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CHAPTER 7

What makes a park inclusive and universally designed?

A multi-method approach

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Introduction

Social inclusion has been the subject of recent initiatives in the United Kingdom and Canada driven by continuing issues of social exclusion of minority ethnic groups, low-income families, people with disabilities, children, youth and elders from mainstream contemporary society. Particularly in the Canadian view, the physical environment and public domain of cities and urban neighbourhoods, including parks, are viewed as critical areas of modern life and, therefore, spaces for social inclusion. As Drache (2001: 8–9) states,

> Environmental inclusion in all cities has to be thought of as the capacity of the physical environment to facilitate and promote sustainable human development. . . . How is the city to become a more inclusive habitat without a process of inclusion anchored in the public domain?

The question turns on the role of urban landscape design in achieving this anchor and challenges designers to provide high quality public spaces that offer more than a merely pleasing physical environment. The question is what tools do park designers need to create such recreational environments that would support social inclusion? This chapter describes a multi-method approach to assess social inclusion in a universally designed park to understand the environment/behaviour dynamics. The approach may be useful to planners and designers wanting to provide successful park environments for all.

The concept of social inclusion goes hand in hand with that of universal design. US architect the late Ron Mace is credited with developing the concept, which he defined as 'the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design' (Ostroff, 2001). He saw universal design as an inclusive concept beyond the 'accessible design' of buildings that would accommodate all human needs, including those of people with disabilities (himself a wheelchair user). Development of the term had its beginnings at an expert seminar (co-sponsored by the US National Endowment for the Arts, NEA), including Mace, which reinforced the notion of 'design for all people' as the umbrella concept under which

'accessible design' (the term 'universal design' had not been invented yet) should fit (Ostroff and Iacofano, 1982). This direction in the US discussion on universal design was further advanced in 2003 by a gathering (again sponsored by the US NEA) of US universal design experts who emphasized 'an overarching need for more research in a wide array of critical topic areas . . . types of populations, products, environments and systems [including] . . . urban design and outdoor recreation' (NEA, 2003: 1). Park evaluations were specifically listed in this context. Across the Atlantic, the current UK term closest to universal design is 'inclusive design'. Aligned with the requirements of the Disability Discrimination Act (DDA, Department for Education and Employment, 1995), it has an explicit focus on disability, especially as associated with ageing – the new reality of increasing longevity.

At the young end of the age spectrum, a case can be made for including the general population of children within the purview of universal design because of their vulnerability and developmental needs (Moore *et al.*, 1992). A small proportion of children live with some type of special need (physical, mental or sensory impairment) that requires special environmental modifications, but children as a whole have special needs defined by levels of maturity and skill limitations. Children are also individuals in the process of learning about the world around them. Richer environments – socially, culturally and physically – enhance and extend the learning process (Hannaford, 1995). Design has an obvious role in helping to create spaces where such richness and diversity of experience can happen – especially for children living in deprived or stressful circumstances.

Taken at face value and as understood in this chapter, the concept of universal design will justifiably include all disenfranchised groups (such as children) whose freedom is currently constrained by environmental barriers, which they are unable to influence or redesign to support their particular needs. It seems obvious that all user needs must be addressed if the design of a space is to be considered 'universal'. Based on the original premise, we may conclude that to be valid, the evaluation of a public environment must address the needs of *all* users, including those with disabilities.

This chapter provides an opportunity to contribute to the discourse through findings from an on-going study of a universally designed park created as an inclusive community environment. Kids Together Park is located in Cary (a fast-growing town with a population of 116,000 in 2006, adjacent to Raleigh, state capital of North Carolina, USA). The park was conceived by the Cary Parks Commission as a family recreation facility accommodating the needs of all users. A community-driven design process was launched in 1994 with a workshop involving children and adults. Children created the name 'Kids Together' and remained an essential part of the design process (see Figure 7.1). After several years of community fund-raising, the park opened in 2000. About one million US dollars were invested, including the cost of extensive infrastructure and site works. The park serves as a research site for systematic studies of park use, including the data reported on here.

7.1 Children's workshop during the community design process for Kids Together Park.

Study goal

Kids Together Park is an appropriate study site because of its design, which offers a diversity of high-quality activity settings potentially attracting multiple user groups. This provides the

base condition for an ecologically valid research design.[1] Data for the study reported here were generated using *behaviour mapping, behaviour tracking, park visits with people with disabilities, setting observations*, and *interviews with users*. Using this multi-method approach, the study goal was to learn how a universally designed park was used and perceived. The purpose was to contribute to the extant evidence-based literature on park and playground design (Cooper Marcus, 1990; Moore *et al.*, 1992).

Theoretical framework

Three overlapping concepts provide the theoretical framework for this study:

- territorial range development
- behaviour setting, and
- affordance.

Territorial range development recognizes that maturing children explore, discover and make sense of their expanding world through experience, learned skills and spatial understanding (Hart, 1979; Moore and Young, 1978; Moore, 1989). To maintain this dynamic relationship with the environment, children repeatedly act at their territorial limits, constantly expanding the 'known' world by pressing against the 'unknown'. For each child to exercise her or his exploratory skills beyond the known, space must be designed with soft, extendable territorial boundaries. Given the range of ages, levels of ability, and variety of child–caregiver relationships present in an urban park, environments with higher levels of diversity are likely to satisfy the exploratory needs of more children at any given moment.

Applied to park design, this view of territorial range development provides children with a landscape offering new exploration challenges and discoveries with each visit. A park with effective territorial range development would thus hold a child's interest through repeated visits across the span of childhood. Territorial design must similarly motivate the continuing interest of accompanying caregivers. They must be as excited to go to the park as their children and feel comfortable once they get there.

Behaviour setting is an ecological unit where physical environment and behaviour are indissolubly connected in time and space. Barker (1976) describes behaviour settings as the subspaces of a geographical area and the predictable patterns of behaviour they afford. Behaviour settings are composed of *entities* and *events* (people, objects, behaviour) and dynamic processes such as sound and shade. Their components are arranged functionally as part of the whole. Functions are independent of adjacent eco-behavioural units. The concept is useful for analysing human spaces because it provides a theoretical means to disaggregate their functional parts, thus providing a key structural component and unit of analysis for the interpretation of findings. Empirically established levels of use can be compared to investment and management costs to provide park managers with benefit/cost measures that can be used to shape future management strategies.

Applied to park design, the behavioural setting concept provides an invaluable vehicle for specifying the function of sub-areas and laying them out in appropriate relationships to each other within the whole park. At the level of behaviour setting, requirements to support people with disabilities will be considered with the requirements of all other users.

Affordance is a concept (Gibson, 1979) which defines functional physical features 'that offer certain possibilities to the individual' (Heft, 2001: 297). Affordances are the functional properties of environments related to individual users. They are neither part of the environment, nor of the perceiver. An affordance exists at the intersection of the subject's behaviour in connection with the environment. Potential affordances exist even if the individual has not yet discovered them. It is the individual's action that makes an affordance 'actualized'. Individuals 'pick up' information by perceiving the relation between the layout of the space, objects and events and their developing skills (Gibson, 1979). As children pick up information afforded by the layout, objects and events in behaviour settings and learn the possibilities for action they offer, these actualised affordances become embodied knowledge that support relationships between individuals and environments. Affordance is a dynamic perceptual process through which interrelationships with behaviour settings develop over time. Affordance considers the individual and the environment as an interactive system.

Applied to park design, the concept of affordance can be used to identify and analyse similarities and differences among behaviour settings such as manufactured play equipment, sandplay areas, pathways and vegetated settings. It is also valuable for explaining, in terms of design details, variations in activity across behaviour settings of the same type. For example, the reason why one sandplay setting may be more popular than another for caregivers with young children could be explained by the elevated enclosure for sand that also affords sitting, like a 'sitting wall'. The layout of settings and territories may vary in dimensions such as geometric form, variations in topographic variety or visual transparency. Components may require specific features such as handholds to make them accessible to children. Characteristics of plants such as fragrance or pickable seeds or fruit may influence the actualization of affordances. Natural events, such as weather, or social events, such as birthday parties, may also influence the actualization of affordances.

Empirical evidence identifying affordances can provide valuable source data for designers by focusing attention on the detailed design of components (*layout*, *objects*, *events*, and for designers we may add *features* and *characteristics*) that really matter from the point of view of users. The extent to which such evidence is associated with a particular component of a behaviour setting may disclose a measure of its universal design value.

Application of theory to park design

Together, territorial range development, behaviour setting and affordance should be thought of as closely linked environment–behaviour constructs that provide a theoretical base for measurement of behavioural links between the built environment and physical activity (Gibson, 1979; Gibson and Pick, 2000; Heft, 2001).

If the design of a neighbourhood family park is considered as the task of creating a community meeting ground or commons, support of social, psychological and cultural objectives is of paramount importance. Such a park will serve a longitudinal function as a place where children, families and communities can develop and become sustained for all ages and abilities.

For children, parks can serve as communal backyards, where they can play freely together and be exposed to experiences that may be unavailable in constrained domestic settings. The overall territory of a park secures support for natural child development by allowing safe access to an ever-widening range of experience in both breadth and depth for children alone, with peers or accompanied by caregivers. An appropriately designed park environment will challenge the increasing maturity level of each individual and at the same time respond to parents' differing levels of tolerance towards children's risk-taking. Activity in settings is triggered by the child's increasing repertoire of actualized affordances learned from the potential for action that settings offer. Diversity of settings and richness of child-related features are the design criteria likely to differentiate more successful from less successful territories from the point of view of child development and family usability.

Methodology

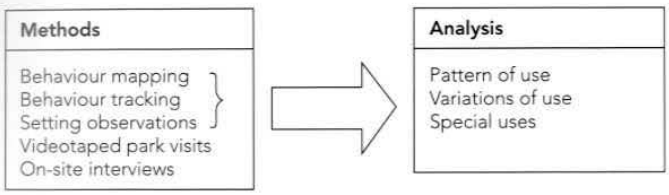
A multi-method research strategy was used to assess the park design through a participatory, inclusive approach that regards users' knowledge and behaviour as a valid and appropriate body of data. Three types of data were collected. First, park-wide spontaneous activity data were collected using *behaviour mapping*, *behaviour tracking* and *setting observations* (described below). To expand the theme of social inclusion, informal observations of use of the park by ethnic/racial minorities and adolescents were included. Second, selected families with a member with a disability were recruited to make a *videotaped park visit*. Third, *on-site interviews* were conducted with the above families as well as with other park visitors.

Three levels of analysis were conducted. First, the observational data were analysed to investigate the *pattern of use* in the park as a whole by children and adults, both in terms of its functional zones and types of behaviour settings. This first level of analysis produced an environment-behaviour assessment of park-wide use, including an understanding of how the dynamics of use between settings were influenced by the park layout. In this regard, the function of the composite play structures and primary pathways received special attention.

The second level of analysis introduced further data to help explain the *variations of use* across different types of behaviour settings by children and adults. To contribute an understanding of effective park site use, relationships between size of settings and behaviour were investigated.

The third level of analysis was aimed at understanding *special uses* of the park – how the layout, settings and features of the park landscape afforded satisfying experiences for children with disabilities and other family members. Dominant park perceptual themes of safety, freedom and ambience identified from interviews with park users were also discussed.

Methodology summary



Procedure

The distinctive layout of Kids Together Park was defined by three intersecting circular pathways that functioned as a behaviour setting type as well as affording access to the other park behaviour settings (see Figure 7.2).

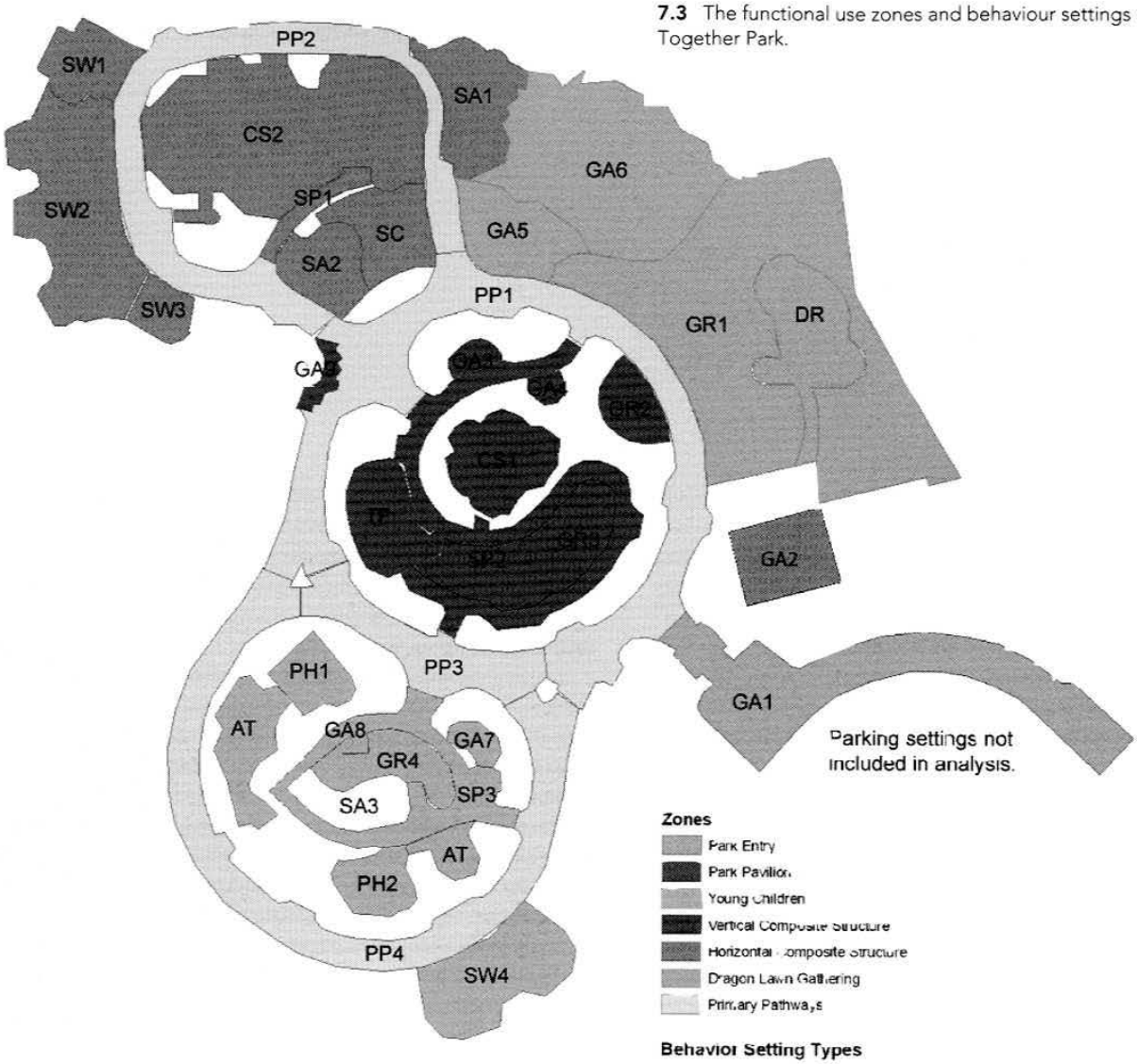
Behaviour mapping, which records the location of use across the site, was conducted by systematically circulating through the space, coding each user by type and location. Behaviour setting boundaries were first established.[2] Coding of users included child in stroller, ambulatory child or adult, wheelchair user (child or adult) and gender (for adults only, because we were interested in caregiver behaviour).[3] Behaviour mapping data were recorded on a paper plan of the site,[4] later entered and processed using Geographical Information Systems software (ArcMap 9.1, ESRI).

Behaviour tracking (a form of behaviour mapping), which records use of the site by single individuals or small groups of individuals, was conducted by following family groups (with their consent) through the space. Each track was recorded on a paper plan (with park entry and leaving times). The routes followed by adults and children were plotted separately.[5] Subjects were treated as a convenience sample. As subjects entered the park they were selected to progressively create a group of trackings covering a range of user types (by family composition, age, ethnicity and gender).

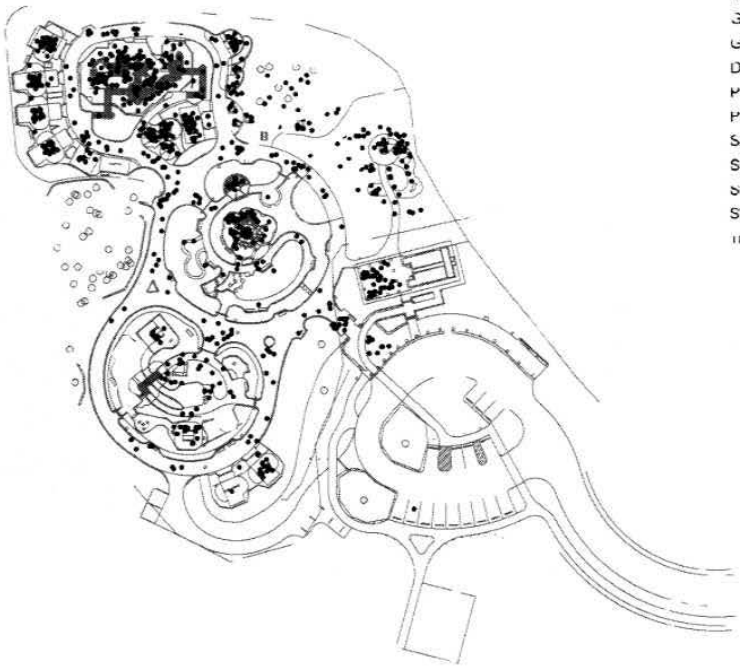
Setting observations were made during the course of multiple walks through the park and conducted by observing the detailed activity of a given setting for the duration of a natural sequence of activity occurring there, usually for several minutes. Observations were noted on a standard form with fields for weather, type/size/age/gender of group(s), type(s) of activity, durations, components of setting used and other observations. Field notes and related photographs were made of user interactions in the setting with physical settings, features, accompanying family members and other park visitors.

Family visits were conducted by first welcoming the family group (families including children with disabilities) at the park entrance to complete consent formalities. After making clear that the group should follow their own path around the park, the behaviour of the target child with a disability was videotaped (including voice captured with a wireless microphone), to record interactions with physical settings, features, accompanying family members and other park visitors. Structured, open-ended interviews were conducted with family members at

7.2 Aerial view of Kids Together Park, soon after construction.



7.3 The functional use zones and behaviour settings of Kids Together Park.



7.4 Behaviour map of Kids Together Park showing the distribution of child users.

the end of the visit. Including the interview, visits lasted 60 to 90 minutes.

In addition to the park visit interviews, students in the first author's classes conducted three uncontrolled, *ad hoc* park user interview surveys over a four-year period, totalling 80 individual interviews. Although these data cannot be considered as a systematic survey, they provide evidence of users' dominant perceptions.

Analysis

The GIS relational database was used to estimate spatial distribution of use related to setting type, setting size, child/adult ratio by setting type and gender ratio by setting type. For the purpose of the analysis, behaviour mapping data were distributed between 40 individual behaviour settings, covering a total of 12 behaviour setting types, within seven functional use zones of the park (see Figure 7.3). Figure 7.4 shows the behaviour map for children.

Functional use zones

The functional use zones were defined as follows:

1. *Park Entry Zone* contains five settings: (not included in analysis) two car parking areas and one disabled persons' car parking area, an approach path/accessible route, and (included in analysis) entry plaza/gathering area with benches and tactile map (see Figure 7.5).

2. *Park Pavilion Zone* contains one setting: park pavilion with picnic tables for group gathering (also contains public toilets) (see Figure 7.6).

3. *Young Children Zone* contains ten settings: small swings, two playhouses, sand and water play, secondary path with bridge, little bridge toy, spring toy, lawn patch, seat wall and bench gathering areas (see Figure 7.7).

4. *Vertical Composite Structure Zone* contains eight settings: low hill with vertical composite structure, two lawn patches, pergola gathering area with seats, sitting wall gathering area, wash-off gathering area, secondary path with benches and tertiary path (see Figure 7.8).

7.5 Zone 1: Park entry – approach, parking, accessible route, entry plaza.

7.6 Zone 2: Park pavilion – group gathering.

7.7 Zone 3: Young children – small swings, playhouses, sand and water play, little bridge, grass patch, gathering.

7.8 Zone 4: Vertical composite structure – low hill, secondary path, tertiary path, grass patch, gathering.

7.9 Zone 5: Horizontal composite structure – large swings, other equipment settings, sand play, accessible sand play, secondary path.

5. *Horizontal Composite Structure Zone* contains eleven settings: horizontal composite structure, large to-and-fro swings, tyre swing, platform swing, balance beam, stepbar climber, sandplay with digger, raised accessible sandplay, group gathering with picnic tables, group gathering in pine tree grove and secondary path (see Figure 7.9).

6. *Dragon Lawn Gathering Zone* contains four settings: dragon sculpture (Katal – 'Kids are together at last'), surrounding, sloping lawn, and picnic tables and tree grove gathering settings (see Figure 7.10).

7. *Primary Pathways Zone* connects to the Park Entry Zone, accesses each of the other zones and contains four settings, each a path section with benches, sitting walls and drinking fountains (see Figure 7.11).

7.10 Zone 6: Dragon lawn gathering – Katal dragon sculpture, sloped lawn, tree grove, picnic tables gathering. Photograph shows chase game afforded by Katal features.

Zone attractiveness index

To measure attractiveness across zones requires taking into account both the proportional amount of use attracted by each zone as well as the proportional number of settings contained by each. Gross level of use of a zone does not constitute a relative measure of attraction unless moderated by the number of settings within the zone. An index of attractiveness is proposed representing the ratio of the percentage of use

7.11 Zone 7: Primary path – benches, sitting walls, drinking fountains. Photograph shows social interaction afforded by the wide walking surface.

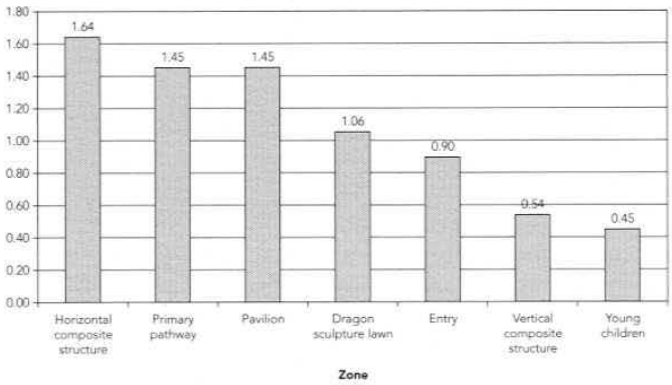
compared to the percentage of settings for each zone, where the value 1.00 is neutral (see Figure 7.12).

Almost two-fifths of the total park use (39.83%) occurred in the Horizontal Composite Structure Zone 5 (see Figures 7.9 and 7.13), with a level of use 2.26 times the next rank order zone (Zone 7, Primary Pathways, see Figure 7.11). Zone 5 was also one of the two most diverse zones as measured by the number of settings per zone, which range from ten (Young Children Zone) to one (Park Pavilion Zone).

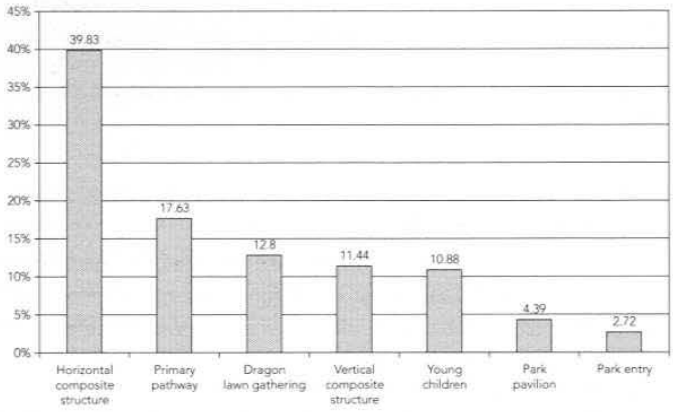
Index of Attractiveness values range between 1.64 (Horizontal Composite Structure Zone) and 0.45 (Young Children Zone). Three other zones have ratios above 1.00: Primary Pathways Zone (1.45), Park Pavilion Zone (1.45) and the Dragon Lawn Gathering Zone (1.06). These four zones could be considered the most attractive relative to the number of settings they contain.

The Horizontal Composite Structure Zone (5) was the most attractive with an index score of 1.64. In contrast, the Vertical Composite Structure Zone score was considerably lower (0.54 – less than 1.00). Why was Zone 5 (located furthest away from the park entrance), so attractive?

It is possible to speculate that since this zone (and the Young Children's Zone) contained more behaviour settings (nine and ten respectively) than other zones, it had more potential to attract a broader range of users with different levels of skill and ability. It was also easily approached and accessed because a primary path connected to its two ramped entries. Not only were there more settings in Zone 5, they were also easily accessible. The swings and horizontal composite play structure components (ramps, slide, overhead glider) were accessible directly from the adjacent primary pathway, which served as a circulation and access spine for a variety of play options as users moved around the space (see Figure 7.14a). These enabled caregivers with strollers to penetrate the setting to use the shady gazebo with comfortable seats, which afforded social gathering within the structure. The upper platform offered a vantage point for caregivers to supervise their children within



7.12 Attractiveness index of zones (percentage of use/percentage of settings).



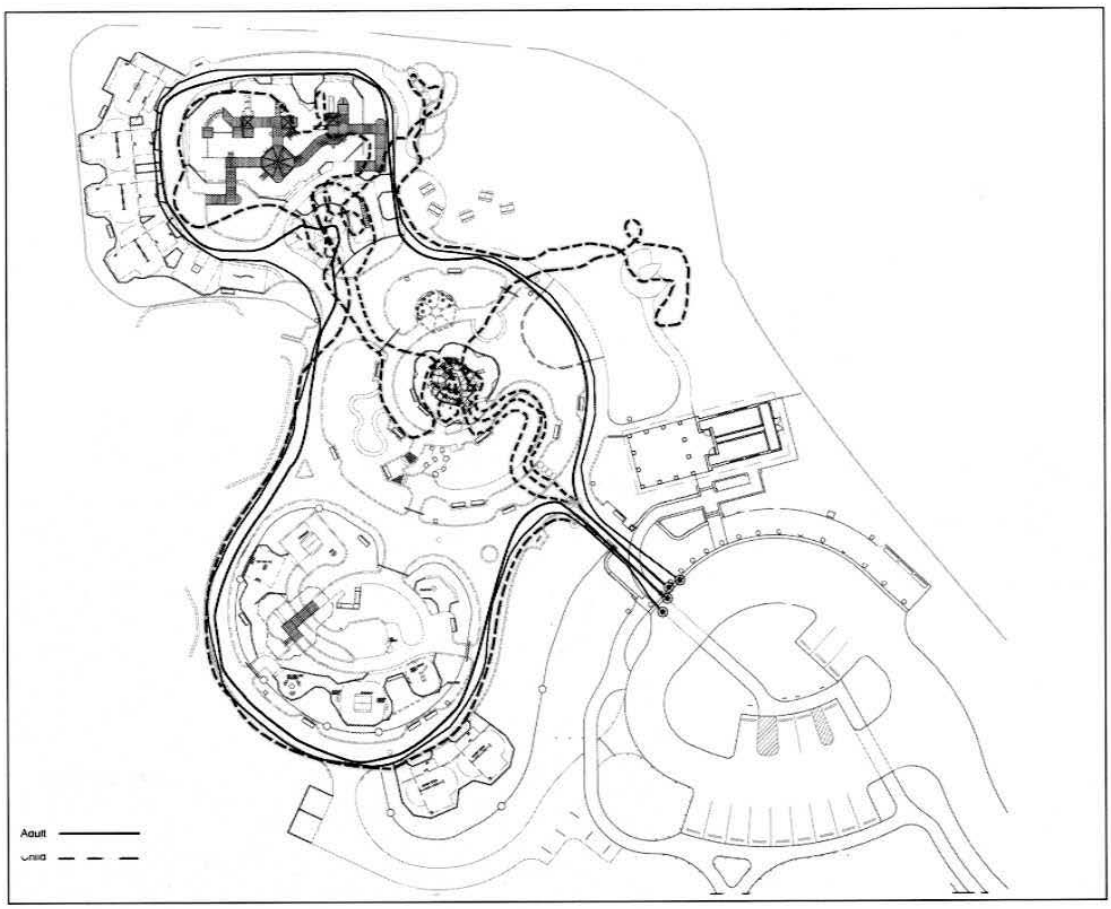
7.13 Percentage of use by zone.

the zone. Caregivers with children in strollers could relax, observe what was going on around them from an elevated position, and participate visually and aurally in the activities of other family members, including older siblings. It can be anticipated that wheelchair users could also benefit from the elevated gazebo setting; however, none were observed in this zone.

Setting observations showed extended family members (grandparents, aunts, uncles, etc.) interacting more with children in the other settings of Zone 5 than in other park zones (see Figure 7.14b).

7.14a Diversity of user interaction afforded by the proximity of the primary path to the variety of features of the horizontal composite structure.

7.14b Diversity of user interactions afforded by swinging settings on the opposite side of the primary pathway from the horizontal composite structure.



7.15 Tracking record of parents and child showing the parents strolling around the looping paths, while their child played in adjacent settings, periodically rejoining parents.

One of the individual trackings demonstrated the particular behaviour pattern of children darting off to play in adjacent settings, while accompanying adults moved along the path (see Figure 7.15). This pattern was most pronounced around the Horizontal Composite Structure Zone because of the larger number of adjacent play opportunities. The sense of seamless connection between primary pathway and adjacent settings in Zone 5 was visually reinforced by the distribution of vegetation, which penetrated both the horizontal composite structure and the swing settings on either side of the primary pathway.

Park Pavilion Zone. Even though the Park Pavilion Zone (see Figure 7.6) was a single setting mainly accommodating family gatherings such as birthday parties, it attracted 4.39% of use, which explains its relatively high attractiveness index.

The Primary Pathway Zone. Subdivision into four settings (12.12% of the total number), each serving adjacent zones and accounting for 17.63% of use, also gave the Primary Pathway Zone a score of 1.45. Why was this zone so attractive?

Many of the on-site interview respondents mentioned the generous width (3m/10ft) of the pathways that afforded easy movement through the park, especially for larger family groups with children riding wheeled toys (see Figure 7.11). This subtle dimension of inclusion provides young children with space to energetically move with less risk of conflict with other users or causing anxiety to caregivers. Respondents also noted the curving form of the pathways that progressively exposed the landscape, adding visual interest to the pedestrian experience.

Kids Together Park demonstrated how pathways can be designed to provide a movement armature throughout the park for strolling and informal socializing in the tradition of the *paseos* in Spain or *promenades* of France and England. Wide, curving paths afford inclusion because a group of half-a-dozen or so can walk and chat together, allowing lulls in conversation to be filled by attention to the progressively exposed sensory landscape and activities of other users – that may stimulate further topics of conversation. Inclusive social relationships are

constrained by narrow paths where individuals must walk behind each other or break the conversation to make way for groups coming in the opposite direction. For groups containing children in prams or strollers or wheelchair users, wide pathways are especially beneficial.

Dragon Sculpture Lawn Gathering (Zone 6). With a score of 1.06, this zone was ranked fourth in attractiveness. It contained four settings (12% of total number, Katal, lawn, tree grove gathering and picnic table gathering) and accounted for 13% of total site use. Activity was mostly related to Katal. The evocative creature attracted children to the zone, who could climb and chase around the dragon and the adjacent sloped lawn, engaged in gross motor activities such as rolling, and activities with caregivers such as wheeled toy and ball play (see Figure 7.16). Other caregivers were able to gather around the adjacent picnic tables settings with their children close by, playing on Katal and sloped lawn. This relationship was observed especially when the picnic tables were used as a base for a birthday party or other family gathering event.

Distribution of use by setting type

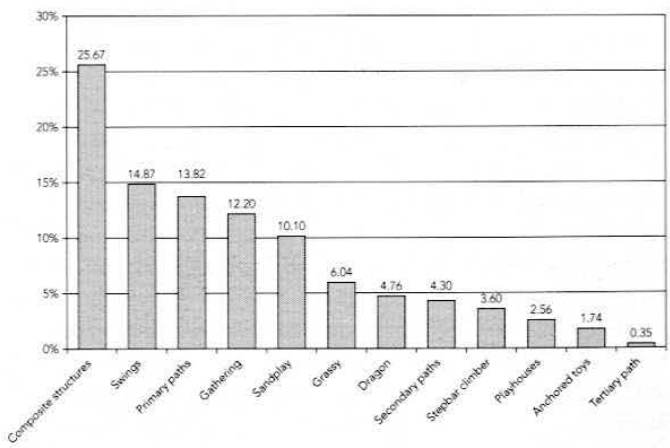
Distribution of the behaviour mapping data across the 12 setting types allows a more highly differentiated level of analysis of use than for functional zones. Park settings and components

7.16 Intergenerational play afforded by the sloping surfaces around Katal.

afforded movement (walking, running, climbing, rolling, hiding-and-seeking, sliding, swinging) on and around manufactured equipment, pathways, topography, trees, shrubs and ground surfaces, and socialising (talking, partying, being with others, observing others) on custom-designed benches, sitting walls, picnic tables and in a pergola and park pavilion. Distribution of this pattern of use by setting type provides an overall environment-behaviour measure, which indicates relative park use across the site from the most to least used setting types. Distribution of use by setting type can inform discussion about the social implications of park design. Equally, empirical findings can better inform physical design to support desired social outcomes.

Of the twelve park behaviour setting types coded, four (composite play structures (25.67%), swings (14.87%), primary pathways (13.82%) and gathering areas (12.20%)) accounted for almost two-thirds (66.56%) of the use. The addition of sandplay (10.10%) indicates more than three-quarters (76.66%) of use occurring in five setting types (see Figure 7.17).

Overall, these findings suggest that park users were attracted by the areas with manufactured play structures, including swings and sandplay, the varied gathering settings (benches designed as art objects, park-style benches, sitting walls and group sitting areas) and the primary pathways. The relatively high use of gathering and pathway settings indicates the social attraction of the park.



7.17 Percentage of children's use by behaviour setting.

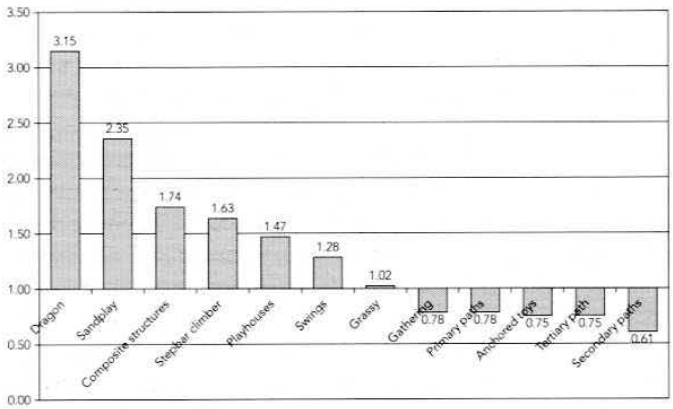
Informal observations of gathering settings indicated a variety of user group configurations including groups of parents chatting in the Young Children Zone, couples using benches, family picnics in the picnic tables and park pavilion settings, and single individuals reading on the sitting walls and benches. While chatting adults strolled through the park, their children played in adjacent settings or engaged in chase games with each other and with adults on the primary pathways wide enough to accommodate active play without disturbing other users (see Figure 7.15).

Setting type/user profiles

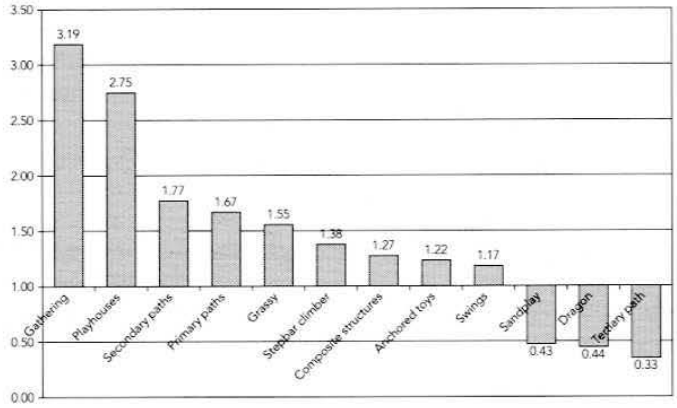
So far, the analysis has focused on use patterns at two levels of environmental subdivision (zones and behaviour settings), without differentiating user types. Behaviour mapping included type of user (child/adult), adult gender, and the presence of strollers and wheelchairs. These data provide two additional use distribution measures by user subgroup.

Child/adult ratio (CAR) is an index of the extent to which different types of behaviour setting are used by adults, children or mixed groups. In other words, where do children and adults play together or separately? CAR is calculated by dividing the proportion of child users by the proportion of adult users for each setting type. A value of 1.00 indicates equal use. A value greater than 1.00 indicates child dominance. A value less than 1.00 indicates adult dominance.

Figure 7.18 shows the proportion of use between children and adults across setting types. Katal the dragon was the most strongly child-attracting (CAR 3.15) by a factor greater than 3:1, followed by sandplay (CAR 2.35). The combined CAR for the two composite structures was 1.74 (mostly due to the vertical structure, with a CAR of 3.32 compared to a CAR of 1.41 for the horizontal structure), thus supporting the earlier discussion about the ease of access of the horizontal structure by adults compared to the vertical structure. The stepbar climber CAR of 1.63 indicates the difficulty of access onto the structure for adults. Their presence was observed helping and supervising their children on the equipment.



7.18 Child/Adult Ratio (CAR) by behaviour setting.



7.19 Female/Male Ratio (FMR) by behaviour setting.

The remaining setting types (playhouses, swings, grassy settings, gathering, pathways – primary, secondary, tertiary – anchored toys) all fall below a CAR of 1.5 either in favour of children or adults. In these settings a balanced mix of children and adults would be expected. From this point of view they could be considered as more inclusive.

Female/male ratio (FMR) is a measure of the extent to which different types of behaviour setting are used by adult females, adult males or mixed adult groups. In other words, where do women and men gather together or separately? FMR is calculated by dividing the proportion of adult female users by the proportion of adult male users for each setting type. A value greater than 1.00 indicates female dominance. A value less than 1.00 indicates male dominance.

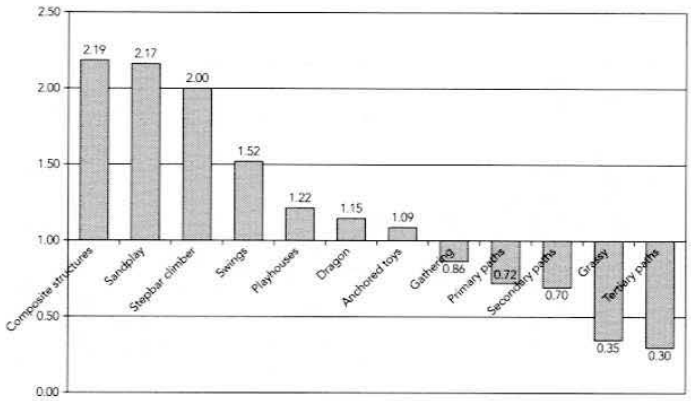
Figure 7.19 shows the proportion of use between women and men adults across setting types. Gathering areas are clearly the most dominant female settings with an FMR greater than 3. It is interesting to note that similar gender-differentiated 'social gathering' behaviour was identified in a behaviour mapping study of 5-to-9-year-old children conducted in a diversified schoolground (Moore and Wong, 1997). The playhouses are a close second in adult female dominance with an FMR of 2.75. This female dominance may be explained by the setting observations of female caregivers engaged in dramatic play with domestic themes with their children.

Spatial distribution of use

The findings thus far have focused on the distribution of use in terms of aggregate users and user groups across types of settings. But this leaves out the crucial variable of space as measured in square metres/square feet.

Mason *et al.* (1975) used behaviour mapping (and user interview data) to justify the importance of small neighbourhood parks in Berkeley, California. We know of no other study used to measure site and setting effectiveness across a whole park system using behaviour mapping. Data from this unpublished study were analysed by Moore (1989) to develop measures, some of which are used in the study reported here. Unfortunately, use data on other parks in the Cary system were not available as part of the present study so inter-park comparisons cannot be made. However, the KTP behaviour mapping data enable an intra-park comparison to be made across settings using the use/space ratio measure developed by Moore and Wong (1997) and Moore (1989).

Use/space ratio (USR) measures the amount of use in relation to the size of behaviour settings (percentage of total use of each behaviour setting divided by the percentage of total area of all settings). Figure 7.20 shows that, from this point of view, composite structure settings and sandplay settings, with USR values of 2.19 and 2.17 respectively, are the most effective setting



7.20 Use/Space Ratio (USR) by behaviour setting.

types measured by the amount of activity attracted in comparison to their size. Scores for the stepbar climber (USR 2.00) and swings (USR 1.52) also indicate effective space use. Values for Katal (USR 1.15), Playhouses (USR 1.22) and Anchored Toys (USR 1.09) are also on the positive side. Although the composite structures had a combined score of 2.19, the individual scores were markedly different. The vertical structure had a relatively high USR of 3.10 because the setting footprint was small compared to the amount of activity attracted. In contrast, the spread out horizontal structure had a USR of 1.97 because of the larger footprint.

Use by children with disabilities

Park visits were arranged with families with a child with a disability. A group of children with sight disabilities was also observed visiting the park. Four visits are reported here that provided an opportunity to observe the uniqueness of individuals with different impairments, in the context of family, responding to the opportunities of a diverse physical environment offering a broad range of behavioural choices. The visit summaries presented below illustrate affordances that appear to be primarily 'sensory'. To say so expands the use of the term 'affordance' into a broader current discourse concerning different possible types of affordance (Hartson, 2003). Since affordance was originally formulated as a concept of perceptual psychology, to consider it from the sensory point of view of body-in-space seems a justifiable step, including the three inter-related component senses: the *kinaesthetic* (sense of *movement* through space); the *vestibular* (sense of *balance* in relation to the force of gravity); and the *proprioceptive* (sense of the *position* of body and limbs in space). The following descriptions illustrate how individuals with a variety of disabilities can discover body-in-space sensory stimulation afforded by a diverse range of settings.

Visit 1 – the challenge of horizontal movement. This informative visit demonstrated how a variety of undulating, curving pathways and shallow steps afforded challenges to someone with low muscle tone. The 28-year-old, almost nonverbal daughter arrived in a wheelchair; however, the first thing the mother did was to make her get out and ambulate. 'Let's get out of the wheelchair and walk; it is good for your mobility,' she said. Together with a family friend, they played on one of the Talking Benches (interactive art objects in the entry plaza, made of curly, steel talking tubes with mouth/ear pieces at each end), which afforded a fun moment of rudimentary verbal interaction.

Afforded by the wide path, the mother pushed the wheelchair ahead so the daughter (reluctantly) had to run after and catch it. The verbal interaction continued, with the mother intent on encouraging her daughter to exercise as much as possible. The daughter pushed the wheelchair like a 'walker' on what became a psychomotor challenge course through the Young Children Zone (see Figure 7.21), pushing the chair up the curving ramp, across the bridge, navigating a sharp bend and chasing the chair down the other side.

As they entered the Vertical Composite Structure Zone, the mother dragged the wheelchair up the wide, shallow stone steps while patiently coaxing her daughter up, one step at a time. The daughter's low muscle tone meant that the 10–13 cm (4–5 in) risers were challenging. They took several minutes to climb with the mother's loud words of encouragement.

The daughter was clearly apprehensive about using the vertical composite structure. She did not seem to understand how to use the transfer platform. The mother, friend and one of the researchers together helped the daughter navigate the steps up to the first level tunnel, through which the daughter

7.21 Pushing a wheelchair up the secondary pathway ramp to the bridge over the 'river of sand' in the Young Children Zone.

was pulled feet first. She appeared insecure, even though the transparent tunnel was not much longer than she was. This contrived, overly challenging experience was not enjoyed by anyone. The interior space of the structure afforded an easier route to navigate. With assistance, the daughter mounted the interior platform (50 cm/20 in) above the woodchip ground surface) and was pulled through the short connecting tunnel to the outside. She laughed and seemed to enjoy the experience. By now it was obvious that the vertical structure did not match the daughter's abilities.

The horizontal composite structure was a different story. As the daughter was tired, she got in the wheelchair and was pushed by her mother up the long entry ramp. They stopped at the slide at the higher level but the entry platform was too high to climb to get to the slide itself. They tried the lower slide but the daughter was very apprehensive and the plan was abandoned. Instead, the mother raced the wheelchair and daughter up and down the ramps and through the structure, simultaneously making loud motor noises. The daughter smiled and laughed, expressing enjoyment. Back at ground level, the daughter was able to climb on the webbing net suspended below an upper platform and, after considerable encouragement, was brave enough to allow herself to 'fall down' on the soft, bouncy surface. A repeat performance was too challenging.

Visit 2 – sibling can facilitate swinging enjoyment. This visit demonstrated the role of an able-bodied sibling in facilitating the enjoyment of vestibular stimulation[6] afforded by a variety of swinging devices (Ayres, 1998). The family group included mother, father and two daughters – one able-bodied, the other her 14-year-old, developmentally disabled, nonverbal younger sister – and this sister's caregiver. The younger girl was attracted to the tyre swing and enjoyed watching children using it (see Figure 7.22). The older girl commented that the tyre swing allowed her sister to get close to the other children, to feel part of the action. The older sister got into the tyre swing by herself

7.22 Swing activity affords social interaction between children with and without disabilities, including family members.

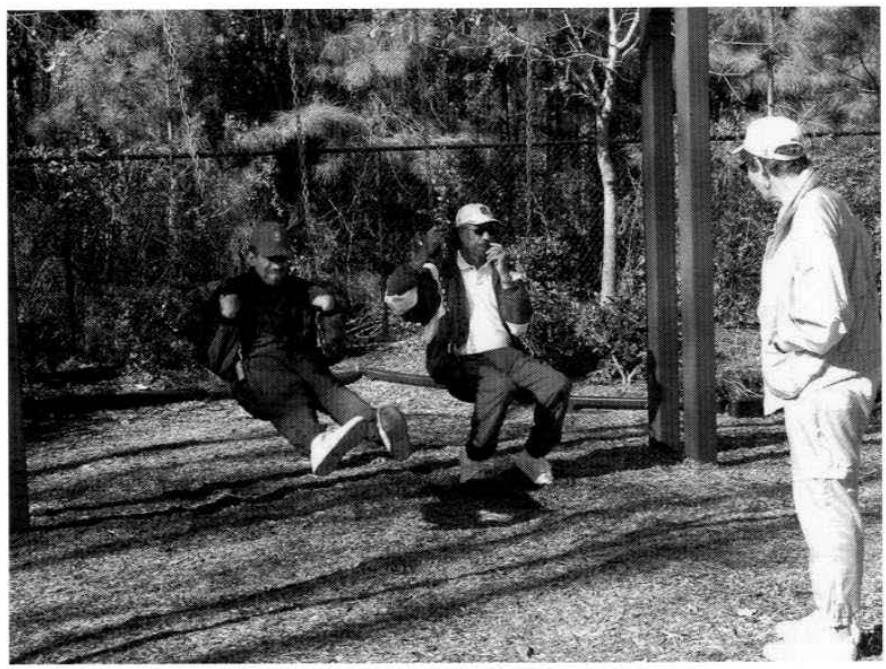
so that her sister could push her. Other children joined her in the tyre, while her sister continued to communicate through her body language that she felt part of the action.

The family moved to the cradle swing (a wide, moulded plastic form provided for children who do not have the ability to sit up and grip the swing chains). The cradle swing is popular with all children because it provides a different experience (prone, looking up at the sky) to a conventional to-and-fro swing. The height of the cradle made accessibility challenging for the younger girl. With her sister's help, she eventually slipped into the seat and appeared to enjoy the rocking sensation (vestibular stimulation).

At the platform swing (square, spring-mounted, metal platform with a central post enabling users to rock back and forth or follow a circular rocking motion), the sisters mounted the platform and both held on to the central post, which the older sister operated, so they could play together. Again, the motion evidently produced enjoyment.

Visit 3 – the pleasure of swinging in secluded natural surroundings. This visit demonstrated again the important role of a close relation (in this case the father) in facilitating swinging. Father, mother and son (43-year-old, autistic, nonverbal, ambulatory) headed straight to the to-and-fro swings and spent the bulk of the time there. The son clearly enjoyed the vestibular stimulation of swinging and was able to pump himself. The father used the adjacent swing to accompany his son (see Figure 7.23) and said they spent a lot of time outdoors together, especially in natural areas, which his son enjoys. He commented that 'my son gets anxious when too many people are around so it is good to be in a place where escape to a more secluded setting is an option' (the to-and-fro swings feel secluded because they are located against the park boundary fence and are separated from the main path by a line of shade trees).

Visit 4 – 'It's like a big playroom.' This visit involved a visiting group of four children of 8 to 10 years old, all legally classified as blind. Accompanied by their caregivers, the four children



7.23 Father and son swing together, while mother looks on.

moved excitedly through the park settings with surprising ease and obvious enjoyment. They especially enjoyed settings that afforded vestibular stimulation (swings, slides, overhead glider), kinaesthetic stimulation (corkscrew slide, fireman's pole) and proprioceptive stimulation (tunnel/bridge, ramped route through the low structure).

Lacking sight, the children's proprioceptive sense especially appeared more developed or at least more central to enjoyment of body awareness as they moved in, on or through varied three-dimensional spaces. Observations of this group (including children blind from birth) reinforced the notion of enjoyment that can arise from being able to 'read' the three-dimensional qualities of space in terms of its bodily affordances – 'Like a big playroom', as one child said.

Park visit commentary

At the end of the visit, the family visitors were asked what they found most attractive, for suggestions for improvement, and to comment on the park as a whole. What visitors liked most included: 'The low structure with ramps and ups and downs is easy with a wheelchair.' 'The park works for wheelchair users.' 'The path structure has a nice flow, easy to wander around.' 'Swings! Tyre swing.' 'Flowers to smell. Plantings. Foliage is beautiful.' 'Benches to watch people.' 'The dragon and "pool"' (water gathered in the dragon's 'tail' after a rain). These comments suggest that the three-dimensional flow, choice of swinging opportunities, and flowering shrubs are the most attractive attributes of the park for families with a child with a disability.

General family comments about the park included: 'Attracts people of all ages and abilities.' 'Good for playing.' 'Compact. Feeling of closeness.' 'Intricate complexity is attractive.'

'Aesthetically appealing. Park is different every time you are here.' 'Whole family can play together. Feels like a "family park".' 'Very active. Easy to wander around and get exercise. Nice flow, no dead-ends.' 'You need to go! Beautiful.' 'Unique. Nicer than the bare openness of many playgrounds.' 'Attracts all people, kids and adults. Addresses needs of children. Engages kids.' 'Great park for kids and families with kids.' 'Intergenerational – whole family, old and young, little children. Great place for teens.' 'Nice place for picnicking.' 'Layout is great. Diverse, holds attention. Fenced in. Safe and challenging.' 'Learning experience. It's a natural experience. It is a wonderful park.'

Suggested improvements included additional handrails and handholds in the play equipment, additional swings to reduce waiting, installation of more benches, provision of summer shade, addition of acoustic instruments and fragrant settings and the addition of a family bathroom. Drinking fountains and a water play fountain were highlighted – children were not strong enough to operate them. Larger scale water play settings were desired. An 'ice cream stand' was requested (since implemented). A Braille map and signs to identify the dragon (Katal) were suggested. A blind child asked for 'baby dragons to play with' so he could understand what the big dragon was like (an idea that all children would appreciate).

In summary, comments suggest that an easily navigated, three-dimensional flowing territory, offering a compact diversity of accessible activity choices – including social settings and swinging opportunities – for extended families in an aesthetically appealing, natural environment are the attributes of a park that families with a child with a disability would find most attractive.

Getting to the park

Park visit interviews (including those conducted with *adults* with disabilities not reported above), indicated that car access to the park was straightforward, with 'handicapped' parking situated a few yards from the drop-off/entry plaza zone. From there, broad, almost flat, gently curving, hard-surfaced pathways provide an accessible route to all zones and main settings of the park. However, from the point of view of information and transportation, substantial issues were identified.

Information. Visitors commented that it was difficult to find full information about the park on the Town of Cary website (no one interviewed had discovered the park that way), which gives no sense of the park's uncommon design. Visitors said they discovered the park by word of mouth or in the news. The lack of public information about the universal design character of the park may explain the fact that, out of the total of 1,616 behaviour mapping data points, only two observations of wheelchair users were made.

Transportation. The park is not served by public transportation and is therefore not accessible to families without a car or to adults who can't drive because of a disability or lack of resources.

Cultural inclusion

The picnic tables, pine grove and park pavilion were used for family gatherings, including birthday parties. These behaviour settings allowed flexibility for *ad hoc* user-defined ethnic traditions. One afternoon, a mixed-age, extended Asian family of ten or so were observed in the pine grove, picnicking on blankets spread on the pine needles rather than sitting at the picnic tables (see Figure 7.24). Some days later, a Caucasian family set up a small shade structure with 'Happy Birthday' banner and organized a birthday party on the picnic tables. Another afternoon, a Mexican birthday *fiesta* was held in the park pavilion, complete with loud musical accompaniment from a CD player, *piñata*, and portable barbeque (surreptitiously tucked around the back of the building). Other visitors could be seen smiling and moving to the beat of the music, indicating enjoyment of the overtly expressive immigrant culture and acceptance by the more sedate established culture. Such activities were an indicator of park family friendliness and an inclusive environment, where groups with differing cultural traditions felt comfortable and accepted by the majority culture.

To conduct a rough test of this hypothesis, the list of reservations for the Park Pavilion for the 2006 calendar year was obtained from the Cary Parks and Recreation Department and coded for non-English family names. They represented 29% of the total. In comparison, the 2006 'non-Caucasian' population was estimated to be 18% by the City of Cary. The difference

7.24 Asian group picnicking on blankets in the pine grove.

between these values suggests that ethnic groups in the community find the park to be more attractive than would be predicted by the proportion of minority ethnic groups in the population.

A 'cool' adolescent destination

Several setting observations of adolescents supported the comment earlier about the park being a 'great place for teens'. Apart from occasional adolescent couples wandering around holding hands, groups of two to four girls were observed 'hanging out' in the park, sitting talking, swinging, walking around. Adults mentioned that adolescents regarded the park as 'cool'. Given the lack of legitimised settings for adolescents in the public, urban realm, the park may serve as a legitimate, safe, social setting for these much-maligned groups, where they can blend in unnoticed. Further research could investigate specific settings, components and characteristics that may explain why Kids Together Park is attractive to adolescents.

Perceptions of safety

In addition to the park visit interviews reported above, *ad hoc* park user interviews provide a sense of dominant perceptions. 'Safe' was the most frequently mentioned attribute. By safe, users typically meant socially secure rather than physically safe play equipment (a dominant theme in park design and management for many years). 'Wonderfully safe because everything is enclosed,' a mother said. 'You don't have to worry about where your children are.' Other parents reinforced the perception of safety with comments such as 'easy to follow kids around', 'easy to see where kids are', 'location of equipment allows easy supervision'. One mother remarked that the park pavilion was the best position for overlooking the entrance so she could make sure her child didn't wander out of the park. A single, visible entrance is one of the primary principles of defensible design (Newman, 1972, 1975). Physical safety was rarely mentioned. Comments such as 'user friendly', clean and 'beautiful, like out of a magazine' could be interpreted to mean that physical safety was assumed to be covered in an environment perceived as high quality.

7.25 Family members relax in the Young Children Zone.

Freedom and control

Because most parents praised the park as safe, one can speculate that the positive atmosphere and diversity of play opportunities of the park served as a model to help parents to allow active, free play without close supervision. If parents feel secure they will be more inclined to encourage their children to explore, to push themselves as they engage with the environment. Too much or constant parental supervision in the name of safety and security can sometimes result in a loss of play opportunities for children. A child who is continuously told to 'be careful' or directed how to navigate or interact with particular settings will lose the advantage of self-learning, skill building, competence and growth in confidence that results from free play under the child's own volition (Frost *et al.*, 2001). In KTP, over-protective parents were rarely observed.

Ambience – an elusive quality

In interviews, users mentioned being attracted by the overall ambience of the park, especially related to its naturalistic character and richness of planting around the play settings. The positive social atmosphere was also recognized. Users noted as positive the diversity of other users by age, ability, cultural background and gender. Visitors' comments indicated that they did not use the park to escape from other people but rather to enjoy the feeling of community. This was especially evident in the Young Children's Zone. Groups of parents were often observed gathered on the elevated bridge chatting, keeping an eye on their children (see Figure 7.25).

User comments suggest that they enjoyed the inclusive feeling of the park because it had attributes of both social and physical ambience. Visitor attention could be directed to one or the other or both simultaneously. When few visitors were around, the natural ambience was there as an antidote to boredom.

Conclusion – a new public role for inclusive, universal design

High quality, family play area environments are crucial vehicles for inclusion because children's play is such a powerful means of communication – both between children and between children and adults. High quality family play environments can stimulate free flowing, positive interaction among park users of all kinds. The KTP study findings indicate a park that attracts multi-age, multicultural, multi-ethnic/racial user groups who find there satisfying experiences. The research techniques applied in this study can be used to understand objectively how park environments and settings are used and by whom. Together they can serve as a tool to better design and manage scarce parkland resources. Over time, the information generated can be used to affect long-term policy changes to improve park environment quality to better serve users.

The concept of universal design, which includes lifecycle issues such as declining abilities with age, is considered by some experts to embrace a broader social inclusion focus on user groups unable to express their environmental needs because of being excluded from the processes that govern the planning, design and management of the built environment (Drache, 2001). There was a time when adults with disabilities were such a group, who struggled for years to become enfranchised, finally to succeed through the passage of the American with Disabilities Act (ADA) in the USA. Although their struggle to participate fully in civil society is not over, at least the law is an unequivocal ally. Other user groups with particular environmental needs do not have this *legal* advantage and remain largely ignored. Pedestrians and bicycle riders are examples (at least in the USA).

In the case of children, their situation is weaker because they depend on the decisions of adults. The assumption is that if the environment is universally designed, adults will be more inclined to use them and, therefore, children will benefit from the accommodation and their inclusion will be guaranteed.

Social inclusion can be applied as a concept to any group whose needs are excluded from decision processes related to the planning, design and management of the built environment. The concept can move our thinking beyond 'integration' (people of different abilities occupying the same space) to a point where the users of a space feel they are participating in a shared social and psychological world. Inclusive behaviours are those that link people of all abilities, ages, ethnic/racial groups and cultures in positive relationships. Until now, universal design has focused its creative energies mostly on the design of buildings and products. The objective, systematic research techniques used here indicate a new potential for the field to broaden its scope, to move beyond the context of private spaces and consumer products into the public realm of urban places. New, smart data-gathering tools now make it easier to code behaviours, user characteristics and environmental interactions. Richer, more substantial data sets, analysed quantitatively, promise to improve understanding of environment-behaviour dynamics. Designers and managers of urban parks will have new types of objective evidence to help improve the fit between the built environment and users' needs across the community. The design and re-design of urban community parks may represent a major opportunity for implementing this ideal in the years to come.

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Commissioner, Bruce Brown, who developed the original concept, the Cary Parks and Recreation Department staff who followed through with the idea, landscape architects Little and Little who executed the design, and citizen Marla Dorrell, who not only midwifed the birth of KTP but also still leads its continuing evolution.

Notes

1 By ecological validity, we mean that the overall designed environment contains a sufficiently diverse range of settings that a study of the variability of human response would be worthwhile and produce useful results.

2 Boundaries of behaviour settings were established prior to the study reported here, based on the results of two pilot studies conducted during the principal author's graduate course: *Human Use of the Urban Landscape*. It might also be noted that, as the park was a tightly defined designed landscape, the large majority of behaviour setting boundaries were defined *de facto* by physical lines in the park layout. This would not be possible in a more loosely designed or natural space, where an initial wave of several cycles of behaviour maps would be required to establish setting boundaries.

3 Behaviour mapping observations were conducted by pairs of observers following predetermined circuits through the space, with one observer travelling clockwise and the other anticlockwise. A single circuit of observation was defined as a round or single layer of activity. All rounds of observation on a given day were defined as a cycle of observation. Multiple cycles were completed covering all days of the week and weekends until all behaviour settings were covered. The total number of cycles were collapsed to produce the complete behaviour map.

4 Since gathering the data for this study, the Natural Learning Initiative (NLI) at North Carolina State University has developed a more efficient and practical method of gathering data using a Personal Digital Assistant (PDA) with pull-down menus. The only item still coded on the paper plan is user location.

5 Since gathering the data for this study, NLI has developed a more powerful method of tracking behaviour by coding video records using The Observer software (Noldus, 2002). This method enables coding of any number of behavioural attributes in parallel time-stamped tracks. The authors acknowledge the work of Daryl Carrington, PhD, who carried out the series of behaviour trackings included here.

6 The vestibular sense is located in the inner ear. One type of receptor responds to gravity when the head is moved.

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