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Optimizing Child-Friendly and Affordable Street Environments within 15-Minute Living Circles: A Qualitative Case Study

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Abstract

Children's daily environmental views and street interactions, especially on their walk to school, are understudied in urban planning and psychological development. Street environments affect children's sense of security and learning possibilities, however there is a gap in how street environments within 15 minutes affect educational engagement and behaviour. This qualitative case study examined Nanchang, China, children aged 7–12's street interactions to determine how they perceive and interact with street environments on their way to school. Observing 10 carefully selected children, analysing their drawings, and interviewing them revealed key features of child-friendly streets, such as eye-catching safety signs, a wealth of recreational facilities, and interactive design elements that greatly impacted children's daily lives. Quality street environments can encourage autonomous exploration, improve social skills, and connect school learning. Provide urban planners and policymakers with knowledge to improve street environments for children's holistic development.

Keywords: *Child-Friendliness, Affordance Theory, Street Environment, 15-Minute Living Circle*

INTRODUCTION

As the field of educational research continues to explore learning environments, scholars are coming to realise that learning is not confined to the classroom. In fact, children's everyday spaces, especially streets and neighbourhoods, also provide valuable educational opportunities, and Fajardo-Dack et al.'s (2024) study highlighted the potential of the linguistic landscape as a tool for language learning, revealing the significant impact of everyday environments on children's English language learning. This view echoes the findings of Zhang et al. (2022), who noted that play in the street positively contributes to children's spatial cognitive skills. In addition, Mann et al. (2022) further explored how urban spaces can be informal classrooms for children's social skills development. They emphasised the key role of public spaces such as streets and parks in facilitating social interactions among children. Meanwhile, the 15-minute living circle is receiving increasing attention as an emerging urban planning model. It is based on small neighbourhoods and aims to create a convenient and integrated living environment (Han, Zhou, Zhong, & Ye, 2022) that provides children with a safe and accessible place for daily learning and activities. In China, more and more neighbourhoods are being renovated or built into such 15-minute living circles (Song, Chen, & Kwan, 2020). However, while some progress has been made in research on children's interactions with the environment, there is still a relative paucity of research on how 15-minute living circles can be specifically designed to provide a child-friendly experience, and Zhao et al. (2022) noted that while urban design is increasingly taking into account the principles of walkability and accessibility, the systematic study and implementation of children's specific needs is still a lacuna in many urban plans.

Citation of one reference in the text from a publication by one or two authors, name of both. Further research has provided insights into the positive impact of street environment design on children's physical activity, thereby contributing to their physical health. For example, Ugolini et al. (2021) discovered that green spaces in cities can significantly increase the number of hours children spend outdoors. Meanwhile, Johnstone et al. (2022) indicated that children's activities in natural environments were beneficial in improving their motor skills. Collectively, these findings emphasise the importance of environmental design in promoting children's physical

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activity, which, after all, is integral to their overall development. While there is a large body of literature on the positive effects of street environments in promoting children's physical activity, little is known about their combined effects on educational engagement and cognitive growth. Current research tends to focus on one specific aspect of impact, for example, Mitra (2020) explored how street play can improve children's physical coordination. However, there is a relative paucity of research on how street environments holistically affect children's social skills, motivation to learn, and cognitive development. Indeed, streets are more than just a pathway to school; they form an important part of children's daily educational experiences. A safe environment for exploration encourages children to interact with their peers and thus learn new skills, while increasing their environmental awareness and enhancing their sense of self-efficacy (Duron-Ramos, Collado, García-Vázquez, & Bello-Echeverria, 2020). These findings all highlight the important role of creating child-friendly street environments in supporting a well-rounded education, including schooling and informal learning experiences in the community.

It is also worth observing that cities across the globe are increasingly recognising the importance of child-friendliness as a way of ensuring that the design of urban spaces meets the developmental needs of children (Sapsağlam & Eryılmaz, 2024). Child-friendliness is not only about creating safe and accessible environments, but it is also concerned with children's health, well-being, and education (Cordero-Vinueza, Niekerk, & van Dijk, 2023). In Nanchang, China, for instance, the city's urban planning in recent years has fully embodied the practical application of child-friendliness principles. The Nanchang Children's Development Plan (2021-2030) and the "15-minute living circle" project are important initiatives aimed at creating urban spaces that are more inclusive and supportive of children's holistic development. Rather than focusing solely on the needs of adults, these projects place children's well-being at the centre of urban design to ensure that they have access to opportunities to learn and grow in their daily lives.

This study endeavours to provide insights into how street environments in 15-minute living circles important educational resources for children's learning and development can be, and how these environments respond to children's needs and preferences. By gaining insights into children's perceptions of their street environments, we will provide evidence-based insights for urban planning and education policy, thereby contributing to the creation of more inclusive urban spaces that are conducive to children's holistic development. This study is expected to provide useful strategies and recommendations on how to incorporate educational values in urban design and how to promote children's informal learning through neighbourhood and street design. This study would explore the following core questions:

1. What child-friendly features do children experience in the street environments of their 15-minute urban neighbourhoods?

2. How do children interact with these street environments on their daily journey to school? And how do these interactions affect their educational engagement and learning behaviours?

Through in-depth analyses of children's drawings and detailed interviews with them, this study attempts to capture the educational value of street environments from children's unique perspectives, with a view to providing practical suggestions for building more educational urban spaces.

LITERATURE REVIEW

Expansion of the Educational Environment: from the Classroom to the Street

The educational environment has expanded from the traditional school classroom to the everyday life of children, with streets and neighbourhoods gaining attention as important places for children to learn and grow, and Kaukko and Wilkinson (2020) argued that real learning often occurs in children's interactions with the world around them rather than in the classroom alone. This view is further supported by the research conducted by Yau (2023), who showed that informal learning in urban environments is equally important for children's development. Streets that have been planned with children's needs in mind provide valuable opportunities for children to build social skills, deepen environmental awareness, and develop practical skills. Furthermore, Mehta and Bosson (2021) revealed the significant value of street play in enhancing children's social interactions, while

Binter (2022) further advanced the unique role of urban streets in fostering children's spatial awareness and problem-solving skills. The concept of the 15-minute living circle offers educators a fresh perspective in exploring how to provide children with safe, attainable opportunities for learning and development. As defined by Wu (2021), the goal of the 15-minute living circle is to enable residents, especially children, to walk to a variety of necessary facilities, including educational centres, within a short period of time. This planning model not only takes into full consideration the needs of adults, but more importantly, it also pays special attention to the special needs of children as urban residents. Xie et al. (2023) pointed out that the implementation of a 15-minute living circle significantly enhanced children's sense of community participation and motivation to learn in certain areas of Fuzhou City, China.

However, despite the initial potential of 15-minute living circles in providing educational resources, research on their practical application and effectiveness in children's everyday environments is still very limited. Existing literature focuses mainly on the application of the concept in the fields of urban planning and adult health, while there is still a considerable dearth of research on how to concretely implement and evaluate the practice of the 15-minute circle of life from a child's perspective (Sari, Lai, & SAID, 2023; W. Wu & Divigalpitiya, 2023). Therefore, an in-depth study of how 15-minute life circles can support children's informal learning by improving the walking environment and providing safe spaces for playing and places for learning from children's perspectives is undoubtedly an important topic that deserves to continue to be explored.

The Educational Value of Child-Friendly Street Design

The concept of child-friendly street design is rooted in a reinterpretation of the role of children in urban spaces and in the spirit of the United Nations Convention on the Rights of the Child. The Convention promotes the right of children to participate in and shape the life of their communities, which encompasses all aspects of the planning and design of the environments in which they live (UNICEF, 1989). Streets, as fundamental elements of the urban fabric, have a deep educational potential to fulfil these goals, thus supporting the holistic development of children. Safety, accessibility, and interaction are the cornerstone principles of child-friendly street design (Pitsikali, Parnell, & McIntyre, 2020). Combined, these principles work to create an ideal space where children can freely and safely explore the world, connect with others, and learn from their surroundings (Shadkam & Moos, 2021). For instance, children's patterns of activity on the street, whether they are playing or travelling to and from school, are an important part of their daily learning and social integration (Zhang et al., 2022).

Well-constructed child-friendly street spaces have a significant positive impact on children's cognitive abilities and social behaviours (Sapsağlam & Eryılmaz, 2024), and Oscilowicz (2020) indicated that interactive elements in street design are effective in enhancing children's social skills and deepening their sense of identity and belonging to their community. Experts in education further highlight the importance of informal learning environments such as streets and parks in developing children's environmental awareness and stimulating their potential for self-directed learning (Ruitenberg, 2014). Meanwhile, Keyvanfar et al. (2022) demonstrated that incorporating educational enablers such as outdoor learning stations and interactive art installations into the design of streets can significantly enhance the quality of children's learning experiences. The 15-minute living circle plan implemented in Shanghai, China, demonstrates the positive impact of urban planning in improving access to educational resources through the creation of child-friendly public spaces, and the need to further explore how these environments can better meet the diverse needs of different groups of children (Yang, Qian, Zeng, Wei, & Yang, 2023). While numerous practices and policies aimed at enhancing the child-friendliness of urban environments have emerged at the international level, there is still a need to deepen the understanding of how street design specifically affects the educational value of children at the cognitive, emotional, and social-behavioural levels (Cordero-Vinueza et al., 2023; Wey & Wei, 2016). In addition, Guo et al. (2023) emphasised the need for urban planners and educators in China to strengthen their collaboration and dialogue with each other in order to more accurately assess and improve the multidimensional impacts that urban street environments have on children. This reflects a gap in the current research landscape, where more in-depth studies are needed to comprehensively explore and evaluate the critical role of street design in promoting children's holistic development. This is particularly important and urgent in the context of China's rapid urbanisation. This study continues and expands on this literature by focusing on how street design within the

15-minute living area of Nanchang City, China, can effectively realise its educational value, and how these design outcomes can precisely respond to children's needs and provide them with richer opportunities for learning and development.

Children, as the direct beneficiaries and core concerns of urban street environment design, deserve more opportunities for voice and participation in the design process (Ekawati, 2015). Incorporating children's views and feedback into the planning and evaluation of street environments not only improves the relevance and effectiveness of the design (de Andrade, Poplin, & Sousa de Sena, 2020), but also demonstrates respect for and protection of children's rights. From inviting children to participate in the organisation of street games to planning workshops, the various forms of participation provide a platform for children to express their feelings about the use of the street environment and their expectations for improvement (Guo et al., 2023). This will greatly enrich the educational resources and experiential opportunities available to children in the 15-minute urban neighbourhood street environment. This study aims to provide insights into child-friendliness and its impact on children's daily interactions on the way to school, with a view to supporting improved educational engagement and learning behaviours (Jam et al., 2011). Therefore, this study will focus on exploring children's street experiences and how these experiences further shape their educational engagement and learning behaviour patterns.

METHODS

Using a qualitative case study approach, this study aims to explore in depth the role and significance of the 15-minute living circle street environment in children's educational experiences. Qualitative case studies are recognised as a powerful tool for understanding complex social phenomena and are particularly applicable to areas that are emerging or not yet fully understood (Yin, 2018). Through in-depth analysis of specific contexts, this approach can reveal how children experience and interact in their life situations and how these experiences and interactions shape their learning processes and behavioural patterns (Stake, 1995). The case study approach allows the researcher to synthesise and interpret data from multiple perspectives, providing a multidimensional understanding of children's behaviour in street settings (Creswell, 2014). By collecting and analysing detailed qualitative data, this study will capture children's perspectives, unearth the subtle dynamics of their interactions with the street environment and explore the impact of the street environment on educational engagement and learning behaviours.

Setting

Nanchang City, Jiangxi Province, China, was chosen as the case study site for this study because, as a rapidly developing provincial capital city in eastern China, it has made significant progress and positive practices in urban planning and the construction of child-friendly spaces in recent years (a map of Nanchang City is shown in Figure 1).

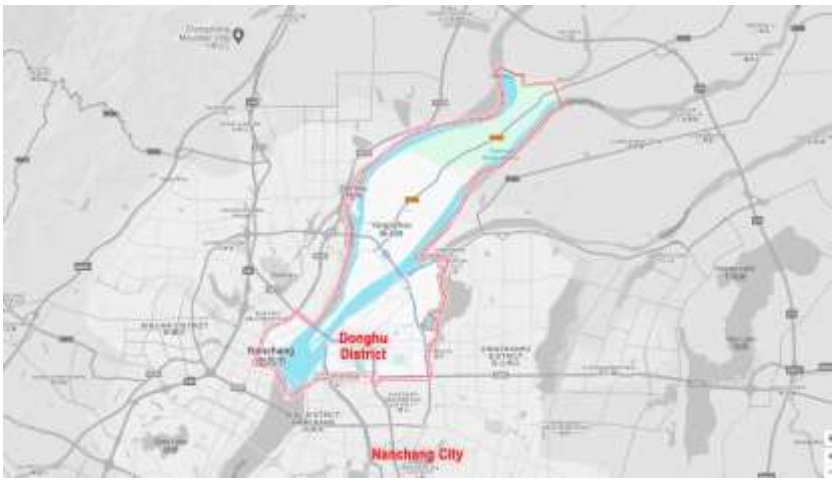


Figure 1: Nanchang City Map.

(Source: Author's illustration based on Google Maps)

The urban structure and street design of Nanchang City provides a unique setting to study children's everyday spaces and educational opportunities in the context of urbanisation. Among the many streets in Nanchang, three representative streets were specifically selected for this study. The criteria for selection are shown in Table 1.

Table 1: 15-Minute Living Circle Street Screening Criteria.

Criteria	Content
Accessibility to children	Ease with which children can reach and navigate the street.
Proximity to schools	Closeness of the street to primary and secondary educational institutions.
Variety of public spaces	Range of public spaces available for children, including parks, playgrounds, and sports facilities.
Safety features	Designated pedestrian zones, traffic calming measures, and safe crossing points.
Level of street activity	Amount of pedestrian traffic and street-level commercial activity.
Presence of educational facilities	Availability of libraries, cultural centers, and interactive learning environments.

Based on these criteria, the three streets selected for this study are Yuxin Street, Living Quarters Street 1, and Pingan Neighborhood Inner Street I (See Figure 2).

Figure 2: Research Streets in Nanchang City.

(Source: Author's illustration based on Google Maps)

These three streets illustrate the different types and functions of urban street environments and provide a diverse perspective on the impact of streets on children's lives, with Yuxin Streets I and II serving as the main external streets that serve as key connections to homes, schools, and other urban spaces, and have important transport and social functions. Pingan Neighborhood Inner Street I, on the other hand, presents a more inward-looking residential environment, providing a semi-public and semi-private community space that is ideal for studying children's behavioural patterns in more intimate settings (see Table 2 for details).

Table 2: Summary the Feature of Sample Street.

Name of street	Type of street	Type of space	Pavement	Significant of street
YX (Yuxin Street)	Synthesis street (external neighborhood street)	Public space	Asphalt, Brick	The important way to go to school (2 main entrance in the street)
L1(Living quarters street I)	Internal Neighborhood-living Street	Public space, Semi-public and semi-privacy space	Colored plastic	Connected Yuxin Street and New Park Street

NIS (Pingan Neighborhood inner street) I	Internal Neighborhood-living Street	Public, Semi-public, and semi-privacy space	Colored plastic	Main entrance square and connected eastern and western of Pingan Neighborhood

In addition to the descriptive information provided for each street, this study collected observational data to understand children's travelling behaviour in these environments. Figure 3 shows the total number of children who passed through each of the target streets over a one-hour period and the mode of travel they chose to use - walking or cycling. This empirical data highlights the importance of these streets to children's daily lives and provides a practical basis for studying children's interactions in street environments.

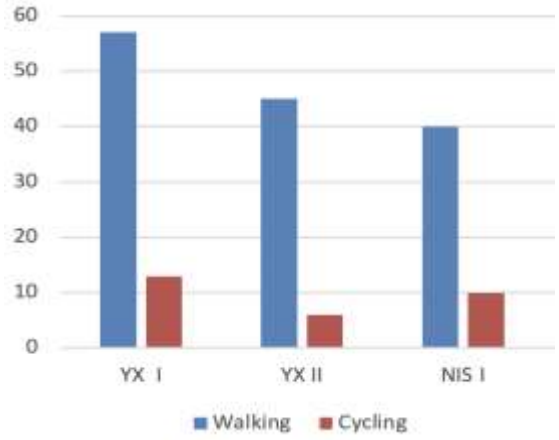


Figure 3: Two Mode of Children Travel on The Target Street.

Participants of the Study

This study focuses on children between the ages of 7 and 12. Children in this age group can walk or cycle in their neighbourhoods on their own and have direct experience and observation of the street environment. Purposeful sampling was chosen as a technique widely used in qualitative research (Creswell, 2014), and 10 children living within a 15-minute radius of SLC were selected for the study. This strategy was designed to utilise resources efficiently and ensure that participants were able to provide depth and breadth of information. As shown in Table 3, the selection criteria aimed to ensure that the children had direct experience of the research setting, as well as exploring how it could influence their educational engagement and learning behaviours.

Table 3: The Criteria Respondent Selection in This Study.

Criteria	Description
Who are Living the 15-minute living circle neighbourhood	Children who living the "15-minute living circle" (New Park Road) neighbourhood could have opportunity interaction with the neighborhood street environment.
Who is studying in a nearby elementary school	Children who are study in nearby Primary school could have opportunity walking or cycling during home-school journey on the target street.
Who are walking or cycling on the target street	The active travel mode could facilitate children interaction with the neighbourhood street environment.
Who are play or travel independently	Children who play and move independently could give them more freedom to explore more with neighbourhood street environment.

Based on the screening criteria, finally 10 children living within the 15-minute living circle of Nanchang City were selected as the main participants in this study. As shown in Table 4, the participants were categorised according to streets, with a 50/50 split between males and females to ensure gender representation. This selection reflects how active children are on these streets and their daily behavioural patterns.

Table 4: Basic Information for Participants.

No.	Name of Street	Children Code	Gender	Age
1	YX I	B1	Boy	9

		B2	Girl	10
		G1	Girl	8
		B3	Boy	10
2	L1	B4	Boy	11
		G2	Girl	10
		G3	Girl	9
		B5	Boy	8
3	NIS I	G4	Girl	9
		G5	Girl	11
	Total	10 people		

Prior to the commencement of data collection, and to ensure the ethical and compliance nature of the study, the research team submitted a detailed research protocol and data collection instruments to the New Park Road Neighbourhood Council to apply for approval of the study. In January 2024, the research team received formal approval to conduct the study in the New Park Road neighbourhood of Nanchang City. This was the first time that the study was conducted in the New Park Road neighbourhood of Nanchang City, and it was the first time that the research team was able to obtain approval for the study. Following the approval of the study, the research team began the process of recruiting volunteers to ensure that the resulting data accurately reflected children's behaviours and experiences in the street environment.

Parents or legal guardians of the children participating in the study provided informed consent, which was signed after they were fully informed about the study and clearly indicated that they understood the purpose and process of the study (see Appendix 1). The informed consent form detailed the rights of the participants, including their privacy protection, anonymisation of data, the principle of voluntary participation and the freedom to withdraw from the study at any time (Fleischman & Ariel, 2016). Ensuring that the rights and interests of all participants (especially minor children) were respected and that the research process was transparent and open was the overarching principle of this study. In addition, to recognise the contribution and time of the children who participated in this study, each participant received a small gift as a token of appreciation at the end of the study. This gift included a stationery set, a notebook, or a water bottle, and participants could choose one of these according to their personal preference. Prior parental consent was obtained for all incentives, and it was ensured that this did not affect the children's free choice to participate in the study.

Data Collection

This qualitative case study was conducted over a 2-week period as part of the data collection for the PhD thesis. The study was conducted in two phases.

The first phase consisted of non-participant observations of children's behaviours in the street environment of the 15-minute living circle, such as frequency of walking and cycling, traffic interactions, and the way they used the street space. To understand more deeply the feelings and motivations behind these behaviours, the researcher also conducted participant observation to experience the children's routes first hand. The second phase consisted of semi-structured interviews with the children as well as the collection of children's drawings. Amongst other things, the interviews were designed to gain insight into their perceptions of the street environment and how this environment was integrated into their daily activities. The interviews also covered the children's perceptions of the street interactions during their daily journey to school and how these interactions affected their learning behaviours (see Appendix 2 for an outline of the interviews.) Additionally, by analysing the children's drawings, the researcher was able to gain a perspective of how the children perceived and mapped their routes between their homes and their schools. These drawings provided visual data that reflected children's understanding of and emotional connection to the characteristics of Friendly Streets, thus supporting the answer to research question one (see Appendix 3 for detailed data collection phases).

At all phases of data collection, the researcher focuses on building trusting relationships with children, which includes informal interactions with children in schools and neighbourhoods, as well as initial meetings prior to formal data collection. This step is not only an ethical requirement, but also crucial to ensure the authenticity

and depth of the data. Good trusting relationships make children more willing to share their true feelings and thoughts, which leads to richer and more accurate research findings.

Data Analysis

A qualitative thematic approach was used in this study to analyse the data collected, this included observations, semi-structured interviews, and children's drawings. The analysis process followed the six-step approach proposed by (Braun & Clarke, 2006):

1. Familiarisation with the data: the researcher became fully familiar with the content through repeated reading and viewing of the interview transcripts and drawings.

2. Initial coding. Based on the initial review of the data, coding the basic elements that appear meaningful in the data.

3. Finding Themes. Organise and merge these codes to form potential themes.

4. Reviewing Themes. Check that the themes accurately reflect the coding of the dataset.

5. Define and name themes: Further refine the definition of themes to ensure consistency within each theme.

6. Report. Select compelling quotations to illustrate each theme and link the analysis to the research questions and literature review.

By applying thematic analyses, researchers can reveal how children perceive the street environment, how they interact within it, and how these interactions affect their learning experiences.

FINDINGS

Characteristics of Child-Friendliness Experienced by Children in Street Environments in 15-Minute Urban Living Areas

Based on the data collected, Table 5 shows the generative themes and sub-themes used in Question 1 to present and discuss the findings of the study.

Table 5: Generated themes and sub-themes (Question 1).

Research Question	Generated themes	Generated sub-themes
What is the child-friendly features that children experience in the street environment of the 15-minute living circle in urban areas?	Characteristics of child-friendliness experienced in 15-minute living circle street environments.	1. Safety features (pedestrian crossings, speed mitigation measures) 2. Recreational features (e.g., slides, swings, swimming pools, outdoor sports plazas, adventure play facilities, football fields, basketball courts) 3. Design elements (e.g., art walls, interactive signage, educational playground graphics, murals, or sculptures of regional cultures) 4. Green spaces (trees, flowers, nature observation points)

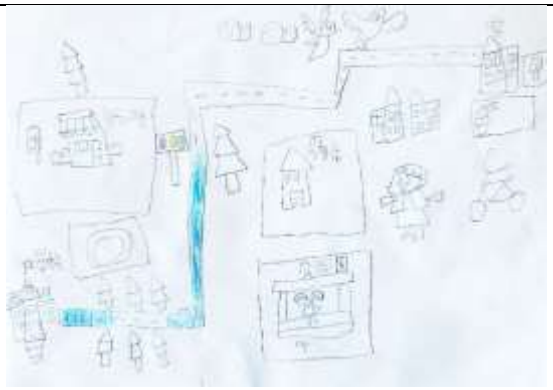
The results of the study show that children experience a diversity of child-friendly features in the street environment of the 15-minute living circle in the urban area. The following are key findings based on the observational data and analysis of children's drawings:

Safety Features

Children felt safer on streets with clear safety signs, pedestrian crossings, and speed mitigation measures, and these features were frequently highlighted in their drawings (as shown in Table 6). In Figure 6, a primary school student named G3 depicted traffic signals and pedestrian crossings in detail in her drawing. These elements, emphasised by bright colours, are not only visually striking, but also convey the children's knowledge of street

safety measures. G3 uses a lot of red and green in her drawing, which not only attracts the eye, but also symbolises stop and go signals, showing the children's understanding of traffic rules. These features significantly enhance children's perceived safety on the streets.

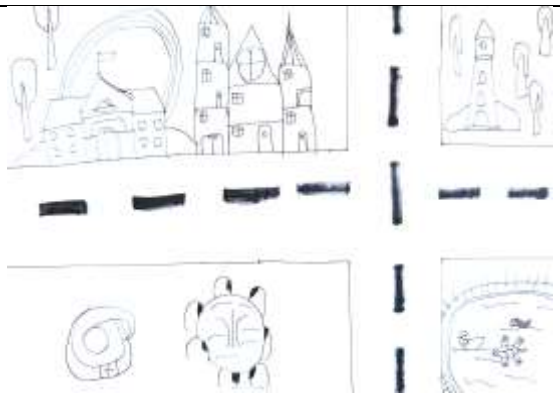
Table 6: G3's Drawing.

	Street name: L1
	Name: G3
	Age: 9

Recreational Facilities

Children's active interaction with recreational facilities such as slides, swings and merry-go-rounds suggests that these facilities are essential to their recreational and social activities, and their depiction of these facilities in children's drawings reflects their enjoyment and use. For example, Table 7 shows a scene drawn by a 10-year-old boy on a road trip from home to school, in which recreational facilities such as a slide are prominently featured. The simple brushwork used by the child to represent the slide in his work not only shows his preference for this recreational facility, but also expresses the significance of these facilities in his daily route. His depiction of the slide goes beyond the simple physical form to capture the joy of play and the spirit of freedom, reflecting how the child sees these elements in the street environment as a source of pleasure for them.

Table 7: B2's Drawing.

	Street name: YX
	Name: B2
	Age: 10

In addition, observational data suggest that these recreational facilities serve as social nodes for children to meet and interact, where they form new friendships, deepen existing relationships, and learn social skills through shared play experiences. Not only are these activities critical to children's social development, but they are also a natural place for the development of their physical coordination and motor skills.

Design Elements

Design elements play a vital role in creating attractive street environments, especially for children, as they not only enrich their daily experience but also become an important part of their learning and exploration. Observations have shown that design elements such as art walls, interactive signage, educational playground graphics, murals or sculptures of regional cultures are more likely to attract children's attention. These elements are often placed where children can easily access and interact with them, which not only encourages their curiosity, but also promotes their knowledge and understanding of the world around them. A prominent example of this is the educational playground graphic displayed in Figure 4. This colourful floor covering engages children with its vibrant colours and engaging design. Children usually stop to observe these drawings, discuss their content, and even play on them. This not only provides a space for play, but also subconsciously teaches children about colours, shapes, numbers, or letters.

Figure 4: Educational Playground.

Green Spaces

Green spaces play a very important role in children's daily environments, especially in urban environments, where they provide children with access to nature and opportunities for exploration and learning. By directly observing and analysing the children's drawings, the results show the attraction of green spaces and their importance in children's daily lives.

Images of large trees and plants are prominently displayed in the drawings made by children G4 in Tables 8. These drawings not only show the children's love for green environments, but also reflect their sensitivity and appreciation of these natural elements. In their work, green spaces were often drawn with exceptional detail and vividness, trees were often lush, and flowers and plants were drawn in a colourful manner, demonstrating the children's deep sense and appreciation of the natural elements that grew around them. The children's behaviour in the green spaces, such as playing on the grass, illustrates that these spaces are ideal for their physical activity and social interaction. This opportunity to play freely and explore nature is essential to children's physical and mental health and cognitive development. In addition, green spaces provide informal learning environments where children can learn about ecology, biodiversity, and environmental protection. Synthesising the results of the observations and drawing analyses, it can be concluded that green spaces are extremely important for creating child-friendly urban environments.

Table 8: G4's Drawing.

	Street name: NIS I
	Name: G4

Age: 9

Children's Interactions in Street Environments and Their Impact on Educational Engagement and Learning Behaviour.

Based on the data collected from the participant observation and interviews, Table 9 shows the generative themes and sub-themes used in Question 2 to present and discuss the findings of the study.

Table 9: Generated themes and sub-themes (Question 2).

Research Question	Generated themes	Generated sub-themes
How do children interact with these street environments in their daily journey to school? How do these interactions affect their educational engagement and learning behaviors?	Street Interaction Approach	1.Walking and cycling patterns. 2.Safe route options. 3.Peers among friends.
	Educational Participation	1.Streets as places for informal learning. 2.Street signage and art as a learning medium. 3.Environmental features as motivators for learning.
	Impact of Learning Behaviours	1.Spontaneous exploratory learning behaviours; 2.Development of social skills. 3.On-site connections to school curriculum content. 4.Physical activity. 5.Environmental awareness. 6.Street culture awareness.

Interactive Approaches to Streets

In participatory observations, children demonstrated a natural curiosity about the street environment. For example, on several occasions, children were observed spontaneously organising games on pedestrian crossings, where they not only followed traffic rules, but also developed spatial awareness and timing skills in the process. In addition, children described how they walked or cycled on their way to school and chose specific safe routes. For example, a 9-year-old girl said in her interview:

"I like to walk the green promenade because there is shade and games painted on the ground and I can jump on the grid as I go." (G1, January 26, 2024)

Her description and similar statements from other children suggest that the street environment provides an element of play that is not just a recreational tool, but also a natural catalyst for their learning and development in everyday life.

Educational Participation

The theme of educational engagement was obtained from the analysis of data from participant observation and interviews. The analysis of educational engagement covered how children used street elements as a learning tool, as well as how these elements stimulated their interest in learning and acted as a conduit for informal education.

The use of the street as a site for informal learning is reflected in the children's stops and discussions in front of the street art. Through participatory observation, it was possible to see a variety of exploratory learning behaviours that the children engaged in on the street. For instance, there were children exploring plant species and discussing their growth cycles in the natural environment of the street. This increased their scientific knowledge and enhanced their perception of the environment. During the interview, Boy B5 shared how he observed the changing seasons in the street:

"I noticed that every time I passed the tree, the leaves were a different colour, which made me remember what I learnt about seasonal changes at school." (B5, January 30, 2024)

In addition, street art and signage often served as a medium for discussion and interaction, with children learning about community history, local stories, or traffic rules through these elements. In participatory observation, observers recorded children's interactions in front of historical markers, where they would interpret the meaning of the markers according to their own understanding. This behaviour demonstrated their critical thinking and interpretive skills. Girl G5 said in an interview:

"I like to look at the old photos on the markers, they tell us what the place used to look like, and my friends and I would guess what life was like at that time." (G5, January 30, 2024)

Finally, the stimulating effect of environmental features on children's learning was reflected in children's curiosity about the natural and design elements of the street. When children stop under a tree or in a garden, they are not only observing the natural world, but learning about biology and ecology.

Influence of Learning Behaviour

It is clear from the participant observation and interview data that the street environment plays a diverse role in the development of children's learning behaviours. Observations showed that children often explored spontaneously on the street and that they were curious about new things. This exploratory behaviour extended beyond the school classroom. For instance, Boy B2 talked in his interview about how he observed different leaf shapes on the road and discussed with his friends where these leaves might have come from (as shown in Figure 5), which also reinforced social interactions with peers. As girl G3 shared the fastest route to walk to school. Children were able to improve their navigation skills through interactive play, which enhanced problem-solving skills and teamwork.

Figure 5: Interaction between Children.

The researchers found that the street environment provides a rich place for children to practice. Here children engage in daily social and physical activities and interface classroom learning with the real world. Children's interactions in the street environment had a positive effect on their cognitive, social, physical, and cultural awareness development.

DISCUSSIONS

This study provides insight into how children perceive and interact with the urban street environment on their way to school. The findings show that street environments play a multidimensional role in children's daily lives and educational experiences. Being in a vibrant and interactive street environment, children feel safer (Gencer, 2017). In addition, their desire to explore and their interest in learning are significantly stimulated. This was evidenced in the drawings made by the children as well as in the content of the interviews. Among other things, safety features, recreational facilities, design elements, and green spaces were seen by children as key elements for their cognitive, social, and emotional development. This shows the centrality of environmental interactions in children's cognitive and social development (Appleyard, 2017). This study analyses the child-friendly characteristics of street environments in a 15-minute living circle in an urban area. Firstly, there are safety features. Specifically, pedestrian crossings and speed bumps, which are critical to creating a safe environment for children to play and learn, directly enhance children's sense of safety, and stimulate their willingness to explore (Cowman, 2017). Meanwhile, recreational facilities and green spaces on the street provide children with a rich choice of leisure activities and serve as a driving force for the development of their social skills and emotional experiences (De Visscher & Bouverne-De Bie, 2008). In addition, the street design elements aspect. Artworks and cultural signage ignite children's curiosity and enthusiasm for learning, transforming the street into a substantial place for informal learning (Guo et al., 2023).

Significantly, the child-friendly characteristics revealed by the study are highly compatible with the findings of several scholars (Cordero-Vinueza et al., 2023; Jansson, Herbert, Zalar, & Johansson, 2022; Riggio, 2002; Tayefi Nasrabadi, García, & Pourzakarya, 2021). The present study highlighted these attributes, particularly in terms of stimulating learning and exploratory potential. More importantly, encouraging children to exercise autonomy and initiative in their developmental process plays a crucial role in stimulating intrinsic motivation and maintaining psychological well-being of individuals. Children's experience of freely exploring and interacting with their peers on the streets fulfils their basic psychological needs for belonging, competence and autonomy, which further fuels intrinsic motivation to learn and explore.

Furthermore, this study addressed a variety of elements in the street environment and how they act on children's educational engagement and learning behaviours. Children's interactive behaviours on the street are an expression of physical activity and an important way in which they learn and develop. This was exemplified by children observing and discussing elements such as street signs. Children use these street elements as tools for literacy and cognitive environments, demonstrating the value of the practical application of cultural tools in the learning process (Rogoff, 2003). Meanwhile, well-designed street environments promote social interaction among children. This helps them develop social skills and provides a natural place for peer learning within the community (Bandura, 1977). In this study, children's choices of safe routes, their experiences of travelling to school with friends, and play activities in the street environment All of which exemplify the value of the environment to children's behaviour in social learning theory. This study further emphasises the profound impact of the street environment on children's daily lives. Correspondingly, urban spaces should aim to meet children's psychological and social needs, and quality street design not only enhances children's physical activity levels, but also stimulates their interest and motivation to learn (Mann et al., 2022).

CONCLUSION

This study is dedicated to exploring the important role of urban 15-minute living circle street environments in children's daily school trips and how these environments profoundly affect children's educational engagement and learning behaviours. By deeply analysing the ways in which children interact in the 15-minute living circle and the value they generate for education, it provides valuable insights into the construction of child-friendly urban design. The results of the study clearly reveal the importance of many child-friendly street features. These include safety, the availability of recreational facilities, interactive design elements and green open spaces. Children's interactions in these well-designed environments significantly enhanced their social skills and environmental awareness, and further contributed to their strong connection to the educational content of their schools. It is worth noting that these interactions also added valuable opportunities for rich independent and experiential learning in children's daily trips to school. This study highlights that effective urban planning should aim to create street environments with diverse recreational and learning spaces that support and promote children's holistic development in the natural environment. Urban planners, educators and policy makers can

consider the findings of this study and work together to create an enriching educational ecosystem for children. This system is not limited to the realm of schooling but extends to a variety of informal learning spaces in the community environment, providing endless possibilities for children's growth. This study strongly believes that by creating a quality street environment that stimulates children's desire to explore, enhances social interactions, and complements schooling, the quality of children's learning can be significantly improved, and the quality of their learning enhanced. Children's quality of learning and life satisfaction can be significantly improved. Future research should further delve into the long-term effects of various factors in urban environments on children's holistic development and actively seek more innovative ways to make urban streets a powerful catalyst for promoting child-friendliness and enhancing educational engagement.

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