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## **AN INVESTIGATION OF STREET AFFORDANCES DURING SCHOOL-HOME JOURNEY IN HIGH-DENSITY NEIGHBORHOOD OF NANCHANG, CHINA**

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### **Abstract**

Affordance theory offers an effective approach to exploring how children perceive and engage with their everyday surroundings, providing important perspectives within the field of environmental psychology for research focused on children. This study examines the interaction between children's actions and the built environment through the lens of affordance theory, which emphasizes the direct perception of environmental functions. Using a taxonomy of affordances, the study investigates children's immediate actions (actualized affordances) during their homeward journeys, extending the application of affordance theory to Chinese street environments. Previous research often overlooks children's immediate interactions with their surroundings and fails to capture the dynamic transaction between children and the environment. This study addresses these gaps by examining street affordances in conjunction with children's perceptual responses to highlight the characteristics of street environments in high-density neighborhoods. The results aim to enhance the understanding of how daily landscapes affect children's behavior, which has significant implications for designing child-friendly urban environments.

**Keywords:** Affordance, School Journey, High-density Neighbourhood, Child-environment Transaction, City of Nanchang

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## INTRODUCTION

Globally, more children are growing up in densely urban environments with limited access to nature and fewer opportunities for independent activity (Zhou et al., 2022). Children are naturally drawn to lively places filled with activity, such as streets, sidewalks, and commercial spaces (Guo et al., 2023; Loebach & Gilliland, 2022; No et al., 2023), which supports a variety of activities and interactions. However, many urban informal public spaces today lack functioning features to fail to support children's diversity activities. The term “third environment” refers to informal public spaces that exist on neutral ground and are characterized by openness, accessibility, and inclusivity (Oldenburg, 1997). These are in addition to the home and school, such as the street environment (Carroll et al., 2015). Therefore, the street environment is viewed as a pillar that supports resident interaction and the community's daily social activities (Tang & Long, 2019), particularly for children's daily school journeys. Furthermore, street environments are of great significance to the physical activity of school-age children. School travel and outdoor play serve as a key source of physical activity (PA) for school-age children (Helbich et al., 2016). Chinese children commute between home and school five days a week, and these daily journeys have become important opportunities for play and social interaction (Zacharias et al., 2017). This interaction could alter their perception and experiences of the various social and spatial characteristics of their surroundings.

In China, the urban planning policy places significant emphasis on the physical and mental health of children, recognizing them as a vulnerable group that deserves special attention. Hence, increasing attention has been given to the affordability of the built environment and the quality of public services for children. It includes quality educational and living environments, as well as safe spaces for leisure and recreation. Consequently, many municipal governments in China have incorporated the development of Child-Friendly Cities (CFCs) into their long-term strategic plans, aiming to enhance physical and social environment quality for children (Nan, 2020). Later, the State Council released the China National Program for Child Development (2011–2020), which identified the construction of a child-friendly environment as a key goal. This guidance highlights that the primary goal of building child-friendly cities and environments is to support and enhance children's physical and mental health (Nan, 2020). Nowadays, urban environment development in China has transitioned into a phase focused on renewing and optimizing existing built environments. Thus, Child-friendly neighborhood street environments should be promoted as a means to advance child-friendly cities and support high-quality urban development (Wei et al., 2024). Children constitute a significant demographic group in urban neighborhoods. Consequently, children should be

prioritized in neighborhood development to ensure their needs are fully met and their well-being safeguarded.

Since the 1980s, the concept of child-friendly environments has been explored from children's perspectives; however, much of the research remains limited in scope, particularly in overlooking the Chinese context (Guo et al., 2023). Additionally, research on the built environment and children's school journey is still scant. Hence, this study provides a foundational starting point for defining a child-friendly street environment to support children's independent school journey. Moreover, this study employed site observation, participatory observation, mapping, and drawing methods. Previous studies adopted child-centered methodologies to identify children's activities and play patterns during school commuting (Egli et al., 2020; Michail et al., 2021; Wilson et al., 2019). It is essential to recognize that children have the right to articulate their lived experiences and actively contribute to shaping their sense of place and belonging. This study reveals not only the complex interaction between material environmental factors and social factors in children's home-to-school journey experiences but also how this socio-material environment is engaged with, negotiated, and explored by them. From an ecological perspective, this study views affordances as a bridge between children's school travel behaviors and the concept of child-friendly environments. Consequently, this study is aimed to identify the properties and attributes of street environments. To that end, this study has been formulated to answer two main questions:

- (1) What are street affordances within two high-density neighborhoods in Nanchang, China?
- (2) What are the support factors for the children school-home journey?

## **LITERATURE REVIEW**

### **Person–environment Relationship (P-E)**

Affordances, as defined as functional properties of environments, offer children opportunities to interact actively with their surroundings (Heft, 1988). In other words, environmental affordances refer to the properties and attributes of a specific environment and are particularly relevant to the design and layout of constructed environments (Young and Cleveland, 2022). It also reveals the needs and preferences of receivers (Kytä, 2004). The person-environment relationship elucidates how children's immediate performance (i.e., their activities) is afforded by the functionally significant properties of the environment (Kytä, 2004). In turn, the children's immediate actions also shape the environment. This person-environment relationship is instant and grounded in functional interaction (Kytä, 2004). Immediate actions and performances occurred during the journey, which actualized affordances in this context. Additionally, Kytä (2003) proposed

that the number of actualized affordances was positively correlated with the degree of child-friendliness within the environment (Kytä, 2003). In other words, the higher availability of these environments indicates more frequent interactions between children and street environments. It reflects the degree of child-friendliness in these environments. Hence, children's play patterns are shaped by collective engagement. This paper identifies the activities, properties, and attributes of street environments that children engage in. Therefore, this study will contribute to the street planning of high-density neighborhoods in China, as well as to the development of child-friendly environments.

### **Affordances as an Approach in Assessing Child-friendly Environment**

The concept of affordances, introduced by Gibson (1979), was intended to explain behavior through the lens of the reciprocal relationship between individuals and their surrounding environment. It is worth noting that affordances are dynamic, changing within the environment as they emerge from individuals' sustained reactions to the possibilities offered by relevant affordances (Gibson, 1966). In other words, environmental affordances offer opportunities and stimuli that encourage specific behaviors and interactions within that environment (Gibson, 1966). Therefore, the ecological psychology approach has been utilized to examine the relationship between children and their environment (Gibson, 1979). In this study, the theory of affordances serves as a primary framework for identifying street affordances and understanding children's play behavior.

### **Taxonomy of Affordances**

Identifying children's actions through the lens of affordances helps researchers understand the reciprocal influence between the environment and children's performance. In this context, the taxonomy of affordances serves as a pillar to support the relationship between children and their environment. It is an important prerequisite for observing children's various activities during their school trips. This taxonomy reveals that environmental features can be characterized functionally based on the activities they enable or facilitate for an individual, adding psychological significance. Heft (1988) categorized the environmental features into ten functional categories: flat, relatively smooth surface; relatively smooth slope; graspable/detached object; attached object; non-rigid, attached object; climbable feature; aperture; shelter; mouldable material; and water. Later, Kytä (2002) proposed the concept of affordances for sociality, emphasizing the opportunities for social interaction that the environment provides. Then, Yusof (2022) expanded the taxonomy of affordances by introducing categories such as soundable, ignitable, and edible, which reflect the sensory and functional possibilities offered by specific environments (Yusof et

al., 2022). As Table 1 shows, this study used thirteen functional categories to identify the functional affordances.

**Table 1:** Functional taxonomy in this study

| No | Author       | Functional Taxonomy              | Affordances                                                                            |
|----|--------------|----------------------------------|----------------------------------------------------------------------------------------|
|    | Heft (1988)  | Flat, relatively, smooth surface | Affords: running, walking, jumping, spinning, playing, relaxing                        |
|    |              | Relatively smooth slope          | Affords: jumping, rolling, throwing                                                    |
|    |              | Shelter                          | Affords: manipulating, shading, taking, eating                                         |
|    |              | Attached object                  | Affords: observing, recognizing, sitting                                               |
|    |              | Climbable object                 | Affords: climbing, jumping, passaging                                                  |
|    |              | Non-rigid attached object        | Affords: spinning, sitting in, lying on, jumping, playing, holding                     |
|    |              | Graspable/ detached object       | Affords: giving, feeding, manipulating, collecting,                                    |
|    |              | Mouldable material               | Affords: manipulating, shaping, digging                                                |
|    |              | Water                            | Affords: splashing, pouring, watching, fishing                                         |
|    | Yusof (2022) | Soundable                        | Affords: chirping (mimicking sound of animal)                                          |
|    |              | Ignitable                        | Affords: collecting, roasting, lighting up, igniting,                                  |
|    |              | Edible                           | Affords: eating, chewing, drinking, tasting                                            |
|    | Kytta (2002) | Affordance for sociality         | Affords: talking, eating, greeting, waiting, lying, chasing, buying, chasing, catching |

*Source: Heft (1988), Kytta (2002), Yusof (2022), Lopes et al., (2018)*

## RESEARCH METHODOLOGY

The study gathered qualitative data from 80 students enrolled in grades 2 to 5 at two primary schools, following approval from Universiti Sains Malaysia (USM) and the two primary schools. Firstly, primary school teachers utilized existing school records to verify that the home addresses of participating children were situated within the specified residential areas. They capitalized on the pre-existing data gathered during the enrolment process, thereby obviating the necessity for the researcher to access sensitive personal details directly. To meet the ethical standard, I asked the parents and their children to sign the consent forms before observing the children's activities. When taking photos, I ensured that children's faces and other identifiable information would not be included, and I would delete any upon request from the children or their parents. To capture a broad range of home-school journey activities, the study first examined the

affordances of each target street. Exploring how the physical and social aspects of target street environments influence children's activities. The selection process was guided by factors such as participant availability and the diversity of street environments, ensuring the study's feasibility and validity.

## **DATA COLLECTION**

This study employed a field observation approach to identify the affordances of the street environment for school-to-home journeys. Therefore, the researchers determined the observation periods based on the children's school hours, once a day (after school), with each period lasting 60 minutes (determined by the absence of new activities during these sessions) on sunny days. Then, the participatory observation approach involves engaging directly with participants in group settings while simultaneously observing their behaviors and interactions (Uwamusi and Ajisebiyawo, 2023). In this study, participatory observation was employed to investigate children's perceptual responses in two high-density neighborhoods in Nanchang, China. The researcher accompanied the children on their school-to-home journey, participating in activities such as walking and socializing. The researcher carefully noted their behavior and perceptual responses, paying special attention to any challenges or opportunities they faced. Meanwhile, detailed insights into children's travel and play behaviors, such as school routes, duration, and destinations, were recorded. Data were gathered by accompanying the children on their journeys and capturing pertinent details in real-time using field notes, photographs, and video recordings. This approach facilitated a comprehensive understanding of the children's activity patterns and the environmental influences on their behavior and perception.

Furthermore, go-along interviews with children provide an in-depth understanding of the factors that influence the affordances they perceive in their street environments. In this session, ask children aged 8–11 to describe what they like or dislike about streets, landscapes, and elements. Hence, Researchers explore both the positive and negative behavioral and perceptual responses to the street environments from the children's perspective. Audio recordings were used, with the children's consent, to ensure accuracy and to support detailed analysis later. The go-along interview was intentionally selected because it allowed the researcher to step into an environment familiar to the children, one they had chosen at designated points during their journey (Alexander et al., 2022). This approach offered deep, situationally relevant insights into the children's experiences and their engagements with their environment.

## ANALYSIS AND DISCUSSION

### The Affordances of Street Environment

As shown in Table 2, the findings reveal an activity pattern for the children's activities carried out in Case 1 and Case 2. As shown in Table 1, a total of 83 street activities were identified through direct observation. Of these, 79 activities (95%) were observed by researchers in Case 1, while 75 activities (90%) were observed in Case 2. The results indicated a slight variation in the number of activities observed in the two Cases. This finding suggests that the street environments of Case 1 are more child-friendly than those of Case 2. The frequent activities performed in both cases include crossing the road, engaging in commercial activities, cycling, running, and chasing (Figure 1). Meanwhile, activities such as homework, group games, and sports are more commonly found in both cases (Figure 1). Moreover, this study found that children run purposefully to cross the road quickly and safely. This behavior is more common among older children, who can better understand their location, manage time, and select safer and more convenient paths. The study identified the activities that children performed in two cases. Street affordance refers to the features of the street that either encourage or hinder children from engaging in activities. The evaluation of street affordances focused on the actualized affordances in each target street rather than the frequency of children's activities.

**Table 2:** Total activities performed by children during school journey

| Target Site                     | Number of activities<br>observed by researchers | Total        |
|---------------------------------|-------------------------------------------------|--------------|
| Case 1: Park Road Neighbourhood | 79                                              | 95           |
| Case 2: Hu Bin Neighbourhood    | 75                                              | 90           |
| <b>Total activities</b>         | <b>83</b>                                       | <b>(100)</b> |

As Figure 2 shows, children also engage in passive activities during the journey, such as observing their surroundings, waiting for friends, or even playing with digital devices while seated in shaded or semi-sheltered spaces (Clark and Uzzell, 2002; Woolley and Lowe, 2013). This finding aligns with Guo et al. (2023), who found that increased commercial area is associated with a greater number of affordances in urban environments. However, this finding contrasts with the conclusion of Michail et al. (2024), who found that children tend to avoid streets with a higher concentration of commercial activities (Michail et al., 2024). Evidence from a 10-year-old boy described, *"I do not like to walk on the left because there are too many people and it is too crowded."* A notable and novel finding was that children engaged in activities near shops and mixed-use spaces, such as areas combining shops and residential buildings, within high-density

neighborhoods. This behavior in mixed-use neighborhood street spaces has not been previously reported in other studies.



**Figure 1:** Children crossing the road and running and chasing (left); children cycling and rope skipping (middle); children playing badminton (right)



**Figure 2:** Children observing and waiting on the benches (left); children playing digital devices on the pavilion (middle); children shopping in the stationery store (right)

Furthermore, as Figure 3 shows, cluttered objects and parked vehicles along the streets impeded the realization of affordances. This finding is consistent with Kyttä (2004), who emphasized that spatial mobility restrictions are associated with decreased actualized affordances (Kyttä, 2004). Apart from these, this study revealed that green elements integrated into the street environment create a supportive environment for a wide range of benefits and opportunities. This environment provides affordances such as running, playing facilities, waiting, observing, eating, and talking. An 8-year-old girl supports this, saying, *"We chase and play with my friends in a small park every day...there are a lot of tree planter boxes and lawn..."* These findings are consistent with those of Ortegón-Sánchez et al. (2022) and Zhang et al. (2024), which suggest that green space along streets has a positive significance in promoting children's play and their health. Moreover, public open spaces can foster a sense of belonging among children by providing familiar and accessible areas where they can play, socialize, and interact with their peers (Young, 2018). Children tend to prefer familiar areas for a sense of safety and security (Rastgo et al., 2024). For instance, as Figure 3 shows, areas like parklet parks, threshold spaces, or vacant spaces. Hence, small parks are effective child-friendly activity spaces in high-density residential areas, especially when they provide areas for supervision and observation (Krishnamurthy and Ataol, 2020).



**Figure 3:** Cluttered objects and parked vehicles along the sidewalks (left); children playing under guardian's observation from a distance in the threshold spaces (right)

### Taxonomy of affordances during home-school journeys

The identified categories of this study are as follows: (1) flat, relatively smooth, (2) relatively smooth slope, (3) graspable and detached objects, (4) Attached objects, (5) non-rigid materials, (6) climbable surfaces, (7) shelter, (8) water, (9) mouldable materials, (10) soundable, (11) ignitable, (12) edible, and (13) affordances for sociality. The study found that each of these categories offers unique opportunities for children's after-school activities, particularly in Chinese high-density neighborhood street environments. The detailed results of the children's activities, categorized by these categories, are presented in Table 3.

**Table 3:** Taxonomy of affordances in 16 categories of Case 1 and Case 2

| Category                                   | Case 1     | Case 2     | Total      |
|--------------------------------------------|------------|------------|------------|
| 1. Flat, relatively rigid, smooth surfaces | 17         | 19         | 36         |
| 2. Relatively smooth slope                 | 8          | 16         | 24         |
| 3. Graspable/detached objects              | 31         | 35         | 66         |
| 4. Attached objects                        | 19         | 16         | 35         |
| 5. Non-rigid attached objects              | 7          | 5          | 12         |
| 6. Climbable features                      | 5          | 5          | 10         |
| 7. Shelter                                 | 11         | 16         | 27         |
| 8. Water                                   | 2          | 11         | 13         |
| 9. Mouldable material                      | 4          | 7          | 11         |
| 10. Soundable                              | 3          | 4          | 7          |
| 11. Ignitable                              | 3          | 4          | 7          |
| 12. Edible                                 | 3          | 4          | 7          |
| 13. Sociality                              | 21         | 20         | 41         |
| <b>TOTAL</b>                               | <b>113</b> | <b>142</b> | <b>296</b> |

The most prominent category of affordances in both cases was graspable/detached objects, with 31 affordances identified in Case 1 and 35 in Case 2 (see Table 3). This finding demonstrates that graspable objects provided

the highest number of affordances across both cases. Graspable/detachable objects on the street include plastic bottles, paper, stone, crayons, dogs, cats, chickens, food, disposable tableware, vegetation (i.e., flowers, leaves, branches, seeds, fruits), ball, soil, sand, stones, flyers, exercise books, stationery, toys, and screen devices. For example, students fold paper airplanes from flyers commonly found on the street and compete to see whose airplane can fly the farthest or tear the paper into pieces to create puzzles ( $n = 3$ ). Additionally, snacks purchased from the grocery store are used to feed animals, such as dogs in supermarkets and cats in fruit stores, or to attract ants to observe their transportation routes. However, the use of graspable objects on the street was restricted by parents, who prohibited their children from picking up items from the ground due to concerns about cleanliness. Moreover, the loose materials of the built environment are more impactful than the loose elements of nature due to their versatility and relevance to the activities that occur in urban spaces (Herrington et al., 2022). Loose materials in the built environment, such as movable street furniture, construction debris, or everyday objects like cans or balls, often offer a wider range of affordances. They can be grasped, thrown, rearranged, or repurposed for creative play, sports, or informal construction activities. These materials are typically more accessible and varied in their functionality, directly aligning with the types of interactions that occur in the street environment. For instance, it affords seven affordances, namely, throwing, kicking, storing, digging a tool, building, shaking, and serving as a sword to fight.

Meanwhile, loose elements of nature, such as leaves, branches, or pebbles, while still interactive, tend to have more opportunities for younger children. For example, tree branches afforded seven affordances, namely digging, burning, writing, building something, and using them as weapons to fight. However, natural elements and available space on the street are often limited, which can constrain the actualized affordances in urban environments where activities such as running, cycling, and social play dominate. In parallel to Guo et al. (2023), the number of affordances was linked to the functional richness and the presence of activity opportunities in China (Guo et al., 2023).

Following this was the second-highest category, social affordances, where both Case 1 and Case 2 provided an almost equal number of affordances. Specifically, Case 1 offers 21 affordances, and Case 2 offers 20. Public open spaces are universally accessible environments that function as shared domains (Hantono et al., 2018), such as pocket parks and vacant areas, which also provide more social opportunities for street use (Chaudhury et al., 2019). These environments enabled a wide range of peer interactions, including talking, teasing, mocking, waiting for adults, doing homework, playing rule-based games, and engaging in commercial activity. For instance, in the “Thief Don’t Don’t Move” game, a child assumes the role of a policeman and stands at the front.

When the policeman shouts, “Thief, do not Move,” and abruptly turns around, any child who moves must quit the game, continuing until only the last thief and the policeman remain. Children’s engagement in pretend play and games with rules indicates their active participation in social environment opportunities. The results parallel those of Madondo and Tsikira (2022), which show that social affordances enhance children’s social skills and language competence through engagement in cooperative play, group games, and the negotiation of game rules (Madondo and Tsikira, 2022).

As Table 3 shows, the category of flat, relatively rigid, smooth surfaces provides the third most affordances. This category included sidewalks, green strips, open paved areas, and mezzanine-level spaces. Based on observation, a total of 19 affordances in Case 2, whereas Case 1 provided 17 affordances. These surfaces are fundamental to children’s daily school journeys, as they support essential modes of movement such as walking, running, cycling, jumping, and skipping. In parallel with Zamani’s (2017) study, hard-surfaced and coherent paths were closely associated with physical play, as they provide suitable conditions for activities such as cycling, running, and walking (Zamani, 2017). A 10-year-old girl commented, “I like to be in here because of the beautiful, colored pavement...” These underscore the significance of coherence and aesthetic qualities in shaping children’s play preferences and emotional responses to street environments. This finding aligns with previous research highlighting the role of surface texture and visual appeal in enhancing children’s engagement with outdoor environments (Aminpour and Bishop, 2021; Loebach and Cox, 2022). Coherent sidewalks improved the walkability of neighborhood street environments (Wei et al., 2021).

## CONCLUSION

The study findings effectively respond to the research question by highlighting the pivotal role of the home-to-school journey in influencing children’s travel and play behaviors within dense street settings. Activities such as running and chasing, engaging in commercial activities, and playing group games showcase a diverse range of skills and experiences. These activities not only contribute to children’s physical, social, and cognitive development but also reflect distinct play patterns shaped by their behaviors in the street environments. The results highlight the importance of the school-to-home journey as a crucial arena for children to showcase and develop their abilities through interactions with their environment. This research also carries several tangible implications for urban planners and policymakers. This study underscores the importance of coherent sidewalks, accessible open spaces near the street, and well-integrated natural and design elements. Recognizing the influence of environmental design on children’s experiences enables urban planners to develop street environments that

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prioritize children's health, well-being, and activities, thereby fostering their independence and self-confidence.

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## ETHICAL STATEMENT

This study received ethical approval from the Human Research Ethics Committee of Universiti Sains Malaysia (USM) under protocol number USM/JEPeM/PP/24060503. Informed consent was obtained from all participants and their legal guardians prior to the commencement of data collection.

## CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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