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Exploring Playful Affordances: Integrating Small Urban Housing Spatial Elements for Toddler's Play

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ABSTRACT
Urban housing often limits children's play opportunities due to restricted space. This study explores how small urban homes can support toddlers' play and development through affordance theory, using the Form-Affordance-Function (FAF) framework to link spatial form, perceived actions, and developmental outcomes. A qualitative case study of five households with children aged 2-5 years employed observations and caregiver interviews to identify perceptible and hidden affordances. Findings show that toddlers creatively engage with both designed and everyday spatial elements, such as floors, stairs, and furniture, transforming them into play opportunities that foster motor skills, independence, and imagination. Designed spaces provided clear, perceptible affordances, while alternative spaces revealed hidden ones through child-led adaptation. The study highlights children's agency in constrained environments and offers insights for architects and caregivers to design flexible, developmentally supportive homes.
Keywords: *affordances; elements; play space; children; urban housing*

INTRODUCTION
Urban housing often faces the challenge of increasing occupancy without a corresponding expansion of living space. As more family members share limited square footage, the complexity of space utilization increases. One potential solution is to enhance the functionality of existing spaces. However, spatial limitations also constrain both architectural design and behavioral dynamics within the household (Putri et al., 2021). Noghrehkar, (2009) emphasizes that individual behavior is shaped by the extent to which the environment meets evolving human needs. When these needs grow but the environment remains static, behavioral development may be restricted.

This issue is particularly relevant in the context of early childhood development. Children aged 2 to 5 years are in a critical stage of growth, where physical activity plays a vital role in supporting cardiorespiratory health, bone strength, emotional regulation, cognitive development, and motor skills (Murni, 2017). According to affordance theory, the physical environment through its form, layout, and material characteristics, can either enable or inhibit these developmental processes (Gibson, 1979; Heft, 1988). Within this framework, the home is not merely a shelter but a dynamic setting that shapes a child's opportunities for action and interaction. This is especially significant in dense urban contexts, where limited space often reduces the availability of affordances for play. Therefore, this study explores how spatial elements in small urban homes can be optimized to support toddlers' play and development through the lens of affordance theory.

This research adopts the concept of affordance to examine how the physical form and spatial configuration of the home environment influence children's behavior and development. In the context of architectural planning, affordance theory provides a valuable lens for identifying environmental attributes that enable or constrain user interaction (Heft, 1988). These attributes can be observed through the relationship between individuals, the objects they use, and the actions those objects afford. This approach aligns with the Form-Affordance-

Function (FAF) framework, which emphasizes the interdependence between an object's form, the actions it affords, and its intended function (Sareh & Loudon, 2024). Within this framework, the home is not merely a static backdrop but an active agent in shaping children's developmental experiences. As children are frequently exposed to their immediate surroundings, especially during early childhood, these environments play a critical role in influencing long-term health and developmental outcomes (Baker et al., 2019)

This perspective is particularly important in urban housing contexts, where spatial limitations often reduce opportunities for physical activity and play. In such settings, architectural design must compensate for the lack of space by enhancing the affordances available within the home. Additionally, this study aims to explore how spatial elements in small urban homes can be intentionally designed or adapted to support toddlers' play and development, using affordance theory as a guiding framework

Building on this theoretical foundation, this research was conducted using the affordance framework to investigate how spatial elements within the home environment support children's play activities. The study focuses on the interaction between the indoor environment and the child, recognizing that behavior is shaped not only by individual needs but also by the physical and perceptual qualities of space. By adopting a naturalistic paradigm and a phenomenological approach, the research seeks to understand how parents and children experience and utilize space in small urban homes. This approach allows for an in-depth exploration of how everyday environments afford opportunities for play, particularly for children aged 2 to 5 years, a critical stage for motor and cognitive development. To address the gap in understanding how children engage with spatial constraints in small urban homes, this study is guided by the following research questions:

1. How do toddlers perceive and utilize spatial elements within small urban homes for play in designed and alternative spatial settings.
2. How do spatial elements within small urban homes afford different types of play activities for toddlers?

RELATED STUDY

Play is widely recognized as essential to children's motor and cognitive development. Activities such as reading, counting, and manipulating toys foster problem-solving and learning, while gross and fine motor skills are developed through physical movement and tactile exploration (Murni, 2017). However, the quality and nature of play are not solely determined by the child's interests or abilities and they are deeply influenced by the environment in which play occurs (Wang et al., 2020; Winnicott, 1971).

In architectural studies, human behavior is understood to have a reciprocal relationship with the physical environment. For children, the home is their primary environment due to the significant amount of time spent indoors (McKey-Paz, 2012). While it is well established that spatial features such as open layouts and adaptable furniture can support play, these insights often reflect idealized conditions. What remains underexplored is how children engage with spatial constraints, particularly in small urban homes where space is limited and not explicitly designed for play (Lindarto et al., 2022).

This study builds on affordance theory to address this gap. Originally introduced by Gibson (1979), affordance theory describes the relationship between an individual and their environment in terms of the actions the environment enables. In architectural contexts, this theory has been expanded to include perceptible affordances which explains those that are visually or physically obvious and hidden affordances, which emerge through creative or unconventional use (Gaver, 1991). For example, the stairs function as an access element that

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allows users to move between different levels, but it may also afford hiding or imaginative play, depending on the child's perception.

Recent architectural research has emphasized the role of material properties, such as texture, flexibility, and durability in shaping affordances (Babri et al., 2022; Putriutami et al., 2020). Heft (1988) further identified how environmental qualities can support children's activities, while Kim (2021) proposed a framework based on space, object, and social interaction to understand affordances in interior environments. Building on this, the current study applies the Form-Affordance-Function (FAF) framework developed by Sareh & Loudon (2024), which highlights the interdependence between an object's form, the actions it affords, and its intended or emergent function.

Rather than focusing on how spaces were designed to function, this study shifts the lens toward how children actually use them, often in ways that diverge from their intended purpose. This forward-looking perspective emphasizes the child's agency in transforming spatial limitations into opportunities for play. By examining how children reinterpret everyday domestic elements like walls, stairs, furniture, this research contributes to a deeper understanding of how spatial design can support play not only through intention but through adaptability and perception.

RESEARCH METHOD

This study adopts a qualitative case study approach within a naturalistic paradigm, focusing on how spatial elements in small urban homes afford play opportunities for toddlers. The case study method is chosen for its strength in exploring complex, real-life phenomena within their contextual settings. This approach is particularly suited to examining the nuanced interactions between children and their home environments, where behavior is shaped by both physical form and perceptual experience.

Rather than relying on a phenomenological lens which centers on subjective lived experiences, this study emphasizes observable interactions between children and spatial elements. The analysis is grounded in affordance theory, which posits that the environment offers action possibilities based on its physical properties and the perceiver's capabilities (Gibson, 1979; Heft, 1988). This is further structured through the Form-Affordance-Function (FAF) framework, which links the physical form of architectural elements to the actions they afford and the functions they serve or evolve into (Sareh & Loudon, 2024).

The research investigates how toddlers engage with both designed and alternative play spaces in their homes. Designed spaces are intentionally created by caregivers, while alternative spaces emerge through children's adaptive use of everyday elements. This distinction allows the study to explore perceptible and hidden affordances, revealing how children reinterpret spatial constraints as opportunities for play (Gaver, 1991).

A. Data Collection

Data were collected through in-site observations to generate spatial configurations and children's interactions with architectural elements such as floors, stairs, furniture, and openings. The observations focused on spatial attributes such as ergonomics, surface texture, slope, and leveling, that influence children's physical engagement. These attributes were analyzed thematically to identify recurring patterns of affordance. Additionally, semi-structured interviews with parents of children aged 2 to 5 years living in small urban homes. This tactic was selected for the following reasons (see Table 1).

Table 1. Purposes of using semi-structured interview in data collection process

Purpose	Contribution
Understanding user behavior	Capturing how toddlers use space from the caregiver's perspective
Identifying affordance	Revealing both perceptible and hidden affordances
Support thematic analysis	Providing keywords and context for coding
Validate observations	Confirming patterns seen in physical space

Source: Author's analysis (2023)

B. Participants

This study employed specific criteria for the selection of participants. The participants selected were parents who have or live with children aged 2 - 5 years and live in urban homes with a house size of no more than 60 m². The researcher made observations on how children occupy their home space to play.

C. Data Analysis

By integrating the FAF framework into the analysis, the study moves beyond subjective interpretation to a functionalist understanding of how spatial design can support child development. This approach bridges architectural and behavioral perspectives, offering insights into how homes can be designed or adapted to enhance children's autonomy and motor development through play.

Additionally, thematic analysis was used to code and interpret the data, linking spatial elements to observed behaviors (Braun et al., 2017). This method enabled the identification of key themes such as setting (designed vs. alternative spaces) and spatial elements (e.g., stairs, mats, furniture) that afford specific actions like climbing, jumping, or hiding.

FINDINGS AND DISCUSSION

A. On-site observation

To get the answer of the first research question, the on site observations to five participants to generate layouts and photographs leading to data displays as decited below:

Participant 1:

He has a designed play space of 15 m^2 (See Figure 1). This space has window openings for parental supervision and furniture arrangement that can be operated by the child. The space is able to accommodate activities that include playing with blocks, picking up and tidying up toys, etc.

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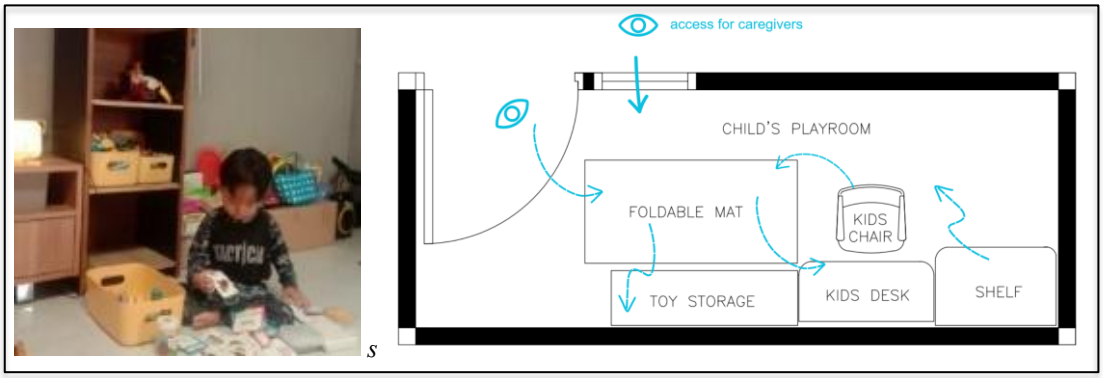


Figure 1. Designed space of Participant 1
Source: Author's observation (2023)

Participant 2

He has a designed playroom of 24 m^2 (See Figure 2). This room has a window opening and is close to the parents' room, allowing access for supervision. The room is equipped with motor games such as slides and ergonomic stools, so that the child is able to operate the surrounding items independently.



Figure 2. Designed space of Participant 2
Source: Author's documentation (2023)

Participant 3

He utilizes a living room of 10 m^2 (See Figure 3). The room has other furniture such as a dining table and stairs as access to the second floor. Utilization as a play area is done by providing toys in the form of a slide. This area facilitates access to parental supervision because people gather in this room.

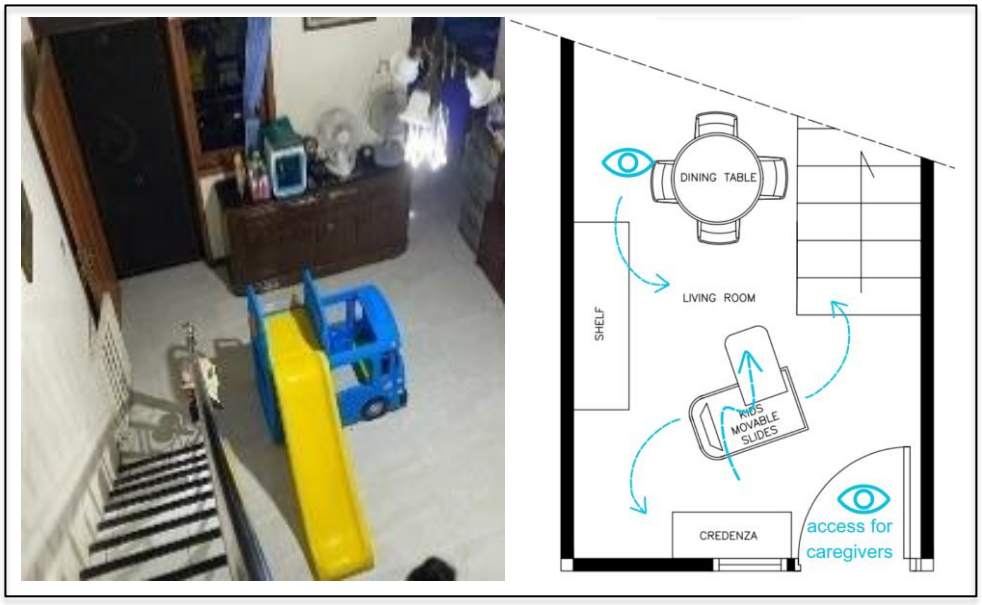


Figure 3. Alternative space of Participant 3
Source: Author's documentation (2023)

Participant 4

He utilizes play area occupying 12 m^2 terrace of the house (See Figure 4). This area was chosen because most of the activities and gathering places are done in the terrace area. The main window and door are utilized as access for parental supervision when the child is playing independently or with friends in the terrace area.

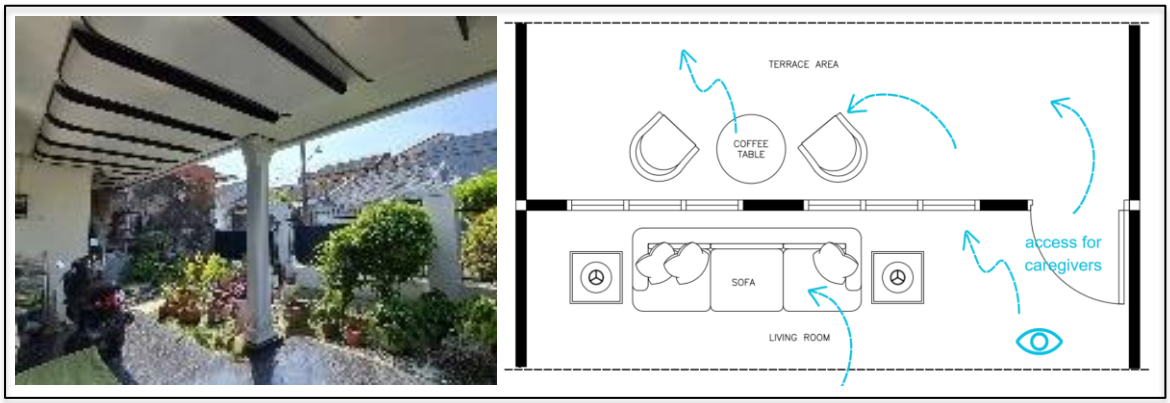


Figure 4. Alternative space of Participant 4
Source: Author's documentation (2023)

Participant 5

She utilizes the 10 m^2 sleeping space as a play area (See Figure 5). In the room, there is furniture in the form of a mattress and a cupboard. The child uses the empty area on the floor to play with blocks and toys. Meanwhile, play activities are also carried out on the mattress such as jumping and rolling.

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Figure 5. Alternative space of Participant 5
Source: Author's documentation (2023)

Based on the results of on site observations, we can align each participant's environment with the Form-Affordance-Function (FAF) framework to analyze how toddlers perceive and utilize spatial elements for play. The structured interpretation is depicted in the following table:

Table 2. FAF-Based Analysis of On-Site Observations

Participants	Play area used in the house	Form (spatial elements)	Affordance (perceived action possibilities)	Function (developmental outcomes)
P1	Designed space, 15 m²	Child-scaled furniture, open layout, window for supervision	Picking up toys, organizing, playing with blocks	Fine motor skills, independence, spatial organization
P2	Designed space, 24 m²	Slides, ergonomic stools, proximity to parents' room	Climbing, sliding, independent use of furniture	Gross motor development, autonomy, confidence
P3	Alternative space, 10 m² living room	Dining table, stairs, slide	Climbing, hiding, imaginative play	Physical coordination, creativity, social interaction
P4	Alternative space, 12 m² terrace	Open terrace, access to windows and doors	Running, gathering, socializing	Social development, group play, exploration
P5	Alternative space, 10 m² bedroom	Mattress, cupboard, open floor	Jumping, rolling, block play	Sensory stimulation, gross motor skills, imaginative play

Source: Author's analysis (2024)

The on-site observations of five participants reveal that toddlers in small urban homes actively engage with both designed and alternative spatial settings. These interactions demonstrate how toddlers perceive and utilize spatial elements based on their physical characteristics, accessibility, and contextual familiarity. The findings are interpreted through the **Form-Affordance-Function (FAF)** framework and are discussed in relation to existing literature on affordance theory in children's play environments.

B. Designed Spaces and Perceptible Affordances

Participants 1 and 2 utilized intentionally designed playrooms equipped with child-scaled furniture, ergonomic seating, and play equipment such as slides. These spatial forms offered **perceptible affordances**, action possibilities that were visually and physically obvious to the child. For example, the ergonomic furniture afforded sitting and drawing, while the slides afforded climbing and sliding. These affordances supported functions such as fine and gross motor development, creative expression, and independent play.

This finding aligns with Heft (1988) taxonomy of children's environments, which emphasizes how specific environmental features support functional behaviors like climbing, sitting, or hiding. It also echoes recent research by Morgenthaler et al., (2024) who developed an environmental taxonomy linking physical features of outdoor play spaces to specific play affordances (Babri et al., 2022). Although their study focused on outdoor environments, the principle that form guides perceived affordance is equally applicable to indoor residential settings.

C. Alternative Spaces and Hidden Affordances

Participants 3, 4, and 5 adapted alternative spaces such as a living room, terrace, and bedroom for play. These environments were not originally designed for play but were reinterpreted by the children through exploration. For instance, stairs and dining tables in the living room afforded climbing and hiding; the terrace afforded running and social gathering; and the mattress in the bedroom afforded jumping and rolling. These are examples of **hidden affordances**, where the child's perception and creativity revealed new uses for everyday elements.

This observation supports Gaver (1991) distinction between perceptible and hidden affordances and is consistent with findings by Tang (2023) who emphasized the importance of flexible spatial arrangements in urban environments to support diverse play behaviors (Baker et al., 2019). Their study also highlighted the role of adult supervision and spatial proximity which explains factors that were evident in the observed homes, where caregivers maintained visual access to play areas through windows or open layouts.

D. Perception Guided by Form and Context

Across all cases, toddlers demonstrated an ability to perceive affordances based on the **form** of spatial elements such as elevation, softness, openness, and accessibility. Their behaviors were guided by how their bodies related to the environment, indicating a strong connection between embodied perception and spatial interaction. This supports the FAF framework's emphasis on the interdependence between form, affordance, and function, as articulated by Sareh & Loudon (2024).

While previous studies have focused primarily on outdoor environments or institutional settings, this study contributes a novel perspective by examining how toddlers engage with spatial elements in small urban homes. It extends the application of affordance theory into the domestic context, showing that even in constrained residential environments, children can

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discover and utilize affordances that support developmental functions. This positions the present study as a bridge between architectural theory and child development research, offering practical insights for designing or adapting home environments to support play.

E. Interview

The second question: How do spatial elements within small urban homes afford different types of play activities for toddlers?

1. Is your child currently in an active stage of indoor play?
   (Purpose: To understand the child's level of physical engagement within limited space.)
2. What types of play activities does your child most frequently engage in at home?
   (Purpose: To identify the nature of play and the child's physical or cognitive involvement.)
3. Which areas of the home does your child usually use for play?
   - Is there a space specifically designed for play?
   - If yes, how does this space support your child's play activities?

   (Purpose: To explore the difference between designed and alternative play spaces.)
4. Does your child have a separate bedroom? If so, is it also used as a play area?
   (Purpose: To assess multifunctional use of space.)
5. How does your child engage in physical play indoors?
   - Does your child often use household elements such as chairs, tables, stairs, or beds for play?

   (Purpose: To identify hidden affordances in household elements.)
6. If there is a designated play space:
   - What furniture or elements are available in that space?
   - How does your child interact with those elements during play?
   - Are you able to easily supervise your child while they play in that space

   (Purpose: To explore designed affordances and parental supervision.)
7. If there is no designated play space:
   - Which area of the home is most often used for play?
   - What household elements does your child use to support their play?
   - Are you able to easily supervise your child while they play in that area?

   (Purpose: To explore alternative affordances and supervision.)
8. Have you ever observed your child using a space or object in an unusual or unintended way during play?
   (Purpose: To identify hidden affordances and the child's creativity.)
9. In your opinion, how does limited space affect the way your child plays at home?
   (Purpose: To gather parental perspectives on spatial constraints and their impact.)

F. Thematic Analysis

Using thematic analysis after the interview records were transcribed, it is analysized using thematic analysis and it is depicted in the following chart:

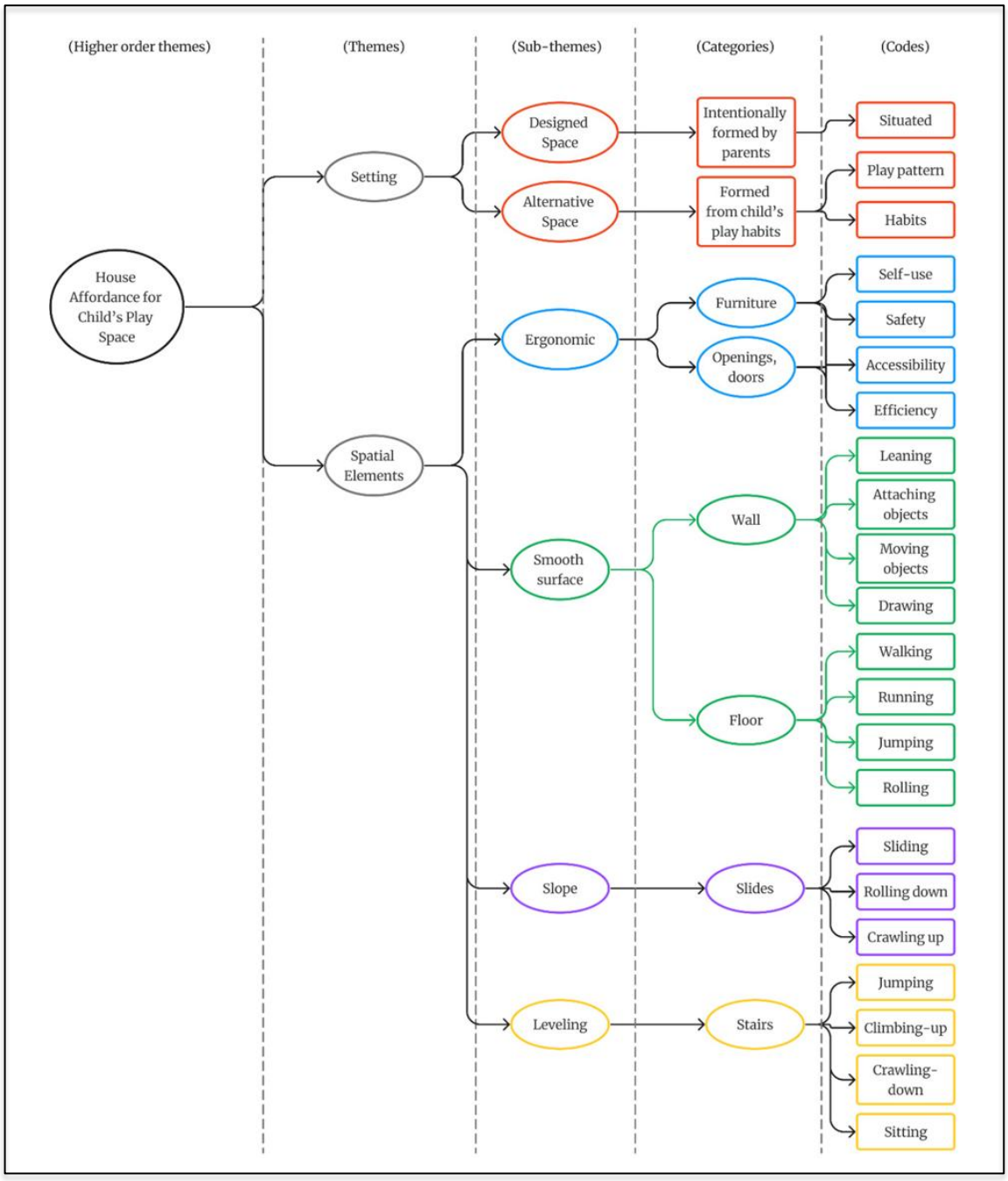


Figure 6. Thematic analysis for participants interview
Source: Author's analysis (2024)

This study reveals that toddlers in small urban homes actively engage with a variety of spatial elements that afford different types of play activities. These elements, whether part of intentionally designed play areas or adapted from everyday household settings, support a range of developmental outcomes including gross and fine motor skills, creativity, and independence. Figure 6 showcases the thematic analysis, structured around the Form-Affordance-Function (FAF) framework, that highlights how the physical form of spatial elements influences the types of actions they afford and the developmental functions they serve.

The floor emerged as the most consistently utilized spatial element across all households. Its flat and open surface afforded activities such as walking, running, and jumping, which are

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essential for gross motor development and energy release. In many cases, the floor also served as a base for block play and other tactile activities, demonstrating its versatility and accessibility for toddlers.

Walls, although not traditionally considered play surfaces, were frequently used by children for attaching or moving objects. These interactions suggest that vertical surfaces afford creative and spatial engagement, particularly when children reinterpret their function beyond structural boundaries. This reflects the concept of hidden affordances, where the potential for interaction is not immediately obvious but emerges through exploration.

Stairs were another commonly used element, especially in homes without designated playrooms. Toddlers used stairs for climbing up and down, which supported physical coordination and independence. Despite not being designed for play, stairs offered strong physical affordances due to their form and accessibility, aligning with the FAF framework's emphasis on the relationship between form and function.

Slides and sloped surfaces, whether intentionally installed or creatively repurposed, afforded sliding and rolling activities. These actions stimulated sensory and motor skills, and were particularly prominent in homes with designed play areas. In contrast, alternative spaces such as inclined terraces or mattress edges were used in similar ways, demonstrating children's ability to adapt their environment for play.

Ergonomic features, such as smooth surfaces and child-scaled furniture, were primarily found in designed play spaces. These elements afforded safe movement and tactile exploration, contributing to comfort and reducing risk during play. Their presence also encouraged independent use, reinforcing the role of intentional design in supporting developmental outcomes.

Overall, the findings illustrate that toddlers perceive and utilize spatial elements in both expected and unexpected ways. Designed spaces offer perceptible affordances through clearly defined features, while alternative spaces reveal hidden affordances through the child's creative reinterpretation of everyday elements. These interactions are shaped by the physical characteristics of the environment and the child's embodied perception, reinforcing the relevance of the FAF framework in understanding how spatial design can support early childhood development.

The findings of this study demonstrate that toddlers in small urban homes actively engage with a variety of spatial elements that afford different types of play activities. These affordances are shaped not only by the physical form of the environment but also by the child's perception and creativity. This aligns with Gibson's (1979) foundational theory of affordances, which posits that the environment offers action possibilities relative to the capabilities of the perceiver (Babri et al., 2022).

In designed play spaces, such as those intentionally created by caregivers, affordances were more perceptible. Features like child-scaled furniture, smooth flooring, and play equipment such as slides clearly signaled their intended use. These findings are consistent with Heft's (1988) taxonomy of children's environments, which emphasizes how specific environmental features support functional behaviors like climbing, sitting, or hiding (Babri et al., 2022). The presence of ergonomic elements in these spaces also contributed to safety and independence, reinforcing the importance of intentional design in supporting developmental outcomes.

Conversely, in homes without designated playrooms, children adapted alternative spaces such as bedrooms, terraces, and living rooms for play. These environments revealed hidden affordances, where everyday elements like stairs, beds, and walls were creatively repurposed for climbing, jumping, or imaginative play. This supports Gaver's (1991) distinction between perceptible and hidden affordances, highlighting the role of perception and exploration in

uncovering new uses for familiar elements 1. The use of stairs and slopes for climbing and sliding, even when not designed for such purposes, illustrates how children reinterpret spatial constraints as opportunities for physical engagement. This observation echoes findings from (Sandseter, 2009), who noted that features of the play environment significantly influence the types of play activities children engage in, particularly those involving physical risk and motor development (Babri et al., 2022).

Furthermore, the study reinforces the value of the Form-Affordance-Function (FAF) framework in architectural research. By linking the physical form of spatial elements to the actions they afford and the developmental functions they support, the FAF framework provides a structured lens through which to understand the dynamic relationship between children and their environments. This perspective is particularly relevant in urban housing contexts, where space is limited and multifunctionality is essential.

CONCLUSION

This study set out to explore how toddlers perceive and utilize spatial elements within small urban homes for play, and how these elements afford different types of play activities. Through a combination of on-site observations and semi-structured interviews with caregivers, the research successfully addressed both research questions. The findings demonstrate that toddlers actively engage with both designed and alternative spatial settings, using a variety of household elements such as floors, stairs, walls, and furniture to support a wide range of physical and imaginative play behaviors.

By applying the Form-Affordance-Function (FAF) framework, the study revealed how the physical form of spatial elements influences the types of actions they afford and the developmental functions they support. Designed spaces offered perceptible affordances that were intentionally created by caregivers, while alternative spaces revealed hidden affordances that emerged through the child's creative reinterpretation of everyday elements. These insights bridge a critical gap in the literature by extending affordance theory into the domestic context of small urban homes, an area that has been underexplored in architectural and developmental research.

Despite its contributions, the study has several limitations. The sample size was limited to five households, which may not fully capture the diversity of spatial configurations and cultural practices in urban housing. Additionally, the study focused primarily on physical affordances and did not deeply explore the role of social or emotional factors in shaping play behavior. Future research could expand the sample size and include a broader range of housing types and family structures. Longitudinal studies could also provide deeper insights into how affordances evolve as children grow and how spatial adaptations change over time.

In conclusion, this study underscores the importance of recognizing both intentional design and child-led adaptation in supporting early childhood development through play. Even in spatially constrained environments, children demonstrate remarkable agency in transforming their surroundings into meaningful play spaces. These findings offer valuable implications for architects, urban planners, and caregivers seeking to create more supportive and flexible home environments for young children.

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