

EXPLORING THE NEXUS: DESIGN CHARACTERISTICS OF URBAN LOCAL PUBLIC SPACES AND CHILDREN'S PLAY BEHAVIOR IN BANGALORE, INDIA

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Abstract. Research in the field of children's play highlights its diverse benefits on developmental requisites. Specifically, parks and playgrounds emerge as key public spaces in an urban environment, which facilitates a range of play experiences conducive to developmental processes. The main aim of the study is to examine the design characteristics of formal public spaces that influence play behavior of children and the supervision modalities in the Indian context. To achieve this objective the study investigated a park and playground in a rapidly developing neighborhood in Bangalore. Systematic observations were conducted to observe children's play opportunities with respect to the physical environments including adult supervision modalities. The outcomes reveal that children's play in the urban context is a supervised activity. The study demonstrates a strong correlation between the age demographics and utilization patterns of play spaces. Though affordances for functional play and rule based games were exhibited in these public spaces, the research found minimal occurrences of Constructive, Imaginative and Exploratory play. Implications for planning and design includes adopting an age-responsive approach to accommodate diverse developmental needs and preferences of children while integrating natural and manipulable materials to enhance play value of play spaces.

Keywords: Children's outdoor play, park and playground, behavior mapping, affordance, supervision.

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1. Introduction

Play, a complex and varied behavior, profoundly impacts a child's overall development, providing satisfaction, stimulation and a path for creativity (Vickerius & Sandberg, 2006). Play doesn't have to have an end goal; it can be creative, self-motivated and enjoyable (Lester & Russel, 2008). Multiple research reviews organized and carried out by the American Academy of Pediatrics (AAP) clearly emphasize the significance of play in nurturing parental involvement, fostering the development of various capabilities, including function skills and enhancing various facets of life (Yogman *et al.*, 2018). Worldwide, technological advancement, urbanization, globalization, traffic, limited walking and cycling facilities, limited safety, accidents and crime has impacted play, culminating in lesser playtime (Scott *et al.*, 2007; Bento & Dias, 2017). Shafik and El-Husseiny (2019) recognise that Communities are controlled by a top-down approach

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of hierarchical planning and production framework. This kind of planning is disconnected from local contexts and cultural norms which affects the production of public open spaces like parks in the city.

The outdoor setting is strongly correlated and demonstrative of increased physical activity levels (Sallis *et al.*, 1993). Outdoor play in formal public places like parks offers many benefits. These urban green spaces along with being linked with positive emotions and promoting healthier lifestyles (Tok *et al.*, 2020) nurture social interactions, enriching children's understanding of themselves and the world (Bento & Dias, 2017). Outdoor environments fulfill children's intrinsic need to engage with their surroundings, enhancing learning experiences (Reimers & Knapp, 2017). Public playgrounds, particularly when located near residences, serve as a basis for initial exploration of children's interactions with their environment (Moore, 1986; Jansson, 2010). Access to recreational spaces like parks and playgrounds is associated with elevated physical activity among children (Dunton *et al.*, 2003). Studies indicate that outdoor environments with natural features provide a wider range of play options compared to indoor settings (Vickerius & Sandberg, 2006; Herrington & Brussoni, 2015).

1.1. Affordances and children's behavior

Bronfenbrenner (1979) emphasises the constant interaction between individuals and their environment through participation in various activities. This discussion focuses on the interaction between the environment and behaviour through play. Hence the concept of affordances, (Gibson, 1977) has been used as the theoretical framework. Affordances offer opportunities for action. Affordances are transactional approaches depending on how people perceive the environment. Objects in the environment facilitate actions when perceived with an intention. For example, a horizontal support surface situated at approximately knee level provides the opportunity for an individual to engage in the action of sitting (Gibson, 1977). How one can engage with the surroundings is understood when perceiving the affordances of the environment (Bell *et al.*, 2001). Affordance comes across as a fundamental concept to understand the relationship between the built environment and children's activities (Cosco, 2007). The built characteristics of the play environment exert a significant influence on the play behaviours of children by providing affordances for specific type of play activities (Chatterjee, 2005). The author indicates that a child-friendly environment will allow for exploring and materializing its affordances. Gibson & Pick (2000) have commented on the cyclic nature of children being influenced by their environment. The nature of this transactional relationship is based on children's perception guiding their actions which in turn furnishes their learning and perception.

Heft (1988) emphasizes how individuals perceive the usefulness of things in their environment. According to their ideas, behavior is determined by the person and the environment. Further, they indicate that these settings have specific needs which are discerned from the surroundings. Heft (1988) provided a detailed classification of environmental features through his functional taxonomy. He elaborated on how certain environmental features afforded certain activities like climb-on-able, jump-on-able, run-on-able or swing-on-able features. Based on the affordances of opportunities and limitations they offered to a child, the functional taxonomy provided insights into those key environmental affordances that were crucial for children's development. Additionally, Heft (1988), recognized how the environment relates to children's activities and how it changes with children's age. A child may perceive an environment in a certain

way which may be perceived in a different way at a later age. Consequently, new affordances emerge as development happens within a child expanding the behavioral range of activities. Kytta (2003) further distinguished affordances into “potential affordances” which are perceivable and “*actualized affordances*” which have been perceived or shaped by the individual.

1.2. Play types and development of children

Heseltine and Holborn (1988) defined 5 developmental themes and identified how they can increase the play value of a space. 1. Environmental development where an expanding body of research suggests that the natural environment promotes a child’s intellectual, physical, emotional and intellectual development (Kellert, 2012). 2. Social Development where Play can induce empathy and emotional intelligence (Goleman, 1996). 3. Physiological development where engaging in natural materials like sand, water and loose materials promotes sensory and motor skills. 4. Creative development which aids problem-solving and creativity through vegetation, landform. Textures and materials (Burdette & Whitaker, 2005). 5. Educational development can aid cognitive and problem-solving skills (Heseltine & Holborn, 1988). According to (Hyder, 2004) the play value of space will depend on how much the developmental needs of children like emotional, physical, intellectual and social capacities are satisfied.

The characterization of various forms of play has evolved, partly influenced by the playwork sector in England. Moyles (2014) categorized play into 5 types - functional, constructive, social play, fantasy and play with rules. (Hughes, 2002) expanded this to 16 types of play. As the expanded version was cumbersome, (Woolley & Lowe 2013) embedded the play types that Moyles (2014) devised, with the sixteen play types of Hughes (2002). They were clubbed together using Heseltine and Holborn’s (1988) developmental themes.

Constructive play has to do with regulations and manipulation of the environment. Functional play was aimed to develop motor skills, by integrating muscles, nerves and brain functions. Fantasy play was to explore situations through language and drama (Wardle, 2000). Social play was to understand social norms and responsibility through cooperating. Play with rules are to do with those situations which are controlled by rules and limitations (Moyles, 2014). Each of these playtypes, play a part in promoting either creative, educational, physiological, environmental or social development. While playing, it is imperative for children to be able to participate in various play types since each play type stimulates and promotes different developmental needs. Therefore, the outdoor play environment which enables children to take part in the most play types would have the highest play value.

1.3. Play Types for Outdoor Environment

Researching play outdoors is crucial to comprehend how to design play environments effectively. Recognizing how the physical environment influences various types of play can promote better-designed outdoor spaces to accommodate children's play requirements. Many studies have used a play typology to categorise children's play behavior in outdoor environments. These studies commonly utilize established play type scales, including Frost's Play Observation Form (1992), Hughes' Playworker's Taxonomy of Play Types (1996) and Rubin's Play Observation Scale (2001) or their adaptations. Since, these scales were initially developed to measure play

behaviour indoors; extensive studies on outdoor play have necessitated modification of these typologies to accommodate the play activities enabled by outdoor environments (Parten, 1932). Subsequently, Loebach and Cox (2020) came up with TOPO, an observation tool to capture children's play types in outdoor environments. TOPO's condensed version had 9 distinct primary playtypes and TOPO's expanded version identifies 32 associated subtypes. Prior to the development of TOPO, (Cox *et al.*, 2018) delineated a systematic observation protocol for behavior mapping, which included a play-type scale based on Rubin's (2001) scale for observing play behavior. However, as Rubin's (2001) original scale failed to capture the nuances of outdoor play, Cox *et al.* (2018) came up with an modified version of Rubin's (2001) scale which was facilitated to capture outdoor activities. This adapted scale incorporates seven play categories: Functional play, Imaginative play, Constructive play, Play with rules, Exploratory play, Restorative activities and Non-play activities. Given the limited play behaviors observed during the pilot study and time constraints for training, the study utilized this concise and adapted play scale to observe play behavior. While research regarding children's behavior has been conducted in various loci, Children's behaviour in urban formal public spaces in the Indian context has not been studied enough. Hence, the objective of this study was to investigate the design characteristics that influence children's play behaviour in Bangalore along with observing supervision modalities in formal public places.

2. The case studies

Parks and playgrounds are representative of formal public spaces for children's play at a neighbourhood level. The study captures children's play behaviour in a park and a playground in a rapidly developing neighbourhood in South Bangalore. The Bangalore Development Authority (BDA) is, the statutory planning authority of Bangalore Metropolitan Area. It is responsible for implementing various developmental schemes in urban layouts. To achieve the objective, a part of one such emergent and rapidly growing BDA layout for Bank Officers and Officials Housing Board Co-operative society, Narayana Nagar, bounded by Kanakapura Road, Swami Vivekananda Road and the Konanakunte Lake (Figure 1) was taken up for study. This part of The BDA layout features a cluster of nine formal public spaces with seven parks and two playgrounds. Preliminary audits revealed that out of seven parks, three were inactive. The remaining five active parks were well maintained with walking paths and landscaped areas, primarily oriented towards adults. Among the active parks, the BBMP temple park demonstrated usage by children as it featured traditional play equipment like slides and swings and hence was taken up for study (Figure 1). Of the two playgrounds, both known as Narayana Nagar playground, the smaller one was under construction. The bigger Narayana Nagar playground was active and frequented by adults and children. All the parks and playgrounds are integral to the cluster of formal public spaces. This configuration allowed for an examination of the park and playground as essential components of a wider recreational network. Within this cluster, the behavioural patterns of a consistent demographic cohort who frequented both the park and the playground were examined.

The BCMC layout park (Figure 1), a part of the BDA layout was located south to Swami Vivekananda Road. Children frequented the park as it featured traditional play equipment, but it was excluded from study as it did not belong to the cluster of parks

considered and would attract a different demographic since a main road segregated the cluster of parks from the BCMC park. Main roads with high traffic volumes inhibit children's play outdoors and their independent mobility (Lambert *et al.*, 2019).

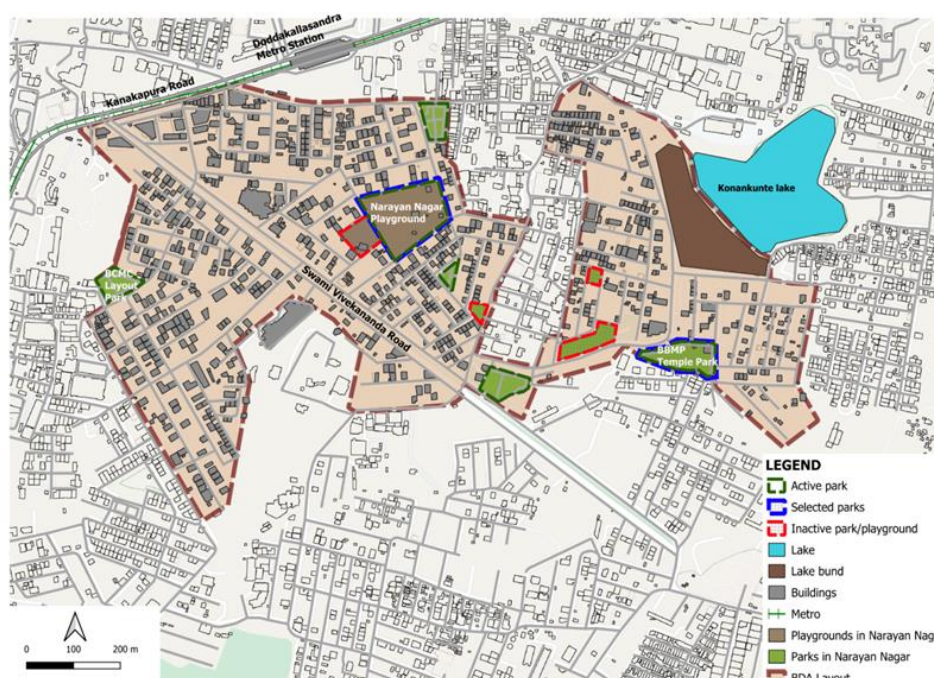


Figure 1. Parks and Playgrounds in BDA layout, Narayan Nagar

Employing behavior mapping techniques, the study observes the supervising profiles of parents and demographics of children, spatial utilization patterns and types of play activities. By understanding the intricate dynamics of environmental design, the research yields valuable insights significant for the creation of engaging play environments for children. Consequently, the study points out the significance of adopting a holistic approach to design and planning in order to promote well-functioning urban landscapes.

3. Research Design

This study aims to examine the play behaviors of local children in a neighborhood park and playground setting through the method of behavior mapping, focusing on how design elements influence physical behaviour. Through this protocol of behaviour mapping, behaviour in relation to the environmental context was studied. Developed initially by Ittelson *et al.* (1970), this protocol is widely used by environmental psychologists to relate behavioural aspects to the context of physical spaces.

3.1. The setting of the local park

The local park spans approximately 2 acres, with flat terrain and includes various amenities such as traditional playground equipment including swings, slides, see-saws and merry-go-rounds, a designated area for gym equipment, a canopy with seating facilities, an open space with pull-up bars and a small temple. The walking path borders landscaped areas with scattered trees lining the edges (Figure 2).

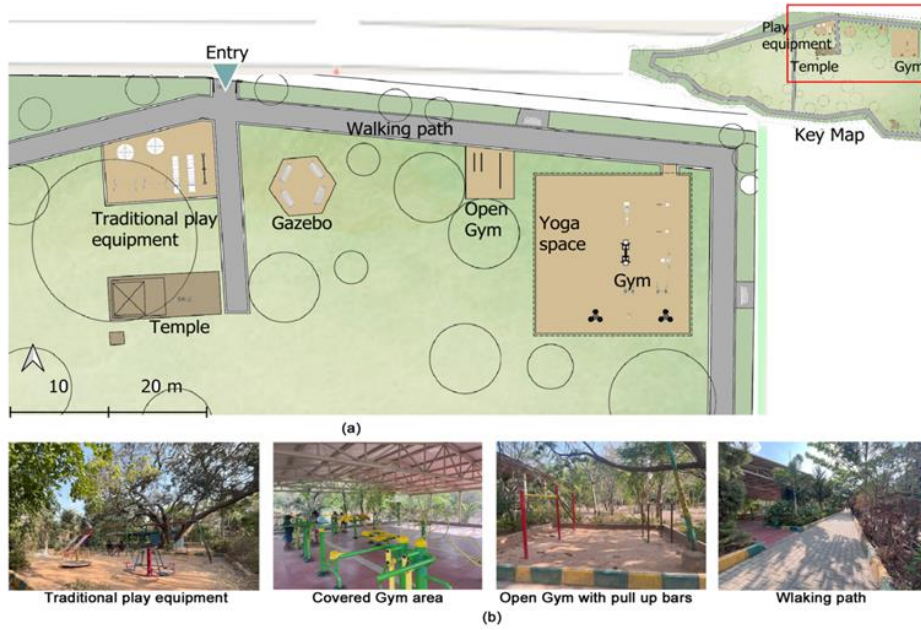


Figure 2. (a) Layout of the park; (b) Photographs of the park

3.2. The setting of the playground

The playground encompasses an expansive area of approximately 3 acres, with 1.63 acres designated as playable space. The terrain is largely flat, adorned with scattered trees along the perimeter. Within the playground, there is a section equipped with traditional play equipment such as swings, a slide, see-saw and merry-go-rounds. Next to this area, a roofed section hosts gym equipment. The ground features intermittent shallow pits, up to 1 foot in depth, intended for planting saplings and young plants, with some pits remaining unfilled. Despite these features, clear open patches are available where the majority of play activities occur, although play behavior is also observed among the grid of shallow pits (Figure 3).

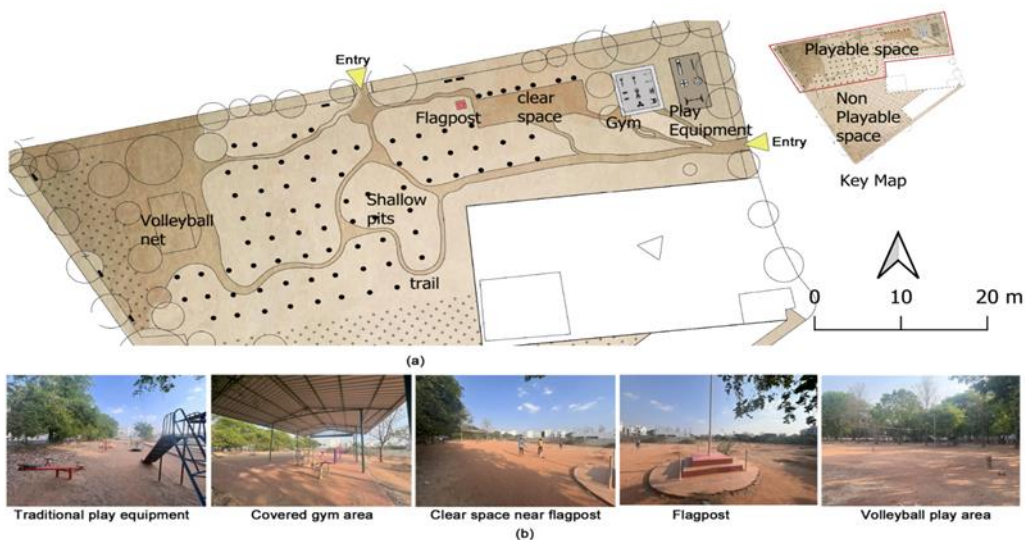


Figure 3. (a) Layout of the playground; (b) Photographs of the playground

4. Methodology

4.1. Data Collection and Observation Protocols

Preliminary pilot visits to the park and playground helped refine the methods used for data collection. Observations in the park and playground were conducted during peak playtimes for an hour. Peak playtimes were identified from the pilot visits as between 5:30 pm to 7:00 pm in the evening. Play activities decreased considerably with the transition of sunset and less daylight.

Observations were conducted through the end of February 2024 to the third week of March 2024. Data was collected over three weeks by four observers, totaling 12 hours across six observation sessions for both the park and playground each. Each session lasted one hour. The sequence of observing the park and playground was alternated between sessions. Observations were done on school days and weekends with temperatures averaging 31 to 33 degrees Celsius and predominantly sunny conditions. Pilot visits aided in defining observation zones, dividing the park and playground into four areas for increased visibility. Four observers managed these zones for efficient scanning and recording. Observers, trained during pilot visits, were divided into four zones and rotated every 15 minutes per session, following the protocols recommended by Cox et al. (2018). Initial pilot tests helped refine the strategies for data collection. The overall inter rater assessment was 98%. Pilot Inter rater assessment for age and play type yielded 96% and 99% respectively. Inter rater assessments integrated in study observations yielded 97% for age and 98% for play types. Method used for Inter rater assessment calculations were as prescribed in McHugh (2012). The observers followed a zone-based scanning method. Each zone was systematically scanned. A child when encountered, was observed for 15 to 20 seconds and data was recorded. Both children and accompanying adults were observed for data collection. Observations focused on children's interactions with the environment and particularly play types.

4.2. Sampling Criteria

In both the park and playground, the target samples were adults and children. The adults who exhibited behavioural patterns of supervision, guidance and engagement with children's activities were documented. These adults were classified as father, mother, grandfather, grandmother and appointed caregivers based on visual perception. Children from birth to 18 years were observed. Age groups of children were initially classified as birth to 6 years, 7 to 12 years and 13 to 18 years but were revised due to challenges in perceiving the ages of 5 and 6 year old children. The revised age categories were birth to 3 years, 4 to 8 years, 9 to 12 years and 13 to 18 years, ensuring reliability among observers. Gender was recorded as male, female or "don't know" based on visual judgement. Play types were coded to capture elements of interaction with the environment, with an open variable allowing observers to describe play episodes briefly. The digital recording included dropdown options with descriptions and examples to ensure accurate coding of play types, tailored to suit the method of behavior mapping employed. A hybrid method involving digital databases and paper-based maps was used. Observers utilized pre-programmed codes and dropdown menus for variables such as gender, age and play types, with an open variable allowing for brief play event descriptions. Location of children were recorded on base maps of the park and playground which were created using field measurements.

4.3. Data Analysis

Data thus collected from the site was transferred to a QGIS system for analysis. The base maps were georeferenced and shapefiles were used to denote location and playtypes. Data recorded on site was later manually transferred into attribute tables in QGIS. Further analysis provided a comprehensive evaluation of spatial data, revealing the intricate relationship between observed behaviors and the physical layout and design of the park and playground. It offered deeper insights into the nuanced connections between children's play behaviours and the design elements of the park and playground.

5. Ethical Considerations

Ethical clearance for the study has been granted by the Research Conduct and Ethics Committee at Christ University, identified by reference number CU: RCEC/00545/12/23.

6. Results

6.1. Demographics

Based on the bar chart provided, it can be deduced that caregivers accompany children during their outdoor excursions to play areas within an urban setting. A total count of 236 parents and 64 grandparents in the park and 261 parents and 33 grandparents in the playground were observed accompanying their wards in supervisory roles. The examination and analysis of this data indicate a greater presence of parents (236 in parks and 261 in playgrounds) compared to grandparents (64 in parks and 33 in playgrounds), suggesting significant adult involvement in overseeing children's play activities. Furthermore, an analysis of caregiver gender demonstrates a higher level of engagement among mothers (133 in parks and 223 in playgrounds) compared to fathers (103 in parks and 38 in playgrounds) in both playground and park settings.

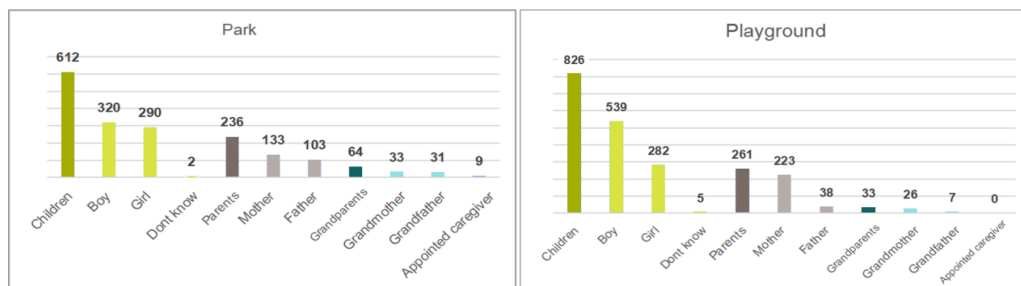


Figure 4. Observations of Children and caregivers

A similar trend is observed in the gender breakdown of grandparents, with a larger proportion of grandmothers (33 in parks and 26 in playgrounds) fulfilling supervisory roles compared to grandfathers (31 in parks and 7 in playgrounds). Additionally, a minimal number of professional caregivers (9) are observed in park settings, assuming supervisory roles during children's playtime. Interestingly, in the park setting, the paternal caregivers had more representations than those in the playground. An intriguing observation is the approximate equivalence in numbers between mothers (133) and fathers (103) in the park, mirroring a similar balance between grandmothers (33) and grandfathers

(31). This parity might reflect the appeal of the park's natural features and ambiance to adults. Conversely, the playground deviates from this trend, with a higher representation of female caregivers in supervisory roles compared to male caregivers (Figure 4).

During the observation period of six days, a total of 821 children in the playground and 637 children in the park were recorded. The analysis highlights that the playground was more attractive to children than the park. Boys outweigh girls in terms of their presence in both the park and playground, with the playground showing a higher demonstration of the male gender (Figure 4).

6.2. Age-wise spatial distribution of Children in the park

Based on the observations derived from the provided map (Figure 5), it was noted that children visited several designated areas, namely the traditional play area placed near the main entrance, the gymnasium area and the open gym in between. The pathway primarily served as a connection between these destinations. Among these spaces, the area with traditional play equipment won the highest preference among children (208), followed by the gym area (161) and the open gym (92), as witnessed by the frequency of visits.

However, when considering age demographics, children in the youngest age group (birth to 3 years) displayed a strong preference for the area featuring traditional play apparatus such as swings, slides, merry-go-rounds and see-saws, which particularly appealed to this age cohort (90). This was followed behind by the covered gym area (34), where children could engage with the equipment under the supervision of their caregivers. This arrangement facilitated dual benefits as it allowed adults to exercise while overseeing their children within the enclosed gym space.

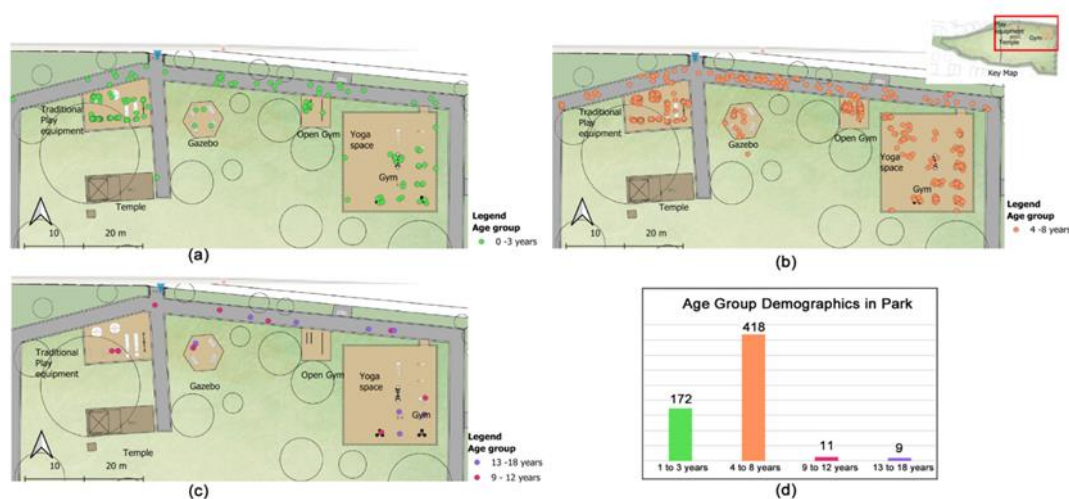


Figure 5. (a) Spatial distribution of birth to 3 years; (b) Spatial distribution of 4 to 8 years; (c) Spatial distribution of 9 to 12 and 13 to 18 years; (d) Demographics of age group in park

In contrast, children aged 4 to 8 years divided their attention almost evenly between the traditional play equipment (115) and the gym area (122). Both sets of equipment seemed equally popular within this age group, with children showing a keen interest in exploring and engaging with the gym equipment. The open gym area, featuring pull-up bars, primarily attracted children in the 4 to 8 age range. The yoga space in the covered gym was a clear open space where activities like badminton, ball games, frisbee and

running were observed. The gazebo, used mainly as a seating area or transition point, received the least attention from all age groups. It was noted that there was negligible engagement from children of 9 to 12 years and 13 to 18 years in the park settings (Figure 5).

6.3. Age-wise spatial distribution of Children in the playground

In the playground, four primary areas were predominantly used for play. An interesting observation was the distinct distribution of age groups within these spaces: The area equipped with traditional play equipment and the covered gym section was dominated by the age group of birth to 8 years, the clear area adjacent to the flag post was dominated by the 4 to 8 year age group and a shaded open space situated at the furthest end of the playground had a heterogenous mix of age groups from 4 to 18 years.

Children aged birth to 3 years mainly dominated the traditional equipment area (93). It was also conveniently situated close to the main entrance. The highest concentration of this age group was found here, followed by the roofed gym area (35). Conversely, very few children of this age group were present near the flag post (24) and the area between traditional play equipment and the gym area (6). None were observed in the volleyball court (Figure 6).

The age group of 4 to 8 years constituted the largest cohort in the playground and was observed across all play spaces. They dominated the space equipped with traditional play apparatus (181) and frequented the gym area (83) and the area adjacent to the flagpost (107). Interactions between this age group often spilled between the area with traditional play equipment and the gym (39). Notably, the volleyball court also saw consistent activity from this group (61). This cohort exhibited play amidst the grid of pits as well (21).

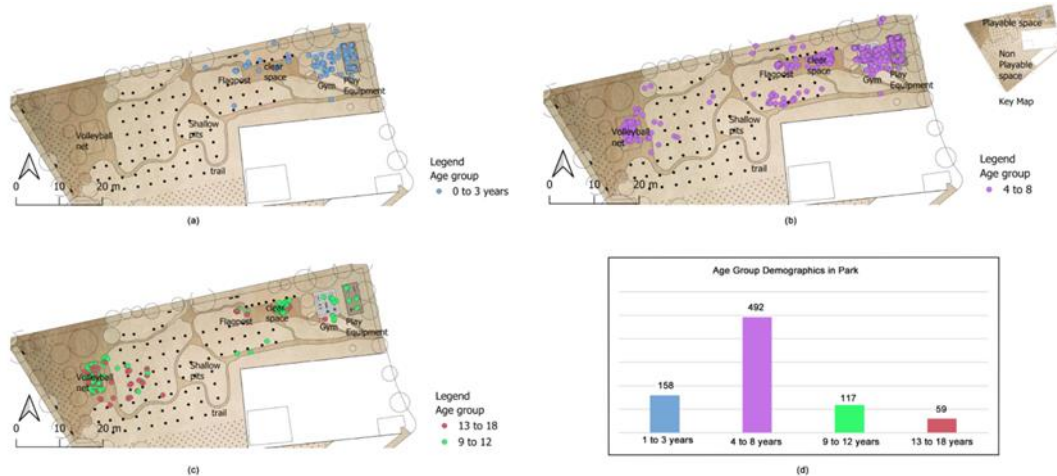


Figure 6. (a) Spatial distribution of birth to 3 years; (b) Spatial distribution of 4 to 8 years; (c) Spatial distribution of 9 to 12 and 13 to 18 years; (d) Demographics of age group in Playground

Children aged 9 to 12 years were predominantly observed at the volleyball court (62), indicating a preference for clear, flat spaces conducive to rule-based play and peer interaction. Following this, they were seen in the area near the flagpost (36), with fewer engagements in the gym area (12) and traditional play area (7).

Children of 4 to 8 years and 9 to 12 years were the only age groups observed across all play spaces. The age group of 13 to 18 years displayed a strong inclination towards the

volleyball court (42), followed by the area surrounding the flag post (17). They were absent from the traditional play area and the gym space.

The secluded shaded area at the far end of the playground, equipped with a makeshift volleyball net, was preferred by adults and older age groups of 9 to 18 years. This area, physically distanced from all other play spaces, was territorialised by older age groups, particularly during games such as cricket, where teams expanded into the sand pit grid. Notably, the older age group engaged in extensive peer interaction and formed one of the largest groups in the playground, with up to 19 individuals observed playing in the volleyball court simultaneously.

6.4. Spatial distribution of play types in the park

In the park, the predominant observed play type is functional or locomotor play, which involves physical movement to perform activities. Virtually all play areas in the park, including the area with traditional play equipment, the open gym and the gym area, encourage functional play. The next most commonly observed activity is non-play and restorative activities in the park setting.

The free open space within the gym area facilitates play with rules. Initially designated for yoga, this small-scaled space effectively supports this play type. Marginalized play types include exploratory play, imaginative play and constructive play and play with rules with very limited or no opportunities for these activities to occur, as indicated by percentages (Figures 7 and 9).

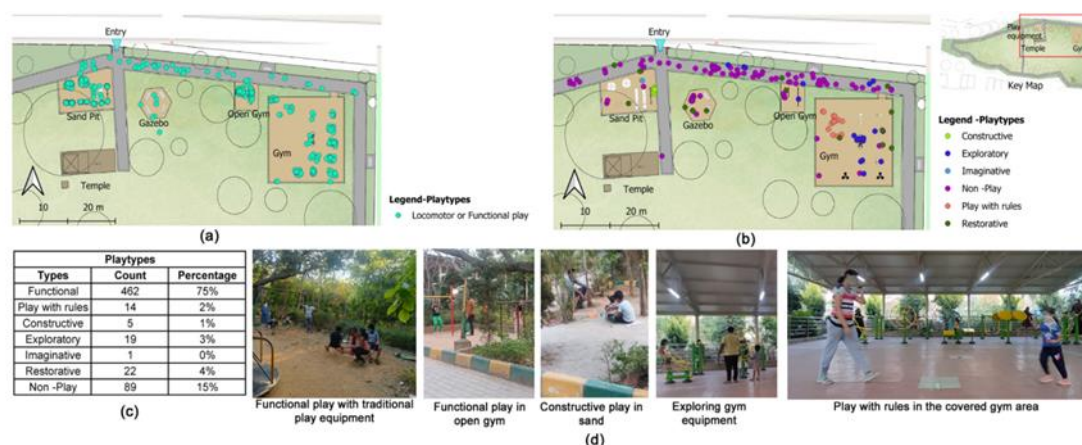


Figure 7. (a) Functional Play; (b) Constructive, Exploratory, Imaginative, Play with rules, restorative and Non Play; (c) Percentages of playtypes; (d) Photographs

Children move through zones housing play equipment or gym equipment, with the walking path serving as a conduit between these zones. Notably, instances of children engaging in running activities along these paths are classified as functional play, aligning with the categorization proposed by Loebach and Cox (2020), whereas walking was considered a transition or non-play activity.

6.5. Age-wise spatial distribution of Children in the playground

Functional play emerges as the dominant playtype, winning the highest count among observed activities. It is closely trailed by play with rules. The primary spaces facilitating functional play are those featuring traditional play equipment and the gym

area, where swings, slides and seesaws particularly appeal to younger age groups, encouraging functional play.

Play with rules, comes in as a close second to functional play, is most frequently observed in the volleyball court and its surroundings, with volleyball and cricket being the prominent games pursued. This activity is predominantly enjoyed by adults and older age cohorts of 13 to 18 years, 9 to 12 years and a minority of 4 to 8 years. The area in front of the flag post is favoured by the 4 to 8 age group for play with rules, likely due to its smaller scale compared to the volleyball court, which suits their team sizes and purposes. Instances of play with rules are also noted between the area with traditional equipment and the gym, as well as around the periphery or spill out areas of the gym space.

The least exhibition or engagement is observed in construction, exploratory and imaginative play. Constructive play is found happening in a minor way in the sand near traditional play equipment and in the spillout space between the sandbox and gym area, with both boys and girls equally engaged. Sand and leaves are the primary materials utilized for construction activities. Exploratory play marginally occurs across the traditional play equipment, gym area and its spillout zones, majorly among girls. Natural materials such as sand, leaves and flowers are commonly explored. Younger age groups (0 to 3 and 4 to 8 years) display curiosity in understanding the mechanics of gym equipment, experimenting with its moving parts and the extent of its movement. Imaginative play is observed in minority near the traditional play equipment and among the grid of pits near the flagpost, with only boys engaging in this activity. Non-play and restorative activities are mainly observed in the clear area near the flagpost and near the traditional play equipment (Figures 8 and 9).

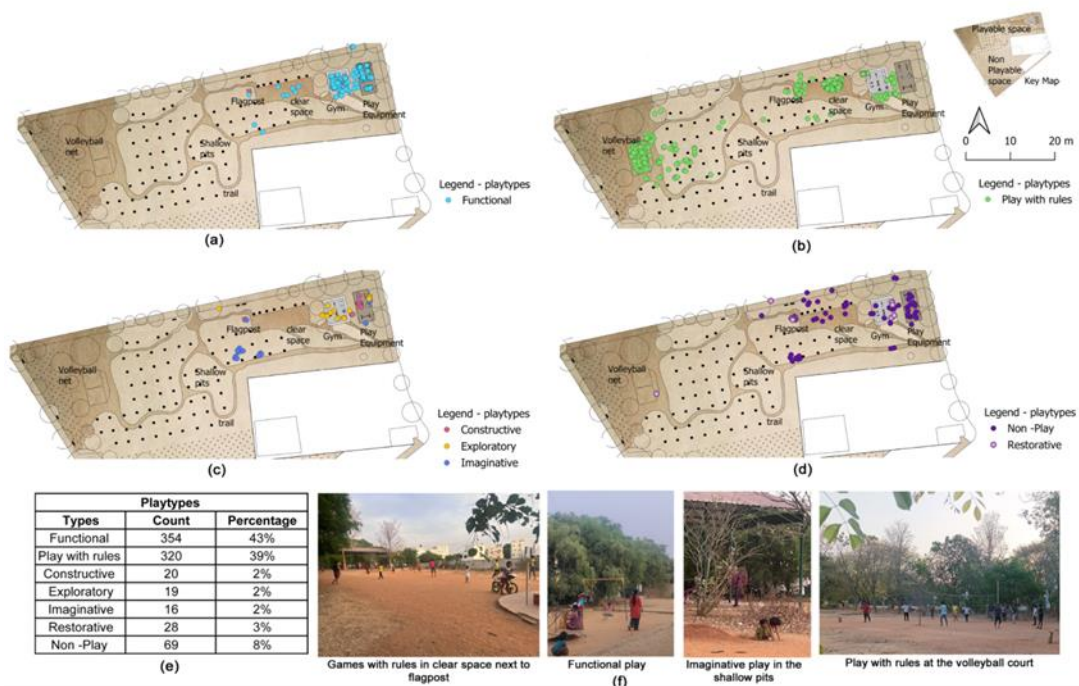


Figure 8. (a) Functional Play; (b) Play with rules; (c) Constructive, Exploratory and Imaginative play; (d) Restorative and Non Play; (e) Percentage chart of Play types; (f) Photographs

6.6. Gender and play types

In terms of gender distribution, girls exhibited a greater prevalence than boys for functional play, solely within the age bracket of birth to 3 years in both park and playground environments. Conversely, across all other age groups, boys demonstrated a higher presence. Notably, girls emerged as the predominant gender in the birth to 3 age category specifically concerning Functional play. Conversely, from ages 4 to 8 onward, boys exhibited a heightened prevalence across all types of play. Furthermore, boys displayed a greater inclination towards “play with rules” compared to girls from the age cohort of 4 to 8 years onward. This trend was particularly pronounced in playground settings, attributed to their design characteristics conducive to this style of play, unlike parks which lacked sufficient open spaces to accommodate such play patterns. Girls exhibited more instances of exploratory play than boys in the playground (Figure 9).

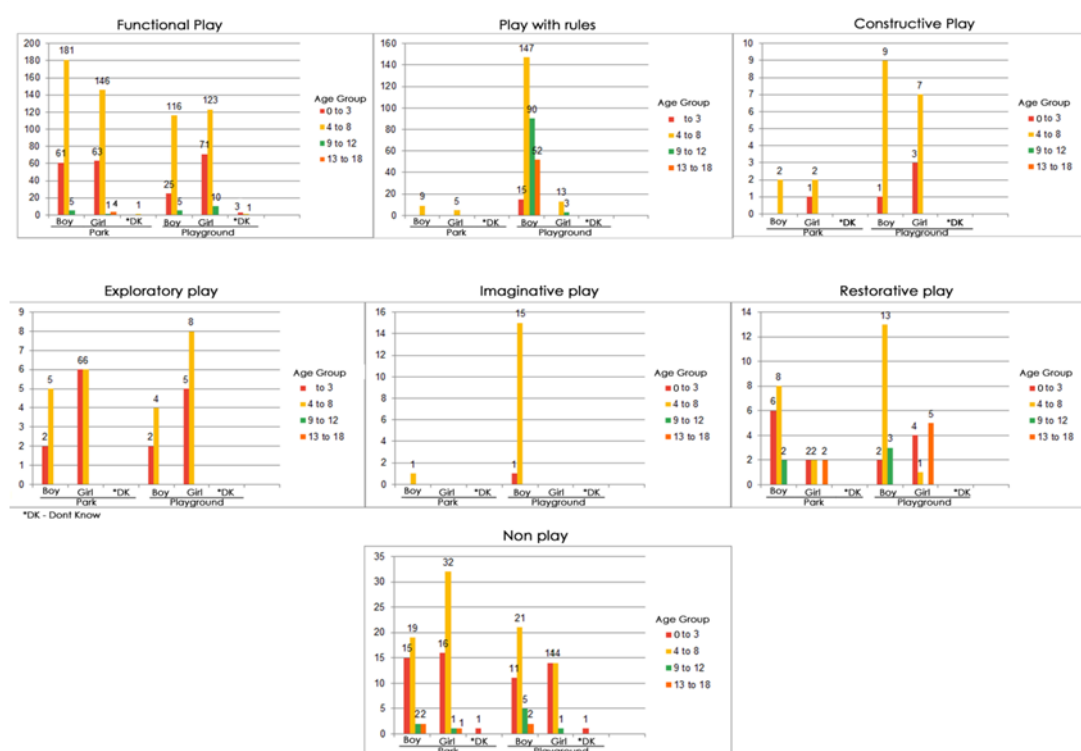


Figure 9. Observations of play types

7. Discussion

This investigation uses behavior mapping to ascertain the range of play behavior accommodated in formal public spaces.

The playground attracted more visitors, a finding consistent with similar observations in both American and Egyptian contexts (Baran *et al.*, 2014; El-Kholy *et al.*, 2022). The analysis brought out the playgrounds' capacity to cater to diverse age cohorts of both children and adults for recreational pursuits, exhibiting a broader spectrum of recreational activities compared to the park. The investigation delineated a prevalence of younger children, aged 1 to 8 years, frequenting both the park and playground, with the 4 to 8-year-old demographic emerging as the most predominant in both settings. Studies

from (Loukaitou-Sideris & Sideris, 2009; Floyd *et al.*, 2011; Ries *et al.*, 2009), simulate these patterns, suggesting that decreased visits by adolescents may be attributed to increased mobility within their neighborhood.

7.1. Supervision modalities

The results noted that play for the younger age cohorts from birth to 8 was a supervised activity, going by the number of caregivers who accompanied children. A similar study in Bhopal revealed that the majority of children were accompanied by parents when visiting an urban park (Raje *et al.*, 2022). The study of Tang and Woolley, (2023) also observes a similar pattern of parental supervision in Beijing. Parental supervision was dominant than supervision by grandparents in both park and the playground (Tang & Woolley, 2023). The park was also attractive to a larger share of grandparents than the playground. Gender-wise distribution revealed interesting patterns. Mothers and grandmothers had higher representations than fathers and grandfathers. This aligns with the notion that female counterparts frequently assume a substantial role in the responsibilities associated with childcare (Walls *et al.*, 2016; Tang & Woolley, 2023).

7.2. Age wise Spatial distribution

The playground displayed a broader age range of child users than the park. El-Kholy *et al.* (2022) observed playground is associated with more vigorous activities than green areas. Numerous scholarly investigations have underscored the nexus between design characteristics and the age compositions of children. Age group wise the 4 to 8 year olds were the most represented in both the playground and the park. This observation is in line with several studies that found the 6 to 12-year age group was observed the most in park and playground zones (Baran *et al.*, 2014; Moore *et al.*, 2010). Similar patterns have been observed by other researchers in traditional playgrounds (Eriksen, 1985; Metin, 2003). This study also observed that this 4 to 8 year cohort while gravitating towards traditional play equipment and also indulged in “play with rules”. Caymaz *et al.* (2018), in their study, tasked primary school-aged children aged 8 to 10 years with sketching their ideal park facilities. Analysis of the findings indicated that the most desired features are swings and slides, among other elements. Research by Refshauge *et al.* (2013) has observed ages of 6-12 years being engaged in functional play which was offered predominantly across the playgrounds studied. In another research, Hughes (2009) indicates that children in the age range of 6 to 12 years demonstrate a capacity for engaging in more elaborate games with established rules, which indicates their cognitive maturity as logical thinkers.

Age wise, in the park setting, representation of 9 to 12 years and 13 to 18 years are negligible. It appears that the park has not adequately addressed the specific needs of children within different age groups. The success of sustainability in an urban park hinges on its ability to embrace individuals, including children of all ages, in a welcoming manner.

In the playground, the older children of 9 to 18 years showed a strong preference only for “play with rules”. The possibilities for these activities can be tied back to the theory of affordances whereby the younger children perceive and experience functional play through slides, swings and merry-go-rounds while the older children see possibilities for social and physical engagement in clear and open spaces through “play with rules”.

In the playground setting, an observable spatial distribution pattern among age groups was discerned. The distribution of individuals according to age exhibited a

hierarchical arrangement extending from the main entrance to the far end of the playground. Notably, younger age cohorts of birth to 8 years, predominantly occupied and exerted influence over the swings, slides, merry-go-round and see-saws which were proximal to the main entrance. The age groups of 4 to 8 years, though spread across the playground exhibited maximum representations with traditional play equipment and the medium-sized clear spaces near the centrally located flagpost. Frost et al. (2004) assert that alongside physical and cognitive transformations, the play preferences and developmental requisites of children evolve over time. As children progress in age, there is a discernible inclination towards seeking more sophisticated interactions with their environment (Ellis, 1973). Age cohorts of 9 to 12 years and 13 to 18 years gravitated towards spaces situated in the peripheral and largest regions of the playground towards the volleyball court at its far end. The 13 to 18 year cohort was primarily observed in the shaded volleyball court along with other adults situated at the distant end of the playground. The secluded characteristic of this area enabled individuals to engage in activities without external interference from other age demographics, Furthermore, this particular zone represented the largest barrier-free space in comparison to others, facilitating engagement in play activities such as cricket and volleyball. Hence, this study underscores the significant connection between children's age and their perception and utilization of spatial potential. Notably in the playground, the volleyball court exhibited inter-age group interactions between the 4 to 8 year cohort, the 9 to 12 year cohort and the 13 to 18 year cohorts along with adults.

7.3. Play Types

The detailed examination of field data, acquired through behavior mapping for the play types, facilitated the correlation of distinct behaviors and activities with environmental attributes.

In the park settings, functional playtype was dominant because of the presence of traditional play equipment. This observation is also supported by Raje et al. (2022) in their study of a park in Bhopal, India, wherein it was reported that the urban park demonstrated more affordances of a functional play type attributable to the presence of play equipment. Research on traditional playgrounds note that it affords the least challenging play and the most non-play (Lee, 1999).

The sand-covered zone in the park, housing the traditional equipment and the shrubs and trees along the periphery of the pathway facilitated infrequent occurrences of constructive and exploratory play. The study by Raje et al. (2022) depicts a similar observation where they reported a notable decrease in exploratory and productive or creative activities of urban play in a park at Bhopal when compared to rural play. The younger cohorts of birth to 8 exhibited exploratory play when they interacted with the gym apparatus attempting to discern its operational mechanisms and intended uses. The confined clear space in the gym section exhibited minimum incidences of “play with rules”. The spatial constraints, characterized by limited geometry and dimensions were conducive to accommodating only small cohorts of children and adults. Playspace size has an impact on the kind of games children play (Bhuyan, 2022).

Arguably, the park lacked barrier-free, expansive open spaces that could engage children in diverse play types. To sum up it was observed that functional play was the dominating playtype in the park. Though functional play takes care of the gross and fine motor skill requirements of development, conventional designs that fail to stimulate a child's imagination may result in feelings of frustration and potentially lead to diminished

utilization of the play areas (Memik, 2004; Refshauge *et al.*, 2012). Hart (2002), argues that the non-portable traditional play equipment provides opportunities for physical activity but does not support exploratory or imaginative play.

In the playground, the prevalent playtypes observed were functional playtypes where children engaged with traditional equipment and gym apparatus and “play with rules”, wherein children engaged in activities such as cricket and volleyball. The younger cohort of 0 to 8 years claimed the smaller barrier-free clear space near the flagpost which comfortably accommodated their small groups. According to DeVries (2015), from age 4 to 8 years, as children develop, they start to exhibit less functional play and indulge in organized and goal oriented play like constructive, imaginative play and games with rules as they get older. The provision of shade from trees lining the periphery of the playground towards its rear and the physical distance it had from the other play spaces, facilitated “Play with Rules”, particularly as it was frequented and claimed by the older age group of 9 to 18 years. Other studies have also noted that wide open spaces afford playing group games (El-Kholy *et al.*, 2022; Baek *et al.*, 2015). Compared to the park, the playground demonstrated more instances of Constructive, Exploratory and Imaginative play types. Natural elements such as sand, flowers and leaves, are readily accessible to children, fostering an environment conducive to exploration and constructive play. Further, shallow excavated pits afforded imaginative play. Raje *et al.* (2022) indicate that rural areas demonstrated imaginative play and exhibited a variety of games with natural elements like mud, water, trees and plants. Heseltine and Holborne (1988), mention key design elements like moveable parts, variable landforms and the presence of natural design elements which increase play value of a play space.

7.4. Gender, age and playtypes

Girls were represented more than boys in the category of birth to 3 year cohort in functional play. Conversely Refshauge *et al.* (2013) observed that boys were represented more in functional play in the age group of birth to five years. Representation of boys was prevalent than girls in the 4 to 8 year cohort, displaying an inclination towards “play with rules”. Karsten (2003) observes that representation of boys prevails when barrier-free playfields are more predominant than the space for play equipment, supporting this study’s observation that boys were predominantly more in number in the playground. The playground exhibited more instances of girls engaging in exploratory play than boys. A research which examined the exploratory behaviours among five month old children of both genders, found that girls displayed a more focused exploratory behaviour than boys (Pomerleau *et al.*, 1992). Though a mix of genders were found in all playspaces, the volley ball court in the playground exhibited only the presence of boys.

8. Conclusion

Realization of play is influenced by barriers and through affordances (DeVries, 2015). Through this research, It is apparent that the design and layout of play spaces significantly influence the types of activities they accommodate. The objective of the study was to examine the design characteristics that influence play in formal public spaces. The results revealed that play areas with traditional play equipment in both park and playground supported functional play and catered to age cohorts of birth to 8 years. The pathways in the park afforded running. The size of the play spaces supported different affordances. The clear space of the yoga area in the park supported games like

frisbee and badminton. In the playground, the smaller clear open space next to the flag post supported activities like running and play with rules like cricket. The open space at the volleyball court in the playground supported play with rules with cohorts of children and adults. It was observed that sand as a ground cover material afforded small instances of constructive and exploratory play. Trees and plants in the peripheral areas of the park and playground afforded exploratory and imaginative play but in negligible numbers.

The study reveals actualized utilisations of parks and playgrounds. It reveals limited opportunities for children to engage in diverse play types. It unveils that there is potential for affordances to be realized. The study has implications for urban planning and design. The observed limitations lie in the age group of children and play types in the play spaces. Landscape designers should prioritize spatial uses to accommodate the diverse developmental requirements and preferences of children across various age groups. To increase play space usage among children, studies recommend providing natural features within the layout, offering organized sports activities and leveraging social networks such as peer groups and friends (Loukaitou-Sideris & Sideris, 2009; Floyd *et al.*, 2011).

Additionally, features that encourage diverse play types could be provided to optimize developmental benefits. Studies have found that complexity in natural landscapes attracts children and encourages diverse play behaviours (Fjørtoft & Sageie, 2000; Baek *et al.*, 2015). Fjørtoft and Sageie (2000) also reported that diversity in the types of vegetation affords increased types of play activities, making play varied and complex. Water encourages exploration in children and serves as a calming feature (Cohen *et al.*, 2010). Variety in ground cover material also increases diversity in play activities (McCurdy *et al.*, 2010). To increase the play value landscape designers could optimize play opportunities with a wider array of play experiences for children like the provision of natural materials, the provision for balancing, running, climbing and jumping. In a study, military equipment that was climbable afforded risky play and was attractive to children (El-Kholy *et al.*, 2022). Planners and designers could include more play types by incorporating accessible loose materials natural features and settings like slopes and untraditional play equipment like rope structures (Zamani, 2016; Heseltine & Holborn, 1988; Baek *et al.*, 2015)

Although this study has provided insights into various facets of adult supervision roles and play types within children's park and playgrounds, it is essential to acknowledge several limitations. The research concentrates on a solitary children's park and a playground. These numbers may not be adequate to conclude on the variety of play environments present in other areas. The research is cross sectional which precludes causal relationships. The data was collected in February/March, coinciding with the examination period for schools. Therefore the observed patterns may not represent typical usage of the formal public spaces throughout the year. Furthermore, the analysis of supervision roles is cursory, suggesting a need for more in-depth investigation.

Considering the findings and limitations of the study, several suggestions for future research and practical considerations can be proposed. Future research could encompass multiple parks across various locations and cultural contexts that could help understand play phenomena in a different light. Moreover, qualitative methods such as semi-structured interviews along with quantitative data obtained through behavior mapping, could provide richer insights into the topic. Future research is essential to obtain a comprehensive understanding of how spatial design can support community engagement and optimize park usage across children of all age groups.

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