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Child-centered placemaking principles: spatial strategies for play in constrained domestic settings in Tangerang, Indonesia

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Abstract

Children living in urban environments are increasingly vulnerable to psychological pressures such as stress, anxiety, and depression, largely due to limited access to space and time for play. Play is a vital activity for children's mental well-being; however, within the context of urban residential areas in Indonesia, particularly in the post-COVID-19 period, play opportunities have become increasingly constrained. Children tend to remain indoors for both living and recreational activities, driven by multiple factors including the perceived insecurity of public spaces, academic pressures, parenting styles, and limited adult supervision. This study aims to explore the principles of placemaking from the perspective of children within private domestic spaces, with a focus on the urban area of Tangerang, Indonesia. Employing a qualitative approach, data were collected through online open-ended questionnaires administered to 104 children, supplemented by in-depth online interviews and direct observation, followed by coding-based analysis. The findings indicate that children aged 10–12 interpret placemaking through two primary dimensions: visual-sensory aspects (tangible affordances such as spatial dimensions and facilities) and perceived-sensory aspects (intangible affordances such as spatial conditions). Their adaptive strategies are shaped by their perception of spatial potential within the domestic environment. These findings offer conceptual contributions to the development of more child-friendly housing and residential area designs through a placemaking approach grounded in children's lived experiences.

Keywords Play, Place-making, Children, Spatial adaptation, Private space

Introduction

During the school-age phase, children undergo a critical period of social development in which play serves as a fundamental activity for building interaction and cooperation with peers (Kourti et al. 2021). This activity generally does not display significant differences between boys

and girls, suggesting that play tendencies are universal and not determined by gender. However, in recent years, particularly since the onset of the COVID-19 pandemic, children have faced numerous restrictions imposed by both their environment and their parents, leading to increased psychological pressures such as stress, anxiety, and emotional distress (Fazeli et al. 2020). In this context, play becomes a vital mechanism for supporting children's mental well-being (Saragih Dec. 2018). Children naturally possess a *habitus* that enables them to play flexibly, anywhere and at any time. Their ability to creatively utilize available space and transform it into a play environment, even within highly constrained physical settings,

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reflects a high degree of adaptability. Cross-national studies support this argument. Research in the Netherlands, for instance, found that during and after school closures due to the pandemic, children spent more time engaged with screens and became less physically active, with the home serving as their primary play environment (Velde, et al. 2021). Similarly, in Portugal, although pre-pandemic trends indicated a gender-based difference in play preferences (boys tended to play outdoors while girls preferred indoor activities), the pandemic compelled all children to rely on domestic spaces for play (Pombo et al. 2020). In Canada, families employed various spatial adaptation strategies within the home to maintain healthy movement behaviors among children during periods of social restriction (Riazi et al. 2021).

The phenomena of working, learning, and playing from home became defining features of the pandemic era and are likely to re-emerge in response to future waves of infection in parts of Asia. Under parental direction, children were encouraged to carry out all activities from home as a preventive health measure. Although this directive has become less strict over time, the practice of home-based activity, especially play, has persisted (Pombo et al. 2020). This has led to an increase in both indoor playtime and screen-based entertainment among children (Kourti et al. 2021). While it may seem manageable, in reality, this situation presents substantial challenges. Parents, particularly those living in small homes, were required to innovate in creating safe and engaging home-based play opportunities (Moore et al. 2020).

These challenges are less pronounced among families with larger homes and higher incomes. However, the prevailing urban housing trend in major Indonesian cities is characterized by the proliferation of compact landed houses, often located far from city centers and with increasingly limited spatial dimensions. According to Indonesian Housing Law No. 4 of 1992, the minimum floor area for a single-family or row house is 36 m², which aligns with international standards for adequate housing (9 m² per person) for a family of four (Susanto et al. Sep. 2020). Many families, consisting of four to five members, live in these relatively small homes furnished with medium-sized furniture, further restricting children's ability to engage in physical play. In low-income households, children often have no choice but to adapt to the constraints of their living environment (Dooley et al. 2020). This spatial limitation leads to intra-household contestation over space allocation (McCann May 2003), which directly affects overall family well-being, particularly the ability of children to fulfill their developmental need for play (Fig. 1).

Within this domestic spatial constraint, children's needs are often deprioritized in family decision-making, reinforcing existing hierarchical norms in Indonesian

parenting culture. Typically, parents assume the role of "givers" and children the "receivers" (Riany et al. 2019), illustrating a power dynamic in which children are expected to obey without question (Sukmadewi et al. 2022). This traditional parenting approach significantly shapes children's play behavior. While previous generations of parents allowed outdoor communal play, current trends show a shift toward structured and formal education-oriented routines at home (Berg and Medrich 1980). Increasing academic pressures, safety concerns regarding public playgrounds, and limited availability of child-friendly spaces have led many parents to restrict their children's outdoor activities (Drianda et al. 2015).

This phenomenon is increasingly evident as more children conduct all daily activities indoors. As a result, parents must play an active role in supporting their children's developmental needs by fostering play-based activities at home. Such an approach requires innovation and sensitivity to the physical limitations of the space, particularly for families living in small, densely populated housing. Moore et al. highlight the importance of turning the home into a play-friendly environment through creative and safe practices (Moore et al. 2020). Understanding how children adapt to spatial limitations for play within their homes is essential. The research focuses on identifying placemaking principles emerging from children's spatial practices in urban housing environments. Therefore, understanding how children perceive and negotiate play space within the domestic realm, especially in dense urban environments, is critical. Such an understanding can inform the design of housing and residential environments that are more adaptive and child-friendly by incorporating *placemaking* approaches grounded in children's lived experiences and spatial perspectives.

Research problem and methodology

This study seeks to explore placemaking practices related to children's play behavior, with particular attention to how children residing in densely populated urban housing environments define and utilize space for play. The research specifically highlights the spatial limitations and contestations that often characterize such residential settings. The central research question guiding this inquiry is: *What placemaking principles can be identified through the lived spatial experiences of children in constrained domestic settings?*

A qualitative approach was adopted, with data collected during the COVID-19 pandemic via an online open-ended questionnaire involving 104 child informants. This was supplemented by in-depth online interviews with informants S, D, and K. One parent (S) was interviewed based on their active involvement in the child's daily life to support data validation. Due to contextual constraints, direct observation was limited to two

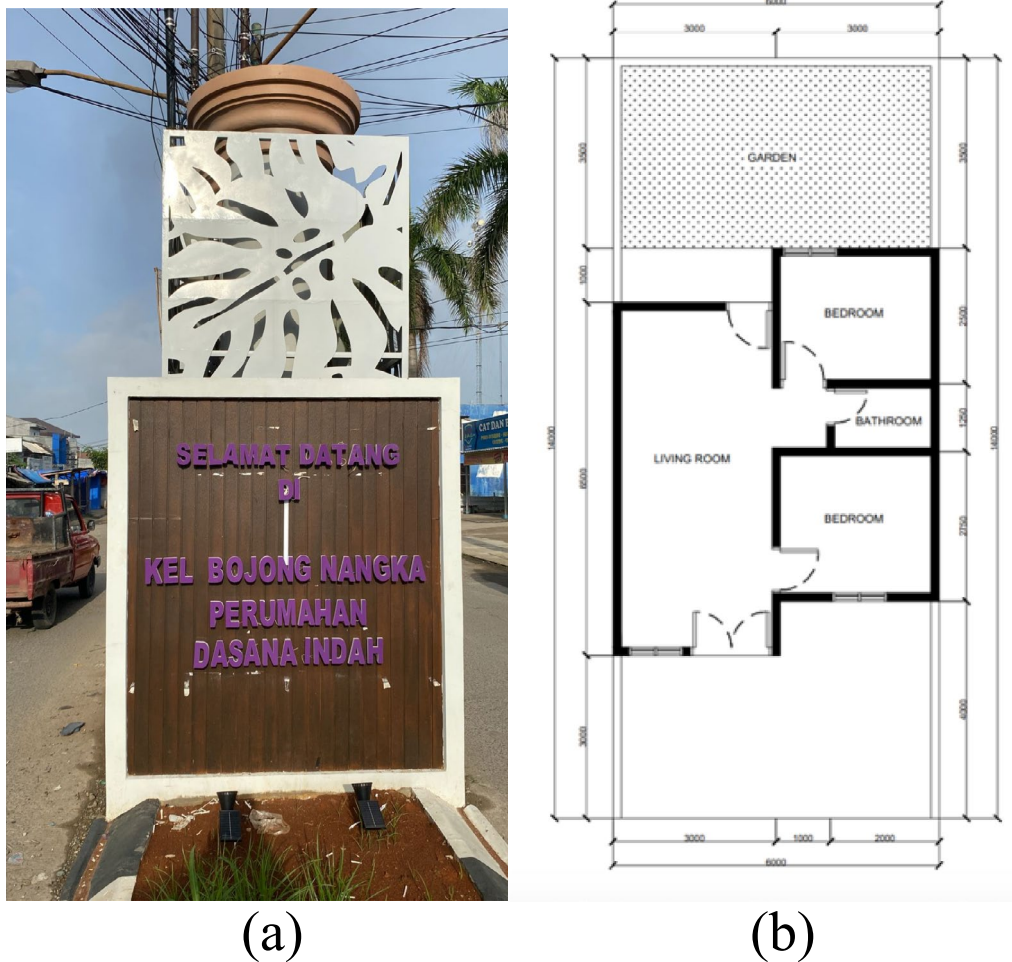


Fig. 1 **a** The Gate of Dasana Indah Housing, Tangerang, Indonesia **b** Original Plan of K House with building area (36 M²), land area: 84 (M²) at Pesona Parahyangan Cluster, Dasana Indah Housing, Tangerang, Indonesia (source: Author 2023)

child informants (D and K). Data analysis was conducted through a systematic coding process. Understanding children's play behavior and their spatial experiences formed the core of the investigation. Participants were children aged 10 to 12 years, consisting of 54 boys and 50 girls. Previous studies have indicated that children within the 8–12 age range are capable of recognizing and articulating their spatial usage patterns with a high level of awareness (Cornell et al. 1994). Responses to the open-ended questionnaire items were analyzed using qualitative coding techniques. Each written response was categorized and interpreted according to thematic patterns. While each answer was unique, shared perspectives emerged, allowing for the identification of common themes. The thematic grouping of responses ultimately led to an understanding of children's sensory approaches in place-making decisions. These sensory responses reflect both tangible and intangible affordances of their environment,

consistent with the foundational concepts of place perception.

Research results

Place & sensory

Since the onset of the pandemic, it has become increasingly important to ensure children's well-being, with play as a critical element in supporting their mental and emotional health. During periods of isolation, digital play emerged as a common alternative (Goldschmidt 2020). While playing outdoors with peers offers developmental benefits, it poses challenges that must be addressed by practitioners and policymakers (Pascal and Bertram 2021). Play requires space, yet it need not be formalized. Children demonstrate remarkable adaptability by transforming even the most unconventional areas, such as streets, railway edges, and pedestrian pathways, into preferred play environments. The progressive disappearance

of residential spaces that can accommodate play activities risks depriving children of opportunities for creative, spontaneous, and socially engaging experiences (Gospodini and Galani 2006). The pandemic has shown that children are capable of assessing the appropriateness of their environment for play. Their awareness of spatial affordances—what the environment allows or invites them to do—reveals a cognitive understanding of how even minimal or constrained spaces can be imaginatively redefined into playgrounds. Children draw from personal experience, physical stimuli, and imaginative processes to reinterpret their surroundings.

Previous research highlights the statistically significant relationship between housing conditions and children's capacity to engage in educational activities, physical movement, and recreational play (Zagalaz-Sánchez et al. 2021). Studies on multifamily housing for low- to moderate-income families demonstrate that play is enhanced through the availability of responsive equipment and age-appropriate design features (Becker 1976). Tuan's conceptual framework distinguishes between "space"—an abstract, emotionally neutral term—and "place," which is

imbued with emotional, social, and cultural significance shaped through user experience (Tuan 1975a). This theoretical perspective underscores the inherently multi-sensory nature of place. Human experience of environments involves not only visual stimuli but also sound, scent, touch, and taste, confirming Tuan's notion of places being defined through sensory interaction (Tuan 1975a). For children, such sensory experiences are instrumental in shaping their perceptions and understanding of their environment, often through pseudo-sensory imagery that facilitates cognitive and emotional appraisal (Tuan 1975b). The child's body functions as a sensory map encompassing sight, hearing, touch, smell, movement, and spatial orientation, comprising both visual and non-visual sensory modalities (Durão and Robertson 2009) (Wulandari 2014). Beyond these core sensory categories, research has identified eight dimensions of *Perceived Sensory Qualities* (PSQ): Natural, Cultural, Cohesive, Social, Serene, Open, Sheltered, and Diverse qualities (Stoltz and Grahn 2021). The *Serene Quality* in particular refers to environments that evoke calmness, safety, and tranquillity—not as spaces devoid of stimuli, but as ones minimally disrupted by noise and disturbances (Stoltz and Grahn 2021).

Observation in K house (children's perspective)

A family consisting of parents and their 12-year-old child (K) resides in a modest dwelling. Recently, the house underwent renovation to expand its spatial capacity. However, due to the constraints of limited land, the expansion has led to the creation of new spatial configurations while simultaneously reducing the dimensions of existing areas. The high demand for functional space, coupled with the limited available land, has resulted in the utilization of areas for purposes beyond their intended function—for example, the adaptation of the terrace into a drying area (Fig. 2).

Indoor environments within the home are often not conducive to supporting optimal play activities for children. Empirical studies highlight that children aged 6 to 12 years benefit significantly from active physical play—such as running, climbing, and other gross motor activities—which require ample spatial freedom. Observations conducted within K's residence reveal spatial limitations in the living room, primarily due to the presence of oversized furniture. The sofa set, which dominates the space, appears disproportionate relative to the room's dimensions, resulting in a sense of spatial congestion. Furthermore, the existing furniture layout restricts circulation, leaving only a 90 cm-wide horizontal passageway connecting the terrace to the kitchen. This spatial constraint poses challenges not only for everyday movement but also for accommodating children's play that requires dynamic and flexible spatial conditions (Fig. 3).

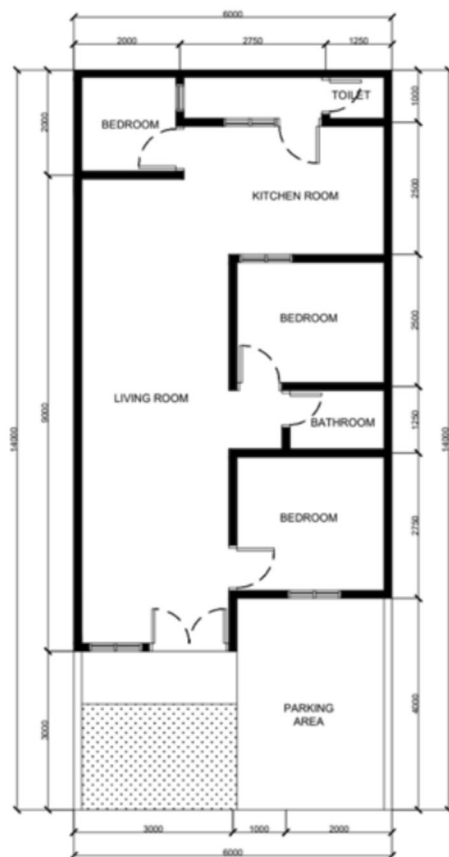


Fig. 2 Renovation Plan of K House with building area (80 M²), land area: 84 (M²) at Pesona Parahyangan Cluster, Dasana Indah Housing, Tangerang, Indonesia (source: Author 2023)



Fig. 3 K House with Front Terrace area after renovation
(source: Authors, 023)

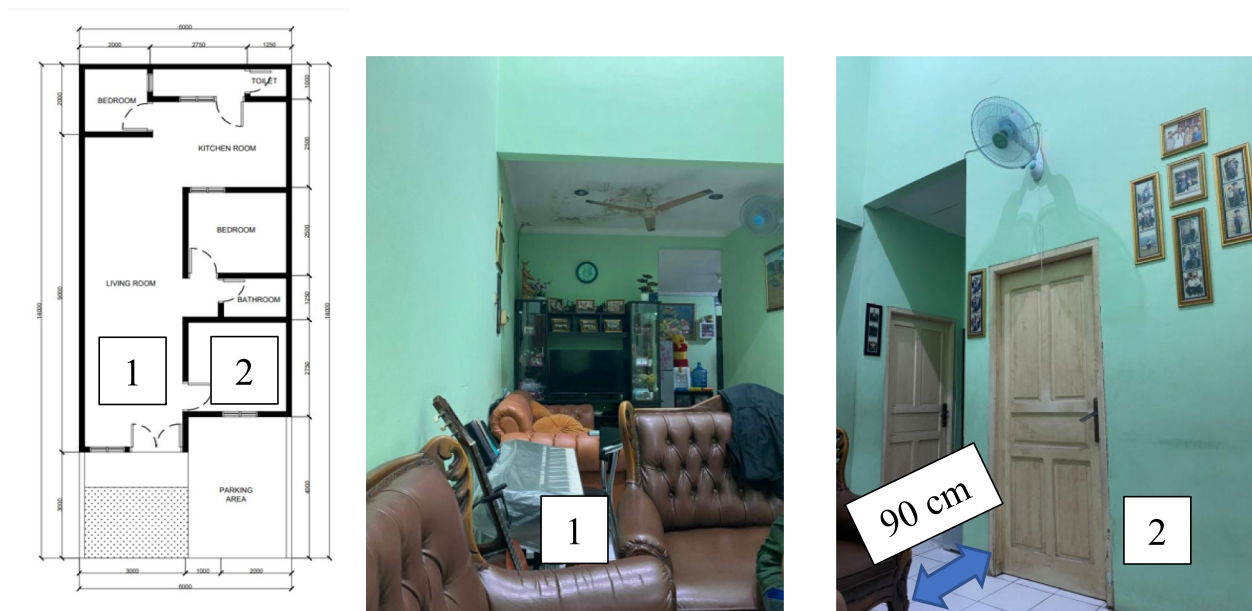


Fig. 4 The big & heavier sofa with 90 cm of space for circulation
(source: Authors, 2023)

From interviews, K and his brother tend to play indoor activities, with the type of game being minimal activity and passive behavior. The choice to do this type of game is possible because K and his brother are aware of the risks and impacts of the lack of potential space (Fig. 4)

"... the sofa bigger and heavier ... we need help to move..." (K, 12 Years Old)

With parental instructions and permission, K and his brother were allowed to use the existing living room to play. Facts show that in everyday life, not many types of games can be played in a room full of sofas.

"...playing chess feels more comfortable in the living room, as the presence of a sofa allows players to sit facing each other..." (K, 12 Years Old)

The statement shows that the playing behavior carried out by K is strongly influenced by the potential of space. When K and his brother chose to play in the living room, the position of the sofa in the living room, which was opposite each other, inspired K and his brother to use the room as a place to play chess, which required the formation of players facing each other. It so happened that K and his brother loved playing chess as much as his father. It is different when they are in the bedroom; the choice to play tends to be a game that can be done while resting, and guessing games are the most appropriate choice of game.

"...often feels cold in the bedroom and typically engages in guessing games while spending time there..." (K, 12 Years old).

The same thing also happened when K and his brother wanted to play with air bubbles made of soap and water; the ideal place to do this was in the bathroom, which is a wet area.

"...often engages in playing with water bubbles while in the bathroom..." (K, 12 Years old).

Observation in D house

From the parents' perspective, insights were obtained through an interview with S, a single parent of three children—two sons attending primary and secondary school, respectively, and one daughter in primary school. S is employed as an administrative staff member at a local educational institution and currently resides with her family in a rental dwelling characterized by a highly limited spatial area. The COVID-19 pandemic and the subsequent enforcement of Learning from Home (LFH) policies have required all three children to engage

in academic and recreational activities entirely within the home environment. This prolonged domestic confinement, combined with the spatial limitations of the residence, posed significant challenges to fulfilling the children's physical and developmental needs. In response, S actively sought to support her children's right to play. However, in the absence of adequate space for active play, the children's recreational activities were constrained to passive forms of play within the available indoor setting. This case underscores the spatial implications of educational and public health policies on domestic life, particularly in low-resource households.

"...there is a play schedule... and the games tend to be games that can be done in the long term..." (S, parent)

D, an 11-year-old child, lives with an older brother and younger sister in a rented house with relatively limited spatial dimensions. The spatial constraints of the dwelling, particularly during the pandemic period, required D and their siblings to exercise creativity to meet their play needs within the home environment. This situation illustrates how spatial limitations can influence children's adaptive strategies for play, particularly under conditions of prolonged domestic confinement (Fig. 5).

The interview revealed that D frequently utilized the storage room and terrace as primary play areas. This choice was made consciously, based on considerations of furniture arrangement and spatial dimensions concerning the types of play activities undertaken.

"...At times, we engage in playing with a rubber ball, while on other occasions, we play with pre-assembled Lego Technic models..." (D, 11 Years Old).

This aligns with the statement conveyed by S (D's parent) during a separate interview session.

"...I provided them with Lego sets, toy cars, and train sets for play. The girls, on the other hand, engaged in activities such as playing with dolls, pretending to cook, and simulating household tasks. ..." (S, D's parent).

The living room was not a feasible space for play activities, as it was occupied by large sofas and a table. Although the parents permitted the children to move the furniture, the substantial size and weight of the sofas led the children to prefer playing in other areas. However, when S was present with them, she assisted in moving the sofas, which enabled the children to temporarily utilize the living room as a play area. S, as a parent, acknowledges the significance of allowing children greater spatial

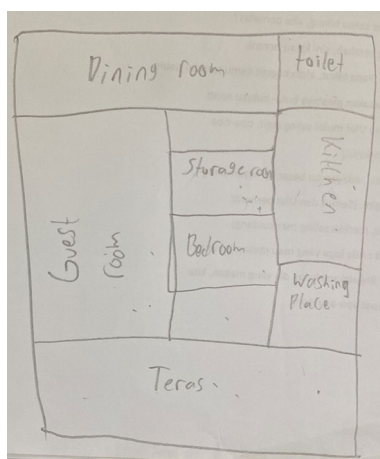


Fig. 5 House of D, sketch by D
(source: Authors, 2023)

freedom during play. By permitting the rearrangement of furniture, S effectively expands the usable area within the home, thereby facilitating more flexible and accommodating play environments for the children.

"...I allow the children to move the existing furniture... so that the living room is more spacious..."

From the statement above, it is revealed that the playing behavior of S children during the Pandemic tends to be adaptation by adjustment. Adaptation refers to changes made by individuals or groups as a behavior of response to environmental demands.(Andrulonis 1978), this strategy was chosen because the available playing environment allows for changes, such as moving furniture in the living room. With a wider dimension of space, children can play more freely, just like playing on a train that requires a certain area of space. Apart from being inside the house, it turns out that K and his brother can also play outside the house; they use a roof-covered terrace, which has a relatively wider space compared to the space inside the house.

D and their siblings also frequently utilized the terrace as a play area. Their preference for this space was closely associated with the specific types of play activities they engaged in.

"...on the terrace playing rubber ball..., the place is wider..." (D, 11 Years Old)

Likewise, the children of S sometimes also use the terrace covered by the roof to play, even though the available space is extremely limited. In children of primary age, thinking about space and understanding space and its relationship to behavior is obvious.

"... on the terrace they play ball..., it's different from inside the house..." (D, 11 Years Old)

Meanwhile, when engaging in Lego Technic play, the children tended to use the storage room, despite its limited dimensions. This choice was primarily influenced by the comfort of the space, which was equipped with air conditioning, even though the area was shared with the bedroom.

"...We more often play with Lego in the storage room, a cool space due to the presence of air conditioning..." (D, 11 Years Old).

Discussion

Children's play strategies

Scholarly discourse surrounding the meaning of play has been extensive, with varying perspectives shaping

its interpretation. Some scholars emphasize the physical dimension of play, framing it as integral to physical development, the cultivation of social skills, and the alleviation of stress while enhancing positive emotional states (Mellou Jan. 1994). From this standpoint, play is seen as an activity that requires clearly defined tools, designated timeframes, and formalized spatial settings. Conversely, other scholars approach the meaning of play from an etymological perspective. Deriving from the Middle English *playe* and Old English *plega*, meaning to frolic, play is associated with joy, cheerfulness, and happiness. This interpretation shifts the emphasis away from physicality toward the experiential and emotional aspects of play. According to this view, play is marked by mental engagement, laughter, and a sense of freedom. These differing perspectives inform a broader conceptualization of play that encompasses several defining characteristics: (1) intrinsic motivation, (2) voluntary participation, (3) enjoyment, (4) symbolic or nonliteral action, and (5) active involvement (Lindberg et al. Dec. 2020). Additionally, elements such as (1) freedom, (2) excitement, and (3) surprise are also considered central to the play experience (Bobby Saragih 2020). This study recognizes the importance of taking a clear stance on the definition of play, ultimately contributing to a more comprehensive understanding of its multifaceted nature.

While they do not reside in the same neighborhood as K and D, this study focuses on children from low- to middle-income families who inhabit compact living spaces. Like K and D, these children navigate various economic and spatial limitations, yet they are still expected to engage in one of the core developmental tasks of human life, namely, the fundamental act of play. From the data, of the 104 informants, 97% of respondents said that they played indoors during the pandemic, it continues until now, stayed and played at home as instructed by their parents. These findings confirm other research on the statistically significant influence of housing and living conditions on the possibility of engaging in educational activities, physical activity, and free play (Zagalaz-Sánchez et al. 2021). Children are having to stay at home and do all their activities. Generally, the space in their homes is extremely limited; there is only a small terrace (optional), a living room, two bedrooms, a small kitchen, and one bathroom. From the data in Table 1, there are noticeable differences between boys and girls in the preferred places for playing at their houses. Generally, 29% of boys tend to play in the living room, 20% in the bedroom, and 4% on the terrace; meanwhile, for girls, 27% tend to play in the bedroom, 18% in the living room 2% on the terrace.

Research with adolescent respondents supports the close relationship between genders in spatial ability. Men

Table 1 Which room do you often use to play?

Gender	Place		
	Living room	Bedroom	Terrace
Girls	18%	27%	2%
Boys	29%	20%	4%

(source: Authors, 2023)

Table 2 Types of play?

Gender	Type of play	
	Handphone Watching TV	Cars, Drawing, dolls, Chess play with Ani- mals, Ball,
Girls	39%	9%
Boys	19%	33%

(source: Authors, 2023)

tend to have better spatial recognition and management. (Nazareth et al. Oct. 2019).

Play behavior is a categorization strategy based on the type of play played by children. Research conducted by Kraft (1989) categorizes play behavior into Active Behavior which is grouped into vigorous (running, climbing, etc.), moderate (catching, shooting, etc.), and minimal activity (walking, etc.), and Passive Behavior which is grouped into social interaction (conversing others, etc.), independent behavior (inactive, solitary) and waiting (Kraft Apr. 1989). Another research categorizes play based on exploratory play, functional play, constructive play, pretend play, and rough-and-tumble play (Fehr et al. 2020). In Table 2, Girls dominate with passive behavior at 39% (Handphone, Watching TV, reading books) and active behavior at 9% (dolls, playing with animals), boys dominate with active behavior at 33% (drawing, cars, balls, chess, playing with animals), and 19% in passive behavior (Handphone, watching TV).

They can play these games independently or with younger siblings. The choice of type of game influences the space used, research shows that children have considerations when they want to use the space for playing.

From Table 1, when children are faced with a space filled with furniture (living room), 29% of boys who chose the living room, 21% prefer to move the furniture and change the layout, either by themselves or with the help of other people (older/ sister), only 8% did not make any changes, this is possible due to the condition of the space and the size of the furniture. This effort is made to get a wider space and allow them to play, usually playing with cars and balls. If moving furniture cannot be done, children will change the layout a little by moving small furniture. This effort is made to make it easier for them to play chess and draw (boys/girls). But if they only watch television, most of them don't make any changes. In contrast with girls, of the 18% who chose a living room, 7% chose to make changes, and 11% chose not to make any

changes. The findings above, although different in probability, prove that boys and girls consider the dimensions of space, both directly available and through efforts to move furniture and change the layout to allow them to play actively. In contrast, girls prefer to maintain their furniture position and not make any changes; they prefer to play passively. Playing in the bedroom is generally done if they are in a condition where they need comfort (cold, quiet). Both Boys and Girls realize that no changes can be made when they play in their room, considering that the furniture is large and heavy and impossible to move; even if something is changed, it is usually only small materials such as a fan or chair. The children realized that in such conditions, the only games they could play were playing games or writing stories, and several other small games. K and his brother could not change their playing environment, the big & heavier sofa, the layout of the sofa that had been arranged, and the parents' direction not to change the layout of the sofa made K and his brother choose to adapt the type of game that was adapted to the potential of the existing space.

Children's play in the living room: a study of domestic placemaking practices

Architecture should be free from gender stereotypical constructions (Umiker-Sebeok Nov. 1996), this research provides affirmed evidence that to conceive a place there are free gender stereotypical, data in Table 1, from 104 informants, 29% of boys argue that living room is more sensible to be a play space and they tend to play there, while girls at 18%, although different gender, the option to play in the Living Room is a similar choice. Choosing to play in the living room for boys and girls is not without reason; children can explain and can tell what they often do there through an open-ended questionnaire. Previous research proves there is a spatial effect on the pattern of play, which has a close relationship with gender; the size of the space can be a determinant of the type of play, and in males, play increases steadily with increasing space, while in females, play decreases in the largest environment. (Klinger and Kemble Jan. 1985). As times change, children's challenges for playing outdoors are, working parents, lack of parental supervision, Indonesian culture in parenting, unsafe playgrounds, and more focus on studies which have an impact on limiting playing time so that the house becomes space for children to fulfill their play needs, in line with other research, on the statistically significant influence of housing and living conditions on the possibility of engaging in educational activities, physical activity, and free play (Zagalaz-Sánchez et al. 2021). Limited time and space are problems that children face, while at the same time, they also have to grow normally through human development. With limited space, they have to struggle to meet these needs.

In a typical small-sized house design, the living room is located beside the bedroom and without partitions, tends to function as a multi-functional space that provides furniture for guests, and space for relaxing (watching TV) sometimes with a small dining table, this space once in a while becomes a private space but can change to a public space, and that change could happen soon. A living room is a space that can accommodate a lot of users, used for family gatherings. The behavior and In Indonesian society, this space is filled with furniture middle-big size as a symbol of luxury, as a manifestation of success, individual social status, and mobility (Amaturo et al. Mar. 1987).

With all the advantages this space provides, 29% of boys choose the living room as a favorite place for play, and it is not only a physical entity but also has a meaning provided by user experience. The choice to play in the living room is due to two aspects, the dimension of place, and more potential for movable, "...freely (coding: dimension) and can be used for different types of play (coding: easy to moveable): cars, Nerf guns, balls..." Boys more conceive a living room than it seems contrast to a bedroom is interpreted as a space that has small dimensions and has limitations in playing. Meanwhile, 18% of girls tend to play in the living room, due to two aspects: they are interested in the dimensions and the facilities of space, "...playing in the living room, watching television (coding: facilities) with my little brother... can play together with freely (coding: dimension)..." so the majority of what they do in the living room is watching television, as for other play activities that they often do when they are in the living room, playing with dolls and drawing (Table 3).

Table 3 Analyzing the coding processes derived from children's verbal expressions during play in the living room

Gender	Statement	Meaning	Coding	Aspect
Girls	"...playing in the living room, watching television with my little brother... can play together with freely..."	Need wider space and facilities	Dimensionally and facility	Visual sensory
Girls	"...if you have friends, you are told to play in the living room..."	can be used a lot of users	Dimensionally	Visual sensory
Boys	"...freely and can be used for different types of play, cars, Nerf guns, balls..."	possible used for various play that require movement	Dimensionally and Moveability	Visual sensory
Boys	"...can be used to play Hot wheels..."	possible used for active games that require space	Dimensionally	Visual sensory

(source: Authors, 2023)

Regarding the ability to understand dimensions, research conducted in Sri Lanka revealed that based on Piaget's theory, children between 7 to 12 years children understand related rectangles and, concrete operation stages (Jones and Smith Apr. 1993). Research proves that there is no gender difference in understanding the dimensions of space. This confirms previous research, without gender differences, statistically, they understand significantly about the three-dimensional and spatial arrangement of three-dimensional cubes (Battista and Clements May 1996). This research also proves that dimensions are part of the visual sensory. Dimensionally, Facility and Moveability are things that can be understood visually, and vision is the ability of someone to recognize light and then interpret it. Visual sensory is the part of the brain responsible for processing visual information.

Children's play in the bedroom: a study of domestic placemaking practices

Apart from the Living Room, small-sized houses are also equipped with 2-bedroom rooms. The tendency is for houses that have been renovated to add a bedroom as the number of family members increases. Bedrooms are grouped into two, the main bedroom for parents and the children's bedroom, but the facts prove that they do not have the opportunity to get a private bedroom, usually, they will share the bedroom with their older brother or sister. Apart from the bed set, the bedroom is also equipped with a cupboard, and even some children's bedrooms are equipped with a small study table.

In contrast to the living room, boys are more dominated by choice, and the choice of playing in the bedroom is generally dominated by girls. According to the Data in Table 1, 27% of girls choose the bedroom while 20% of boys choose it. They have a reasonable excuse to play in a living room, visually sensory things (in this case dimensions, facilities, and moveability), while with a bedroom, children prefer non-visual sensory (sounds, smells, tastes, and touches) even the majority see things related to comfort, tranquillity, and privacy (perceived). Girls give a more mind argument "...The room is calmer and makes me feel alone ...", "...can carry out activities calmly and independently ..."; while Boys give physical arguments "...can lie down, sit on the bed ...". Those who choose the Bedroom as the room they often use for playing for reasons that tend to be the conditions displayed by the room, comfort (children said: *cold*), privacy (children said: *feel alone*), and quiet (children said: *no interference*). The hot weather has an impact on most homeowners using air conditioning as an effort to provide room comfort, and it is generally placed in the bedroom (Table 4).

Child-centered placemaking principles

Place is not only a physical entity but also has a meaning provided by user experience (Tuan 1975b). And research shows that the COVID-19 pandemic causes depression, stress, and anxiety, particularly for children (Thakur et al. Jul. 2020). Stress in children tends to be due to changes in routine, due to being at home compared to school, and interactions with siblings and parents (Liu and Doan Sep. 2020). The strategy to reduce stress is to play (Saragih Dec. 2018), but the conditions during the Pandemic make it impossible for them to play outside. Adaptations at home are an effort made by the family to maintain healthy movement behavior for their children. (Mellou Jan. 1994).

"Placemaking" is the process of creating and enhancing space to improve the quality of various places for the quality of life of the people who use it (Strydom et al. 2018). Although this applies to public spaces, it is also possible that this concept can be applied to domestic spaces, such as at home. Participatory, flexible, and accessible are the main characteristics of this concept.

Adaptation is a strategy to adjust activities when facing changes, especially changes in the environment. Thus, behavioral adaptation emphasizes human reactions in the face of incompatibility with the environment. (Samra et al. 2024). Another definition of adaptation is a process of decision-making and a series of actions taken to maintain

the capacity to deal with changes or disturbances in the environment (Horswill 1995). Adaptation theory provides several types of adaptation. Structural adaptation is adaptation that involves the physical changes of organisms that are visible. Physiological adaptation is adaptation to physical changes that are not visible. When children are faced with a space filled with furniture (living room), 29% of boys who chose the living room, 21% of them prefer to move the furniture and change the layout, either by themselves or with the help of other people (older/ sister), only 8% did not make any changes, this is possible due to the condition of the space and the size of the furniture. This effort is made to get a wider space and allow them to play, usually playing with cars and balls. If moving furniture cannot be done, children will change the layout a little by moving small furniture. This effort is made to make it easier for them to play chess and draw (boys/girls). But if they only watch television, most of them don't make any changes. In contrast with girls, of the 18% who chose a living room, 7% chose to make changes, and 11% chose not to make any changes. The findings above, although different in probability, prove that boys and girls consider the dimensions of space, both directly available and through efforts to move furniture and change the layout to allow them to play actively. In contrast, girls prefer to maintain their furniture position and not make any changes, they prefer to play passively. Playing in the bedroom is generally done if they are in a condition where they need comfort (cold, quiet). Both Boys and Girls realize that no changes can be made when they play in their room, considering that the furniture is large and heavy and impossible to move. Even if something is changed, it is usually only small materials, such as a fan or chair. The children realized that in such conditions, the only games they could play were playing games or writing stories, and several other small games.

Space will turn into a place when it is used and lived (Rasmussen 2004) and place-making is an effort to shape a space or improve the quality of a space into a place, that has meaning for users, where they can live, work, play and learn in inside, not only a physical entity. In this case, the idea of adaptive play space is a space that can meet the needs of children's play by using all their senses to develop communication and social intelligence, cognitive, recreation, and creativity by manipulating their space to place. The idea of place-making is also shared by children; they could turn space into a place (Rasmussen 2004). There were two real differences shown by the children when they gave answers to the same questions in different spaces. Children who tend to play in living rooms, children convey more about the tangible aspects, dimensions of space, and facilities that are seen by children, "... the sofa is bigger and heavier... we need help to move..." Meanwhile, children who choose to play in the

Table 4 Analyzing the coding processes derived from children's verbal expressions during play in the bedroom

Gender	Statement	Meaning	Coding	Aspect
Girls	"...The room is calmer and makes me feel alone..."	Experience an undisturbed space from the audio side	Comfort-ability and privately (Serena Quality)	Perceived sensory
Girls	"...because in my bed room I can do what I want to do with comfortably..."	Feeling a space where you can carry out activities independently	Comfort-ability (Serena Quality)	Perceived sensory
Boys	"...can lie down, sit on the bed..."	Can regulate physical conditions that are more relaxed	Comfort-ability (Serena Quality)	Perceived sensory
Boys	"...can play games on a soft mattress, the bed room is cool..."	Can regulate a relaxed physical condition and feel the cold room temperature	Comfort-ability (Serena Quality)	Perceived sensory
Girls	"...can carry out activities calmly and independently..."	feel the atmosphere of a calm space independently	Comfort-ability and privately (Serena Quality)	Perceived sensory

(source: Authors, 2023)

bedroom, children convey more about the intangible aspects and condition of space, which are felt by the children, “...*This room is cold...and quiet*”. The place-making process is carried out by dimension; there is something that comes to mind and is seen visually. This research proves that the place-making process is influenced by two sensory aspects, the visual sensory and the perceived sensory.

Spatial strategies for play in constrained domestic settings

Creating a play space in small houses with 4–5 family members and medium-sized furniture as a manifestation of success has two challenges: the limited area and space contestation, but this becomes important to understand, considering that the majority of the urban population in Indonesia lives in houses with this model. Adaptation is coping with stress or strategies to achieve a balance between the individual and the environment. Research conducted by Berry concluded that the adaptation process was carried out by 3 strategies: 1. Adaptation by reaction, individuals change their behavior to fight against a new environment; 2. Adaptation by adjustment, an individual changes his behavior as the environment changes; 3. Adaptation with withdrawal, individuals who leave the existing environment because of environmental changes (Moore, Faulkner & Rhodes 2020), Berry suggests that adaptation by reaction and withdrawal are usually impractical and that adaptation by adjustment is the only viable strategy in the adaptation process. Children have spatial abilities and even imaginative-creative abilities. The experience of playing at home during the COVID-19 pandemic gave me a new understanding of home design, especially with small dimensions. Based on surveys and comments, future design recommendations for homes should include flexibility in the use of space (Alhadedy and Gabr 2022).

From an architectural perspective, Tables 1 and 2 show that boys and girls have different spatial abilities. Research shows that men have more environmental experience, which impacts better spatial abilities. (Davis and Cashdan 2019) Wider spatial preferences, to carry out activities of playing ball, cars, chess, etc., which are carried out by boys, showing that they understand the process of play and game tools and the consequences for the dimensions of space. Girls have different play needs, playing with mobile phones, dolls, and watching TV, they need more space that is quiet and more private. The same thing happens when they choose to play with animals such as cats and dogs; the choice to play on the terrace gives them an understanding that they need free space, which does not cause damage to furniture. However, the playing process at home is not easy, the furniture (layout and form) and room dimensions greatly influence their

playing choices, two cases above, it can be concluded that the playing behavior of children who live in small houses makes the potential of space a major consideration for children to choose the adaptation to play. From the child's perspective, the potential of space can be grouped into two, which are: 1. Visual Aspect: furniture arrangement and shape of furniture “... *the sofa is bigger and heavier... we need help to move...*” 2. Perceived Aspect: condition of the room “...*This room is cold...and quite*”.

If the potential of space supports it, it is possible to move furniture or change the furniture layout and get support from parents, the pattern of play behavior tends to be done in the form of spatial strategy by adjustment. If one of the potentials of space does not support it, the strategy conducted by the child is spatial strategy by reaction. Meanwhile, if the two potentials of space do not support, then the strategy taken by the child is spatial strategy with withdrawal. The spatial strategy for play process is described in (Fig. 6).

Conclusion

Placemaking is defined as “the process of creating quality places where people want to live, work, play, and learn” (Strydom et al. 2018). In the architectural context, placemaking emphasizes the creation of spaces that foster emotional, social, and functional connections between individuals and their environment. This research, which included observations in small houses and online open-ended questionnaires filled out by 104 children aged 10–12, all living in small-sized homes in urban Tangerang, Indonesia, aimed to explore various aspects of their experiences., demonstrates that spatial limitations often stimulate greater creativity in how children construct their play environments. The selection of play areas is largely influenced by the type of game being played. Gender differences also emerge in spatial use: boys tend to utilize communal areas such as the living room, primarily because certain games require more open or shared space, whereas girls prefer more private, enclosed areas for their activities. Moreover, the physical configuration of the home—including furniture arrangement, room shape, and overall spatial conditions—significantly influences the strategies children employ to use space for play. The study also shows that placemaking, from the perspective of children, serves as a strategy for adapting to, interpreting, and organizing their immediate surroundings, both creatively and spontaneously, to play and engage in everyday activities, despite spatial constraints. The principles of placemaking as constructed by children are based on two principles: the visual-sensory aspect (tangible features such as spatial dimensions and facilities) and the perceived-sensory aspect (intangible features such as spatial conditions). These findings offer a conceptual contribution to the development of

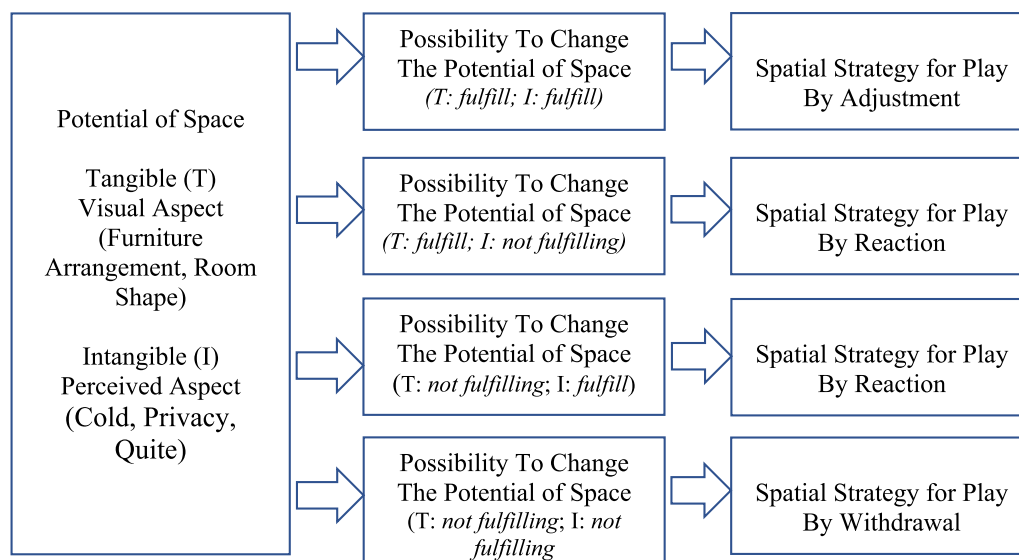


Fig. 6 Spatial Strategies for Play Process
(source: Authors, 2023)

more child-friendly housing and residential area designs, grounded in a placemaking approach informed by children's behaviors and spatial experiences.

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Authors contribution

JFBS: Conceptualization; Data curation, Investigation, Methodology, Project administration, Validation, Visualization; TYWS: Formal analysis; Resources; Supervision; JFBS, TYWS: Roles/Writing—original draft, Writing—review & editing.

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Data availability

The authors confirm that the data supporting the findings of this study are available within the article's supplementary materials.

Declarations

Competing interests

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