pathway, and dramatic play setting). In another research conducted by Natural learning Initiative (2007), behavior mappings were conducted to identify behavior setting boundaries to be explored in terms of science learning behavior and associated social and environmental variables.

The review of these studies suggests the appropriateness of affordance and behavior setting concept in order to recognize how various design constituents of parks can actualize different physical activity levels for individuals. Additionally, it points out the lack of research in terms of park behavior settings and affordances, while it can provide a theoretical framework to compare and explore each functional unit of a park in terms of physical activity affordances. These concepts will contribute segregating the park environment based on individual behavior, while understanding how each environment affords for a particular gender.

3 METHODS
This study took place in a sub-urban part of Cary, NC, USA during winter 2011, through three observation sessions. The study site was a neighborhood scale park, incorporating major zones such as woods, playground, pathway, lawn, vegetation, parking, and rain garden (Figure 1). Data were collected through observing the people present in the park, and coding their physical activity levels using the SOPARC (System for Observing Play and Recreation in Community), applied by previous researchers (Cosco, 2006; Tester and Baker, 2009, etc.). The park was visited by three trained observers for behavior mapping who achieved inter-rater reliability for determining the physical activity levels. Observers also coded for gender, activity type, while coding the location of the individuals on a paper map. The park was divided into particular zones and behavior setting. The observers scanned each zone clockwise, while rotating their zone location. Each observation included a 15 second for observing and 20 second for coding. Each day of observation, a reliability round was conducted from the observers. After the data collection, they were imported to GIS (geographic Information Systems), to be attributed based on location and behavior settings.

Analysis involved the application of SPSS to explore descriptive and correlational association. Descriptive analysis provided information about the frequency of observed individuals based on gender, physical activity levels and behavior types, within behavior settings, and zones. Correlational analysis examined the relations between the behavior setting type and gender, behavior setting type and level of physical activity, and gender and physical activity levels. The analyses were meant to allow researchers to understand how behavior settings or zone were mostly used by each gender, what physical activity level
was afforded by behavior settings or zones, and if there were any gender difference in terms of the level of activity engagement and type of activity.

![Figure 1. The map of park with specified zones](image)

4 RESULTS

Through behavior mapping observation 474 data points were collected. The descriptive analysis indicated a number of 192 males (40.5 %) and 282 females (59.5 %) users. Most users were engaged in sedentary (43.5%) and moderate (44.1%) type of activities, while only 12.4% were coded for vigorous levels of physical activity. Additionally, the results indicated that more than three quarters of people (77%) were engaged in walking, standing, sitting, and playing with facilities type of behaviors.

Within 28 behavior settings, users were mostly observed on the rubber ground (14.8%), and subpath (10.3%). The chi square analysis indicated no significant association between gender and physical activity levels (p>0.05). However, the proportion of males engaged in vigorous activity levels were significantly 7.1% higher than females (p<0.05). Furthermore, the chi square analysis indicated no significant difference between genders in terms of the type of behaviors involved. However, male users seemed to be 9% more engaged in self organized games than females (p<0.01). Males were seen significantly 10 % more than females in the lawn (P<0.01). Interestingly, the proportion of female users was 8% more than males in the primary pathway zone, while male were 11.3 % more than females in the lawn zone.
The lawn area afforded the three ranges of physical activity levels, while being the most capable behavior setting in terms of vigorous activity levels. Additionally, sub pathway, rubber ground, main pathway and lawn were the behavior settings that mostly afforded moderate levels of physical activity. Rubber ground, benches, and sitting walls relatively afforded the most sedentary physical activity levels. Table 1 displays the comparison of zones in terms of affording various physical activity levels. The results suggests the playgrounds to have the most distributed levels of physical activity, affording the highest level of moderate, sedentary, and vigorous physical activity. Following that, primary and sub pathway zones afforded the highest level of moderate, and the lawn zone vigorous type of physical activity.

<table>
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<tr>
<th>Physical activity levels</th>
<th>Entrance</th>
<th>Gathering</th>
<th>Vegetation</th>
<th>Lawn</th>
<th>Parking</th>
<th>Playground</th>
<th>main pathway</th>
<th>Secondary pathway</th>
<th>ST</th>
<th>Woods</th>
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<tr>
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<td>9</td>
<td>2</td>
<td>14</td>
<td>19</td>
<td>16</td>
<td>83</td>
<td>31</td>
<td>33</td>
<td>0</td>
<td>2</td>
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<tr>
<td>Sedentary</td>
<td>3</td>
<td>34</td>
<td>45</td>
<td>7</td>
<td>1</td>
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<td>30</td>
<td>20</td>
<td>2</td>
<td>0</td>
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<td>11</td>
<td>0</td>
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<td>9</td>
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<td>1</td>
<td>1</td>
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5 DISCUSSION
This research attempts to extend knowledge about how diverse park behavior settings can afford a variety of physical activity opportunities for users. As has been suggested in previous research, neighborhood parks can provide physical activity and leisure opportunities for children and adults within proximity (Flyod, Spengler, Maddock, Gobster, and Suau, 2008). While parks can provide vigorous and sedentary type of activities, it is necessary to explore what park characteristics are associated with these levels (Bedimo-Rung, Mowen, and Cogen, 2005). While most research in this terms of physical activity levels in parks are based on self-report methods (Bedimo-Rung et al., 2005), few studies have objectively measured how parks’ behavior settings can associate with different levels of observed physical activity behaviors. In this research, through the application of behavior mapping and GIS program, and the concept of behavior setting and affordances, the physical environment of the park was observed in terms of physical activity behavior affordance.

Contradicting with other studies (FLyod et al 2008; Loukaitou_Sideris , 1995; Loukaitou-Sideris and Sideris, 2010) the behavior mapping result indicated female individuals to be more using the park than males. This may be due to the accessibility of the park in the neighborhood context, or the social environment attributes the park provided for them, while supervising for their children. In fact, the survey results from Loukaitou-Sideris and Sideris (2010) found a positive association between female-use of park
space to the perception of safety provided by the environment. Future survey research from park users can contribute to understand if females perceive high levels of safety and what environmental characteristics is associated with this perception.

Results from this study supports previous research through indicating most park users to be engaged in sedentary activity levels (Bedimo-Rung et al., 2005; Cordell, McDonal, Teasley, et al., 1999). The observational data builds on the self reported findings of Cordell and colleagues (1999) in which 67% of participants reported walking, observation, or sitting as their frequent activity in parks. Although sedentary activities may not provide the health benefits of higher levels of physical activity, the result suggests the importance of providing these potential affordances to increase the level of park use, so individuals can benefit from the restorative effects of nature (Kaplan, 1992; Maller, Townsend, Brown, and St Leger, 2002).

Nevertheless, while engaging in all types of activities can impact mental health and stress, moderate to vigorous types of physical activities are recommended for their many benefits (Bedimo-Rung et al., 2005). It is possible that the lack of interesting facilities for activity engagement of various age groups and abilities may have influenced users’ engagement in sedentary and moderate activities. For instance, the research results of Ridgers, Fairclough, and Stratton (2010) indicated that when children were not provided by equipment they were engaged 8.2 % more in sedentary activity and 7 % less moderate activity. Another study by Potwarka et al., (2008) displayed that parks with lower number of facilities had fewer numbers of people engaged in moderate to vigorous physical activities.

Consistent with other studies (Moody, Prochaska, Sallis, et al., 2004; Trost, Owen, Bauman, et al., 2008) the results indicated males to be more engaged in higher levels of physical activity. For instance, Moody and colleagues (2004) found that Boys are more involved in physical activity programs compared to girls. In a recent study by Ridgers et al. (2010) on schoolyards, the findings indicated that during recess girls were 138% more engaged in sedentary play activities and 82% less in vigorous physical activities than boys.

These findings suggest the lack of interesting facilities for female users in park settings to engage in vigorous physical activity. Some researchers have investigated the physical environment attributes relating to increased level of female physical activity. In a self reported study by Loukaitou-Siders and Siders (2010) the findings indicated that girls generally preferred playing with the park play equipment such as swings or slides. The results of the study by Potwarka et al. (2008) suggested that the existence of parks with playgrounds, basketball courts, walking paths, swimming pools, tracks, and multi-purpose rooms, in proximately of less than 5 miles was positively correlated to higher levels of out of school physical activities in female adolescents. In a study by Scott and colleagues (2007) physical activity levels of adolescent girls was positively associated with the perception of access to facilities (golf course, basketball court, tracks, playing fields, dance clubs, etc.) and total objectively measured of recreational and sport facilities within 1 mile distance of home. Recent research by Mota et al. (2009) indicated that adolescent girls are more activities with available walking and cycling infrastructure, aesthetic qualities, and available equipment. These examples show how females may have different interests for park facilities that encourage them to participate in vigorous levels of physical activity. Yet, there is a requirement for further empirical research on what specific behavior settings can stimulate different females within various age groups to be more engaged in higher physical activity levels.

The results suggests the existence of large open green behavior setting to be a significant contributor for affording different levels of physical activity. This may be associated with the flexible, curved shape of the lawn with its large open flat surface that afforded opportunities for organized games, running, or walking activities. In fact, the research by Seaman, Jones and Ellaway (2010) indicated that Individuals were attracted to quality green spaces when they offered them things to do. Observational study by Golicnik and Thompson (2010) indicated that the type and shape of lawn to be a significant contributor for active informal ball games. Consistent with the result of other studies (Golicnik and Thompson, 2010; Loukaitou-Siders and Sideris, 2010), observers coded for mostly male teenage and adults playing football or ball games in the lawn field. The results imply the importance of acknowledging and providing behavior settings that can afford organized physical activity opportunities, while being flexible in the terms of use, to amplify male user’s physical activity.
Following the design guidelines for pathways by previous designers (Marcus, 1998; Striniste and Moore, 1989) the pathways relocated individuals to various parts of the park through its non-linear, curved shape, while affording varied views, opportunities to sit and rest, and changing settings for openness and enclosure. Additionally, the brick paved main pathway had unique artistic shapes and curves that increased its aesthetic quality. These spatial qualities may have increased user’s perception of safety and may be the reason that the pathway settings were one of the mostly used by individuals, and especially females. Related to this assumption, a study done by Evenson and colleagues (2006) showed that perception of safety and aesthetic quality impacts the park use. Future qualitative research is required to explore how the spatial qualities of the pathway can affect different perception and use for females.

The behavior mapping and observation results of this study revealed that females were more interested to use the primary pathway, while the curved pathways were a major behavior setting used by most people for moderate levels of physical activity. Supporting previous research (Kaczynski, Potwarka, and Saelens, 2008; Moore, 1986; Moore and Cosco, 2010; Moore and Wang, 1997) the behavior mapping results specified how the hard surface of the pathways afforded cycling, stroller-moving, and running activities.

The playground area was the major zone affording a variety of physical activity levels. Confirming Moore and Wong’s (1997) observational findings, the safe rubber ground surface afforded a safe surface for children’s moderate to vigorous physical activity. The existence of sitting walls surrounding the playground afforded sitting opportunities for adults to supervise children while socializing, which may increase children’s opportunities for park visit and physical activity levels. Confirming this belief, the interview results by Seaman et al. (2010) implied that increasing chances of monitoring and supervision for adults has a positive association with children’s outdoor play opportunities. Similarly, the research by Moore and Cosco (2007) indicated that providing behavior settings that affords chances of supervision has a positive relationship with parents’ use of parks. The results accentuate the significance of safely surfaced design for playground settings where children can engage in vigorous to moderate levels of physical activity. These setting require providing affordances for sitting and vantage points so parents can supervise with children while socializing with other guardians.

6 CONCLUSION

Urban neighborhood parks are important contexts for promoting free, accessible physical activities for citizens. Therefore, it is critical to understand what physical environment characteristics within park spaces can afford vigorous to moderate level of physical activity, in order to design more health promoting spaces. Importantly, different genders have various abilities and desires, which are required to be understood to promote physical activity levels in both genders in park spaces. In this case study, the findings provide evidence that pathways, playgrounds, and lawn behavior settings to be the behavior settings that mostly afford moderate to vigorous level of physical activity. Additionally, the type of surface and form of these settings affected the type of use. While in most settings there was no significant difference between genders, lawn was mostly used by males for vigorous type of activities, and female users were more attracted to the pathway as a mean of walking while socializing, and enjoying the park. The results of this study would have been strengthened if the observations were conducted in longitudinal periods and various seasons. Additionally, the comparison between genders was not applicable in some behavior settings due to the lack of data. Therefore, further empirical evidence is required to amplify these results and compare various behavior settings in terms of physical activity affordance for genders. Furthermore, research on user’s perception of these behavior settings and the type of physical activities they afford can contribute to understanding the behavior mapping findings.

7 REFERENCES


