An Exploration of Cross-generational Childhood Outdoor Play Experiences in Chinese Communities, Taking Wuhan as an Example

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Abstract

Citizens' lifestyles have been changed by the transition of the physical environment and social structure under the context of rapid urbanization. In particular, there is a dramatic difference in children's outdoor play experiences compared to their parents' and grandparents' childhood times. In order to build safe, playful and sociable environments for promoting children's independent mobilities in their communities. This research was conducted in different types of communities in central Wuhan to understand these changes. A total of 1,688 questionnaires, 34 interviews and 97 diaries were collected from 415 residential communities in central Wuhan, with a sample age range of 6 to 87 years.

Key findings are highlighted: 1) There are statistically significant differences in children's outdoor play behaviours across the three generations. The SPAT model has been developed to illustrate the intergenerational difference in playing spaces, people, activities and time. 2) This study identified that the degree of parental control, the attributes of the physical environment and residents' perception of the social environment in the communities had a significant impact on children's outdoor play. The study combined factor analysis and path analysis to develop an SEM model to explore the factors that influence children's outdoor play and the interaction between these factors. 3) Correlation and regression analyses were conducted on four selected communities with 116 recorded mappings to examine the relationship between the physical environment and children's outdoor activities by introducing the space syntax theory.

This research conducted a large number of statistical tests and combined them with qualitative research to discuss the children-environment-time-space relationship and their interactions. It provides a richness of findings to give suggestions for child-friendly implications. It also presents the differences in the demand accessibility of green spaces by children from lower socio-economic backgrounds. This research has led to a rethinking of rapid urbanization and children growing up in Chinese cities. Social justice for green space should be considered in future urban development to promote every children's independent play in their communities.

Declaration

I, the author, confirm that the Thesis is my own work. I am aware of the University's Guidance on the Use of Unfair Means (www.sheffield.ac.uk/ssid/unfair-means). This work has not been previously presented for an award at this, or any other university.

Yuanyuan Shi
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List of Attended Academic Conference

The following list contains work from this research that has been orally presented:

2021.03.20, Wuhan University, Wuhan China, The 8th International Forum for Interdisciplinary Sciences and Engineering

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2018.09.29 – 2018.09.30, University of Nottingham Ningbo China, Ningbo China, Playful Encounters Conference

2018.06.23 – 2018.06.25, Wuhan University, Wuhan China, Urban China Research Network Conference

2017.05.08 - 2017.05.09, University of Edinburgh, Edinburg UK, Researching with and for children: Place, pedagogy and play

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Abbreviations

CFCI	Child Friendly Cities Initiative
CGC	Commercial Gated Communities
MVPA	Moderate-to-vigorous physical activity
CFC	Child Friendly Cities Initiative
SES	Socioeconomic status
SEM	Structural equation modelling
EFA	Exploratory factor analysis
CFA	Confirmatory factor analysis
MI	Modification Index
KMO	Kaiser-Meyer-Olkin
RMSEA	Root mean square error of approximation
GFI	goodness-of-fit
AFGI	AFGI Adjusted-goodness-of-fit
CFI	CFI comparative fit index
DF	Degree of freedom

Preamble

Growing up in China today is a lot different than I was a kid.

It was a baby boom year when I finished my master from Sheffield and worked as a landscape architect in 2016. Many new babies came to my friends' and relatives' families in the lucky year of the monkey, with their parents' belief that the clever monkey baby would be a success and lead a happy life. During my visits to these families, I had numerous opportunities to talk about our childhood with people from different age groups. Consequently, I realized that children's lifestyles have changed radically in just a few decades.

My research interests are founded on understanding how and why children's outdoor play experiences have changed compared to what their parents and grandparents did in their childhood. This began with understanding the characteristics of current children's outdoor play in their communities by different age groups. My master's dissertation investigated the time, companions and types of children's outdoor play in the density communities in Wuhan. The findings showed the limited time the current children were spending outdoors and addressed the importance of parents' safety consideration when their children played outside (Shi, 2017). In this research, I take a deeper step to find academic evidence to quantify the changes in children's outdoor play experiences across three generations and how such changes differ between physical attributes, social networks, and changing policies. While the cross-generational difference in childhood outdoor play experiences has been widely agreed upon, it remains poorly documented in China.

"Wuhan, different every day!"
The selected slogan reflects an energetic city that is continuously striving for development. Before rapid urbanization, children could play everywhere. They went outside with their friends, played what they liked and had lots of adventures. The construction and development in the city have changed the children's lives. Today, the children in Wuhan were not allowed to swim in the ponds or rivers as before. They spend more time indoors, often with adults, go out by cars rather than walk or cycle. Children were protected by their parents and grandparents from traffic, abduction and injuries. We are building a greater city, but it has also caused a perception of growing danger for children to play outside.

"How can contemporary children play in a safe, playable, and sociable community as we did in our childhood?" I keep asking this question during my research.

Chapter 1: Introduction

Urbanization is remarkable in China in terms of both scale and speed in recent years, as the urbanization rate rose from 19.39% to 63.89% between 1980 and 2020 (National Bureau of Statistics of China, 2021). Nearly 900 million people accounting for 63.9% of the total population in China lived in cities in 2020. Accelerating urbanization has brought dynamic interactions and changes for citizens, such as massive urban construction, increasing traffic, and rural-to-urban migration (Chan and Zhang, 2009; Han et al, 2018). Residents' lives have been greatly influenced by the great urban transformation through shifting social, economic, environmental and political changes (Wu, 2012; Lin, 2007).

The value of outdoor play has been emphasized in many research fields with its physical, psychological, and social benefits for children's development (Sandseter, 2007; Khan, 2019). Although it has been widely accepted that outdoor play has life-long health benefits for children (Edwards and Bromfield, 2009; Prezza and Pacilli, 2007), current children are experiencing a dramatic reduction in travel distance, time, companions, and natural environments in the outdoors, compared to their parents and grandparents would have done in their childhood (Woolley and Griffin, 2014; Karsten, 2005; Kinoshita, 2009; Soga et al., 2018). The reduction of children's outdoor play experiences over generations is an issue in a global context. Although this phenomenon is generally acknowledged by Chinese citizens, it remains surprisingly poorly documented, particularly with less academic evidence to support it. Many of the existing studies about Chinese urbanization focus on economic growth (Bai et al, 2011), land use (Tian et al., 2005), and migration (Zhang, 2001). Limited work is known about the extent to which levels of childhood outdoor play experience have changed over time in Chinese cities.

Wuhan is an interesting site for studying the transition of outdoor play experiences across three generations. As the biggest city in central China, 11.21 million permanent residents are living in the city. 10% of the population is children (Wuhan Annual Report, 2019). Wuhan is known as "River City" and "City of a Hundred Lakes" for its prominent natural landscape. The defining feature of the lakes that are scattered all over the city has significantly influenced the city's urban spatial structure and development pattern (Zhu and Kung, 2020). In addition, the natural landscape of rivers and lakes has played a key role in providing green space for recreation for urban residents. It is a tradition for the previous residents to swim in the rivers and keep cool by walking and sitting on the banks of the lakes. As a result of the rapid urbanization of Wuhan, children have less space, time and friends for play than their parents and grandparents did. Current children also have less contact with nature than these previous generations in their daily life because of the changes in physical attributes, social networks, policy implementation, and technological progress over time. This research aims to develop an understanding of the changes of childhood outdoor play experiences across three generations in the process of urbanization by taking Wuhan as an example. Suggestions from this research would be applied to improving children's play initiatives in outdoor spaces and given to Chinese policies and principles in future settlements to build child-friendly communities. This research will

report the result of a questionnaire survey of 1,668 citizens in Wuhan, designed to access the three generation's childhood outdoor play experience.

1.1 Context

Growing cities and the global trend of urbanization have brought challenges to children's health with the rapidly changing environment and the loss of open spaces (Kabisch et al., 2017). Children are the foundation of a nation's future, and there are currently 122 million children living in urban China (National Bureau of Statistics of China, 2021). It is children's nature to play throughout history and in all cultures, while play is often overlooked by adults' understanding as an unnecessity of life (Hodgkin and Newell, 2007). There is a need to promote the right to play in childhood among adults and the general public with consideration of children's capacity to realize their right to play in their everyday lives.

Children's Right to Play

Play is a vital part of childhood and is essential for children's health, well-being, and development (Lester and Russell, 2010). The importance of play was recognized by the United Nations Convention, which states that adults should recognize, respect, and promote children's play as a right. Considering children's right to play in their daily lives, there is a need for the provision of safe and secure environments for play. The Child Friendly Cities Initiative (CFCI) was launched in 1996 to support municipal governments in realizing the rights of children and improve the lives of children by building child-friendly cities. The CFCI has emerged in China since 2016, Shenzhen and Changsha have expressed an interest in building child-friendly pilots. In practice, the implementation of the CFCI framework in China is mainly focused on building child-friendly environments in public open spaces, streets, and communities in cities.

The Decline in Children's Outdoor Play

Although play benefits children's development and well-being, there have been various research reports on the disappearance of children playing in the streets and a gradual decline in children playing outdoors in the past decades (Karsten, 2006, Gill, 2007, Kinoshita 2008). In the early 1990s, small groups of participants were involved in a comparative study over generations, describing the decline in freedom of movement in their neighbourhoods in New York (Gaster, 1991). This was supported by a generational study in Amsterdam, which confirms the changing character of children's geographies with the transition of children's play spaces from streets to private home spaces (Karsten, 2006). Childhood play experiences were proven to be different across the generations in Sheffield, which claims that contemporary children experienced a dramatic reduction in the distance, types of outdoor spaces, activities, and companions compared to previous generations (Woolley and Griffin, 2015). The findings in the review of three generations' play maps in a Japanese neighbourhood point out the decreasing natural spaces, social interaction with other children, and time spent outdoors (Kinoshita, 2009). Children were found to spend more time at home compared to their parents (Tandy, 1999), and resent study shows childhood experiences of connection to neighbourhood biodiversity were declined by genetations (Soga et al., 2018).

Over-protection from Parents

The current tendency of parents' fear of traffic accidents, street crime, and safety considerations to restrict children from playing outside is global (Bartlett, 2002; Chawla, 2002; Grayling et al., 2002; Gill, 2007). While over-parenting with traditional beliefs and norms would put more constraints on children's outdoor play in Chinese contexts (Ng and Deng, 2014). This has been exacerbated by changes in birth policies and the social environment with the implementation of one-child policy in 1980 and Chinese economic reform since 1978. Chinese parents would limit the amount of outdoor play time by placing more value on children's academic achievements than on children's play activities (Wang et al., 2020). Besides, the one-child policy has led to parents' overprotection of children as children become more emotionally precious to their families with the anxiety of abduction in urban China (Shi, 2017).

1.2 Rationale and Novelty

The rationale for this research is centred on the cross-generational changes in children's outdoor play experiences in Chinese cities. It considers the evidence on the vital benefits of children's physical, social, emotional and academic development. The current Chinese children might have fewer opportunities to play outside due to the academic burden and parents' restrictions. Besides, a kit of fixed play equipment was normally provided in the community for children to play with, which was approved with little play value (Woolley, 2007). This research addresses these issues with scientific results and promotes children's outdoor play through planning intervention and community design.

This research will contribute to the body of knowledge that examines how childhood outdoor play has been changed by the physical environment, social context, and related politics in Chinese cities. More specifically, this research will offer new insights into an issue of children's outdoor play is becoming increasingly important due to rapid urbanization, both in China and within a broader global context. This research is innovative in that it makes an important contribution to an area for which there is currently limited research evidence available by providing a richness of findings. It would be valuable for future research in this area with the application of structural equation models to explain the complexity of children's outdoor behaviours. It also contributes to the development of child-friendly communities in China by giving suggestions for design strategies and planning policies.

1.3 Research Aims

The children's lives have experienced a dramatic environmental transition compared to their parents and grandparents' childhood experiences. There is a need for a better understanding of how these changes influence children's outdoor play. A key challenge towards children's outdoor play in Chinese cities today is the lack of understanding and recognition by urban planners of the importance of the neighbourhoods in the everyday lives of children and their parents. This research aims to understand the relationship between children's outdoor play behaviour and the environments in their communities, which could improve the play environment through planning and design interventions.

1.4 Research Questions

This research considers the evidence of changing childhood outdoor play under the process of urbanization, and how opportunities for outdoor activities can be encouraged for children through building a physical and social environment. To achieve the research aims, the thesis will answer the following research questions:

(1) How has children's outdoor play experience have been changed over three generations in Chinese communities?

(2) How are such changes different between different types of communities?

(3) How has the transition of surrounding physical attributes and environment influenced cross-generational children's outdoor play experiences over time?

(4) What are the linkages between the changes of cross-generational children's play experiences and the social structure and network?

(5) How have policy changes influenced cross-generational children's outdoor play experiences over time?

1.5 Thesis Structure

Chapter One provides an overview of the research context, the rationale for conducting this research, and the developed research aims and research questions.

Chapter Two reviews the literature in the area of children's research, including the growing up in cities (GUIC) projects, intergenerational studies in the world, and changes in children's geography. To understand children's play, the widely used conceptual framework includes the home range concept, where children's independent mobility and

affordance are included. This chapter evaluates the variety of environments in which children interact in their outdoor play, and it focuses on the specific areas in Chinese communities and Chinese families. It ends by discussing the limitations and research gaps identified in this research topic.

Chapter Three presents the research framework and scope of this research. It shows the detail of the research design, research methods, measurements and sampling established in this research. It lists the data collection process and reflection of these procedures.

Chapter Four presents the context and transition in Wuhan during the past decades, which helps understand the background of the participants living in this city. It also describes the context of the four selected communities and gives an overview of the collection of data in this research.

Chapter Five presents the changes in childhood outdoor play across three generations. Using a SPAT model, it describes in detail the generational differences in spaces, people, activities, and time.

Chapter Six presents the results of a comparative study of four communities. It shows the difference in children's outdoor behaviours and residents' perception of the communities. This chapter contains the family influence on children's outdoor play, includes generation to generation, family members and parental control.

Chapter Seven presents the combination of data from different research methods to describe the relationship between children's outdoor play, the physical environment and social context. A new insight into children's outdoor play has been gained with space syntax and structural equations.

Chapter Eight presents the results from questionnaires, interviews and behaviour mappings collected in this research. It draws the findings together to answer the five research questions and reflects the limitations of this research.

Chapter Nine presents the summary of the findings in this research and the implications of this research. It includes suggestions for participants and opportunities for future research. It finishes with a personal reflection of childhood life on losing biodiversity in the city.

Chapter 2: Literature Review

Children are growing up in an increasingly urbanized society, particularly in Chinese cities, which are experiencing the world's fastest urbanization. Urbanization brings an economic boost to the cities but fails to necessarily induce sustainable urban environments for children's outdoor play with limited public spaces (Karsten, 2005; Kinoshita, 2008). This is evident in the decline in outdoor play and the increase in adults' supervision by generations. This chapter explains the nature and value of children's play to show how outdoor play benefits children's development and well-being. Children's play behaviours are strongly correlated with the built environment in urban settings, which could be improved through planning and design policies. It will discuss the theoretical concepts in existing research on children's outdoor play under the global trend of urbanization and the research gaps identified in this topic.

2.1 Understanding of Play

Cognitive Theories of Play

Children's play is a universal phenomenon in their development and is culturally founded and adapted. The modern dynamic perspective seeks to explain the content of the play, the theorists central to these perspectives are Piaget and Vygotsky. From Piaget's perspective, children build up knowledge through active engagement with the environment, and children's development in terms of each stage that relates to children's age and gender (Piaget, 1962). Vygotsky's theory supplemented Piaget's theory, demonstrating that social interaction influences children's cognitive growth that children learned from the beliefs and attitudes modelled by their families, communities, socioeconomic status and culture (Vygotsky, 1978). Burner's work continued Vygotsky's work and he assumed that when children play, they develop knowledge about and experience of the environment, which can increase their flexibility. He considered that children freely explore using novel combinations of behaviour and are not concerned about achieving a goal (Burner, 1972).

In conclusion, it can be seen from the above discussion that theorists hold quite fundamentally different views about the nature and purposes of play. Collectively, these studies indicate the importance of the dynamic play environment influences and child development on children's play. The play environment not only recognized the significance of the space that children occupied but also the materials in the site, the children themselves as well as the family's ethnic culture and the cultural context.

The Nature of Play

Although there is no obvious goal of play, it is widely seen in human's life and other species of mammals (Smith, 2005). Researchers view play is important in children's development and regarded as a mechanism of developing skills needed from childhood to adulthood (Piaget, 1962; Vygotsky, 1967). However, studies of behavior biology and the expanding area of neuroscience show that the effects of play may be more immediate, assisting children in interacting with their present physical and social settings (Pellegrini and Smith,

1998; Power, 1999; Lansdown, 2005). Piaget's theory of cognitive development suggests children acquire knowledge through interactions with the environment (Anderson, 1992), and these environments also shape the identities of children (Collins and Coleman, 2008). Although understanding of play vary widely, play is distinguished by physical and emotional flexibility which allows children to explore the environments and develop skills to adapt them. Many definitions have been made for the word "play". For this research, play will be concluded as behaviour characterized by children's active engagement with their free choice, personal direction, and intrinsic motivation (Woolley and Lowe, 2013).

The Value of Outdoor Play

Years of research in different fields around the world have demonstrated the importance of children's play for both children's individual development and society's benefits. Staying physically active, the outdoor play makes a great influence on children's daily living and the complexity of children's needs, especially in urban environments (Hillary et al., 2005; Hills et al., 2007). Outdoor play is essential in the development of physical skills through walking, jumping and chasing (Bunker, 1991). It also stimulates children's creative thinking, develops self-esteem, and increases their learning knowledge (Burdette and Whitaker, 2005; Heseltine and Holborn, 1987; Barton and Pretty, 2010). Play outside also provides opportunities for children to cooperate and negotiate with other children. This social interaction benefits children's emotional and social states (Goleman, 1996; Korpela et al., 2002).

Benefits of Nature Contact for Children

Numerous studies have discovered children's preferences, of play spaces and the findings collectively reveal the positive impact on children from playing in natural environments (Moore, 1985; Fjørtoft, 1998; Chawla, 2002). It addresses the importance of providing more natural spaces for children to play in urban environments as the natural playscape are more attractive to children and provide more diverse forms of play (Moore and Wong, 1997; Titman, 1994; Herrington and Brussoni, 2015). Contact with nature contributes to children's mental health and well-being, which leads to long-term health outcomes (Korpela et al., 2002; Richardson, 2014; Barton and Pretty, 2010, Thompson and Aspinall, 2011). The nearby nature helps reduce diseases such as asthma and allergies (Lovasi et al. 2013; Fuertes et al. 2014) and develop a well-regulated immune system (Rook, 2013). The research found a positive relationship between accessing green space and children's physical activity (Gill, 2014; Coombes et al., 2013), which helps children develop a healthier body (Kim et al. 2014). The effects of nature also benefit children's cognitive development, mental health, and strong parent-child bonds (Hart, 1979; Moore, 1986; Ginsburg, 2007). However, there is a great loss of children's freedom to explore nature in urban environments with the progress of urbanization (Louv, 2005; Kyttä, 2006).

Risky Play

The flexibility, uncertainty and unpredictability are essential part of play, which helps children develop diverse skills. The characteristics of physical and emotional flexibility in play has positive effects, while the uncertainty of risk and danger involves in play (Gosso et al., 2005; Sandester, 2011). Research around the world identifies children who are restricted from playing outside by their parents' safety considerations (Allen and Rapee,

2005; Gill, 2007). Besides, there is a current tendency of some cultures to overprotect children and design 'safe' play equipment with little play value (Woolley and Lowe, 2013). However, children express a strong interest in risky play, and they learn to balance risks and adaptive capabilities through adventurous (Stephenson, 2003). Risky play can be defined as thrilling and exciting forms of play that are adventurous with a risk of getting injured (Sandseter, 2009). It involves playing situations at great heights and high speeds, such as climbing, jumping, and high-speed bike riding (Smith, 1998; Stephenson, 2003). Researchers suggest that play environment should provide childhood experience for risky play to develop children's adaptive systems of self-protection and resilience (Plumert, 1995; Mariana et al., 2012).

2.2 Research on Children in Cities

GUIC Projects

The Growing Up in Cities project of UNESCO has highlighted children's daily lives affected by urban issues in different cities in 1972 (Lynch, 1977). Children were interviewed and invited to describe the spaces and territories where they took various of activities. This research project were relaunched in different parts of world to understand children's needs for play in policies, urban planning and practice in 1998. The second phase of this project emphasizes the importance of children's involvement in planning, design and policy (Chawla, 2016). These research projects involved children describing and mapping spaces of their daily lives, and they provide an understanding of the complexity of the built environment and children's play behaviours from children's point of view. The issues revealed by this GUIC project are still very relevant today as the world continues to urbanize, such as increasing traffic, lack of play spaces, and urban crime. Despite the social, cultural, and economic differences, the comparative study among cities revealed some essential universals of growing up that children share similar play experiences from childhood to adulthood.

The Decline in Children's Outdoor Play

Various studies have indicated the decreasing trends of children's playing outdoors and independent access to public spaces (Karsten, 2005; Hofferth, 2009; Kinoshita, 2009; Woolley and Griffin, 2015). These research shows the characteristics of intensive parental supervision culture of restricting children's outdoor play due to the fear of injuries and safety consideration (Gaster, 1991; Karsten, 2006; Kinoshita, 2009; Valentine, 1997; Malone, 2007). The parental safety concern was found to be related to the changing urban context and transit environment, regarding to the increase of strangers and traffic (Woolley, 1999; Björklid, 1994). Busy roads increase the risk of traffic injuries (Durkin et al., 1999), and the negative effect on children's health from traffic-related air pollution (Brauer et al., 2002). However, the changes in children's play habits of spending more. time indoors are concerning with its negative effect on children's health and well-being. Lacking outdoor play and daily physical activities were found to associate with the increasing rate of children's obesity, anxiety and depression (Gray, 2011).

Changes of Children's Geographies

Children's geographies involve studies of the environments in children's lives in terms of experiential, political, and ethical significance. It was new research as a subdiscipline of human geography, and it still lacked a research frame in the complexities of geography. Children's geography has been developed with academic research since the mid-1990s, with valuable research (Matthews, 1992; Freeman and Tranter, 2011). Children might experience and understand the environment in different ways compared to other groups of residents in society. The development of children's geographies focuses on children's everyday lives, and it also copes with childhood studies (Holloway and Valentine, 2000). Children's geographies take an insight into various circumstances by the nature of the children, such as gender variation, age variation, family contexts, social contexts and cultural differences (Matthews and Limb, 1999). It also refers to children in the environment from different types of spaces, children's understanding of these places, as well as the hazards and social issues surrounding the physical environment (Hart, 1979; McKendrick, 2000; Blunt, 2007). Research in children's geography has critically argued the lack of a larger-scaled process with its emphasis on children's everyday lives (Mitchell and Elwood, 2012). The major challenge in children's geography is the 'same old stuff' provided by researchers (Horton et al., 2008), and it should be particularly given methodological and observational depth with ethical consideration (Horton and Kraft, 2006).

The geography of children's outdoor play as it relates to physical and social factors of the built environment in their neighborhoods has received a lot of attention.The availability of green spaces in the neighborhoods is an important factor in children's outdoor play (Handy et al., 2008; Holt et al., 2008), while the traffic-related concerns in the neighborhoods have a negative influence on children's outdoor play (Veitch et al., 2006; Yoon and Lee, 2019). According to research, play areas and formal playgrounds have little influence on children's outdoor play (Burke, 2005; Veitch et al., 2008).The impact of the social environment on children's outdoor play focuses on their social safety, interaction with neighbours and the presence of friends in their communities (Vietch et al., 2007; Aarts et al., 2010). Interdisciplinary research from the perspectives of sociology and psychology has focused on the relationship between subjective perceptions of the neighborhood and children's outdoor play (Burdette et al., 2005; Sandseter et al., 2019).

2.3 Children's Play and Environment

Play Affordance

The affordance theory was widely used as a central criterion for children-friendly environment, which can directly describe the interaction between children's behavior and the perceived environment in the framwork of ecological psychology. The concept was developed to understand that the perceptual experience of the environment was fundamentally influenced by functional significance rather than material structures in the environment (Gibson, 1977; Heft, 1988). Since affordance is concerned with the relationship between a person and their surroundings, research participants cannot be separated from their surroundings. The theory of affordance has been largely applied to

environmental preference research for design implications (Hadavi et al., 2015). Research shows natural playgrounds provide higher risky play opportunities (Sandester, 2009), diverse play spaces would encourage children's physical activity (Cosco et al., 2010), and natural elements would stimulate children's cognitive development (Zamani and Moore, 2013). This concept has been also applied to evaluate the criteria for child-friendly environments with two criteria of independent mobility and their play affordances (Kyatt, 2004). The model of four hypothetical types of the outdoor environment through two dimensions is widely used in child-friendly principles (Figure 2.1). The Bullerby type indicates a child-friendly environment, as it provides sufficient possibilities for independent mobility that enable children to discover play affordances in the environment. This type of environment allows a positive interactive cycle between children and the environment. Research showed the Bullerby-type environments negatively decreased while the greenhouse type environments increased with the rising degree of urbanization in the city (Kytta, 2003).

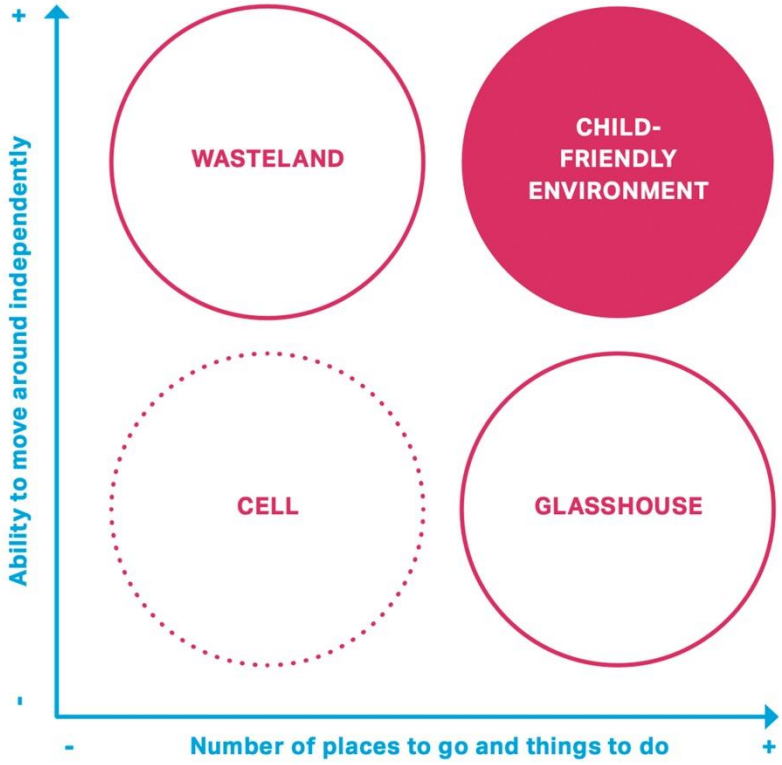


Figure 2.1 Interpretation of Kyttä's matrix of child-friendliness (Source from: Arup, 2017)

Space Syntax

Compared with functional needs of affordance theory, the space syntax has demonstrated the spatial configuration affected human's movement. Space syntax is a set of techniques for analyzing spatial layouts and a range of social, economic and environmental phenomena in building and urban areas (Hillier et al, 1983; Hillier and Hanson, 1984). It uses quantitative analysis and geospatial computer technology to investigate the relationship between spatial configurations and human movement patterns. The set of theories and methods provided by space syntax has been used and developed around the

world in various research areas. Previous studies using the space syntax approach have shown "movement patterns are powerfully shaped by spatial layout" (Hiller et al., 1993) and "buildings can create more interactive organizational cultures" (Peponis et al., 1989). Similar to adults' ways of using urban spaces, previous research indicated that children's movements are constrained by the spatial pattern (Hillier, 2007). Children quickly find the most integrated places to explore when there is no special space provided for them. In the same way, children were observed to stay and play primarily in the most active spaces wherever there were also likely to be significantly more adults in the space (Gehl, 1987).

Children Play on Streets

This perception was different from adults' views of streets as linking spaces, while they were regarded as playgrounds for children (Moore, 1987; Forrest et al., 1997). Residential streets are important as informal play spaces for urban children, where children can play freely and socialise with other children (Moore, 1987; Tranter and Doyle, 1996; Karsten and Vliet, 2006; Malone, 2002). Children used to be observed playing the streets, while research notes street play has almost disappeared in urban environment (Kinoshita, 2008). Current children, on the other hand, have been described as indoor children with restrictions on playing in the streets (Karsten and Vliet, 2006). Thus, research suggests that urban planners and designers need to support children to re-claim the residential streets as important play spaces for children in the city (Tranter and Doyle, 1996; Karsten and Vliet, 2006).

2.4 Changing Chinese Communities

The Community

The definitions of the community were widely discussed. It was viewed as an unfixed structure (Valentine, 2004), also suggested as a child's attachment to places (Visscher and Bie, 2008). They all share the similarity that the concept of community focuses more on social aspects rather than physical spaces. Research has demonstrated the importance and value of children's well-being to play in the community (Ellen and Turner, 2010; Glaster, 2011). It was supported by children's development of their selfhood and independence, as well as learning familiar and strangers through exploration in their communities without parents' supervision (Spilsbury, 2005; Goldfeld et al., 2014). The importance of community play is also recognized as children's development in building trusting relationships through social networking (Groves, 1997). Social networks were important, with their positive correlation to children's outdoor play (Irwin, 2007). Similar research in different contexts has found that a positive association with the community would have long-term benefits for children as they grow up (Edwards and Bromfield, 2009; Prezza and Pacilli, 2007). These studies have examined the value and importance of community play with its positive influence from children's childhood to adulthood. Their strong evidence based on surveys of large samples could provide support for the concept in this research.

The Transition of Chinese Communities

Community typologies in China have changed dramatically over the past sixty years with political and economic changes (Staub and Yu, 2014; Breitung, 2012). Until the 1950s,

most citizens in urban China lived in traditional low-rise courtyard houses that were accessible through a web of alleys (Miao, 2003). Since the 1950s in Maoist China, the state has constructed six to seven-story apartment buildings for workers in state-owned enterprises as a work-unit community (Zhang and Chai, 2014). These units were the basic building blocks and formed the original gated community of pre-reform Chinese cities that were characterised by a high degree of social homogeneity and the proximity of workplaces and residences (Zhang and Chai, 2014). The different work units might differ in status and scales, but they were built with gates and walls, functionally and socially mixed. In recent decades, under the forces of rural-to-urban migration and marketization, a new housing pattern has emerged with commercial gated communities in China. In contrast to the previous urban context, the new residential development is mostly separated from the workplace, and they are distinguished by their social status (Breitung, 2012). With Deng Xiaoping's economic reform initiatives in 1978, large-scale gated communities have been constructed in China during the process of housing marketization (Ma and Wu, 2005; Miao, 2003).

Gated Communities in China

Despite widespread criticism in Western discourse (Miao, 2003), the commercial gated community is widely accepted and even desired by Chinese city dwellers (Breitung, 2012). A more detailed definition of "gated communities" which is more similar to the current type of gated communities in China has been explained in Renaud's research (2015). They were defined as enclosed residential subdivisions with contractual agreements between property developers and homeowners under private operation. Built as morphological enclaves with security features and physical enclosures, they are also designed to prevent others from access. Therefore, gated communities are viewed as security strategies for the residents who seek comfort in social homogeneity. Property rights are implemented in property owners' associations, the private governance structures regulating the selection of residents based on social status, social preferences, or lifestyle.

From the definition above, two main points in this term of Chinese commercial gated communities can be found. One is that the security entrance and boundary exist to restrict public access. The other is that the people within its boundary share similar characteristics such as social status, income, or housing preferences, and are willing to operate their residential surroundings according to their associations to seek their ideal living style. And according to the Chinese context, the selection of residents in gated communities is mainly based on their income because of the development in commercial real estate since 1978 (Miao, 2003). The formation mechanism of gated communities varies a lot depending on the various contexts. In China, although globalization and economic marketing have promoted the prevalence of gated communities, the power of the central government plays an important role in this top-down process (Pow, 2011).

2.5 Chinese Families Life

The one-child policy in China has gradually become a historical phenomenon since it was released in 2016. However, its affection for Chinese family patterns will last for a long time.

Skip-generation Raising

As the first generation of only children in China, some young parents cannot take care of themselves before they can look after their children. Besides, under the circumstances of the high divorce rate in China, it is inevitable to have the trend of "skip-generation raising". According to recent research, Chinese adult children rely heavily on their ageing parents for financial support, as well as household chores and child care (Chen, 2006; Pan, 2002). The dominance of relationships in Chinese families should be considered (Ho, 1998). It has been a Chinese cultural tradition for grandparents to help look after their grandchildren in a three-generation family type since the mid-1950s (Li, 2015). While the phenomenon of intergenerational parenting in Chinese families is not only an inheritance of culture but also a result of dynamic social changes that have occurred over the past decades, including policy changes and rapid urbanization, the one-child policy has also altered urban family life and the way that children grow up. The elderly have been gradually transited to child-centred since the one child-policy in 1979.

The phenomenon of left-behind children under the process of urbanization in China has been addressed in recent research. Those children remain in rural areas with their grandparents or other relatives while their parents leave them all year round to work in urban settings. Unlike in rural China, the situation in urban China could be quite different. named "skip-generation raising" in Chinese, which has been defined as grandparents raising their grandchildren alone or with their parents at least for half a year (Guo, 2014). Young parents in urban areas suffer enormous pressure raised by increased urbanization. It is common for grandparents to help take care of the grandchildren when the parents are searching for a fortune for their careers.

4-2-1 Family Structure

In modern urban China, grandparents raising their grandchildren is a common and normative trend, rather than an individual phenomenon. Although there is a lack of published statistics on the rate and extent to which grandparents actively participate in taking care of their grandchildren in urban China, empirical studies have indicated the high proportion of grandparents who play a pivotal role in providing child care. One study shows that 45.4% of the grandparents from sampled households (N=1627) had been involved in looking after their grandchildren in urban Xiamen (Goh and Kuczynski, 2010). Another study in urban Shanghai also confirmed that more than half of the children had been raised by their grandparents (Wu, 2010). The 4-2-1 phenomenon was unique in China after the strict implementation of the one-child policy. This structure focuses on the kinship that exists rather than the family members within a household (Guo et al., 2002; Song, 2000). It brought many issues to the family, particularly the challenge of taking on the responsibilities of the ageing family by following the Chinese tradition (Jiang et al., 2011; Phillips and Feng, 2015; Zhang et al., 2018).

Parental Safety Consideration

Parental safety considerations are suggested as a prominent reason for the decline in children’s independent mobility and access in these public spaces (Davey, 2008; Valentine

and McKendrck, 1998). There are numerous reasons for this safety fear, which include traffic, strangers, crime, and dogs (Garnarino, 1995; Valentine, 2004). There is a gender difference in these safety concerns: girls are more concerned with strangers, while boys are more concerned with traffic (Mathews, 2003). Recent research continually confirms that parents' perception of the environment positively correlates with children's moderate-vigorous physical activity (Tappe et al., 2013; Carver et al., 2010). Collectively, these studies outline a critical role of increasing parents' safety in their communities to support children's outdoor play in this research.

Academic Burden on Children

The country provides nine years of compulsory education, after which it becomes very competitive to enter high school. The inequity of educational resources, resulting from the Hukou system and school-district houses, has stirred anxiety among parents. Thus, it leads to great academic pressure on students and financial pressure on parents. This heavy academic pressure has lasted several decades and resulted in a lack of sleep, poor physical health and even social disorder among children (Sun et al., 2012; Lin and Chen, 1995). Aiming to effectively reduce academic pressure, the country is now carrying out a national strategy to prevent excessive homework and prohibit conducting training on holidays from August 2021.

2.6 Dimensions of Children's Outdoor Play

Children's Home Range

Before the term home range, children's physical and cognitive accessibility of the environment, which relates to children's perception, cognition and use of the environment (Carr and Lynch, 1968; Van Vliet, 1983). Originated from the field of environmental psychology, the concept of home range is generally understood as the encounters of children's environments outside home. The home range was regarded as a crucial consideration in children's research that parents' restrictions could be avoided in children's outdoor play (Hole and Miller, 1966), more likely a negoation between parents and children (Hart, 1979). It is associated with children's perception of territoriality (Anderson and Tindal, 1972), and is suggested as the distance children travel to play from their home (Matthews, 1992). Related to the frequency of children used in these spaces, the home range was suggested in three terms of habitual, frequent and occasional range (Moore and Young, 1978). As a meta-analysis, the three terms of home-range concepts well illustrated the spatial and temporal character of children's outdoor environment experience (Gaster, 1995). The concept of home range deserves attention as it was frequently used to raise the concern of decreasing in children's exposure to diversity of outdoor environment (Carr and Lynch, 1968).

Empirical Research on Home Range

Previous research shows there was no difference between children's home range and gender before the age of seven (Matthews, 1987; Moore and Young, 1978). Then the home range area could be increased by ten times, as well as the increase in travelling distance (Anderson and Tindal, 1972 and Matthews, 1987). Urban children were found to visit more

places, compared to rural children, who tended to have a further travel distance from their home range (Anderson and Tindal, 1972). Research shows that children living in the old parts of the city tend to have more environmental diversity than in new-developed areas (Moore, 1986). Some research suggested there was no gender difference in children's identified places of the home range (Moore, 1978; Millward, 1989). Whereas, boys' home range was found to be greater than girls' after the age of eight (Matthews,1987). The gender difference also exists in teenagers' perception of the home range, with boys more interested in challenging outdoor spaces (Owens, 1988). Together, these studies indicate that children's home range might relate to children's age, gender and the location of their homes.

Children's Independent Mobility

The concept of children's independent mobility was commonly described as children's freedom to travel around their neighbourhood unaccompanied by an adult (Tranter and Whitelegg, 1994). It reflects parents' allowance and children's ability to cope safely outside without adults' supervision (Hillman et al., 1990). Children's independent mobility includes children travelling alone or accompanied by other children. It should be understood that the multiple purposes of this ability could not be limited to play, but also travel to other destinations throughout their communities. Children's independent mobility has been widely accepted in the field of human geography research and in child-friendly cities by providing safety and accessibility in urban environments for children. However, this concept has been criticized as research should focus on the various relationships between companions that children's mobility involves (Mikkelsen and Christensen, 2009). Although it is a personal preference to be independent, they inherit safety perceptions of the external environment from their families. In addition, parents can take children to some places which remain inaccessible for children by themselves (Handy et al., 2005). Nevertheless, the research focus on independent mobility normally concerns the degree of children's ability to move around in an urban environment without parental supervision and the benefits that come from this.

The Importance of Children's Independent Mobility

A large body of literature has identified the benefits of children's independent mobility. Independent mobility was regarded as an essential element of children's integrated personality, that children need this ability to enter public spaces for play and socializing (Duhl, 1963; Jacobs, 1964). The research shows interest in finding that proximity in public space is important in promoting childhood friendships when uncompanioned with parents (Hole, 1966; Opie and Opie, 1969). Besides, children's independent mobility is a key role in developing a sense of identity, self-esteem, creativity and taking responsivity for oneself (Noschis, 1992, Kegerreis, 1993). However, children were found to gradually lose their independent mobility due to increasing traffic and parents' safety considerations (Valentine and McKendrick, 1997; Cahill, 1990). The implications of the findings from these earlier studies regarding children's independence and mobility for outdoor play have translated into calls for change in child-friendly policies.

Factors Associated with Play

Children will experience various physical environments and social environments during their growth process. It has been suggested that children's outdoor play environments consist of four elements: a place to play, time to play, friends to play with and what children actually do (the activity or play). These elements were further developed to analyse children's outdoor play in a post disaster context resulting in the SPIT model suggesting that children's outdoor play requires Space, People, Interventions and Time and that these dimensions can either support or limit children's outdoor play (Woolley and Kinoshita, 2015). This model will be used within the thesis to help understand some of the situation for children's outdoor play in China.

2.7 Research Gap

Taken together, the studies of children's outdoor play undertaken in different cities and generations support the notion that children's play behaviours are influenced by the built environment. The research in children's geography reflects upon the nature of difference and pays attention to younger people's spatiality. Reviewing this literature offers a variety of mediators and broad contemporary contexts that should be considered in this research topic. Moreover, it is worth paying attention to academic areas with children's specific requirements and their abilities, as they are a significant component of society. Empirical research also suggests the historical and autobiographic approach in generational studies, suggesting that much of the research is based on oral histories, archive research, and observations. However, there are relatively few historical studies in the area of children's outdoor play in terms of the changing urban context in Chinese cities. Due to the developing nature of children's research, the studies conducted are often small groups of interviews, childhood memories, and children's drawings (Chawla, 2002; Woolley and Griffin, 2015). Although these studies are normally conducted through a descriptive qualitative approach, they show great value in detailed data that policymakers and planners would not normally spend time collecting children in the same way the researchers did. Previous research also shows that raising children's voices has social significance, as children are rarely mentioned in academic and political situations.

As reviewed above, a fair amount of research has been conducted for a better understanding of the changes in children's outdoor play grow up in urbanized cities. The broad research in children's geography faces the challenge of raising similar concerns, using similar sources, and making similar conclusions (Horton et al., 2008). However, there was limited literature available in the Chinese context. The research on children's play in Chinese cities is just beginning, with small research focused on nature education in playgrounds (Wang et al., 2018) and the intergenerational difference in recreation preferences in parks (Dong et al., 2014). They fail to take the city as a whole and the importance of informal play in childhood. Besides, Chinese planners and designers must move away from an approach to play provision that relies on building playgrounds only, which has little potential for the city to provide a safe, playable and sociable environment for children.

In response, this study applies the previous conceptual framework of home range, affordance theory, independent mobility and SPIT model to the Chinese context. A

comprehensive study had been conducted with a large sample of surveys and detailed descriptions in qualitative methods. During the past decades, Chinese citizens have witnessed dramatic changes in their physical environment, social context and related policies under the process of urban development. This research has focused on the interactions between children and the rapidly changing environment by examining the cross-generational childhood play experience. It gives a deeper understanding of play from different dimensions by functionally and spatially evaluating how outdoor play is affected by a range of physical, social, cultural, economic and political factors.

Chapter 3: Research Design and Methodology

This chapter provides the conceptual and theoretical underpinning for the methodological approach, the specifics of the research methods implemented in the cross-generational study and the community study, and then it presents the research design. The literature review in chapter two revealed the importance of play for children's development and the factors that affect children's outdoor play drawing from the physical environment, social networks, family influence, and cultural contexts. To achieve the research aims, a comprehensive approach was required by the measurement of the cross-generational difference as well as providing a detailed understanding of childhood outdoor play. A mixed-method study design was employed, specifically, a quantitative survey conducted across three generations resident in Wuhan followed by qualitative focus groups grew up in different types of communities comprising individuals who had participated in the survey.

3.1 Conceptual Framework

Worldwide studies provide a better understanding of how changing urban environments affect children's outdoor play in terms of space, companions, activities, and time. Parents' safety considerations of the physical environment and social context significantly influence children's independent play, and children's outdoor play behaviours might be different by their age, gender, and the built environment.

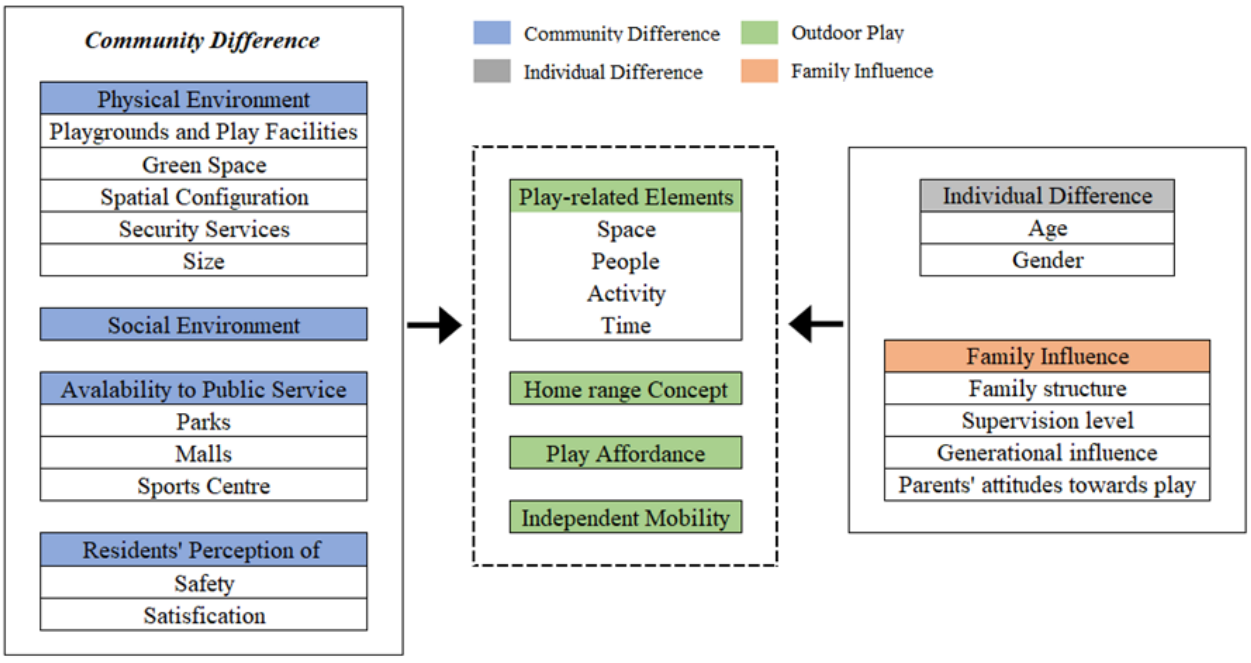


Figure 3.1 Conceptual framework for children's outdoor play in communities (Source: Sketched by the author)

3.2 Research Aims and Objectives

Research Aims:
The aim of this research is to develop an understanding of the changes in childhood outdoor play experiences across three generations in different types of Chinese communities. The findings will be used to link to the child-friendly city principles to make suggestions for Chinese policies and principles in future housing settlements to encourage and improve children's outdoor play in communities.

Hypothesis:
As a result of the rapid, increasing and ongoing urbanization of Chinese cities, children have less space, time and companions for play than their parents and grandparents did. Current children also have less contact with nature than these previous generations in their communities as a result of urbanization. These changes in children's play are due to the following reasons:
-Children's lifestyle has changed by technological progress with the increasing air-condition, electronic products, vehicles over time.
-Children's home range and playing time has been reduced with the changes in physical attributes and environment around them, such as increasing traffic and air pollution.
-Children have fewer companions for play with the changes of social structure and network over time.
-Children's outdoor play experiences have been influenced by policy changes.

In order to test these hypotheses, the following research questions will be addressed.

Research Questions:
RQ1. How has children's outdoor play experience changed over three generations in Chinese communities?
RQ2. How are such changes different between different types of communities?
RQ3. How has the transition of surrounding physical attributes and environment influenced cross-generational children's outdoor play experiences over time?
RQ4. What are the linkages between the changes of cross-generational children's play experiences and the social structure and network?
RQ5. How have policy changes influenced cross-generational children's outdoor play experiences over time?

3.3 Research Methods

This research aims to examine the temporal trends of children's outdoor play experiences with the process of urbanization in the past decades. Considering the very limited historical data available on children's daily lives, the retrospective survey is a widely used technique to study childhood experiences (Batcho et al., 2011; Clements, 2004; Smith and Lillard, 2012). Although there were challenges in the accuracy of memories with self-reported questionnaires, studies showed good reliability for most childhood experiences (Hardt and

Rutter, 2006). Interviews were commonly used in generational research of childhood play experiences by parents and grandparents (Karsten, 2006; Woolley and Griffin, 2014; Skar and Krogh, 2009). Still, the potential of misremembering by adults was questioned, as the descriptions of childhood memories contain a high degree of emotions (Jones, 2003). These limitations may be reduced by carefully designing questions and skilful interviewing (Soga et al., 2018; Karsten, 2006). Besides, supported materials were suggested in inter-generational research to compare the findings extracted from the iparticipants' responses, such as local historical maps, archive research and statistical analyses of historical data (Karsten, 2006; Woolley and Griffin, 2014; Kinoshita, 2009).

With special ethics considerations, research design, and methods, child-centered research can be complicated and challenging (Morrow and Richards, 1996; Punch, 2002).For a long time, children have not been a principal focus of academic research, and their experiences are usually reported by their parents (Clements, 2004; Bringolf-Isler, 2010). Children, as social actors, should be engaged in the related research and planning process (Lynch, 1960). The growing interest in child-centered research has contributed to the development of a growing body of interdisciplinary research methods. A variety of methods were employed in child-centered research, including questionnaires, interviews, mapping, diaries, and photographs. Interviews have long been the central method to interpret children's perceptions and experiences, and they have been successfully conducted with school-aged children (Shaffer et al., 2000; Rebok et al., 2001). Go-along interviews allow researchers to examine participants' experiences within the environment in urban spaces (Lynch, 1960; Kusenbach, 2003; Evans and Jones, 2019), as well as reflect the social relations in the communities (Finlay et al., 2015). Children participated go-along interview was a successful qualitative approach to investigate children's physical activities in outdoor environments (Karsten, 2006), and it was suggested to incorporate the focus groups of children with go-along interviews to generate group discussions at a site (Carpiano, 2009; Pawlowski et al., 2016). Data collection occurred through multiple methods like observations, behavior mappings, photo and children's drawings, which are also recommended for research in children's outdoor play (Cullen, 1993; Malone and Tranter, 2003). Observation tools, including the system for observing play and leisure activities (SOPLAY), systems for observing play and active recreation in communities (SOPARC), and the child activity rating scale (CARS), have been developed and applied in children's research to obtain objective data on children's physical activities in outdoor spaces (Mckenzie et al., 2000; Mckenzie et al., 2006; Puhl et al., 1990; Cosco et al., 2010).

With the consideration of children's cognitive ability to process and respond to structured questions about their behaviours, perceptions and opinions, children are often excluded from large-scale quantitative research (Scott, 2000). However, research in medical and

psychological evidence suggests children's responses are reliable and valid (Spencer and Flin, 1990; Kowalski et al., 1007; Treuth et al., 2005), and there is a strong consistency between children's self-reports and parallel ratings by mothers and teachers (Measelle et al., 1998). Besides, reliability can be increased by skilful questions (Spencer and Flin, 1990), and the clarity of questions influences the quality of the data (De Leeuw and Otter, 1995). For many areas of children's research, it is desirable to gather information from multiple sources to avoid the bias of one method (Tein et al., 1994; Karsten, 2006). School-aged children were able to give articulate and informative responses to questions about their own experience and knowledge in recent times (Amato and Ochiltree, 1987). Child-friendly and innovative techniques are needed to communicate with children, such as, sufficiently simple languages, colourful images and video to engage children's interest in research (Punch, 2006; Scott, 2012).

Although child-friend cities have been implanted in several cities in China, there are very limited materials that directly address the play experience of childhood in China. This research used a mixed-method approach to combine a variety of research tools to arrive at a comprehensive understanding of cross-generational changes in childhood experience (Bryman, 2008). When children play, they are engaging in a complex process that affects all aspects of the content of their play. A quantitative approach was employed to access the demographic data of the participants, while the process of children interacting in outdoor play relied mainly on observation and in-depth interviewing. Quantitative data is primarily presented in this research to evaluate the changes in childhood outdoor play by generation, community type and other factors. The interviews were conducted to compare the quantitative and qualitative findings in aggregate and make the survey data more robust. In addition, the use of qualitative interviews and behaviour mapping can compensate for the limitations of the quantitative approach. The methods are presented in the order of the stages in which they were conducted in the fieldwork.

Questionnaire

Self-questionnaire is one of the main instruments for gathering data using a social survey design with its advantage of economic and effective administration (Bryman, 2012). This research is based on a large set of questionnaires completed by people from three generations and children participants will engage in this research method. Although the low reliability of survey data from child participants has been argued, it has also been suggested that children can provide more reliable responses as they grow older (Borgers et al, 2003; Holiaday et al, 1989). The age of 7 is a major turning point in the development of children's cognitive ability (Piaget, 1929; Bogers et al, 2003; Leeuw et al, 2003) and is considered the age at which they can provide reliable data. Considering this, this study focuses on school-aged children from 7 to 12 years old, whose cognitive ability is sufficiently developed and language skill is well expanded.

The main objective of this method was to identify the differences regarding childhood outdoor play by generation, community type and other related indicators. This research takes the mechanisms of nuts and bolts as philosophy to use elementary units of

individual's life experience to explain complex social phenomena of cross-generational difference in childhood outdoor play (Elster, 1989; Blauug and Mark, 1992; Hollis, 1994). It used an experimental research design by complying with three separate questionnaires for each generation that differed in terms of question structure and wording. The questionnaires designed for child participants were suggested to be simple and short (Ancold et al, 1995; Bickman and Rog, 2008); including child-friendly illustrations with colours and cartoons to hold children's attention (Ryan and Schwartz, 1956; Barker and Weller, 2003). Similar to the children's questionnaire, this research kept the grandparents' questionnaire as short as possible.

In the questionnaires, respondents were asked questions relating to three aspects. First, exploring the participants' childhood outdoor play experience in their daily life, personal information was obtained by asking their age, gender, community and family members they grew up with. Second, play related questions were asked to indicate where they played, with whom they played, what they played and the frequency and duration of outdoor play. Following this, the participants were asked to explain their attitudes towards outdoor play and their community environment. The questionnaire also included open-ended questions in the survey to improve enlightening.

Semi-structured Interviews

The aim of this research was to explore the generational changes in childhood outdoor play, that participants from different generations were invited to share their childhood play experience. In-depth interviews were then carried out with a sample of adults and children who had signed in their questionnaire responses that they were willing to be interviewed. Semi-structured interviews were chosen to ensure the cross-case comparability and address specific issues on their play experience (Kallio et al., 2016; Mclntosh and Morse, 2015).
Interviews were undertaken separately with children, parents and grandparents to get a deep understanding of the childhood experiences from each generation. The main content of the interview consisted of rich and detailed information about the participants' childhood outdoor play, their impressions of their play environment, and their hopes and fears for future children related to outdoor play. Participants from three generations were targeted to conduct with prospective residents who grew up in a particular community.

Child-led Walks

Child-led walks have been tested as an effective tool for engaging children in environmental features and for revealing their outdoor play experience (Loebach and Gilliland, 2010; Hecke et al, 2015; Veitch et al, 2020). It allows the researchers to directly observe children's mobility patterns and creates an interplay between the researcher, the participants and the outdoor environment. Which can help identify the significant places for children and prompt in-depth discussion about their play in the community. To conduct this method, children were asked to lead a walk of their frequently visited places in their community, while the researcher tracked the routes on maps and recorded the ongoing dialogue. In the latter child-led walks, children were asked what they wanted to improve in their community.

Observation and Behavior Mapping

Observation and behaviour mapping were widely used in children's research associated with outdoor environments (Cosco et al, 2010; Moore et al, 2010; Cox et al, 2018). Outdoor spaces in communities possibly can be the most common built environment experienced by children. Undertaking observation and behaviour mapping will improve the understanding of links between outdoor environments and children's play behaviours. One day observations from 8:00 to 21:00 were conducted and recorded with the format of system for observing play and leisure activity in youth (SOPLAY) in each of the studies. There is a growth of interest in the use of visual materials (Bryman, 2012), graphical materials were advocated in children's research (Chawla, 2002).

3.4 Study Design

This study contains three phases, the initial context study, the questionnaires, interviews and mapping children's play behaviours in selected communities. The research initiatives undertaken was to investigate the urbanisation process during the past decades, which would be helpful to select the case study areas and explain its impact on the changes of childhood outdoor play over time. The second phase applied the learning from the literature review to design and collect questionnaires for three generations. The third phase examined children's interaction with the outdoor environment in different types of communities. The research design approaches combine both quantitative and qualitative research. The mixed methods of questionnaires, semi-interviews, and behaviour mapping work together to answer research questions for cross-sectional, longitudinal, and comparative research designs.

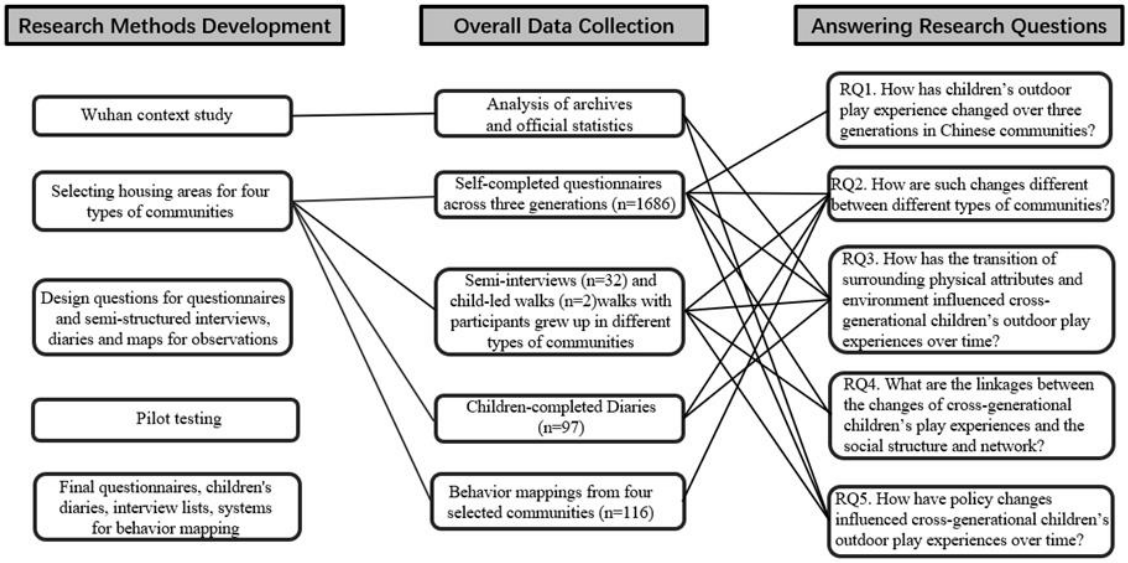


Figure 3.2 Reserch design outlined for this study (Source: Sketched by the author)

Context Study of Wuhan

As the largest city in Central China, Wuhan experienced rapid urbanization over recent decades. Although a considerable amount of literature has been published on urbanization

and children in China, they are mainly concerned with the social issues of left-behind children and the education of migrant children. There is little published data on the association between urbanization and children's outdoor play in Wuhan, and even in China. The context study was designed to contextualize the transition of the city during the urbanization process and its impact on childhood outdoor play.

The transition and typology of Chinese communities have been reviewed in chapter two. Following the selection criteria, the community types studied in Wuhan were chosen as urban villages, communities in old towns, work-unit communities and commercial gated communities. The selection process of the study sites, the history and features of each community will be reported in chapter 5. The secondary analysis of official statistics, old maps and documents will be used to identify the transition of the city over the past decades.

Cross-generational Study

This study integrated the questionnaire and interviews for each generation, the school-aged children, their parents and grandparents. A pilot study was conducted in November 2017 to determine how well the research instruments worked. The first wave of recruitment for questionnaires and interviews were conducted in March 2018. There was a difficulty of access and sampling issues in recruiting participants from specific community types in the centre of Wuhan. The main fieldwork two was undertaken in October 2018 to recruit participants particularly from the work-unit communities and urban villages.

The interviews were originally designed for participants who completed questionnaires as well as were willing to be interviewed in their community. Therefore, the research messaged around 20 children's parents selected from the questionnaires. The message described the content of the interview questions and how they would be conducted with other children. This strategy was not successful, only 2 parents replied that they would like to be interviewed and both of them cancelled on the day scheduled for the interview. Then the researcher found that it worked well simply to walk around in the selected community and ask children and their parents' consent for interviews on the site.

Community Study

In order to find how the outdoor environment supports children's play in the community, observations had been conducted for suggestions in future design and planning in the community. Regular times for observations of the children's behaviour in the community were set, children and their families were invited for interviews and engaged in conversations. Non-participating observations and interviews were carried out on the site. In addition to interviews, children's and adults' activities were observed and recorded. Child-led walks were conducted to identify the children's play spaces and travelling routes. During the process of the go-along interviews and child-led walks, the researcher took maps and made field notes to record the information. With the agreement of the participants, audio recording and photography of specific spaces were undertaken in order to collect the data.

This study was undertaken by focusing on the current children's outdoor play in different types of communities. The transition of the social network associated with children's

outdoor play in the communities across three generations was obviously identified from the questionnaires and interviews. With the indifference of such social connection in today's community, this study will focus on the physical environment and its relationship with children's outdoor play.

Experts' Views
Landscape experts who are involved in the design and planning process of outdoor environments in communities would be also invited in this study to find how the guidance and policies changes and how they influenced the outdoor environment design in communities over time. Besides, the staff of property management in communities of Dongyuan Estate from both Wuhan and Chongqing were interviewed to evaluate play facilities performance on children's outdoor play.

3.5 Recruitment of Participants

This research aims to be able to generalize the findings of the changing childhood outdoor play experience across three generations in central Wuhan. It is important to derive a probability sample to keep sampling error to a minimum and to be as representative as possible of all children in each of the selected age cohorts. The target child population for this study was considered as school-aged children aged 6 to 12. Considering there is no public official document stating the age distribution of the children's population and it is a large city with a widely dispersed population, it is desirable to use the clustering sample (Bryman, 2015).

Sampling of contexts
It is reasonable to select Wuhan as a site for the examination of childhood outdoor play under the process of urbanization with the high urbanization rate and the increasing expansion pattern in the city. Then four residential communities were chosen in the centre of Wuhan as study sites, whose residents had a different socioeconomic background. Each community is an exemplifying case in its community type with different physical attributes and social networks. This will be reported in detail in the following chapter 4.

Sampling Participants
Current children in China are protected by their parents and grandparents, thus it could be extremely difficult to access the children directly as a stranger. This research used mixed modes of administration for survey participants. Experiments with different modes of administration were tested in the pilot study.

Accessing Participants for Questionnaires
In a gated community in China, property management helps with the maintenance of the community. It was desirable to recruit residents from the property management in the selected community. Since there were no commercial benefits in turn to the property management, this strategy was not successful due to the inactive participation from the staff.

Table 3.1 Mixed modes of survey administration

Mode	Evaluation
Property Management	Rejected.
Neighbourhood Committee	Rejected. Time-consuming and low validity.
Manual Distribution	Rejected. Time-consuming and involved ethical consideration.
Primary School	Accepted. High response rates and effectiveness.

Neighbourhood Committee, well known as "juweihui" in Chinese, is the lowest level of government in charge of civil affairs and social service. Distributing a large survey through the neighbourhood committee has been widely used in social research in the Chinese context, especially in recruiting residents from the old town and urban villages. Staff working in the neighbourhood committee were contacted to help to collect questionnaires from residents in the old town in the pilot study. Six months later, only 45 copies of questionnaires were collected and most of the answers were invalid and incomplete. The staff also rejected a future interview in the community due to the demolition affairs between the residents and the government at that time.

While waiting for the help of these administrations, a manual distribution and collection box was set at the entrance of the community with the permission of property management. Although residents were likely to take a copy of questionnaires away, not many were returned to the collection box. Then the researcher asked a familiar resident to start from their children and then asked her to introduce other families they knew with school-aged children in the community. As the contacts developed, I visited a small number of households on a regular basis. And sometimes, the researcher needed to wait in the households for the children to complete the questionnaire. This strategy was rejected again because it was time-consuming and because of safety consideration of the researcher herself, staying in the households.

A very good response rate of 82.1% was obtained with the help of the teachers in a primary school. The completed answers and rich information in the open questions enabled the validity and stability of the respondents. Thus, this research was helped by the primary schools collecting questionnaires. This is not suggesting that accessing children from schools is somehow exemplary or representative for data collection, but it exhibits desirable qualities of participants' responses in terms of accessing children in this research.

Accessing Participants for Interview

As previously stated, the researcher failed to recruit participants for interviews from the previous step of the questionnaire. In this research, there were 12 categories of participants to be interviewed in two levels of sampling of context (four types of communities) and then of participants (three generations). With the difficulty of conducting survey research in a particular community like the work-unit community, the snowball sampling technique was employed in order to interview more participants who grew up in the work-unit community.

Accessing communities for Observation and Behaviour Mapping

Sometimes, accessing communities, especially gated communities, can be very difficult in

China with its strict security entrance. Thus, there are two ways to access the communities in this research: by knowing someone who lives in the community or by getting permission from the property management centre or reception. However, driving a car for entering the gated community is much easier in real life.

3.6 Sampling and Sample Size

The question relates to the size of the sample "How large should the sample be?" has been asked a thousand times when doing this research. For quantitative research, the sample should have enough participants to detect statistically significant differences between groups (Pallant, 2016). The increase in the numbers of a sample can increase the statistical precision. However, this is a time-limited research project conducted in a large city with very limited resources. A very large sample does not outweigh the cost. In previous research, a probability sample of 1,000 individuals could be valid for quantitative research (Bryman, 2015). The sample size formula gives an ideal sample size of 1067 with a total population of 10,892,900 (Wuhan census, 2018), the required margin of error of 3% and a confidence level of 95%. A sample size of 1,200 was chosen as it provides a sufficient sample for undertaking detailed analyses and could be equally divided into each sub-group.

In order to be able to generalize the findings from the sample to the population from which it was selected, the samples must be probability samples. A multi-stage cluster sampling was employed with random selection in four primary schools. The four primary schools were purposely selected because they were located in different housing areas. According to the policy of the school district houses, most of the students in these schools could be clearly identified for which type of communities they come from. Following the local school districts, these schools were located in four types of communities. The child participants were invited to take three copies of questionnaires with attached information sheets and consent forms back home.

Sample Size and Saturation

In qualitative research, grounded theory advocates the sample to be relevant to the research questions and able to test the emerging theoretical ideas (Charmaz, 2006). This research continued to collect data, including collecting documents, interviewing, and observing through theoretical sampling until new data no longer stimulated new theoretical understandings. The minimum number of interviews required was between twenty and thirty in published qualitative interviews (Warren, 2002). Similarly, when evaluating the data after completing interviews with every six children from four selected communities in this research, it reached theoretical saturation and no additional interviews were necessary. Besides, the open questions from the questionnaires provide abundant qualitative data in making comparisons between multiple groups.

Process of Sampling

There are two phases of conducting sampling in qualitative data in this research. A total of 34 participants took part in the interviews about their childhood play experiences. The

sampling process has to do with the selection of units (Yin, 2009), categorised by their gender, age group, generations, and types of communities they grew up in.

This research selected four residential community types in central Wuhan, whose residents had different combinations of the physical environment and social mix. Before 2018, it was very challenging to find study sites for Danwei since the previously selected two communities were all under demolition. In order to answer research question 2, interviews were added to collect data from Danwei in phase 1. Snowball sampling was used to recruit participants who grew up in Red Steel City as selected areas for Danwei in November 2017.

Finally, the researcher was able to collect questionnaires from four different residential areas by October 2018. Phase 2 sought to sample typical cases that exemplify a dimension of interest in their childhood outdoor play by selecting participants from questionnaires. Taking part in the interviews of childhood outdoor play experiences was an optional activity for participants, and approximately 30 people from GH Primary Schools expressed a desire to be interviewed. After sending messages to make an appointment for interviews, three participants replied "yes," but only one boy attended on the arranged day. After that, the researchers used stratified purposive sampling to select representative children for interviews from the four selected communities rather than participants who completed the questionnaires.

Table 3.2 Sampling process and recruited participants for interviews

Methods	**Community Types**	**N**			**Total**
		Children	Parents	Grandparents	
Phase 1 (2018.01-2018.03)					
Interviews	Urban Village	-	1	1	13
	Old Town	-	1	-	
	Danwei	-	4	6	
Phase 2 (2018.07-2018.10)					
Child-led Walks	Urban Village	5	-	-	21
	Old Town	5	-	-	
Interviews	Danwei	5	-	-	
	CGC	6	-	-	

3.7 Measurement of Outcomes

Data was collected from three generations of four different types of communities. Collected paper questionnaires were manually coded into SPSS 25 and Nvivo 12. Though manual input and data-processing cost an amount of time, it enables the reliability and validity of the questionnaires to get rid of invalid respondents with a series of checks by the researcher. There are a few studies on this topic through a quantitative approach, self-designed questionnaires have been employed after examining children's questionnaires in other researchers. The questions had been pre-tested and revised many times before distribution in the main study.

Play Relatedness Questions

The following SPAT model will be used to describe the changes of childhood outdoor play with spaces to play, people to play with, activities to play and time they spent on playing outside in chapter 5. The SPAT model is developed from a SPIT (Space, People, Interventions and Time) model to study children's outdoor play in a post-disaster situation (Woolley and Kinoshita, 2014). Since this research is not taken in an extreme situation, we choose Activity instead of Interventions to understand children's outdoor play in their daily life. The playtime and distance travelling to play were measured as an accurate range of dimensions. The play spaces and play activities were generated as fixed-choice answers from open questions tested in the pilot study.

Attitudes Towards Community

Similar to other research (Pallant, 2016), children found it difficult to process a rating scale. For children's evaluation on the safety, satisfaction and preference of the environment in the community, yes, no and why were provided in the questionnaire. While for the parents' and the grandparents' questionnaires, a five-point Likert scale was employed. The open questions in the questionnaire were coded and analyzed following the strategy of grounded theory (Charmaz, 2014).

Data in Behaviour Mapping

Space syntax was employed to explore the association between children's play activity and the built environment in the community. Correlation tests between the number of observed participants and integration value were widely used to investigate the role of spatial configuration on people's behaviour (Hillier, 1992 and Liu et al, 2012). Space syntax has the capability to explain the pedestrian movement, safety, and sense of place relying on the spatial configuration of communities.

Coding and Thematic Analysis

The coding process began at a relatively early stage after the transcription and translation of the initial data collected from the first site in early 2018. Grounded theory was implemented to conduct a line-by-line analysis of the interview transcripts to generate a huge number of initial codes. Then the vast array of codes was reduced to themes that helped to understand the data and produce concepts. Each of these concepts had distinctive attributes or dimensions. To saturate the concepts, new data were collected from three

different sites. The same data-collection approach was taken to constantly compare with the first site until no new concepts were generated. This process reinforces the concepts and produces a categorization of children's outdoor play experience across the four types of communities. Then thematic analysis was applied to extract core themes by repeatedly examining the focused coding.

3.8 Evaluation Approach

Pilot Study

The access and sampling issues were considered in an early stage and a pilot study was conducted to test the research methods in November 2017. This helped to identify problems and develop the final questionnaire to ensure the survey questions operate well and particularly relate to the research questions. Before administering a self-completion questionnaire and interview to the participants, questions were pre-tested with a small set of respondents from three generations. The character of the questionnaire for each generation has been identified. Children lose interest in completing a long questionnaire, so the questionnaire for children was kept simple and short. The parents' generation is more willing to express their opinions on the community, therefore, most open-questions have included the parents' generation. Grandparents preferred closed questions; open questions have been generated to the maximum extent in the final version of the grandparent's questionnaire.

Questionnaires

A total of 1,688 participants completed the questionnaires. This research takes the sample characteristics to reflect the entire population in terms of gender, age and social-economic status. There are lots of good features about this sample, it included a range of people from school-aged children, their parents and grandparents. Second, it has a very good response rate, which is representative of the target population with a high level of cooperation from school staff and participants. It is difficult to remove bias altogether, while this research has made best efforts to ensure that steps are taken to keep bias to an absolute minimum.

Interviews

Two groups of children participated in the child-led walks in urban villages and old towns, other children were involved in a personal interview on the site. For adult participants, three walk-along interviews were conducted in the selected work-unit community. The other participants were engaged in face to face interviews in the café or telephone interview. The only focus group took part with the interview of groups of experts on the design and planning for children's outdoor places in the community. During the process of the professional interview in the landscape aspect, they naturally talked about their childhood play experience.

As the most widely employed method in qualitative research, the flexibility of the interviews in this research makes it very attractive. Beginning as a stranger, full and clear explanations were made about the aims of this research and what I was hoping for helped to put the participants at ease. The participants were invariably more relaxed when

beginning to sketch in details of the participants' childhood play and they became pleased after being interviewed.

Observation and Behaviour Mapping

From the observation, a great deal of variety in the patterns of interaction among children has been identified from different types of communities. Introducing the space syntax theory and narrowing down the focus of the mapping to the association between physical configuration, children's behaviour and function in the space worked well in this research. The use of behaviour mapping also provided an opportunity for discussion on the landscape elements in the site.

The Strengths and Weaknesses

Taking advantage of effectiveness by conducting questionnaires in this time-limited research, it provides a high level of generalizability and reliability in representing citizens' childhood play experiences among three generations in Wuhan. The good statistical significance indicates the scientific evidence of generational differences in childhood outdoor play. It was not possible to explore participants' beliefs and values about their childhood outdoor play. The semi-structured interviews give an open mind about the contours of the generational changes in childhood play. Meanwhile, the list of questions covered in the semi-structured interviews allows the conversations to focus on specific topics and be comparable among different age groups of participants. Followed by the questionnaires, the child-led walks, observations and behavior mappings in selected communities give a better understanding of the interaction between children and the environment in real life. Collectively, these research methods collectively constructed the details, thoroughness, and validity of the generational changes in childhood outdoor play under urbanization.

3.9 Ethics Considerations

This research was approved by the Department of Landscape Research Ethics Panel (Reference Number 014002 and 017356). Ethical consideration was undertaken at all stages of the research process.

Consent with Children

Before access to the children, arrangements had been made by the gatekeepers such as primary schools, property management and children's parents or family. Then children were asked whether they wished to participate in this research. The information sheets and consent forms for each level of authority are presented in Appendix B.

Anonymity and Confidentiality

In order to maintain the privacy and confidentiality of the participants, all individuals were coded with an ordered number and related information with the community, age, and generation. For example, "HQ7B11P" stands for a parent of a 7 years old boy who lived in

Huaqiao Community. Most of the participants were only involved once in this research and so the participants' name was not obtained. Some of the participants left their names and telephone number for future interviews, their confidentiality was carefully considered at all stages of the research. The children's faces will not be shown and identified in the visual data of this research.

Safety Consideration of the Researcher

Conducting research in public space was regarded as very safe in urban China. However, accessing closed settings is different. The researcher experienced staying in the participants' homes for a while in order to collect questionnaires. This phenomenon should be avoided with safety considerations.

In summary, the research was able to arrive at a more complete account of the mixed methods than obtained by either a quantitative or a qualitative research approach alone. The findings will be presented in terms of substantive issues in the following chapters by thinking of the quantitative and the qualitative findings thematically.

Chapter 4: Wuhan Context

As briefly established in chapter 2, children's outdoor play is influenced by the physical and social environment in the city. During the past five decades, China has witnessed strong urbanization with accelerating urban construction and a large area of urban expansion. It results in dramatic changes in physical attributes, social context, and lifestyles in children's daily lives. Meanwhile, the implementation of the one-child policy leads to the family spending more resources, in terms of time and money, on their only child, especially in cities where the one-child policy was much more regulated and enforced. This research believes strongly in the importance of the diverse affordances provided in the city rather than just playgrounds and aims to reconcile the physical attributes and social context to create a safe environment to encourage children's outdoor play. It contextualizes the recent decades' promotion of urbanization in Wuhan as an important factor to influence children's outdoor play. This chapter introduces the background of Wuhan and provides a special collection of urban construction showcasing the transition of lakes and urban parks as destinations for citizens' recreation based on the analysis from archives and statistics reports. It also presents the transition of communities in the city and the selection of the communities involved in this research for observations.

4.1 The Case Study City: The Great Wuhan

Lying at the very heart of China, Wuhan is roughly equidistant from the key cities of Beijing and Guangzhou on a north-south axis and forms a vital link between Shanghai and Chongqing on the east-west line. As the capital city of Hubei province, Wuhan has evolved from the three old towns of Wuchang, Hankou and Hanyang in 1926, which are located at the intersection of the Yangtze River and the Han River. Wuchang was the oldest official administration and now serves as both the administrative and the cultural centre of both Wuhan city and Hubei province. Hankou was one of the first Chinese cities opened to foreign trade in 1861 and gradually developed as the most thriving business sector in Wuhan. Hanyang was a key arsenal city and became the first Chinese modern iron and steelwork site in the early 1900s. It is now an industrial area for automobile manufacture.

The triple town of Wuhan has a geographical centrality that gives its site immense strategic and commercial significance. Sun Yat-Sen envisioned that Wuhan would be the centre of China's railway system and become one of the most important cities in the nation and the world. He wished Wuhan could be developed to a similar size as New York and London. Historically, Wuhan was described as the "centre of the whole empire", and the place from which it is easiest to keep communication with the rest of the provinces (Rowe, 1984). It is not only a historic and cultural city but also a regional economic, transportation, and educational centre. Wuhan played an important role in history, and it was comparable to Beijing and Shang in manufacturing and educational development in the early 1900s (Sun and Wu, 2004). However, the economic growth of the city was slowly implemented as a result of the consequent war against the Japanese invasion (1937 to 1945) and the coastal oriented reform and open policies began in the 1980s.

Under the pressure of fast economic growth and revitalization, Wuhan maintained high-speed urbanization and economic development in the 1990s. It has been a populous city in the middle reaches of the Yangtze River and the largest city in central China. In 2019, Wuhan had 11.21 million inhabitants and its administrative area covered 8,569 km2 (Wuhan Statistical Yearbook, 2020). The central Wuhan area is densely built, with a 100% urbanization rate, and 73.7% of residents are classified as non-agricultural in the household registration system.

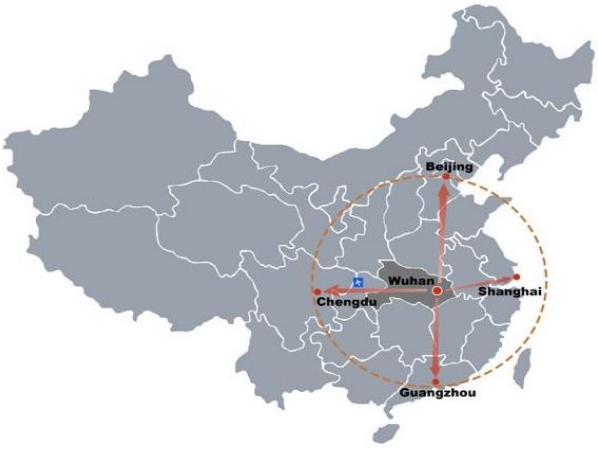


Figure 4.1 Main Chinese cities within 4 hours train of Wuhan (Source: Sketched by the author)

Figure 4.2 Wuhan on the confluence of two rivers (Source: Wuhan Chorography office)

Geography

Hubei province lies in the heart of China, forming a part of the middle basin of the Yangtze River. Hubei is bounded by mountains on the north and by highlands that lie at an elevation of above 1,800 metres on the west. The level of the land falls rapidly from west to east and forms the Jianghan plain. The plain is defined by the Yangtze and Han rivers. Large areas adjoining the rivers are covered by innumerable shallow lakes. It was a traditional cultural zone with a history of 3,000 years and famous for its huge marsh. Wuhan is in the east of the Jianghan Plain, at latitude 29° 58'–31° 22' N and longitude 113° 41'–115° 05' E. Most of the land is plain and decorated with hills and a great number of lakes and pools. These

large bodies of water occupy one-quarter of Wuhan's urban territory. Specifically, there are 164 lakes in the main urban area (Wu and Xie, 2011), making Wuhan famous for the city of a hundred lakes.

Figure 4.3 Residents took recreations along the East Lake one-month after lockdown in Wuhan (Source from: http://big5.www.gov.cn/gate/big5/www.gov.cn/xinwen/2020-05/10/content_5510322.htm#10)

Climate

Wuhan's climate is humid subtropical with abundant rainfall in summer and four distinctive seasons. Wuhan was known for its humid and hot summers, which made it one of the four furnaces of China. Located in the hot-summer and cold-winter zone, Wuhan also experiences cool winters with occasional snow. When there were no air-conditioning systems in residential buildings before the 1980s, residents went outside to improve their thermal comfort. Bamboo bed arrays were one of the Wuhan folk customs. They were the must-have item for Wuhan people to cool off during the oppressively hot and humid weather in the summers. Residents brought bamboo beds outside into the streets, fanning the children and staying outside all night. These bamboo beds take on all kinds of functions, such as chatting, playing, eating, reading, chatting, and diverse social activities. When air conditioning became popular, bamboo beds gradually faded out of people's lives. Taking a walk around the lakes or ponds is another tradition, and the culture is deeply embedded in Wuhan where the residents still frequently do recreational activities along the Yangtze River and lakes.

4.2 Urbanization in Wuhan

The Success of Economic Growth

Wuhan's economic prosperity is spreading over the past 40 years. According to the archive collection of Wuhan city and census data published by Wuhan Statistical Bureau in 2020, Wuhan has experienced fast economic growth since the 1990s. Wuhan's economy was mainly driven by investments in large construction projects, transportation, and housing

developments. Many pieces of evidence showed Wuhan has entered a new era of economic boom and started the construction of the metro system in 2010 (Zhao and Shen, 2019). Wuhan's GDP increased from 192.32 billion to 1,622.32 billion RMB Yuan from 1991 to 2019. The upsurge of economic success has improved life greatly for the residents in Wuhan, they are now able to spend more on education, health care and travelling for leisure to improve their life quality (Ye, 2008).

Table 4.1 The increase of income, education level, living space and constructed green urban space in the city

Year	1978	2000	2019
Annual Disposable Income of Urban Resident Households (RMB yuan)	359	6,761	51,705
Higher Education	37,000	401,900	4,174,600
Housing Area (square meter)	5.1	13.1	35.78 (2015)
Percentages of Green Urban Areas	-	32.9%	40.2%

Transportation

Nowadays, Wuhan has a well-developed transport system with diverse options on metro systems, a wide network of buses including Bus Rapid Transits (BRTs), ferries and bike-sharing programmes in the city. Wuhan Tianhe International Airport in Wuhan is the biggest and busiest airport in central China. There are more than 120 domestic and international destinations where citizens can fly from Wuhan Tianhe Airport for family holidays. Due to its strategic location, Wuhan has an advantageous position both in the historical and current railway networks in China. In the High-Speed Rail era, both the central and local governments have plans to enhance the hub role of Wuhan in the national railway system (State Council, 2004). There is a high growth rate in accelerating vehicles. There were 4 million registered cars in 2020, compared to 1 million registered cars in 2010 (Zhu, 2021). The high intensity of traffic in the city also addresses great challenges to local planning and transport with accelerating urban development.

Urban Construction

In the past decades, Wuhan has witnessed massive changes in national and local policies on urban development. As shown in Figure 4.4, the spatial and temporal growth has shaped a representative urban morphology of the city through rapid expansion and urban construction. The transition is interpretable from socio-economic and spatial processes in each corresponding period.

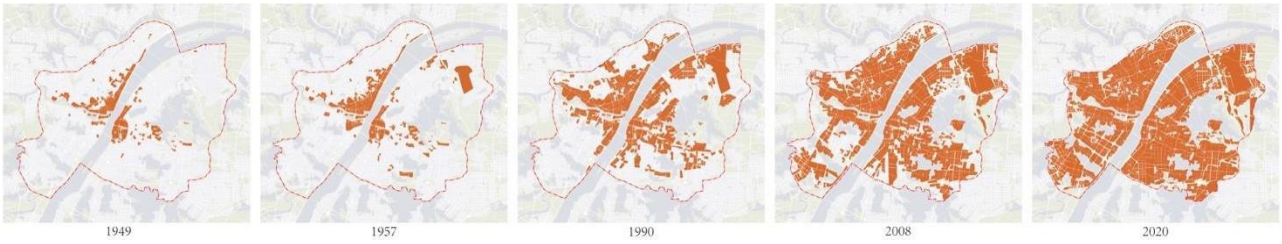


Figure 4.4 Urban growth and spatial transition in Wuhan from 1949 to 2020 (Source: Sketched by the author)

Rapid urbanization has posed significant ecological challenges with the encroachment of lakes, wetlands, and woodlands into cities. Even though many places in the city are named after lakes or woodlands, it is uncommon to find large bodies of water or trees in these areas today. From the 1980s to 2016, the number of lakes dropped from 127 to 30, and the coverage of the lakes has continuously decreased with a coupling relationship with urbanization and urban expansion (Wu et al., 2019). Although the city has a long history of fighting flooding threats caused by heavy rain in the summer, the serious flooding of 2016 was blamed on the filling of lakes for urban development.

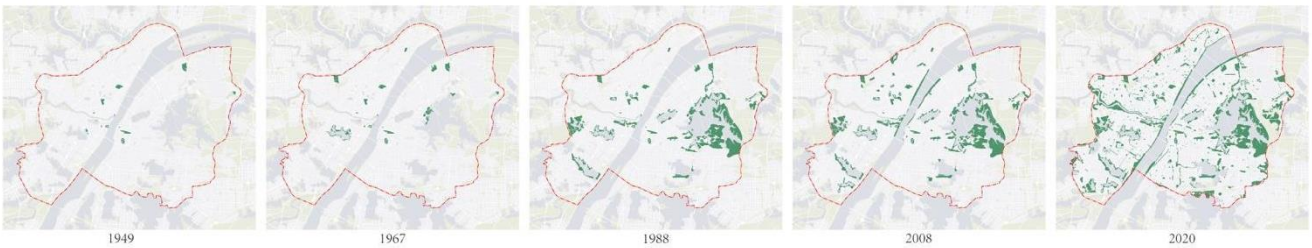


Figure 4.5 Urban parks constructed in Wuhan from 1949 to 2020 (Source: Sketched by the author)

Wuhan has declared its sponge city scheme on piloting ecologically friendly drainage systems for water management, such as rain gardens and grass swales. Residents could take advantage of green spaces built in such projects. Besides, the city had built many parks for the citizens' recreations during the past decades. And the government announced plans to build a hundred pocket parks in the city as part of its green space development in 2021.

Housing development in Wuhan

From empirical research, Wuhan has shown rapid housing development since the 2000s (Han and Wu, 2004). With the recent and rapid economic development of the city, the residents' demand for a better indoor environment is rising. Increasing construction for gated communities has improved the living quality, as well as the economy, and it has experienced a housing market boom in the past two decades. As the main attraction to migrants in central China, there are many old communities with affordable rent for the migrants. The latest census shows that about 3.94 million migrants lived and worked in Wuhan in 2020. With the housing development in the whole city, Wuhan consists of a group of urban centres with a relatively even distribution of importance.

4.3 Typologies of Housing Communities in Wuhan

This research has examined cross-generational childhood play experiences in different types of communities in Wuhan, from urban villages to what people think of today's commercial gated communities. These communities are not only distinguished by their spatial form, but also by their social characteristics as well as their mode of neighbourhood governance (Breitung, 2013). The state and private actors play different roles in the different types of communities, as well as the difference in residents' involvement in the community. In Wuhan, four categories of bounded communities with the transition of times and political contexts during the 20th to 21st centuries have been identified.

Urban Villages (since 1978)
Surrounded by tall buildings, transportation infrastructures and other modern urban constructions, urban villages are a unique phenomenon as a result of rapid urbanization and expansion in China (Breitung, 2013). To meet the demands of migrants, dense buildings have been built up during the 30 years of Chinese economic reform since 1978, normally in big cities such as Beijing, Shanghai, Shenzhen, and Wuhan. Urban villages are commonly inhabited by lower-class residents and migrants (Liu et al., 2010); thus they are associated with overcrowding, the poor physical environment and social issues.

Old Town (since the 1940s)
This type of community was located in the most central area of the old town, witnessing the historic transition of the city with the characteristics of walkable roads and clusters of small businesses. They are the liveliest areas in the city with diverse social interaction and a notable place for affordable rent for new migrants.

Danwei – Work Unit Gated Communities (since the 1950s)
The Danwei system, or work unit, constituted a form of social organization in Maoist China since. It has been formed over many years as a result of the country's economic and political practices (Bray, 2005). Built with traditional Chinese architecture, work unit communities are enclosed by a wall and accessible through one or more gates (Bjorklund, 1986). It followed the principle of organizing workplace and housing as a spatial unit that each enterprise should provide a community for their workers to fulfil their work, social, and cultural needs since the 1950s (Miao, 2003). Regardless of their size, any Danwei was obliged to supply a full set of facilities and welfare service for its members, including housing, shops, schools, canteens and a medical care center.

Commercial Gated Communities (since the 1990s)
The commercial gated community (CGC) is a residential community or housing estate containing strictly controlled entrances for pedestrians and vehicles. They are often characterized by a closed perimeter of walls and fences. Gated communities usually consist of small residential streets and include various shared amenities (Pow and Kong, 2007). With the accelerating commercialization of housing, large-scale gated communities have been constructed in China since the 1990s (Wu and Webber, 2004). This phenomenon has been criticized for leading to serious social issues such as social segregation, traffic congestion and social inequality (Miao, 2003; Song and Zhu, 2009).

4.4 Selected Communities in this Study

The housing reform introduced in 1998 has improved urban residents' living conditions as well as brought significant changes to social, economic, and spatial impacts in urban areas (Wang and Murie, 2003). Despite the wide variety in the size and built-time of each housing community, they all share a common range of characteristics in the built environment and residents' socioeconomic status in the same typologies.

Study Areas

In order to find representative neighbourhoods for each community, the 11 housing areas that have been visited from July 2017 to October 2018 are shown in Figure 4.6. The most difficult part was finding a Danwei. Previously identified communities, such as Wuhan Boiler Company, Wuhan Electricity Community, and Wuhan Red Steel City, were undergoing urban demolition during the field visits. In addition, collecting sufficient samples from the urban villages was another challenge. However, the Danwei system and urban villages have been unique phenomena in urban China during the past decades. It is a key point to understand how children's daily lives are associated with the spatial and social characteristics of these communities. After continuous visits to the city, the four types of housing communities have been identified: Yuhualing community for urban villages, Huaqiao community for the old town, Ganghua communities for Danwei, and the South Lake residential area for commercial gated communities.

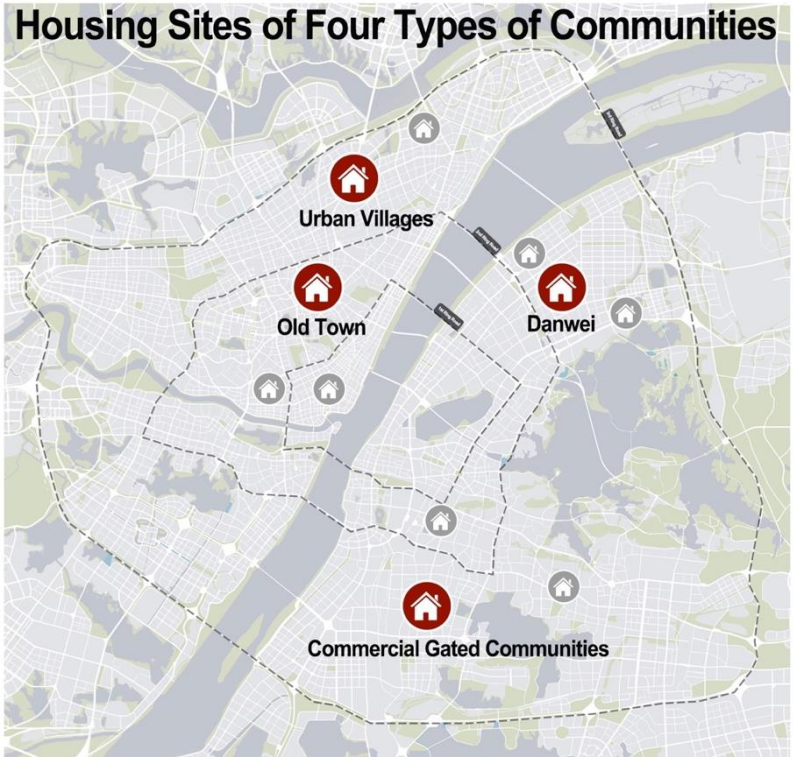


Figure 4.6 Study areas for the four types of housing communities (Source: Sketched by the author)

School District Houses

The school district house phenomenon has grown increasingly prominent with the urbanization of Chinese cities. It refers to houses located within the admitting range of primary or secondary schools that allow students' free admission to the nearest schools. Considering getting help from primary schools was the most effective way for data collection in this study, all communities have been listed after the questionnaires were collected. A total of 415 communities were recorded in this research, and the four communities were selected based on the largest number of responses collected from the study areas. Muxuling village was selected as a case study site for urban villages with 12 responses, and Huaqiao community was selected as a sample of this type of housing community with 7 responses. There were 16 responses from the Ganghua 128 community, built by Wuhan Iron and Steel Corporation, which has selected a representative community for Danwei. The Poly community in the south lake residential area was chosen as a case study site for a commercial gated community with 17 responses.

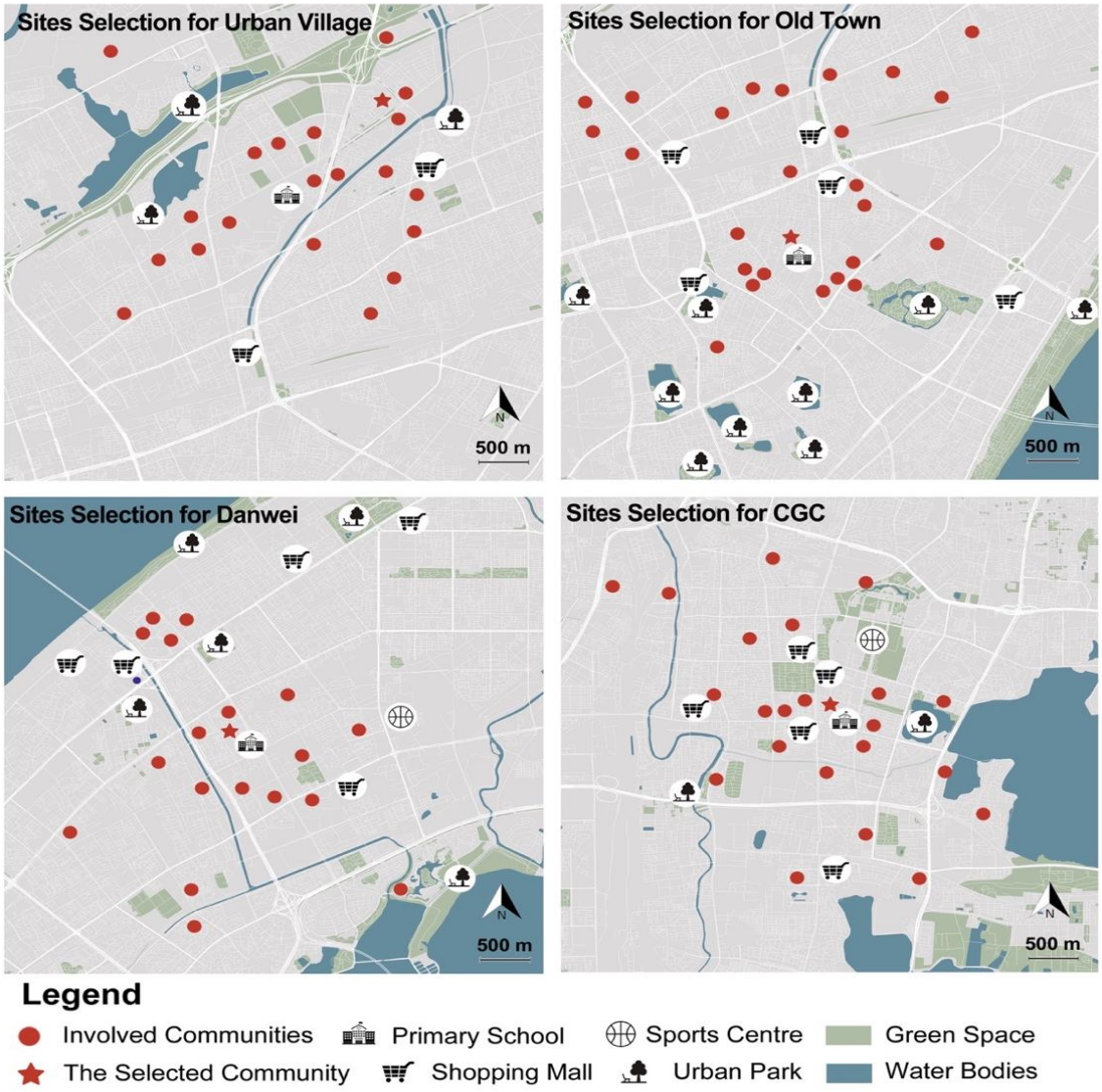


Figure 4.7 The four selected communities in the study areas (Source: Sketched by the author)

The Four Selected Communities

Muxuling village is a dense community with no green space or playgrounds in the community. The main spaces where children played were the side streets and the front of a shop in the community. There are many street trees in the Huaqiao community. A square with fitness equipment was built for residents' recreational activities. Similarly, a square located in the center of the Ganghua 128 community and play equipment were provided for the children. The Poly community is a high-rise community, while the other three are mid-rise communities. Besides, the area of Poly was much larger than the other three communities, which made it less dense compared to the other three. As shown in Table 4.2, the physical environment and functional features inside the community were very different from each other. Besides, the four communities had different levels of accessibility to surrounding urban parks, shopping malls, and sports centers in Figure 4.7.

Figure 4.8 The plans of the four selected communities (Source: Sketched by the author, original photo taken from from Gaode Maps)

Figure 4.9 Images of the four selected communities (Source: Photos taken by the author)

Table 4.2 The physical environment in the four selected communities

	Poly	**Ganghua 128**	**Huaqiao Community**	**Muxuling Village**
Community Type	CGC	Danwei	Old Town	Urban Village
Built Year	2011 - 2015	2002	1995	-
Gated/Ungated	Gated	Gated	Ungated	Ungated
Floors	34	7	8	-
Number of Buildings	28	40	24	-
Households Number	6054	2125	1239	-
Functional Attributes				
Shops	*	*	*	*
Sharing Public Spaces	*	*	*	
Green Spaces	*	*	*	
Fitness Equipment	*	*		
Children Playground	*	*		
Sports Fields	*			

4.5 Summary and Reflection

Difficulties in Data Collection

Wuhan has implemented large urban demolition for the renewal of urban villages, old towns, and old factories in recent years. In the 13th five-year housing and real estate demolition plan in Wuhan (Wuhan Government, 2017), 131 old urban reconstruction projects would be demolished and rebuilt from 2016 to 2017. It should be acknowledged that the difficulty of finding an ideal site for urban villages and work-unit communities in the centre of Wuhan. Unfortunately, the demolition coincided with the previously selected sites. The representative work-unit communities such as Wuhan Boiler Community and Wuhan Steel Community were under the process of redevelopment, and parts of the studied areas were demolished during the site visit in the summer of 2017. Wuhan's electricity power community was then selected as a study area in October 2017. However, the unexpected demolition started when the researcher went back to China in December 2017. Urban demolition is perhaps a formulation of rapidly growing cities. Therefore, it is noticeable that the demolition in the selected communities reflects the high speed of urbanization and urban construction in Wuhan. Besides, Wuhan experienced an unusually cold wave in January 2018, which delayed the process of data collection.

The Challenge

The findings in this data were analysed from secondary data, mainly archives, which included annual reports, city plans, policy documents, old maps, and press articles. This chapter analyses the challenging issues in traffic, migration, the environment, and ecology that children face in the city after evaluating the process of its urban growth in the past decades. This research argues the current official data and public statistics are insufficient to support child-friendly planning and design in Wuhan.

Evaluation of the Urbanization and Housing Development

The economic prosperity through urbanization has certainly elevated the standards of living of millions of residents in Wuhan, which could be evaluated with the increasing incomes, better education received and improved living environment. Besides, the one-child policy has changed the way that families place investment equally in their only daughters, which promotes gender equality in urban China (Lee, 2012; Veeck et al., 2010). By relating childhood play experiences to generations, it can be stated that the growing environment has greatly changed over time in material conditions. This research focuses on the transition of cross-generational childhood outdoor play under the process of urbanization in Wuhan, at scales varying from direct children’s experiences of outdoor play to a wider urban scale. The results lie at the interface between children’s characteristics, the physical environment, and social networks in the context of an urbanized city.

Chapter 5: Cross-Generational Study in Wuhan

From understanding the current childhood outdoor play experience in urban China through data analysis in this research, it was evident there was a great change in children's outdoor play compared to previous generations. Due to the lack of recorded evidence in this area, this study used a SPAT model developed from the literature review as a framework to compare the changes in childhood outdoor play across three generations. The participants in this study are school-aged children aged 6 to 13, their parents aged 28 to 56, and grandparents aged 49 to 87. The main study was undertaken from January 2018 to October 2018. This chapter offers details on the description of the sample composition and presents the results of generational differences analyzed from the questionnaires and interviews.

To understand the research question 1: How have children's outdoor play experiences changed over three generations in Chinese communities? The following hypotheses are tested:

1. There is a relationship between generation groups and childhood outdoor play.

2. The places that the current children frequently play have become more home-centred.

3. Parents and grandparents are more involved in current children's outdoor play.

4. There are generational changes in childhood play activities.

5. Children spent less time to play outside compared to their parents and grandparents in their childhood time.

5.1 Participants

Response Rate

2,100 copies of questionnaires were distributed to participants from five primary schools using multi-stage cluster sampling. Once accounting for the validity of the collected questionnaires, 613 children (46.4%), 605 parents (35.9%) and 468 grandparents (27.8%) from 615 families participated in the self-completion of questionnaires. Overall 1,686 responses established a very good response rate of 80.3%. The high response rate indicates the sample is representative of the target population in this research (Bryman, 2015).

Table 5.1 Number of questionnaire respondents from each generation and total response rate

Primary School	Number of Surveys Sent	Number of Respondents			Total	Response Rate
		Children' Generation	Parents' Generation	Grandparents' Generation		
Main Study1						
Daishan	240	63	64	46	173	72.1%
Huaqiao	360	100	101	74	275	76.4%
Main Study2						
Yuhualing	420	144	137	85	366	87.1%
Huaqiao	360	101	101	84	286	79.4%
Ganghua	360	115	114	103	332	92.2%
Jindi	360	90	88	76	254	70.6%
Total	2100	613	605	468	1686	80.3%

Table 5.1 provides an overview of the response rates and the number of participants collected from the primary schools relevant to the study areas. It illustrates the main characteristics of the good response rate with the help of school teachers in conducting children's research in China. What stands out in the table is fewer participants in the grandparents' generation. In the main study one, it was identified that the non-response of the grandparents' generation mainly come from the families of children older than 10 years old. In the main study two, a suggestion was made on the questionnaire that the children could make a video call to their grandparents and help them complete the questionnaire. The following discussion presents details of the sample composition.

Demographic characteristics of the sample

The demographic details of the three groups can be seen in table 5.2. It presents the summary of the sample composition and shows more female participants (two-thirds) involved in the parents' group, while there are approximately equal proportions of male and female participants in the children's and the grandparents' groups.

Table 5.2 Summary descriptive statistics of the sample composition

		Children's generation (n=613)		Parents' Generation (n=605)		Grandparents' Generation (n=468)	
		n	%	n	%	n	%
Gender							
	Male	285	46.7	195	32.2	207	44.2
	Female	325	53.3	408	67.4	250	53.4
Age							
	6	42	6.9	Minimum	28	Minimum	49
	7	91	14.9				
	8	104	17.0	Maximum	52	Maximum	87
	9	94	15.4				
	10	119	19.5	Mean	37.05	Mean	64.89
	11	107	17.5				
	12	52	8.5	Standard deviation	4.270	Standard deviation	6.015
	13	1	0.2				

The age distribution in the children's group meets those expected across the range of grades in primary school. The boxplots in Figure 5.1 show the detailed age distribution of male and female participants across the three-generation groups. In this research, the distribution of age for males and females is very similar across three generation groups.

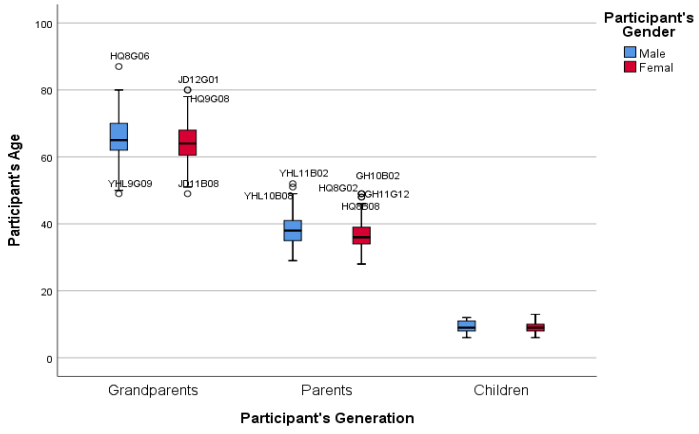


Figure 5.1 Boxplot for age distribution in three-generation groups

5.2 SPAT Model to Understand Generational Difference in Childhood Outdoor Play

All statistical analyses in this chapter were conducted using IBM SPSS statistics 25.

Missing data

Although invalid responses of self-completed questionnaires have been detected and removed before statistical analysis, it is rare to get all complete data from every case. Considering it is a large set of data, this research uses pairwise exclusion of missing data rather than replacing missing values by estimating means or mode. The replaced value of mean or mode can distort the results of the analysis (Pallant, 2017). While excluding cases the pairwise option will exclude the case with the missing data in a particular analysis. However, the case will be included in other analyses with their necessary information.

Normality

The normality of the distribution of participants' age has been assessed separately for three-generation groups in Table 5.3. The Kolmogorov-Smirnov test has been used to assess the normality of the distribution of participants' ages. For the results in each generation group, the $p<0.01$ suggests strong evidence of non-normality. Considering the nature of the data, only non-parametric techniques will be used for the following tests in this research.

Table 5.3 Kolmogorov-Smirnov tests of normality

Participants' generation	Sig.
Grandparents	.000
Parents	.000
Children	.000

It is quite common in social science that the variables are not normally distributed in the statistical test (Pallant, 2017). However, the actual shape of the age distribution for each generation appears to be reasonably normally distributed (figure 5.2), which have been also supported by a normal Q-Q plot in appendix C.

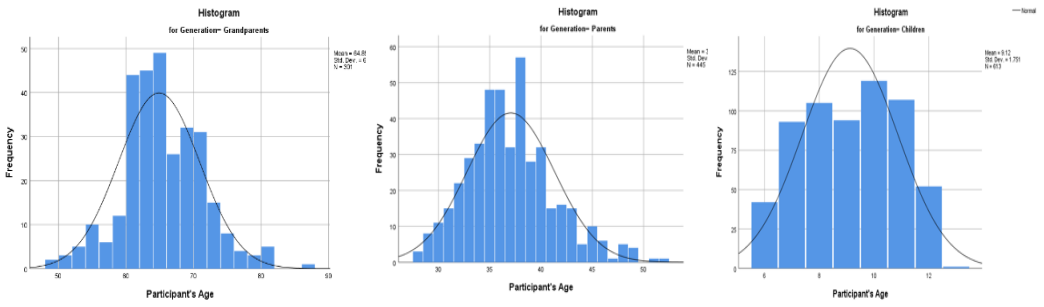


Figure 5.2 Histogram age distribution in three generation groups

Chi-square test for independence

This study was interested in generational changes in childhood outdoor play. Given that a large number of variables were measured on categorical and ordinal scales, non-parametric techniques were ideal to be employed in this study. A Chi-square test was used to compare the proportions of participants that occur in each of the categories and check if there was an association between the generation and the measured variables related to outdoor play.

Hypothesis One: There is a relationship between generation and children's childhood outdoor play.

Correlation Coefficient

The relationship between generation and distance, frequency and duration was investigated using Spearman's rho correlation coefficient. There was a weak negative correlation between generation and the travelling distance (Spearman rho= -0.182, $p<0.01$); a moderate negative correlation between generation and the play frequency (Spearman rho= -0.374, $p<0.01$) and a moderate negative correlation between generation and the play duration (Spearman rho= -0.92, $p<0.01$). The result indicates that as the generation increases, the distance travelling to play, together with the frequency children play outdoors and the duration children play outside decreases.

Table 5.4 Spearman's rho Correlation Coefficient

Spearman's rho	Generation (n=1686)	Distance (n=1659)	Frequency (n=1648)	Duration (n=1629)
Generation	1			
Distance	-.182**	1		
Frequency	-.374**	.175**	1	
Duration	-.392**	.241**	.377*	1

**. Correlation is significant at the 0.01 level (2-tailed).

The relationship between gender and measured play variables was examined by Spearman's rho correlation, the correlation coefficient is significant with the p-value lower than the significant level of 0.05. However, the result shows there was no relationship between gender and distance (-0.063), frequency (-0.055) and duration (-0.067). Full results can be found in Appendix C.

Community Where Children Grew Up

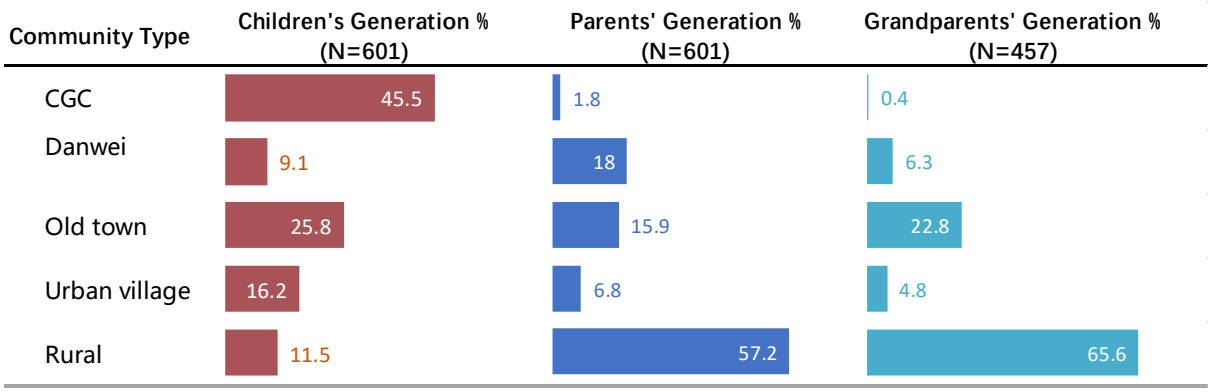


Figure 5.3 Difference in types of communities that children grew up in across three generations.

Figure 5.3 shows the dramatic changes in the physical environment that children grew up in from the grandparents' generation to the children's generation. Pearson Chi-square test strongly supported the evidence that there was a significant association between generation and the type of communities where each generation grew up ($\chi 2$ (1) = 888.101, $p < .001$). The most significant changes over the three generations are the number of each generation who grew up in rural areas and commercial gated communities. There was a decline in those growing up in rural areas with 65.6% of the grandparents' generation growing up in rural areas, a gradual decline to 57.2% of the parents' generation, and then a sharp decline to 1.5% of the children's generation. This is accompanied by a reverse trend in the number of children who grew up in commercial gated communities. Only 0.4% of grandparents lived in a commercial gated community in their childhood, and this remained steady for the parents' generation with the percentage of 1.8% and increased to 46.4% in the children's generation. The other two types of community that have noticeable differences are Danwei and Old Town. Of the parents' generation 16% grew up in Danwei, and this figure was overwhelmingly higher than the corresponding figures for the grandparents' generation of 6.3% and the children's generation of 9.3%. The largest number of children who grew up in Old Town was 26.3% of the children's generation, followed by 22.8% of the grandparents' generation and 16% of the parent's generation. On the whole, children who grew up in an urban village have changed rapidly from 4.8% of the grandparents' generation to 6.8% in the parents' generation and doubled to 16.5% in the children's generation. To sum up, more contemporary children have grown up in urban areas compared to previous generations. It also indicates the process of urbanization during the past decades that people continually move to urban areas.

Family Structure

Table 5.5 Changes of family structure that children grew up in across three generations

	Children's Generation (n=606)		Parents' Generation (n=450)		Grandparents' Generation (n=314)		Chi-square Tests	
	N	%	N	%	N	%	value	Sig.
Parents	584	96.4	404	89.8	251	79.9	64.928	.000
Grandparents	144	23.8	81	18.0	56	17.8	7.049	.029
Siblings	65	10.7	118	26.2	158	50.3	174.060	.000
Relatives	9	1.5	14	3.1	8	2.5	3.237	.198

Pearson Chi-square test was used to discover if there is a relationship between generation and the family members whom children lived with. The result proves the significant association between generation and family members such as parents ($p < .001$); grandparents ($p = .198$) and siblings ($p < .001$).

Table 5.5 illustrates that the proportion of children living with parents gradually increased from 79.9% in the grandparents' generation to 89.8% of the parents' generation and rose to 96.4% of the children's generation. Similarly, there was an upward trend in living with grandparents from approximately 18% in grandparents' generation and parents' generation to 23.8% in the children's generation. As a result of the one-child policy initiated in 1979, there was a remarkable decline in having siblings in urban families. Nearly 25% of the parents' generation grew up with siblings compared to 50% of the grandparents' generation, and this number falls to 10.7% in the children's generation.

Overall, the current children are more likely to grow up in a three-generation household, that adults spending more time caring for the children compared to their parents and grandparents. The increase in living with parents together with grandparents in Chinese families has been emphasized in many articles recently, debating the 4-2-1 family and the phenomenon of grandparents taking care of grandchildren. This change would influence children's lifestyles, as well as children's companions when they play outside, which will be discussed in Chapter 7.

The results provided in this section confirms that there is an association between generations and children's outdoor play. In addition, the housing community and family structure that the current children grow up in is different compared to the previous generations. In the next section, the SPAT model will be introduced to describe how children's outdoor play has changed across three generations.

5.3 SPAT Model to Understand Generational Changes in Childhood Outdoor Play

SPACE

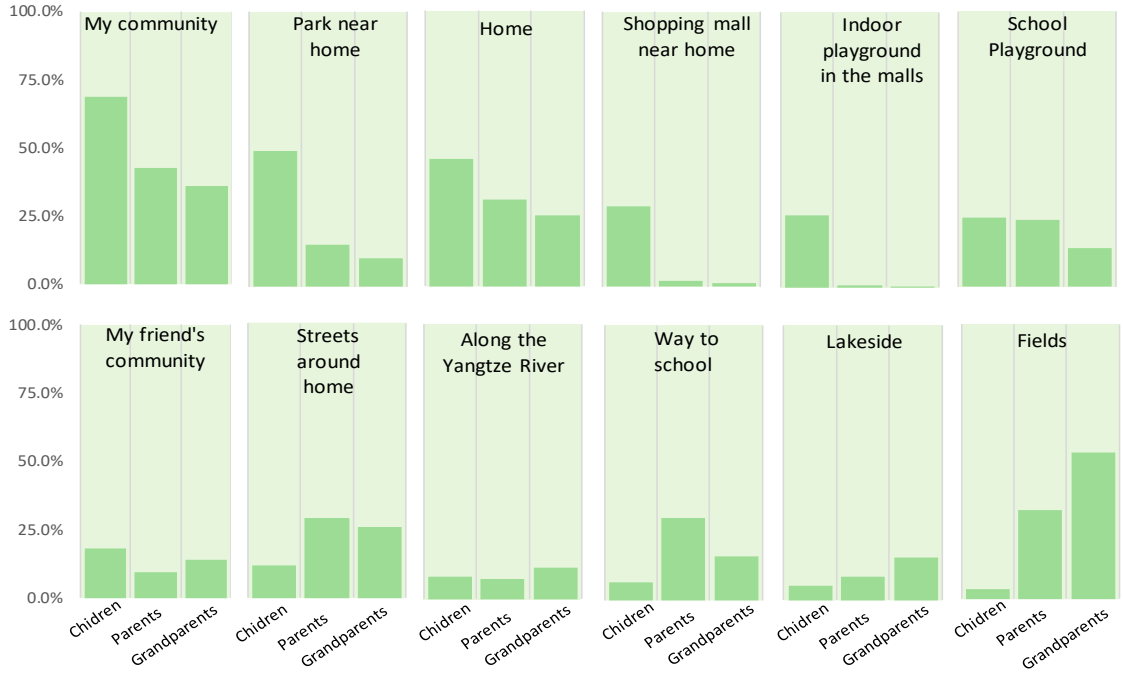


Figure 5.4 Changes in spaces where children usually play across three generations.

There were 1,657 responses to the question: “Where do they normally play in their childhood time?” Figure 5.4 reflects the difference between participants from three generations and the spaces they frequently visited. There is strong evidence in the Pearson chi-square test to suggest that playing spaces and generation were linked ($\chi 2$ (1) = 1603.301, p< .001). However, a separate chi-square test for each space shows there was no association between generation and playing along the Yangtze River (p= 0.065).

Based on the chi-square tests of difference in proportions of each place, it shows that the percentage of playing spaces from the current children's choices varied a lot compared to the previous two generations. The most significant increase of playing spaces from the grandparents' generation to the parent’s and the children's generations are children’s own community (35.9%，42.6% and 68.8% respectively); shopping mall near home (1.5%，2% and 29.4% respectively); indoor playgrounds in malls (0.4%， 0.8% and 26.2% respectively), children’s home (25.6%， 31.3% and 46.0% respectively) and park near home (10.5%, 15.4% and 49.5% respectively). Whereas, the noticeable decline from the grandparents’ generation is lakeside from 15.3% reduced to 8.6% for the parents’ generation and 5.1% for the children’s generation. More than half of the grandparents frequently played in the fields when they were kids, while this number drops to 3.5% in the children’s generation. Besides, the grandparents’ generation is different from the

parents' generation and the children's generation in playing less on the school playgrounds. While children in the parents' generation are more likely to play on the way to school and in the streets near home.

People

Hypothesis Three: More parents and grandparents are involved in the current children's outdoor play.

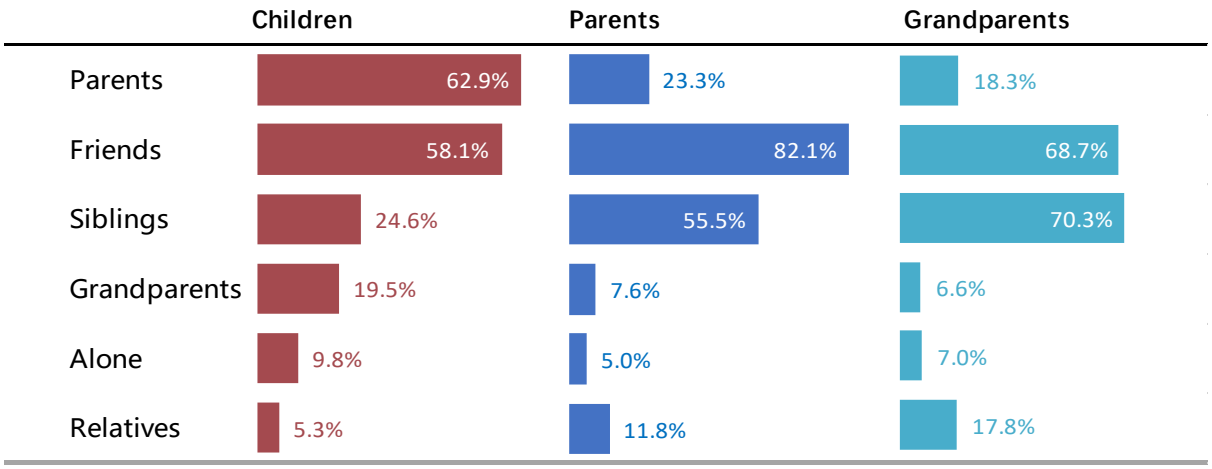


Figure 5.5 Changes in companions whom children usually play with across three generations

Figure 5.5 shows the difference in companions with whom children play outside across three generations. The Pearson Chi-square test strongly supported the evidence that there was a significant association between generation and the type of communities where each generation grew up ($\chi 2 = 774.64$, $p < .001$). It reflects the trend that children's generation have a much higher rate than the previous two generations in playing with adults, with 13.81% of the grandparents' generation playing with their parents, rising to 23.3% in the parents' generation and increasing dramatically to 62.9% in the children's generation. The percentage of playing with grandparents remained stable from the grandparents' generation (6.6%) to the parents' generation (7.6%), while there is a considerable increase in the children's generation to 19.5%. Conversely, the data leads to a decreasing trend in playing with siblings and relatives from the grandparents' generation to the children's generation. The number of children who played with their siblings in their childhood falls from 70.4% of the grandparents' generation to 55.5% in the parents' generation and dropping dramatically to 24.6% in the children's generation. Also, there is a gradual reduction in the proportion of children who played with their relatives from the grandparents' generation (17.8%) to the children's generation (5.3%). It is a remarkable result that the majority of participants reported they regularly played with their friends in their childhood. Especially the high rate of 82.1% in the parents' generation, followed by 68.7% of the grandparents and 58.1% of the children's generation. There is a significant difference ($p = 0.006$) in the rising number of children playing outside alone in the children's generation compared to the parents' generation and the grandparents' generation.

ACTIVITY

Hypothesis Four: There are generational changes in childhood play activities.

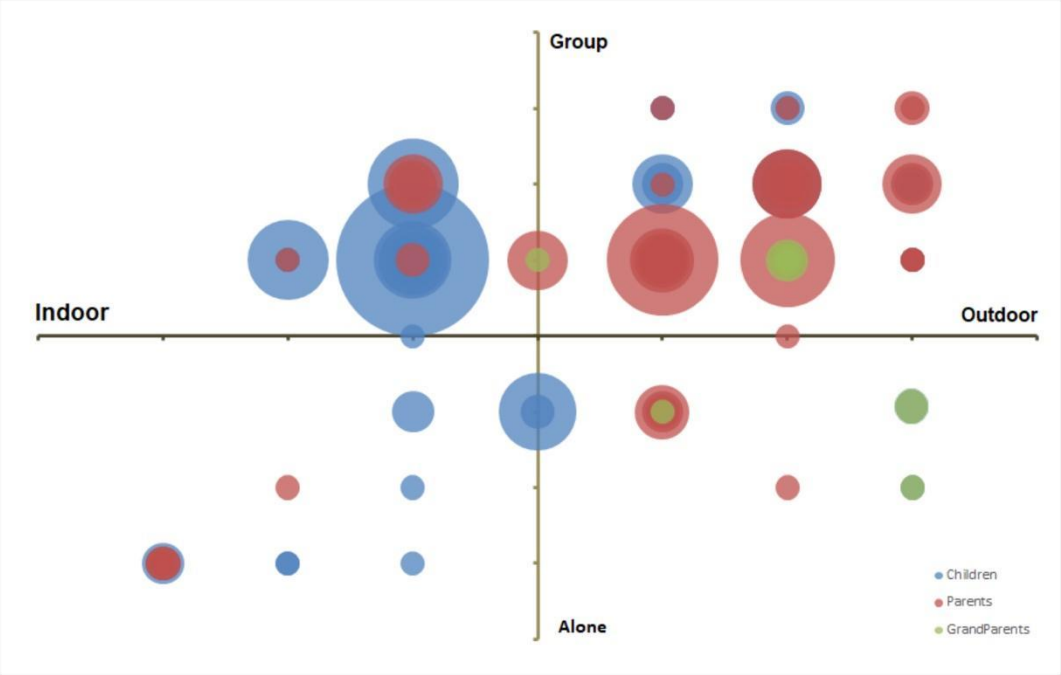


Figure 5.6 Quadrant chart analysis of childhood outdoor play activities.

There are 93 activities and games that have been identified from the open questions and interviews. Most of grandparents and parents were found to play in a natural environment when they were children, especially the lakes and rivers were highlighted. Traditional Chinese games were also frequently mentioned across the three generations, some of these games are still being played today, such as hide and seek, hopscotch and eagle catching chickens. While many of them disappeared in the current children's generation, particularly those involves the historical and cultural background of that time like 'tunnel battles'. Many children mentioned the video games and phone games when responded to the games they frequently played.

These activities have been scored by different categories in terms of the places they take the activities and the number of children involved. The vertical scales represent the number of children participating in these activities from 1 to 10, and the horizontal scale represents the places where activities are taken from indoor to outdoor environments. A quadrant chart analysis has been made to divide these activities by the place and the number of children for each activity to be taken. From the answers in the parents' and the grandparents' generations, what they normally played in childhood time refer to space-specific play activities. These specific activities like climbing trees, catching insects, and catching tadpoles gave the children a great chance to play in natural environments such as fields, rivers and ponds. Besides, 'wild play' has been frequently repeated by the grandparents, such as 'swimming wildly in the Yangtze river and 'running wildly in the open ground'

which indicated an active childhood time. Therefore, these activities show great potential to play outdoors and contact with nature. There is an increase in the parents' generation with outdoor group activities, especially traditional games which included numbers of children to participate. While the grandparents' generation tends to be more independent to explore the outdoors. The activities the current children normally play have been gradually changed over time, children today would have less chance to play in the same way as their parents and grandparents did. The activities they normally play become more indoor and carried out with fewer friends.

TIME

Hypothesis Five: Children spent less time to play outside compared to their parents and grandparents in their childhood.

The relationship between generations and play time has been explored in how often and how long children regularly play outside in their childhood. The chi-square tests showed there was significant association between generation and the time children play outside from the two dimensions of frequency ($\chi 2$ (1, N= 1648) = 279.398, p< .001) and duration ($\chi 2$ (1, N=1629) = 348.891, p< .001).

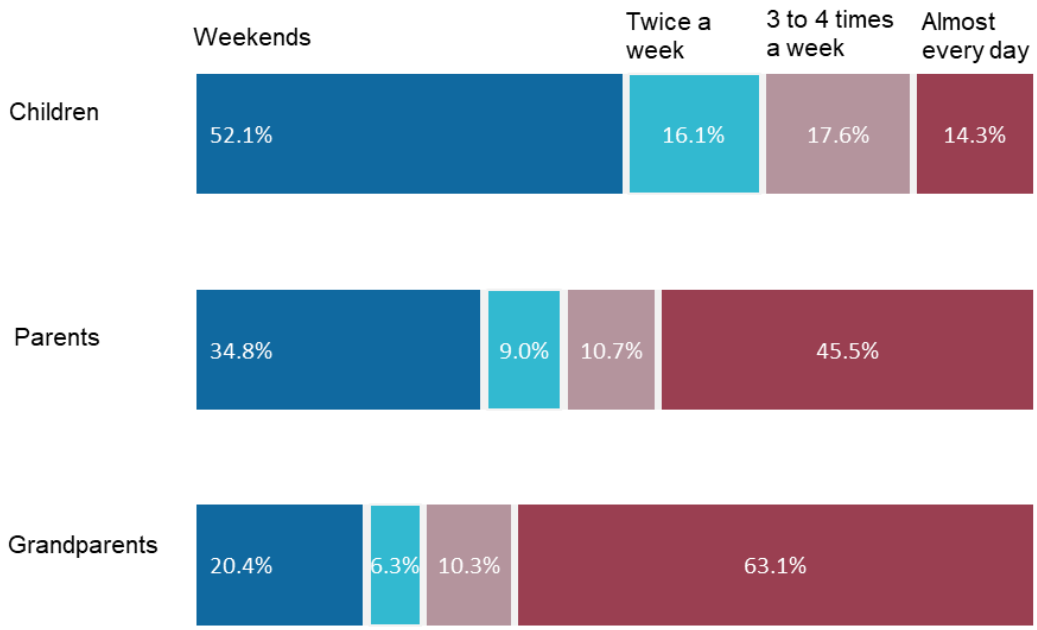


Figure 5.7 Changes in frequency children usually play outside across three generations.

Figure 5.7 reflects the great differences in the frequency children went out to play during the transition from the grandparents' generation to the children's generation. The percentage of children who went out to play every day changed dramatically from 63.1% of the grandparents' generation to 45.5% of the parents' generation and a steep drop to 14.3% of the children's generation. In comparison, a different trend emerged in the number of children who only played outside on weekends across three generations. There was 20%

of the grandparents' generation who played outside in weekends, increasing to 35% of the parents' generation and to 52% of the children's generation.

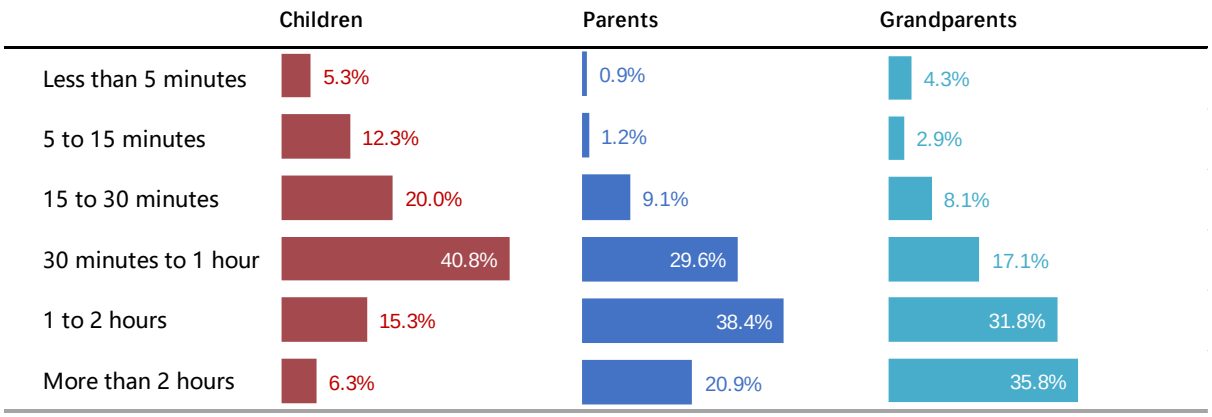


Figure 5.8 Changes in duration children usually play outside across three generations.

Similarly, figure 5.8 reveals that there has been a marked fall in the duration of children's outdoor play across three generations. Children spend less time playing outside compared to the previous two generations, with 60% of children in the grandparents' generation and the parents' generation normally playing for more than one hour. However, this number drops to 21.6% of the children's generation. Nearly 40% of the current children's generation play outside less than 30 minutes every day, 20% of children play between 15 to 30 minutes, followed by 12.3% of children play between 5 to 15minutes and 5.3% of the current children playing for less than 5 minutes.

5.4 Changing Home Range

Figure 5.9 indicates that current children have experienced a decline in the distance they travel to play outside compared to previous generations. The Pearson Chi-square test strongly supported the evidence that there was a significant association between generation and children's home range ($\chi 2$ (1) = 134.339, $p < .001$). Taking 500 metres as a criterion, which is the average distance from different apartments to the main entrance in current gated communities after measuring the superblocks involved in this research. The results show parents and grandparents were more likely to travel further to play outdoors when they were children, which indicates the current children's generation has become more home-centred.

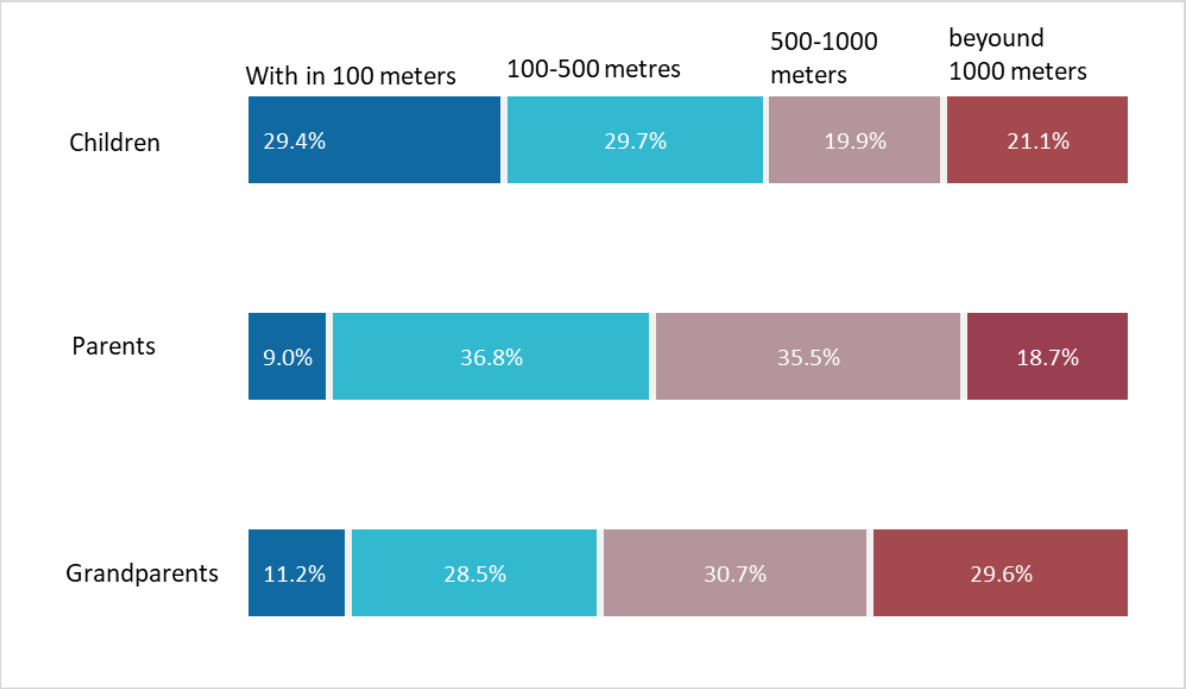


Figure 5.9 Changes in children's home range over three generations.

Changes in children's occasional range over three generation

The concept of childhood's domain of habitual domain, frequented domain and occasional domain has been introduced to understand children's play spaces (Moore and Young, 1978; Moore, 1986). The previous result of the home range which is regarded as the habitual domain indicates the decline of children's play places and pathways connecting them by generation. However, the following result from children's travelling destinations shows an expansion of children's occasional domain by generation.

Figure 5.10 Changes in children's occasional domain over three generations.

From the grandparents' responses who mentioned visiting a new place, four of the answers are about going to a city or town in a rural area. The other answers are Lushan Mountain and Huangshan Mountain in neighbouring provinces. The capital city Beijing is a popular place for the link-up train from Wuhan to Beijing during their childhood. For the parent's generation, they could go further, not only to cities in Hubei Provinces and neighbouring

provinces but also to coastal cities like Qingdao and Dalian. Beijing is still the most popular city for travelling among the parents' generation. In the children's generation, travelling to adjacent cities has become a frequent domain with current children visiting them monthly or even weekly. As a result of the progress of transport, many children have experience of travelling abroad. Their occasional domain has been dramatically extended compared to their parents and grandparents to places such as Thailand and the UK. These distant destinations reflect the development of transportation in the past decades and the spatial-temporal changes in childhood play across three generations.

5.5 Summary

Overall the sample in this study was representative and proportional to the target participants based on random selection. The collected questionnaires provided an adequate basis for the measurement of their own reliability, and the statistical results were encouraging. As a self-designed questionnaire, it has limitations in choosing appropriate statistical testing with the nature of the data in this research. Scales were not employed in the questionnaires after the pilot-test questions with the intended participants, because it was unreliable when used with children from non-English-speaking backgrounds (Pallant, 2017). However, the Chi-square tests and Spearman' rho of correlation coefficient were successful because it was able to identify the difference in outdoor play experience across three generations.

The following hypotheses were tested to examine the possibilities of different generation groups experienced in childhood outdoor play. The findings are as follows:

1. **There is a relationship between the generation groups and childhood outdoor play.**

   This hypothesis is accepted. There was a reduction in the travelling distance for outdoor play from grandparents' childhood time to current children's childhood time. Similarly, there was an obvious decrease in the frequency and duration of time that children spent outdoors from the grandparents' generation to the children's generation.

2. **The places that the current children frequently play has become more home-centred.**

   This hypothesis is accepted. It is expected that the travelling distance for outdoor play of the children's generation has decreased compared to the previous generations. The result has been supported by both correlation tests and Chi-square tests confirming that there is a decline in the children's everyday home range by generation. The results of play spaces showed the increasing number of the current children's generation playing at home, in their own communities, parks and shopping malls near home rather than fields, lakeside and streets in the parents' and grandparents' generation.

3. **Parents and grandparents are more involved in the current children's outdoor play.**

This hypothesis is accepted. There is a significant difference in the companion with whom children played outside. The number of companioned parents and grandparents in the children's generation is doubled compared to the parent's generation, and three times of the grandparents' generation.

4. **There are generational changes in childhood play activities.**

This hypothesis is accepted. The varied cross-generational activities in childhood play have been reported from the aspects of environment and groups of people conducted by each activity.

5. **Children spent less time to play outside compared to their parents and grandparents did in their childhood time.**

This hypothesis is accepted. The significant difference between the generation group and play time concerning the fewer frequency and duration when the children's generation play outside.

6. **The application of Moore's Home Range Model**

The concept of three term of home range measured children's environmental experience by two dimensions of spaces and time. The habitual range was generally regarded as the outdoor environments in the neighbourhood, and the frequented range could be understood as the places children frequently visited in the city in weekends. These two terms of range could be applied into planning and design process from the level of child-friendly communities to child-friendly cities. With the progress of transport, it becomes more time saving and convenient for children to travelling distant destinations. The research in occasionally play was very limited, while it has values in giving suggestions for improvement on child-friendly transports, connections and public services in distant destinations. As this type of play range gradually become a life style in Chinese family, it will certainly bring a new generation with expanded horizons that never before in history.

Additional Variables

The questionnaires collected additional measurements changed across generations which have not been reported in this chapter. As accounted in the literature there is a known influence to gender, age and supervision level in the effect of children's outdoor play will be available in the following chapters.

Chapter 6: How Communities and Family Affect Children's Outdoor Play

Family influences were often implicated in the children's outdoor play. The children's play behaviour also differed based on the characteristics of the community they grew up in. This research includes investigations of the differing types of communities and the influence these communities have on the children's outdoor play who live in them. This chapter explores deeper childhood outdoor play experience using the SPAT model and how the different communities and households may influence children's outdoor play. To this end, the chapter will focus on 1) household social-economic status from different community types; 2) community differences in outdoor play; 3) family influence on the outdoor play; and 4) children's gender and age differences in outdoor play.

To answer research question two, this chapter has addressed two major questions:

1. Is there a relationship between community type and children's outdoor play?

2. How does community type affect residents' opinions towards children's outdoor play?
   a. safety consideration of children's outdoor play in the community
   b. satisfaction of the play space in current community
   c. participants' attitude towards the improvement of their community

This chapter also answers the following questions:

3. How does family influence children's outdoor play?

4. How did children's outdoor play experience differ by gender and age?

6.1 Socioeconomic Status in Different Communities

Considering the questionnaires were collected with the help of the school teachers, questions like "family income" and "parents' educational level" were not asked in the questionnaires to avoid children being prejudiced. The community of residence and the primary school in which children studied can be considered as key factors to measure the participants' socioeconomic status in this research under the Chinese context.

Economic Conditions

Table 6.2 illustrates a range of characteristics of the housing communities in the studying area. It provides the average house price of each study area and the calculated mean walking distance from the entrance of each community to the closest public park, shopping mall, and sports centre. The house price was accessed from a real estate services platform-Lianjia in December 2020. And the walking distance was measured by Baidu Map.

Social class was not commonly discussed in China, and the studied areas were chosen from the middle range of the property market in Wuhan. However, there is a difference in the socioeconomic status (SES) of the participants from the four study areas with lower SES in the urban village to higher SES in a commercial gated community. It can be seen that the communities with higher prices in South Lake have shorter travel distances to surrounding primary schools, parks, shopping malls, and sports centres.

Table 6.1 The characteristics of housing communities in different studying areas

	Yuhualing	**Huaqiao**	**Ganghua**	**South Lake**
Main Community Types	Urban Village	Old Town	Danwei	CGC
House Price (RMB/m²)	15,333	17,889	17,277	21,933
Built Year	-	1994	2003	2007
School (metre)	1,800	2,300	3,600	1,100
Public Park (metre)	2,100	2,300	2,600	882
Shopping Malls (metre)	2,300	2,400	2,000	835
Sports Centre (metre)	3,600	4,200	2,600	1,468

Notes: The communities of Yuhualing were under demolition for new development since 2011.

Family Structure

Chi-square tests showed a significant difference between the proportion of siblings and community type across three generations. In the children's generation, 18.2% of children who lived in urban villages had siblings ($\chi 2$ (4, N=601) = 12.555, p= .014) compared to less than 10% in the other three types of community, as shown in table 6.2. Similarly, 35.7% of the rural children in the parent's generation grew up with siblings compared to approximately 10% in urban communities ($\chi 2$ (4, N=448) = 28.217, p< .001). There was

no association between other family members and community type, nor any relationship between community type and family structure in the grandparents' generation.

Table 6.2 Chi-square tests between community type and siblings in the family

Live with Siblings	Children's Generation (N=601)	Parents' Generation (N=448)
Chi-square Tests P-value	.014	.000
Rural	-	35.7%
Urban Villages	18.2%	11.5%
Old Town	8.2%	10.5%
Danwei	7.1%	11.7%
CGC	9.7%	10.0%

Home Range

The result for the home range, shown in table 6.4, shows the current children living in urban villages travel shorter distances compared to the other three types of communities ($\chi 2$ (12, N=598) = 31.792, p=.001). While children who grew up in Danwei travelled the furthest distance for play in the four community groups in the grandparents' generation ($\chi 2$ (1, N=456) = 19.708, p< .0073). The test showed there was no significant association between community and home range in the parents' generation ($\chi 2$ (12, N=599) = 11.482, p=.448).

Transport for Outdoor Play

A chi-square test was performed to examine the relationship between community type and the transport mode children usually use for outdoor play. There is a significant relationship between community type and children playing outside by private car ($\chi 2$ (4, N=432) = 31.935, p< .001). More children living in Danwei and commercial gated communities played outside by private cars, compared to children living in urban villages and old towns. However, there was no relationship between community type and other travelling modes, such as taking public transport, walking with their parents, walking with friends or walking by themselves.

Table 6.3 The percentage of children from different communities who took private cars to play outside.

	Urban Village		Old Town		Danwei		CGC		Chi-square	
	N	%	N	%	N	%	N	%		
By private car	16	25.5	34	37.4	26	65.0	125	55.3	31.935	.000

6.2 Children's Outdoor Play in Different Types of Communities

Pearson Chi-square tests were performed to examine the relationship between the community and children's outdoor play. The results in table 6.5 show that children's outdoor play experiences from each generation have an association with the community they grew up in.

Table 6.4 Chi-square tests between community and children's outdoor play across three generations

SPAT Model	Chi-square Test Result (*p-value*)		
	Children's Generation (n=613)	Parents' Generation (n=605)	Grandparents' Generation (n=)
SPACE (Places that children normally play)			
Own community	.000	.000	.009
Friends' community	.393	.000	.063
School	.591	.001	.001
Park near home	.004	.000	.000
Shopping Malls	.007	.472	-
Streets near home	.022	.000	.000
Yangtze River	.000	.000	.000
Fields	.703	.000	.000
PEOPLE (Companions whom children with play outside)			
Parents	.171	.000	.001
Grandparents	.267	.094	.615
Siblings	.160	.000	.006
Community Friends	.000	.000	.043
School Friends	.756	.000	.000
Family Friends	.132	.369	.092
ACTIVITY			
	.639	.000	.000
TIME			
Frequency	.106	.018	.015
Duration	.516	.007	.026

Space

Results indicate a statistically significant difference between community type and childhood outdoor play spaces for the children's generation ($\chi 2$ (36, N=599) = 112.611, $p < .001$), the parents' generation ($\chi 2$ (48, N=601) = 392.418, $p < .001$) and the grandparents' generation ($\chi 2$ (48, N=457) = 339.950, $p < .001$).

In children's generation, approximately 80% of the children's generation who lived in Danwei and CGC were more likely to play in their own community, compared to half of the children from the old town and urban village. The highest proportion of each place that the children's generation frequently visited stands out with children living in CGC playing in shopping malls, children from Danwei playing along the Yangtze River, children from old town playing in parks near home, children from urban villages playing on streets around their home.

In the parents' generation, the childhood play spaces where rural children frequently visited were significantly different from other communities. Rural children spent more time playing in fields rather than parks, on streets near their homes, and along the Yangtze River than children from other communities. The rural children had the lowest number of children, 33.4%, playing in their community and 18.6% playing in school playgrounds. In contrast, children who grew up in Danwei mainly played in their communities while the highest number of children from the old town played in school playgrounds.

In the grandparents' generation, rural children differed from urban children in several playing spaces. In the same way as the parents' generation, fewer rural children played along the Yangtze River. Children from Danwei and the old town spent more time playing in parks and streets near their homes than children from the urban village and rural areas. On the other hand, more than half of the children from the urban village and rural areas played in the fields, while children from Danwei tended to play in the school playground.

To sum up, the difference of places children frequently visited between community types could be explained by the available environments close to home. Therefore, rural children played in fields more frequently, more children from Danwei went to Yangtze River as these communities were close to the river in this research. Besides, the constructed play spaces attract children when there were little things to play in their own communities. Currently, children from ungated communities play outside of their communities compared to children mainly play inside the communities.

People

There is an association between community type and people whom companioned with children in outdoor play for the children's generation ($\chi 2$ (40, N=598) = 61.641, $p = .016$), the parents' generation ($\chi 2$ (40, N=600) = 256.688, $p < .001$) and the grandparents' generation ($\chi 2$ (40, N=452) = 135.266, $p < .001$).

There are more children from CGC and Danwei who played with community friends in the children's generation. The play companions in the parents' generation varied by

communities in several key aspects. There are 20% of children from rural areas and Danwei who played outside with their parents, and this number doubled in urban villages and old towns. Nearly 70% of children in the rural and urban village played with siblings, then this number dropped to 30% in the old town and Danwei. Besides, children in urban settings had more school friends to play with compared to rural children. In the grandparents' generation, more rural children accompanied their parents and siblings while children living in other communities were more likely to play with community and school friends. Children who grew up in urban villages stand out as having the maximum number of playing with family friends among these communities.

Activity

Chi-square tests showed there was no significant association between community type and activities children play in the children's generation ($\chi 2$ (4, N=599) = 36.273, p= .639). While the play activities differed significantly in the parents' generation ($\chi 2$ (48, N=448) = 211.295, p< .001) and the grandparents' generation ($\chi 2$ (80, N=) = 319.944, p< .001). The activities that rural children played differ from urban children in many important ways in the parents' generation. There were more children growing up in the old town and Danwei who played with paintings and blew soap bubbles. On the contrary, rural children were more likely to play tug-of-war, roll a hoop and climb trees. In the grandparents' childhood time, the result shows fewer rural children involved in all play activities compared to children from urban settings.

Time

There is no association between community type and outdoor play time in the children's generation from the aspects of frequency ($\chi 2$ (12, N=598) = 18.317, p= .106) and duration ($\chi 2$ (20, N=596) = 19.085, p= .516).

The difference between community type and the frequency of children playing outside is notable that children from the old town played out most frequently in the parents' generation ($\chi 2$ (12, N=596) = 24.367, p= .018), as well as the grandparents' generation ($\chi 2$ (12, N=446) = 25.056, p= .015). Children from urban villages played out longer among all the communities in the parents' generation ($\chi 2$ (20, N=582) = 39.060, p= .007). While children who grew up in Danwei played outside longer compared to children in the other communities in the grandparents' generation ($\chi 2$ (20, N=443) = 34.004, p= .026). Full results in this section can be seen in Appendix C.

Qualitative Data Supports the Results

Findings from children's interviews from four selected communities support the results in this section. When they referred to play spaces, children living in the Huaqiao community frequently mentioned visiting Jiefang parks while children living in Poly normally played in their own community. More detailed information about the companions was gained through observations and interviews of children who played with their friends in the community. Most children lived in gated communities (CGC and Danwei) and played in pairs; they were neighbours and classmates studying in the same class. Interestingly, children in un-gated communities (urban villages and old town) prefer to play with a small

group of children. They occasionally become companions if they are neighbours. Sometimes they might not know each other's names even though they played together.

6.3 Participants' Attitudes Towards Childhood Outdoor Play in Communities

Safety Consideration

Participants were asked specific questions relating to safety when they played outside as a child in their community. Table 6.6 provides an overview of the responses from different community types among three generations. The association between community type and children feeling safe to play outdoors was statistically significant difference in the children's generation ($\chi 2$ (4, N=582) = 10.131, p= .038) and the parents' generation ($\chi 2$ (8, N=433) = 19.649, p= .012). In the children's generation, the commercial gated community has the highest proportion of children who felt safe to play in their communities, while Danwei has the lowest. On the contrary, Danwei became the safest community in the parents' generation with almost 90% of children agreeing that it was safe to play outside in the community. Although the test showed no relationship between community type and the sense of safety in the grandparents' generation, it has a similar trend with the parent's generation that fewer children felt safe to play outside in rural areas.

Table 6.5 Participant's opinions towards safety of childhood play in their communities

	Rural		Urban Villages		Old Town		Danwei		CGC		Chi-square Tests	
	N	%	N	%	N	%	N	%	N	%	value	Sig.
Children (N=582)	-	-	71	74.0	119	78.8	39	69.6	228	84.1	10.131	.038
Parents (N=433)	165	70.8	20	80.0	66	88.0	81	89.0	-	-	19.649	.012
Grandparents (N=296)	134	76.1	14	87.5	70	87.5	20	90.9	-	-	7.504	.483

Questions had been asked in the questionnaires and interviews to assess the reasons why participants felt safe to play outside in their communities. Opinions differed as to the safety of outdoor play from participants who grew up in different communities and generations. From the participants' responses, the following themes emerged: social environment, neighbourhoods relationship, community security services, adult supervision, and unsafe elements.

Social Environment

The majority of participants felt safe to play outside in a good and safe environment in their childhood from the grandparents' generation and the parents' generation. A good social

environment refers to simple physical and social settings, less population mobility and equality in that time, compared to today's environment in which children grew up.

"I felt safe to play outside. Everyone was poor at that time and there were no traffickers. I felt safe even sleeping with my door open."

-male, 76, grew up in rural

"We used to have a very safe environment. There were fewer buildings in the community, fewer migrants and less traffic at that time."

-female, 59, grew up in old town

"People were nice in my childhood and every child was equal. We enjoyed our play in the community."

-female, 41, grew up in Danwei

Participants felt unsafe for the children to play outside when there was more traffic and migration in a complex social context with the process of urbanization.

"It is unsafe for me to play in the community because strangers can come in. If the bad people trafficked me, I can't see my mum and dad anymore."

-girl, 9, grew up in old town

"It worries me when my child is playing in our community. There are so many tenants here for short rent and I know nothing about them."

-female, 41, live in the urban village

Neighbourhoods Relationship

Participants repeatedly report close relationships with their neighbours to help them feel safe to play in their communities when they were a child. Particularly, children who grew up in Danwei in the parent's generation report the highest number of strong relationships with their neighbours. Theme nodes were coded as nice and kind people, familiar with the residents, close neighbours and friends to play with.

"I never considered safety issues when I was playing in my community when I was a child. My neighbours are just like my relatives. Sometimes, my parents can't go back from their work, I can have dinner in my neighbours' home. We frequently visit each other and the adults will help look after their neighbours' children."

-male, 34, grew up in Danwei

"It is very safe to play in my community with other children. We were friends and we always played together."

-female, 36, grew up in old town

"My community is not big and I am now familiar with the people and the environment in it. I won't get lost when I play in the community."

-boy, 12, grew up in Danwei

"Our neighbours and my family were from the same village. When we play outside, we can see the people we know frequently."

-female, 57, grew up in the urban village

Community Security Service

Community security service enhances the children's feeling of safety when they play outside in the children's generation. It was widely used in the gated community in this research with the security entrance, CCTV and 24-hour security guards.

"There are many security guards on patrol in my community. They are very brave and they can protect us. I feel very safe when I see them."

-girl, 9, grew up in a commercial gated community

"We had CCTV in the community, the bad people will be caught by the guards if they entered our community."

-boy, 8, parent, live in Danwei

Adult Supervision

The watch of adult supervision was regularly reported in the participants' responses. These supervisions mainly came from parental supervision, as well as grandparents, other adults in the community and elder siblings.

"It is very safe, my parents always accompany me when I play in the community. They can protect me. "

-girl,7, grew up in a commercial gated community

"Our community is surrounded by walls, so it is very safe. When I play equipment in my community, other adults will remind me of dangerous situations."

-boy, 12, grew up in Danwei

"My elder brother always looks after me and plays with me."

-girl,8, grew up in old town

"I am already growing up safely from a little child. However, I feel it was unsafe when I played outside without adult supervision when I looked back. Especially when I played by myself in the ponds and hills."

-male, 63, grew up in rural

Unsafe Elements

Overall, 19.6% of participants felt unsafe to play in their community when they were children. The proportion of people who reported feeling unsafe to play in their community differed by generation ($\chi 2$ (4, N=1319) = 19.698, p= .001). More participants in the children's generation felt unsafe to play in the community (20.6%), followed by 18.9% of the parents' generation and 18.5% of the grandparents' generation. Five key elements, shown in Table 6.7, that made the respondents feel unsafe to have been identified as vehicles, strangers, facilities, animals and water. From the interviews and open questions, proppriate play equipment could improve resident's satisfaction with their communities. However, they felt unsafe for children to play in the communities if there were poor facilities with little maintenance and unsafe equipment in children's play area. There are potential risks if children inappropriately use adult's outdoor fitness equipment.

Table 6.6 Five most frequent nodes from the theme of "unsafe element"

	Count	
Vehicles	86	too many vehicles, high-speed, traffic accidents, trucks
Strangers	68	traffickers, migrants, renters
Urban Settings	32	poor facilities, narrow spaces, unsafe equipment, urban constructions
Natural settings	32	ponds, lakes, rivers, Yangtze River, fields, hills, dam,
Animals	21	dogs, wild cats, snakes, toxic animals

Satisfaction

A total of 972 respondents reported the things they satisfied or unsatisfied with the existed things in the communities they lived in. The most recurring themes relating to satisfaction are listed in table 6.8 below.

Table 6.7 Main themes identified in participants' satisfaction with communities

Themes	Count	Sub-themes with satisfied communities
Play Affordances	329	playground, recreational equipment, squares, sport
Low Traffic	168	diversion routes for pedestrians and vehicles
Close Relationship	147	nice neighbours, friends, familiar neighbours
Pleasing Landscape	132	woodlands, green plants, gardens, natural, fresh air
Community Service	101	security service, maintenance, clean

Regardless of which community they lived in, participants across three generations are satisfied with low traffic and close relationships with neighbours in the communities. Current parents and children raised concerns about the suitable play spaces and facilities in the community to maximize children's needs when they play outside. In addition, parents

and grandparents were delighted with the natural and rich green spaces in their childhood time, and children were satisfied with the pleasant green spaces in their community. High standard community service also promoted residents' satisfaction with their communities. In contrast, participants felt unsatisfied with their communities if there were few places and facilities for outdoor play; potential risk in traffic and strangers, and poor maintenance in the communities.

Participants in the commercial gated communities are distinct from other types of communities in that they have higher standards for the outdoor spaces in their communities.

> "I felt bored with outdoor spaces in my community. Something exciting like artificial rock climbing should be built for us."
>
> -boy, 12, live in a commercial gated community
>
> "There are no green plants in our community, I hope we can have a big tree here."
>
> -girl, 8, live in the urban village

Participant' Involvement

To assess suggestions for future implications on children's outdoor play and pre-test the possibilities for Wuhan citizens involved in the future planning process, a number of questions of communities had been explored in this research. Most participants raised concerns about the play experience in the community they grew up in and the community they currently live in. Children, as well as adults, do care about the improvement of children's play in the community. Many children were excited and optimistic about their involvement while some adults gave detailed suggestions focused on the particular situation. However, a few adult participants from urban villages held passive attitudes on giving suggestions.

> "We are migrants and we don't have the right to share our opinions."
>
> -male, 42, live in the urban village
>
> "We need to earn money, then we can consider playing."
>
> -male, 65, live in the urban village
>
> "The community will be demolished soon; I don't think there is anything that could be improved for children's play."
>
> -female, 34, live in the urban village

6.4 Family Influence

Children's outdoor play behaviours are most influenced by their families. This research has explored how children' play experiences were influenced by family members and parent's control.

Family Heritage

Spearman's rho correlation coefficient was computed to assess the relationship between the children's childhood outdoor play behaviours and their parents' childhood outdoor play experience. Overall, these variables were found to be positively correlated. Increases in the participants' home range, play frequency and duration for outdoor play were correspondingly correlated with further travelling distance, higher frequency and longer outdoor playing time their parents did in their childhood. The parents' influence on their children is stronger between the grandparents' generation and the parents' generation with moderate correlations, compared to weak correlations between the parents' generation and the children's generation.

Table 6.8 Generation influence on children's outdoor play

	Generation Influence	
	Children & Parents	Parents & Grandparents
Home range	.211**	.475**
Frequency	.098**	.324**
Duration	.202**	.404**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Siblings Encourage Outdoor Play

Chi-square tests were employed to examine the relationship between family members and childhood outdoor play behaviours. The relation between living with siblings and these variables were significant. Children who lived with siblings were more likely to travel further ($\chi 2$ (3, N=1362) = 35.202, p< .001), with 63.3% of children who had siblings travelling more than 500 meters to play compared to 45.6% of children who were the only child in the family. Children who had siblings could play outside more frequently ($\chi 2$ (3, N=1351) = 74.586, p< .001), only 19.9% of the only children could play outside every day and this number doubled in the multi-child families. Similarly, children who grew up with siblings spent longer time outdoors ($\chi 2$ (5, N=1351) = 61.079, p< .001), 51.2% of children with siblings played outdoors for more than 1 hour compared to 28.1% of the only child. This section has been supported by the qualitative data from many answers that siblings played together outdoors.

Parents' Safety Consideration

Parents' concerns about safety are the most common reason why children were not permitted to play outside. This was followed by the weather conditions, children's academic burden and difficult access to outdoor play spaces. Parents worried about vehicles, strangers, complex environments, and trafficking as the main barriers to independent outdoor play.

Figure 6.1 Word cloud of the safety consideration in the communities

Parents' Control on Children's Outdoor Play

There was a statistically significant difference between parents' control across the three-generation groups as determined by one-way ANOVA (F (2, 1322) =229.726, p<0.001). A Tukey post hoc test revealed that the degree of parental control for the children's generation (M = 3.21, SD = .983, p <.001) got from their parents was statistically significantly higher, compared to the parents' generation (M = 2.31, SD = .996, p <.001) and the grandparent's generation in their childhood time (M = 1.76, SD = 1.080, p <.001). Besides, there was a statistically significant difference between the parents' generation and the grandparents' generation at the p<.001 level.

There was no relationship between the degree of parental control and children's gender and the community type in which they lived. Results of the Spearman correlation indicated that there was a strong positive association between children's age group and parents' degree of control (Spearman rho= .769, p<0.01). The children aged between 10 to 12 years old got more control from their parents compared to younger children in this research.

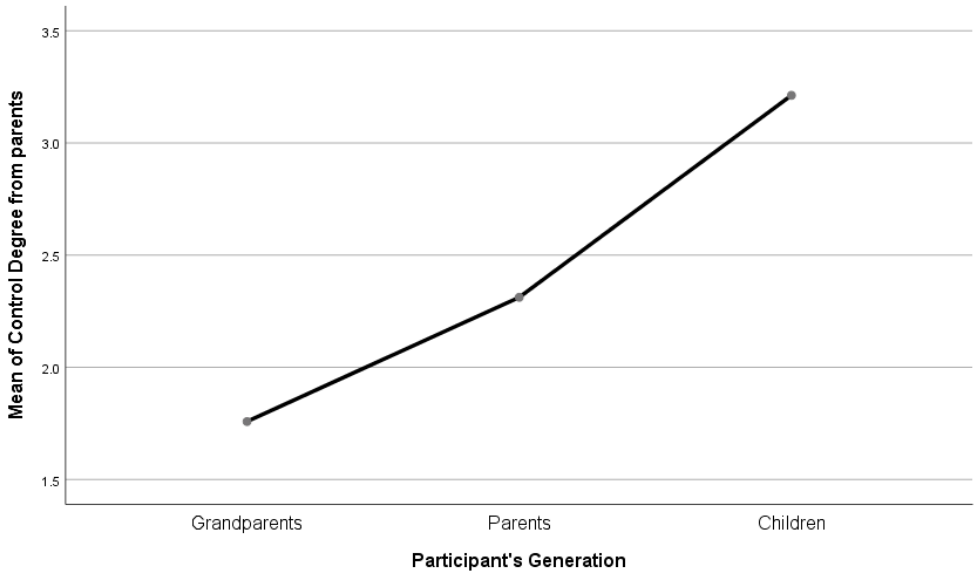


Figure 6.2 Line graph of parents' control means

Children Without Control

144 participants reported they had little control from their parents when they played outside in childhood. These responses are mainly from the parents' generation and the grandparents' generation. The answers included several reasons: it is children's developed self-discipline to manage their play behaviours; it illustrates the siblings' companions and safe environment at that time, and it describes how busy parents could not spare any time to supervise the children.

"I got no control from my parents when I played outside as a child. I would go back when it was time to go."

-female, 36, grew up in old town

"In our childhood, our parents had no control over us. Because there were many children in my family and we took care of each other. We just like free-range kids."

-female, 49, grew up in old town

"I grew up in a military district compound and it was very safe for outdoor play. We didn't need any supervision from our parents."

-female, 43, grew up in Danwei

"There were too many children in the family and our parents had so much work to do. They had no time to control us."

-male, 63, grew up in Rural

How and Why Parents Control Their Children

There are three types of parental control with a time limit, restricted places and restricted activities when their children play outside. Time limits on outdoor play refer to playing outside before dinner or before dark in the parents' and grandparents' generation. Whereas,

it is often limited to only one hour in the children's generation. In addition, the way parents control their children were different across three generations. Children normally get oral instructions to stay safe when they play outside. However, children would get physical discipline like hitting and shouting from their parents when they went to unsafe places in the parent's generation and the grandparent's generation. While parents usually want to keep their children within eyeshot or want to stay with their children at every moment in the children's generation. Besides, children were required to play with the younger siblings in the parents' and grandparents' childhood time.

First of all, parental control aims to keep children safe and get away from strangers, traffic accidents, getting lost and injured when they play outside. Besides, parents limited playing time for learning in the children's generation. While children managed to do household chores in the parents' and grandparents' generation.

6.5 Age and Gender Difference in Children's Outdoor Play

Spearman's rank-order correlation was run to determine the relationship between age and children's outdoor play behaviour. Chi-square tests were performed to examine the relationship between gender and measured variables in children's outdoor play. Results in table 6.10 present measured outdoor play variables that correlate with children's age from the aspects of space, people and activities. There is a statistically significant difference between boys and girls in the dimensions of play companions, play activities, playing time and home range.

Table 6.9 Spearman's Rho Correlation Coefficient

	SPAT	Children's Age (Spearman's Rho)	Children's Gender (Chi-square P value)
SPACE			
	Friends' community	.134**	.123
	Park near home	-.096**	.557
	Shopping malls	-.121**	.613
	Indoor playgrounds in malls	-.196**	.356
	Along the Yangtze River	-.113**	.511
	Lakeside	-.111**	.186
PEOPLE			
	Parents	-.270**	0.980
	Grandparents	-.174**	0.914
	Siblings	.091*	0.008
	School Friends	.238**	0.049
	Alone	.166*	0.491
ACTIVITY			
	Sports	.021	0.048
	Relax	.129**	0.489
	Get fresh air	0.115**	0.014
	Play Games	-.158**	0.637
TIME			
	Duration	.061	.001

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

SPACE

The weak positive correlation shows when children getting older, they are more likely to play in their friends' communities (Spearman rho= .134, $p<0.01$). On the contrary, a weak negative relationship between age and other spaces indicates when children getting older, they less frequently played in parks (Spearman rho= -.096, $p<0.01$), less frequently visited shopping malls (Spearman rho= -.121, $p<0.01$), less frequently played indoor playgrounds (Spearman rho= -.196, $p<0.01$), less frequently visited Yangtze River (Spearman rho= -.113, $p<0.01$) and less frequently travelled to lakeside (Spearman rho= -.111, $p<0.01$). There was no significant association between gender and playing spaces.

PEOPLE

The test for correlation between children's age and companions shows when children getting elder, there is a decrease in playing with parents (Spearman rho= -.270, $p<0.01$) and grandparents (Spearman rho= -.174, $p<0.01$); and an increase in playing with siblings (Spearman rho= .91, $p<0.05$), school friends (Spearman rho= .238, $p<0.01$) and by themselves (Spearman rho= .166, $p<0.05$). There is an association between children's gender and companions. More girls accompanied their siblings ($\chi 2$ (1, N=603) = 7.021, p= .008), and more boys played with school friends ($\chi 2$ (1, N=603) = 3.833, p= .049).

ACTIVITY

The result shows there is a weak negative relationship between children's age and playing games (Spearman rho= -.158, $p<0.01$). While with the increase of their age, more children played outside to relax (Spearman rho= .129, $p<0.01$) and get fresh air (Spearman rho= .115, $p<0.01$). When it comes to gender difference in play activities, more boys liked sports ($\chi 2$ (1, N=604) = 3.905, p= .048) while more girls preferred to get fresh air in their community ($\chi 2$ (1, N=604) = 6.059, p= .014).

TIME

The test shows there was no correlation between play time and children's age. There is a significant relationship between gender and the duration children play outside, boys play outside longer than girls ($\chi 2$ (1, N=601) = 21.292, p= .001).

Children Do Not Like Outdoors

Three children declared they did not like the outdoor play. The unexpected answers were all from girls. This research aimed to explore children's independent outdoor play who have constraints on them and who do not play outside frequently. Their opinions towards outdoor play differed from the rest of the children participants in this research. Although it was a small number compared to the rest of the participants, it was worth further research since fewer older girls were observed on the sites.

"I don't like to play outside and I hate insects. I will get wet and get ill if I play outside."

-girl, 7, live in the old town

"I don't like playing outside at all."

-girl, 12, live in CGC

“I don’t like going out to play.” -girl, 11, live in CGC

6.6 Summary

This chapter combines quantitative and qualitative results to explore research question two. It began with rough definitions of the questions in the questionnaires and interviews, and themes were identified when core phenomenon frequently occurred in the course of coding. Overall, childhood outdoor play behaviours were influenced by children’s age, gender, their family and the community they grew up in.

1. Is there a relationship between community type and children’s outdoor play?
Yes. Childhood outdoor play behaviours varied by the community they grew up in. In the grandparents' generation and the parents’ generation, the main difference between community types and outdoor play were the distinct places, companions and activities of rural children compared to urban children. In the children’s generation, participants shared similarities in play activities and time among four types of communities. While children grew up in different types of communities, they had diverse play spaces, and the play companions differed between gated and ungated communities. Surprisingly, the rural grandparents reported fewer play activities. This reflects the nature of play, which is defined as children’s active engagement with their free choice, personal direction, and intrinsic motivation (Woolley and Lowe, 2013).

2. How does community type affect residents' opinions towards children's outdoor play?
There were different combinations of physical attributes and social background in the selected four contrasting residential areas in central Wuhan. The childhood outdoor play experience varied by community type, with different play facilities, constructed play spaces, neighbourhood relationships and place attachments. The participants were sampled for the heterogeneity of the different physical and social mixes in the four selected areas. However, the participants’ attitudes towards safety shared homogeneity across three generations. Participants felt safe for the children to play outside in a secure community and a safe social environment. Meanwhile, familiar neighbourhoods and adults’ supervision help children feel safe playing outdoors under circumstances with unpredictable conditions.

Similarly, participants from all communities are generally satisfied with safe, playful and low-traffic communities with responsive maintenance and secure service. A close neighbourhood relationship also improves residents’ satisfaction with their communities. Still, participants living in commercial gated communities expected higher standards for the outdoor play spaces in their communities. Migrants, particularly those living in urban villages and old towns, had a weaker sense of community belonging compared to other residents.

3. How does family influence children's outdoor play?

Children's outdoor play behaviours are most influenced by their families since the parents control the outdoor play time and activities based on the physical and social conditions in the community. When children get older, this level of parents' control becomes higher to balance play and academic achievements. Growing up with siblings encourages children to play outside longer, more frequently and allows for a larger home range. There is also a family heritage aspect to children's outdoor play, that if the parents played outside more, their children are more likely to play outside more.

4. How do children's outdoor play experiences differ by gender and age?

As children become more independent, they prefer to play alone and with friends rather than with adults as they get older. On the other hand, older children less frequently visited places except for their friends' communities. From the interviews, we can see older children had more academic pressure and played outside mainly to relax. Gender also affects outdoor play behaviours by companions and play activities. Girls are much more likely to accompany their siblings, while more boys visit and play with their school friends. Boys are much more likely to play sports than girls, while girls prefer low-intensity activities.

Chapter 7: How Physical and Social Environments Affect Children's Outdoor Play

This chapter presents the results from the observations in the four selected communities. It briefly describes the characteristics of children's outdoor play behaviours and the physical environment of the communities. This used spatial configuration, functional features and landscape features to investigate the influence of physical attributes on children's outdoor play. Then it presented the scenes observed on the sites to reveal children's social interaction in the communities. Then to get a better understanding of outdoor play in life, the participants' attitude towards play was investigated.

The chapter answers the research questions: RQ3. How do physical attributes influence children's outdoor play? and RQ4. How does the social environment influence children's outdoor play?

This chapter addresses the following questions:

1. Does the spatial configuration of the physical community influence children's outdoor play?

2. How did participants experience the landscape in their childhood play?

3. How did children interact with other residents in their communities?

4. What are the parents' opinions towards current children's outdoor play?

7.1 Methodological Approach

Walk-by Observation

The researcher designed a walking route to observe the spaces children would play in throughout the communities and recorded the children's play activities and their companions. To investigate the children's interaction with their surroundings and other people, the observed objects included preschoolers (aged 3 to 6), school-aged children (aged 7 to 12) and retired seniors. The observations in old town and CGC were carried from July to October in 2018, while Danwei and urban village were observed in January 2019. Each community has been observed for two days, one in weekdays and one in weekends. Four time-slots to observe the site from 8:00 to 11:00, 11:00 to 14:00, 14:00 to 17:00 and 17:00 to 20:00 in the day. The research walked and recorded the number of children and their activities every hour in the target areas in the communities. Overall, there were 116 behaviour mappings collected from July to October in 2018.

Structural Equation Modeling

Most of the quantitative research in the social sciences uses linear regression analysis, that is, based on controlling certain variables, testing the direction and coefficients between independent variables and dependent variables. When analyzing some variables that are not directly observable, a multiple linear regression model is used to reduce the dimension of the data and find out the core factors of the variables. However, it has constraints on multilevel casual analysis and information omission in condensing data (Ma & Lu, 2019). As a multivariate statistical analysis technique, structural equation modelling (SEM) can be used to analyze structural relationships among measured variables and latent constructs (Schreiber et al, 2006). Almost all the variables of interest in this research are not directly observable, such as children's outdoor play, family influence, constraints on children. The use of a single indicator to fully capture the complexities of children's outdoor play is impractical. Thus, SEM was employed to investigate the relationships between multiple variables with the combination of factor analysis and multiple regression analysis.

To measure the relationship between children's outdoor play and other variables, the data has been randomly divided into two groups, with half of the data used as a derivation sample and the remaining data used as a validation sample. Firstly, an exploratory factor analysis (EFA) was implemented to extract the major factors and determine the factor structure model. Then confirmatory factor analysis (CFA) was used to verify the factor structures to test the prior model with the other set of data. EFA and CFA are the two main types of factor analysis, and they both consist of a series of complex analysis procedures to investigate the observable or theoretical phenomenon and the underlying relationship among observable information (Field 2009). CFA is usually used to validate the factor structure. If there are prior assumptions and a theoretical basis.

EFA is used when there are no prior assumptions and the results are analyzed solely on data. In most cases, in order to better analyze structure validity, researchers will randomly select half of the data for EFA and the other half for CFA (Byrne, 2001).

7.2 Physical Attributes in the Communities

Outdoor space available in communities was considered as the most frequent place by the children's generation where they played from the self-report questionnaires (see figure 5.4 in chapter 5) and interviews. This section briefly describes the activity reports of residents from different age groups who stayed outdoors in their communities, and the relationship between children's outdoor activities and physical environment.

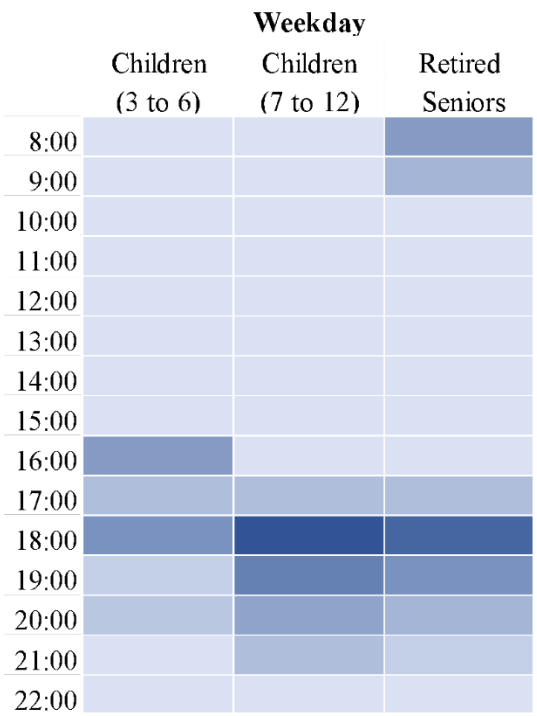


Figure 7.1 Residents stayed outdoor by the time of the weekday

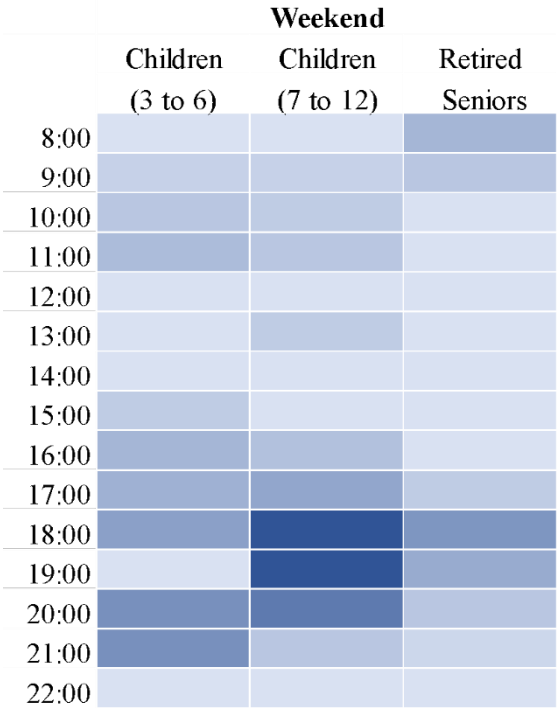


Figure 7.2 Residents stayed outdoor by the time of the weekend

Time Features of Children Spending Outdoors

After the analysis of the recorded observation, heat maps were developed to focus on the time features of the children's outdoor usage patterns of the day. As shown in Figure 7.1 and Figure 7.2, the darker blue means more residents are observed in the communities. In general, there was no difference between the time-slots children spent outdoors and the community type they lived in (more details can be seen in Appendix E). The results show the timetable children arranged to play outside in their daily lives.

School-aged Children

According to the result in Figures 7.1 and 7.2, the school-aged children started to play outside from 17:00 after school. The number of observed children increased to the peak times from 18:00 to 20:00, then dropped until few children were playing outside after 21:00 on weekdays. From the records at the weekend, the peak time children played outside started one hour earlier compared to it was on weekdays. There were observed children who played outside in their communities in the morning and lunchtime rather than just

afternoons and evenings. The analysis of diaries with children's self-reported daily routines supports this result (see Appendix E).

Pre-schoolers and Retired Seniors

To investigate the socialization between the school-aged children and other residents in the community, the activities of other age groups were observed and recorded. More children and retired seniors were observed to spend time outdoors in their communities compared to teenagers and adults. Similar to the school-aged children, the pre-school children played outside after school on weekdays and played outside all day on the weekends. Children in this age group were accompanied by the adults when they played outside, they present a longer usage of the community compared to other age groups at the weekends. The usage of outdoor spaces by the retired seniors indicated a similar trend between weekdays and weekends. They preferred to exercise before 10:00 in the morning and shared the same peak time with the school-aged children in the afternoon and evening.

Other Age Groups in the Observation

In the observation, babies and young children under three years old were taken outside by adults for sun exposure, particularly around 10:00 and between 16:00 to 17:00. A few teens were observed to stay outside in the communities, they were observed sitting, chatting and skateboarding with a pair of friends. Adults were observed jogging and walking dogs in the communities. Compared to the other three age groups reported in the figures, the babies together with toddlers, teens and adults stayed a shorter time outdoors in their communities, and they seldom socialized with other residents.

Spatial Layout and Children's Movements

pace syntax has been employed to explore the association between the urban environment and human's physical activity; previous studies approved that human's movement patterns and spatial behaviour were affected by spatial configuration (Hillier et al., 1993). The spatial configuration is defined as the spatial relation between spaces, and it can be quantified as integration value. The quantified integration value represents the degree of integration of the initial space in the system. In the study of space syntax, a space with a higher integration value refers to a better connection with other spaces that show more connectivity to the network, while a lower value indicates segregation (Hillier, 1995). It suggests that configuration of the urban space itself is the main generator of patterns of movement. This research used the segment model to investigate the children's physical activities and built environment in the community. The integration value with different distances was calculated in the segment map by using UCL Depthmap + Beta 1.0 software, and statistical analysis was performed in SPSS.

Pearson Correlation Analysis

Table 7.1 shows the Pearson correlation coefficients among integration values and the number of observed children in the four selected communities. There was a strong positive correlation between the integration value and the number of children who played outside in the Ganghua 128 Community, $r(22) = .790$, $p < .001$. The observed children were found to be moderately positively correlated in the Yucai Community, $r(19) = .584$, $p < .01$. There

was no statistical difference between the number of observed children and integration number in Poly and Muxuling Village.

Table 7.1 Pearson correlation between pathway integration value and the number of observed children

	Poly	Ganghua 128	Yucai Community	Muxuling Village
R300	-.163	**.790****	.579*	.095
R500	-.089	.758*	**.584***	.097
R750	-.154	.729*	.583*	.097
R1000	-.117	.727*	.583*	.097
R1500	-.110	.727*	.583*	.097

Figure 7.1 Children played on the residential streets in the communities (Poly, Yucai, Muxuling from left to right)

Traffic Influence

Overall, the result in Table 7.1 shows a high integration value related to more children playing on the pathway in both the Ganghua 128 Community and Yucai Community. However, there was no significant association between these variables in Poly and Muxuling Village. As mentioned in the literature, traffic could be one of the main reasons that restricted children's outdoor play. With the theory of natural movement in space syntax research, the integration value is positively linked with the human's activities as well as other transport (Patterson, 2016). There were no pedestrian roads segregated from vehicles on the main streets in the four communities, and they all had the problem of car parking occupying the public spaces in the communities. Furthermore, pedestrians shared the entrances and main routes with the vehicles in Poly and Muxuling Village. From the observation on the four sites, it could be seen that Poly and Xumuling have a higher traffic density on the routes with higher integration value. Hence, the high volume of traffic could be the main restriction to explain the phenomenon of children not playing in the pathway with higher integration values in these two communities.

Figure 7.3 Traffic and parking in Poly

Figure 7.2 Trucks in Muxuling Village

To give a comprehensive study on the association between physical attributes and children's activities in the community, this research explored the urban form character with the spatial configuration and land use mixed dimensions (see Figure 7.6). The integration core refers to spaces with the highest integration value in the communities. The number of residents in each space was represented as different sizes of circles, which were calculated by the average number observed per hour. Considering the population difference in each community, it only provides a general comparison of where residents are gathered in the same community. The next section will focus on the functional features that provide affordances for children's outdoor play.

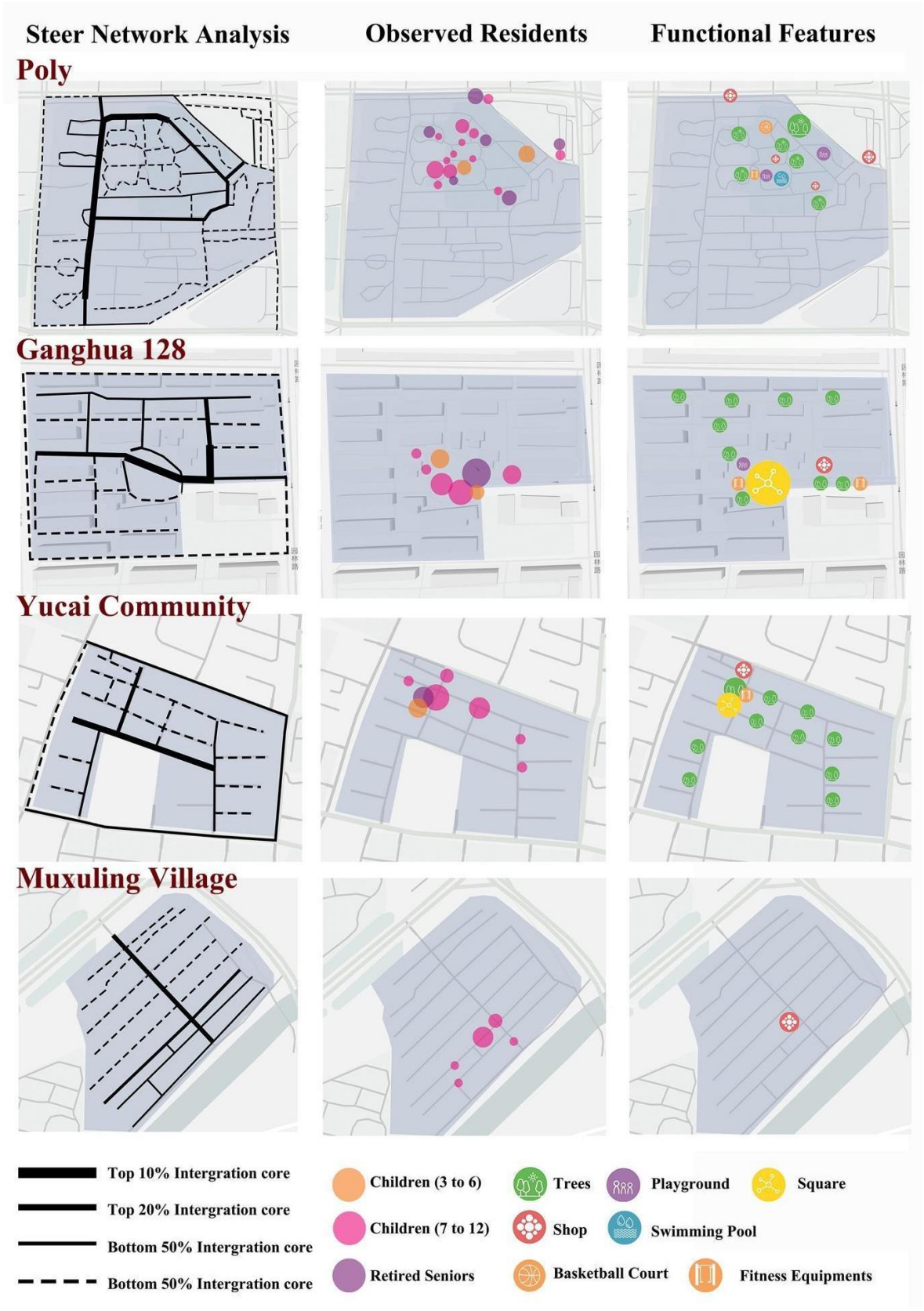


Figure 7.4 Street network analysis, observed residents and functional features in the four communities

Functional Features in the Communities

Normally, children are attracted by the functional features in the community, as shown in Figure 7.6. From the analysis of the observation, children mainly played in the activity zones with the location of playgrounds, squares, sports centres and the presence of shops. Except for the Muxuling Village, the other three communities provided public sharing spaces, fitness equipment and green spaces for residents' recreation needs in the communities. Besides, there were specific playgrounds developed for two age groups of children in Poly. There was also a simple playground with simple play kits and soft carpet in Ganghua 128 Community. The children who lived in Muxuling Village only played on the streets near a shop close to the main road in the community.

Playgrounds

The two playgrounds in Poly after school were the liveliest places during the researcher's visits to these communities. They were provided to support two age groups: one was for younger children under three and one was for children above. These two playgrounds provided various pieces of fixed play equipment, and both of the playgrounds incorporated green space around them. Surrounded by fences and hedges, younger children were safe to play inside without the interference of traffic and toy vehicles. Although they were very popular among younger children, the school-aged children seldom played there. A number of child participants involved in this research mentioned they get bored with the playground in their communities, and wished that something exciting could be developed. Some parents agreed with this point by stating that their children no longer played in the children's playgrounds when they became schoolchildren. The playground in the Ganghua 128 Community was less attractive with simple equipment, so the children just played there for several minutes and then walked away.

Fitness Equipment

Quite a lot of school-aged children were observed to play with fitness equipment in the communities. Such outdoor equipment was designed for adults and it could be dangerous for children when used in inappropriate ways. Many Chinese studies have reported children's accidents caused by this equipment (Jiang et al, 2017), and parents in this research raised safety concerns about the equipment, especially when the equipment was old and unmaintained.

Open Spaces

Through the observation in this research, the ideal places for school-aged children to play were found to be lawns and basketball courts in Poly, squares in Ganghua 128 Community and Yucai Community, and wide pathways in Yucai Community and Muxuling Village. All these places were open spaces in the communities without activity restrictions, where children could chase with their friends, play with toy vehicles and even play football. These open spaces also shared similarities as physically separate from traffic and socially with residents walking around them, which made children feel safe to play there.

The following Table 7.2 illustrates the observed children's activities and the most active spaces in the four communities. The observations identified that the safe and accessible open spaces were fundamental for the school-aged children playing outside. As shown in

Table 7.2, green space in Poly provides more affordances for children's activities compared to other communities. The activity codes were based on the SOPARC systems with fitness, sport, active games, and sedentary related codes. Toy vehicle codes were added as many children were observed to play with scooters, bikes and powered vehicles on the sites.

Table 7.2 Observed Outdoor Activities in the Selected Communities

Fitness: walking, dogs walking Sports: basketball, football, badminton, ping-pong Active Games: chasing, jumping, climbing, sliding Sedentary: sitting, standing, lying down Toy Vehicles: scooters, bikes, powered vehicles, electric scooters	 Figure 7.5 Outdoor spaces in Poly
Fitness: walking, dogs walking Sports: badminton, ping-pong, Active Games: chasing, jumping, climbing, sliding Sedentary: sitting, standing Toy Vehicles: scooters, bikes, powered vehicles, skateboard	 Figure 7.6 Outdoor spaces in Ganghua 128
Fitness: walking Sports: badminton, football Active Games: chasing, jumping, shooting game Sedentary: sitting, standing	 Figure 7.7 Outdoor spaces in Yucai community

Fitness: walking Active Games: chasing, jumping Sedentary: standing	 Figure 7.8 Outdoor spaces in Muxuling village

7.3 Landscape Features and Children's Outdoor Play

Landscape plays an important role in childhood outdoor play as is evident from a series of answers through participant's childhood play memories, their preference for community green space and their expectations for future outdoor play. These landscape features included fascinating rivers, forests, mountains to urban parks, trees and birds in the city. This section examines the relationship with the landscape around participants' communities and the impact of landscape has had on children's outdoor play.

Water Features

The most commonly discussed landscape feature in memorable childhood play experiences is water. A total of 1371 references from 1215 participants' responses involves water play as well as places close to the water. Children in the grandparents' generations were natural explorers of the rivers and ponds, with watercraft for transports and pleasure being highlighted in the parents' generation, while the current children showed great interest in coastal cities, water theme parks and swimming pools. The way people interact with these water bodies was important, and the popular blue spaces in this research can be defined as the Yangtze river, lakes, streams, ponds and seaside.

The Yangtze River

Before many pools were built in the city, it was a tradition for the locals to swim in the Yangtze River in hot summers. Then it became a cultural activity to swim in the Yangtze River inspired by Chairman Mao who swam across the Yangtze River in 1966. The ferry line was a fast and efficient way of crossing the Yangtze River before the metro was operated in 2012. Although the current children might no longer swim in the Yangtze River or take the traditional ferry, the riverside park in Hankou was the most popular park among the children in this research.

"I could remember that my parents took my siblings and me to swim in the Yangtze river on summer days. We were the children of a river city and we were born to swim in the Yangtze River. "

-male, 63, grew up in old town

"Taking the Yangtze ferry to come back to Wuchang was exciting."

-female, 38, grew up in Danwei

"I can remember that I was so happy the first time I flew kites with my parents in the riverside park."

-boy, 11, grew up in urban village

Seaside

Travelling to other cities was also a memorable play experience for current children. Nearly three quarters of the 83 domestic destinations were coastal cities, and all overseas destinations reported in this research were islands. Attracted by the beach, the coastal cities were an ideal choice for interior families to spend holidays.

Lakes, Streams and Ponds

With the benefits of water resources in Wuhan and surrounding cities in Hubei province, children in the previous generation became associated with water by fishing, catching crayfish and swimming in the lakes, streams and ponds. Water play on a hot summer day can be fun while playing near water was prohibited by the parents when children were unsupervised. Exactly 53 participants reported the risk and parent's safety consideration of children playing with water. A number of participants in the parents' generation mentioned undertaking recreational activities in the East Lake, and today's children showed more choices to play by the riverside as more parks have been constructed along the lakes in Wuhan.

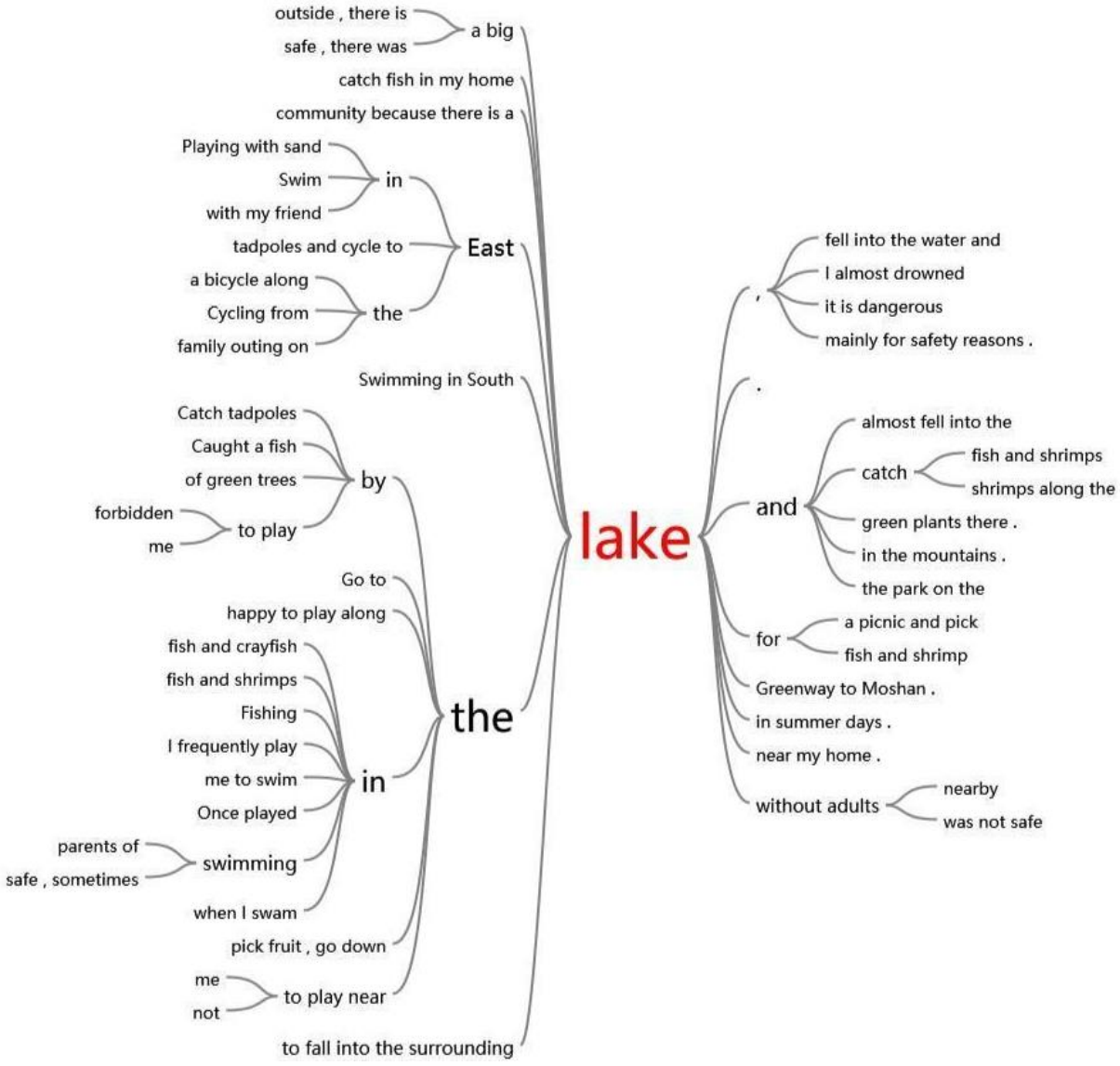


Figure 7.9 Test search for "lake"

Mountains, Hills and Valleys

The beautiful scenery created by the natural landforms provided memorable childhood play experiences in the previous generations. The natural environment where grandparents grew up was often described as "lucid waters, lush mountains and fresh air". Hills and valleys were remarkable as workplaces for the grandparents to herd cattle and provided natural food for the parents to pick in their childhood. Mountain climbing was very popular among the parents' generation when they were children. Except for the coastal cities, the parents were favourable to bring their children to the cities with mountain attractions.

"I was quite satisfied with the environment I grew up in, there were beautiful mountains and clear waters. And I could hear the birds singing and smell the fragrance of flowers."

-male, 74, grew up in rural

"My memorable childhood play experience is when the school teachers organized a spring trip to Wuyi Mountain. It was my first time taking a bus and I was so excited to climb the mountain with a group of classmates."

-female, 35, grew up in rural

"It was the trip to Hua Mountain with my parents, I was so proud of myself that I reached the top and we enjoyed the sunrise there."

-boy, 11, grew up in Danwei

Trees

From the participants' replies, it is evident that trees are important in childhood. There were 175 references to trees, three comments were negative regarding little sunshine in the rooms shaded by trees, risk of falling from trees and being annoyed by fruit dropping from trees. While the vast majority of participants expressed positive attitudes towards trees, the current children wished there could be more trees in their communities. Trees provided natural access for children to contact with fruits, birds and insects, and many children in the parents' and grandparents' generation took tree climbing as a recreational activity. Although the current children seldom climbed trees, the imagination, memories and affection ignited by trees was across three generations, genders and living communities.

"I like the ginkgo tree in my community, its leaf was like a small fan."

-boy, 7, grew up in old town

"When autumn comes, the falling leaves are like butterflies dancing in the sky."

-girl, 7, grew up in a commercial gated community

"Although there are only a few leaves and no flowers in the community, I feel very quiet and peaceful. When the winter comes, I will put snowballs on the branches to make a snow tree."

-girl, 11, grew up in a commercial gated community

Figure 7.10 Word cloud of outdoor spaces children participants liked in their communities

Landscape Elements in Children's Community

There were 454 references in relation to children's preference of the outdoor spaces in the communities, 335 children liked the current outdoor spaces while 119 disliked them. Figure 7.12 depicts a word cloud of the design elements of outdoor space that children preferred in their communities. Children were pleased with flourishing green plants, especially flowering and fruit trees, flowers and grass. The vegetation contributes to the beauty and environmental quality of the community and attracts children with flowers, birds and insects. In addition, constructions with natural elements in the communities, such as ponds and rockeries, were welcomed by the children. It was also important to provide recreational areas like squares and playgrounds for children to play outside. In contrast, children disliked the featureless landscape in the community with little vegetation. Meanwhile, the green space with poor maintenance could have bad impacts on children's outdoor play, with three children mentioning mosquitoes biting due to the poor environment in the community.

"I quite like my community; it is so green! We have flower blooming all year round, cherries and magnolias in spring; gardenia in summer, sweet-scented Osmanthus in autumn and plum blossom in winter."

-girl, 9, grew up in a commercial gated community

"There are many trees in my community, many kinds of birds, and many insects in the grass. "

-boy, 11, grew up in old town

"I felt so relaxed and comfortable to sit under the shade of the big tree in my community where I can forget my worries."

-boy, 11, grew up in Danwei

"I like my community, there are always many strange plants growing every year."

-boy, 11, grew up in Danwei

7.4 Social Interactions in the Communities

One of the important reasons why children should be outdoors is that children need socialization in the outdoor world rather than just interacting in structured settings such as schools and homes. In Figure 7.6, the pathways with higher integration values were connected with the activity zones in Ganghua 128 and Yucai Community. Which not only attracted children to play there but also provided great opportunities for children to meet and interact with other residents. Thus, many interactions between children and other age groups were observed in these two communities while there was less interaction among residents in Poly.

Weakening of the Acquaintance Society

The society children grew up in the previous generation, such as rural areas, urban villages with the same residents from the same hometown and Danwei, constituted the Chinese traditional acquaintance society. With the progress of urbanization and migration, the urban environment is turning from an acquaintance society into a society of strangers. The current children, as well as the adults, need to learn to be familiar with the strangers in the communities, make friends with them and play with them.

Play with Friends

Another important element in children's outdoor play identified in this research was friends to play with. While the way to make friends has changed in the current generation. Parents, especially those who lived in CGC mentioned the lack of friends to play with their children in the communities. In order to allow their children to play with other children, they had to make friends with other families first. However, they naturally made friends with other children in their childhood.

From the observations, children normally played outside with pairs or small groups in Poly and Ganghua 128. With further interviews, it could be seen that they were classmates or family friends in the communities. Conversely, large groups of different aged children playing together had been observed in Yucai and Muxuling. They met in the gathering places in the communities and played together.

Intergenerational Interactions

There was a trend that the grandparents involved in taking care of the grandchildren would accompany them when they played outside. Meanwhile, children interacting with other seniors were reported and observed in this research. Two parents who grew up in Danwei, talked about their experience of sharing public activity zones with the seniors in the communities. In their childhood, they always played in the public space after the seniors finished their morning exercises. The observations taken in Ganghua 128 and Yucai community revealed the number of children playing outside alone coordinated with the number of seniors on the sites. The respondents from children's questionnaires and interviews indicated that children felt safe to play outside in the communities if there were adult residents who stayed outside.

Play with Peers and Release the Adults' Burden

One of the reasons parents do not let their children play outside is that the parents have no time to accompany them when they play outside (see Figure 6.2). According to the observations, the adult companions normally spend their outdoor time with sedentary activities such as standing besides, sitting and playing with mobile phones. They seldom played with their children or interacted with other adults if their children played by themselves. After a while, they would ask their children to go back home if they lost patience. Once the children interacted with other children, the situation could change. Studies have reported the burden and stress in taking care of their children (Chen and Liu, 2012) and the following figures describe how the accompanying adults became relaxed when their children played with other children. The two scenes were based on the real phenomenon during the observations.

Figure 7.11 Scene one: the companioned grandmother (Source: Sketched by the author)

In scene one, the grandmother was encouraging her grandson to practice skipping rope. The boy got bored with the uninteresting training, and the grandmother also felt a bit depressed. Several meters away, three boys were playing badminton. And they found it difficult to allocate which two could play and the others just watched beside. Occasionally, the three boys decided to play hide-and-seek, and they invited the single boy to join them. The boy said yes, and they had a very happy outdoor time. Moreover, the grandmother also got a chance to join the square dancing that she had expected for a long time.

In scene two, the companion's mother had to stand there to supervise her children for nearly an hour. She became fidgety and kept watching her mobile phones. Suddenly, her sons noticed a snail and their excitement also attracted other children. Inspired by her sons, the

mother put the phone into her pocket and started to chat with other women besides. Gradually, her face was filled with a smile.

The two figures reflect the social intervention in children's outdoor play, which was difficult to record by other methods. Social intervention could be children's natural desire to interact with others, as well as socialisation with the help of adults and communities. One of the essential parts of outdoor play is social interaction through playing with their peers. The descriptions of the two scenes reveal the importance of children playing with each other. It is not only the benefits brought to children through social interaction that help release the burden of adults from supervising their children outdoors.

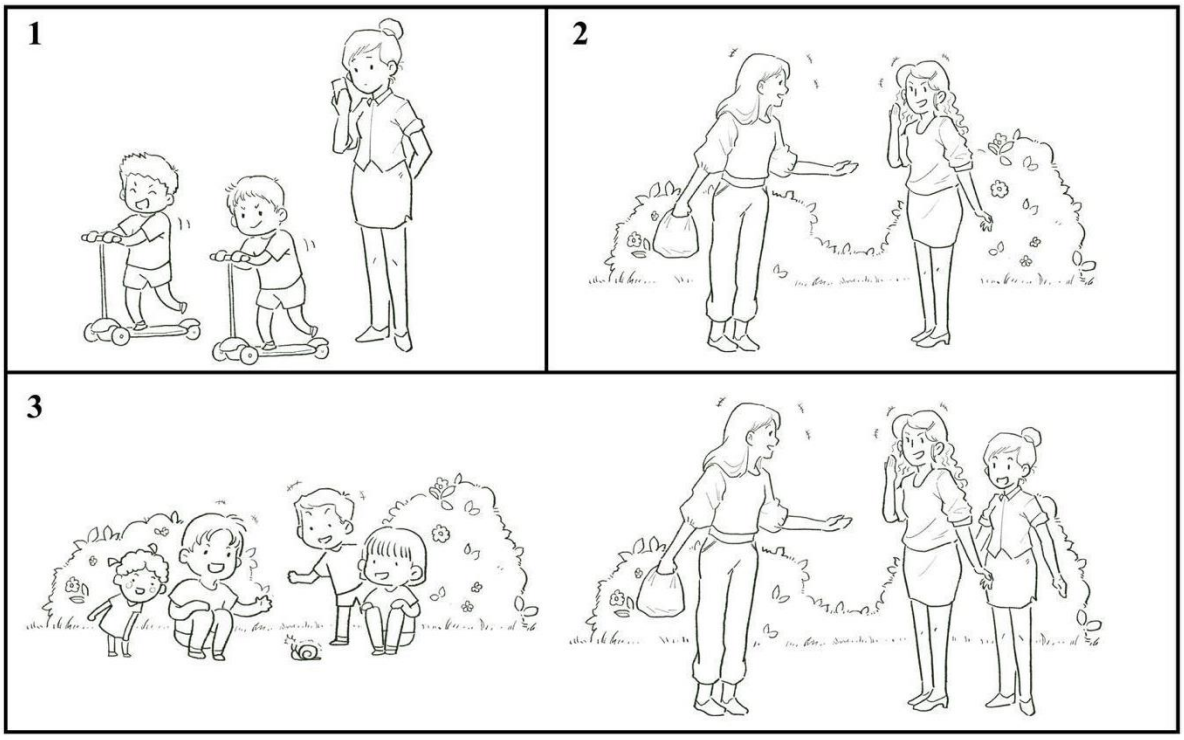


Figure 7.12 Scene two: the companioned mother (Source: Sketched by the author)

7.5 Additional Attributes

Several additional factors emerged from the analysis; the weather conditions could be one of the key aspects that determine whether children stay outdoors. The implementation of policies reported by the participants played an important role in the regeneration of the old communities. Isolated spaces with spatial segregation in the communities could be ideal recreational places for other groups of people.

Weather Conditions

The responses from the questionnaires suggest that children would not play outside on rainy days, hot days and winter days. The observation indicated children, as well as other residents, are least active outdoors during the coldest months when the temperature is

below 10℃. However, they stayed outside in the evening even on the hottest days of the summer, even around 35℃.

Implementation of Public Policy

Two public policies were mentioned by the participants, one was the Wuhan Sponge City Program and the other was the National Keep-fit Program. Residents were pleased with the implementation of these policies because their communities had been revitalized with new paving and facilities. From 2016 to 2021, the public announcements about old communities turned from "demolished for new development" to "regeneration of the old communities".

Isolated Spaces

There is a belt of open green space with grassy slopes and woodlands located at the edge of Poly, which is ideal for children to sit and relax. Surprisingly, children participating in the interviews did not realize there was such a place in their own community. Even though a 12 years old girl was expecting a natural and quiet place to stay with her friends. The green space was isolated with a low integration value and it was enclosed by fences with a small gate. Besides, it was a bit far from the central activity zones that the residents need to come across many pathways to access it. Thus, few residents used this place in the daytime. However, it became lively with residents walking with dogs. Similarly, teenagers were observed to skateboard in the deeper dead-end streets where other children would not play there.

7.6 Participants' Attitudes Towards Play

This section concerned the participants' attitudes towards outdoor play, by including the responses to the following questions: What is outdoor play? Will the parents wish their children to play as they did in their childhood? What is your most memorable childhood outdoor play experience? The participants' opinions towards these questions reflect what they treasured most in play and the kind of environment they wish children to grow up in.

What is outdoor play?

A total of 1189 participants responded to this question, the main options participants regarded as outdoor play were outdoor games, sports, walking, visiting parks and theme parks. Many participants did not give an exact option, and they described what they regard as outdoor play. Their response suggests that outdoor play is a natural way of children's free choice to do joyful outdoor activities with many benefits.

"Things that have nothing to do with homework were play."
"All the children's own choice is play."
"All outdoor activities which benefit children's development were play."

Will the parents wish their children to play as they did in their childhood?

Among the 486 respondents, 78.2% of parents wished their children could play in the same way as they did in their childhood. According to their replies, the outdoor time in their childhood was free and joyful which formed a happy childhood in their life. They thought childhood outdoor play benefits children's development a lot for physical fitness, mental health and social interaction. Besides, it was children's nature to play outside and get close to the natural world. These parents considered the current children had fewer chances to spend outdoors as they did in childhood, and they wished their children could have more chances to play outside, make friends, do physical activities and be exposed to the natural world rather than staying indoors and playing with electronic equipment.

However, 21.8% of parents did not hope their children to play as they did in childhood. They raised concern about the busy traffic and migration, thinking it was no longer safe for the children to play outside as it was in their childhood. Meanwhile, 19 parents believed the current children are growing up in a developed environment with better material conditions compared to the poor and hard childhood they had. Moreover, some parents hold the opinion that as the new generation, the current children should keep up with the new development and spend more time on study for future progress.

Childhood Play Memories

Participants were asked to describe their most memorable childhood outdoor play experience in the questionnaires and interviews. By collecting the play experiences of previous generations, this research explored how childhood play changed over time in different physical and social contexts. These stories help to understand the environment children grew up in, which includes family environment, school environment, community environment and social environment. The play memories reflect how participants grew up, what they treasured most and the kind of living environment they wish to have.

Totally 931 respondents were involved and 1728 references have been generated through analysis. Most participants found thinking about and talking about their childhood play memories to be a pleasant experience. The information collected from the responses were diverse and a Sankey diagram was made to illustrate the data. The core themes extracted from the childhood memories were companions, places, activities, Figure 7.15 shows the proportion of participants flowing into different dimensions of play experiences. It captures all sorts of childhood outdoor play experiences from the children's generation to the grandparents' generation: playing alone or with friends and families; in the communities, natural settings or travelling to new places; adventurous, natural elements, or group events; which were part of their play world. Although the Sankey map excludes information of time which were not clearly described in the childhood play memories, it shows the flow of the other three dimensions of SPAT model in children's outdoor play. Most children's play experiences include travelling to new cities and theme parks with their families. The parents and grandparents were more independent in play with less participation from family, and they took adventurous and natural play in the countryside as an unforgettable childhood play experience.

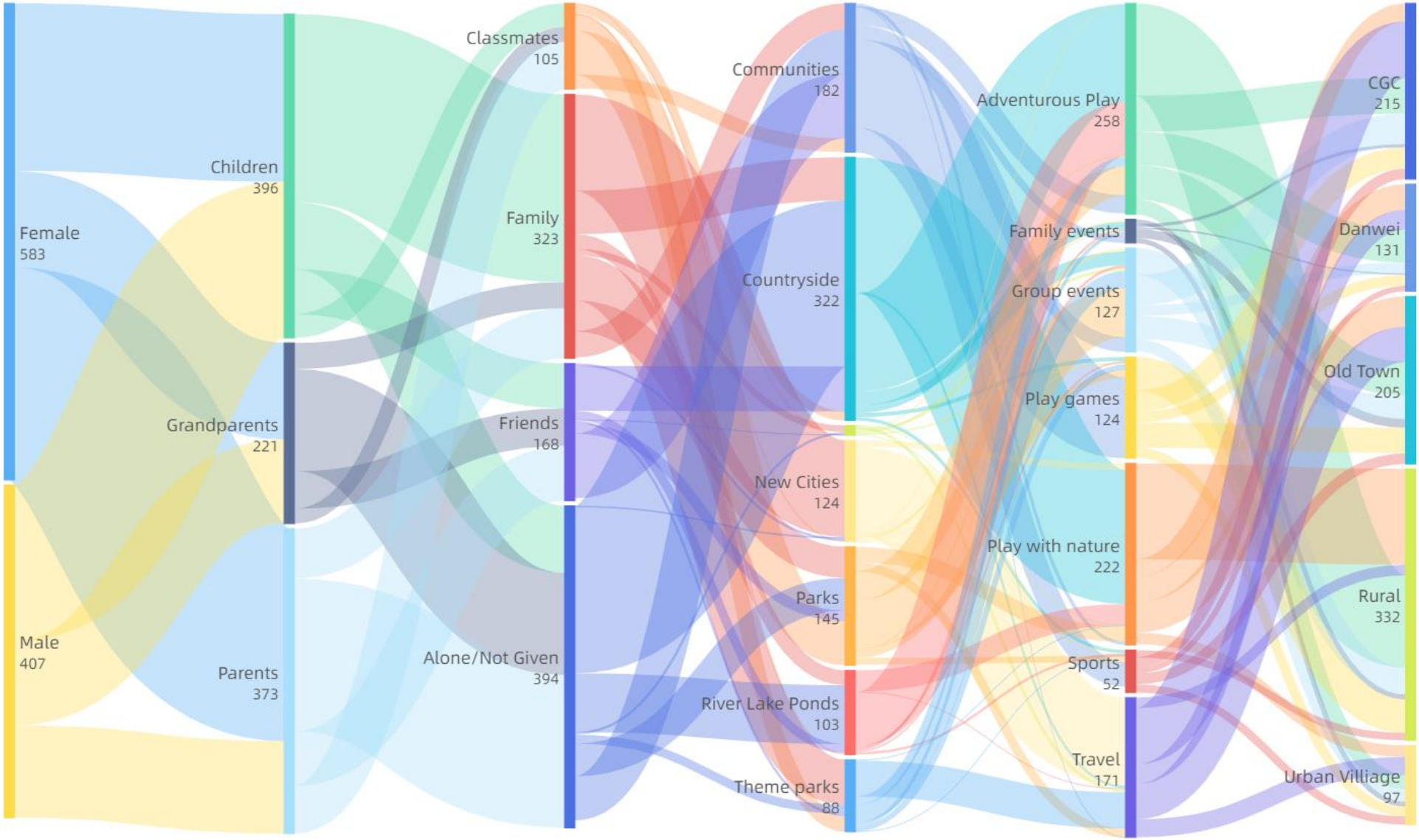


Figure 7.13 Visualizing participants' memorable childhood outdoor play experience using Sankey diagra

7.7 Structural Equation Modeling Result

Sample Size

In this study, 1000 sample questionnaires were randomly selected and divided into two groups for EFA and CFA. In general, small sample size can lead to issues such as model convergence failure, incorrect solutions, inaccurate parameters, and unacceptable model fit (Wang & Wang, 2012). According to Tabachnick and Fidell (2007) in their guide to sample size: 100 means poor, 200 is fair, 300 is good, 500 is very good, and over 1000 is excellent.

To evaluate the suitability of sample data for structure modelling, the KMO (Kaiser-Meyer-Olkin) measure of sampling adequacy and Bartlett's Test could be checked before factor analysis. The KMO test is an index used to compare the simple correlation coefficient and the partial correlation coefficient between variables, and it mainly appears in factor analysis of multivariate statistics (Field, 2009). The KMO statistic takes a value between 0 and 1. High values larger than 0.7 are considered useful for sample data to do factor analysis (Field, 2009). Bartlett's test of sphericity indicates the correlation between the variables in the correlation matrix. The small value of the significance level, usually less than 0.05, indicates that sample data may be useful for factor analysis. In this study, the result of KMO and Bartlett's Test are 0.743 and 0.000, which indicates that the sample is suitable for factor analysis.

Table 7.3 The KMO and Bartlett's tests of the questionnaire

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.743
Bartlett's Test of Sphericity	Approx. Chi-Square	1519.699
	df	36
	Sig.	.000

Factor Analysis

Factor analysis refers to the study of statistical techniques to extract common factors from variable groups (Kline, 2015), 9 ordered categorical questions were extracted from the questionnaire sample to conduct EFA to investigate the relationship among the latent variables. According to the Scree Plot (see Appendix F), the "elbow" of the graph that eigenvalue starts to level off is around the point of 3, thus the number of factors is determined (Cattell, 1966). To check the quality of data condensation, the cumulative variance of 3 factors was calculated by SPSS and the result is reported in Table2. Three factors explained 55.950% total variance, which is sufficient to represent original data. Although cumulative variance is important in factor analysis, and the larger percentage of total variance means a more precise extraction of the factor, There are varying opinions about the criterion of the cumulative variance, particularly in different research fields, for instance, the natural sciences, psychology, and the humanities (Henson & Roberts, 2006). No specific threshold exists. In the natural sciences, factors should be stopped when 95% cumulative variance is reached (Hair, Anderson et al. 1995), while in the humanities, the cumulative variance is commonly as low as 50 -60% (Hair, Anderson et al. 1995; Pett, Lackey et al. 2003).

Table 7.4 The total variance explained with three principal components.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.496	27.739	27.739	2.496	27.739	27.739
2	1.583	17.593	45.331	1.583	17.593	45.331
3	.956	10.618	55.950	.956	10.618	55.950
4	.830	9.221	65.170			
5	.724	8.045	73.216			
6	.677	7.520	80.736			
7	.630	6.995	87.731			
8	.592	6.582	94.313			
9	.512	5.687	100.000			

Extraction Method: Principal Component Analysis.

Reliability of the Scale

Reliability is the concept used to indicate the quality of measuring a method or technique, mainly evaluating the accuracy, stability, and internal consistency of scales, that is, the degree of variation of the measured value caused by random errors in the measurement process ((Bland & Altman, 1997). Cronbach's Alpha is commonly quoted to demonstrate the reliability that scales and tests have been constructed (Taber, 2018). According to a statistic by Taber (2018) on the use of Cronbach's Alpha, most reports describe 0.6-0.95 as an acceptable value of alpha. However, Schmitt (1996) has suggested that there is no standard range that makes Alpha acceptable, and in some circumstances, a low value of Alpha with strong theoretical knowledge of scales can still prove significant. Table 7.4 summarises the results of Cronbach's Alpha for the test of reliability, and it basically meets the acceptable requirements of Cronbach's Alpha. The relatively low value of Cronbach's Alpha may be due to the large age span of the questionnaire participants (more than three generations), and it might also be because the younger primary students cannot fully understand or effectively respond to all the questions.

Table 7.5 Tests of reliability of the questionnaire

Factor	Observed Variable	Cronbach's Alpha
Family influence	Family Structure Place Diversity Companion Diversity	0.598
Constrains on Children	Community Type Supervision Level Parents Control	0.608
Children's Play Experience	Nature Access Play Duration Play Frequency	0.624

Validity of the scale

Validity mainly evaluates the accuracy, validity and correctness of the scale, namely, the deviation between the measured value and the target true value. To evaluate the measurement model of three factors: family influence, constraint on children, and play experience of children, CFA was conducted with AMOS by using a maximum likelihood parameter estimate (Byrne, 2001). CFA is a method to test whether observed data fits a hypothesis model that is based on theory and previous analytic research. In this study, the factors extraction and measurement structure are obtained by EFA, thus the measurement model could be produced in Figure 1. Another half sample of questionnaires has been used to assess model fit.

The fit statistics are reported in Table 7.5. Considering Chi-square is sensible to sample size, the root mean square error of approximation (RMSEA) is reported as an evaluation

of overall fit (Rana & Dwivedi, 2015). Hu and Bentler (1999) recommended that an RMSEA value smaller than 0.6 indicates a relatively good fit between the hypothesised model and observed data. The goodness-of-fit (GFI) and adjusted-goodness-of-fit (AGFI) are 0.971 and 0.945, which are higher than the acceptable value of 0.9 (Hu & Bentler, 1999). The comparative fit index (CFI) is an incremental fit index that compares the goodness of fit between a hypothesised model and the baseline model (Xia & Yang, 2019). Because of the stable and robust characteristics of CFI, it is suitable to be reported when sample data is not very consistent (Gerbing & Anderson, 1992; Fagan, Neil & Wooldridge, 2003). For the CFA model, the index of CFI is 0.769, which is lower than the acceptable value of 0.9. Another inadequate fit index is the relative chi-square, which is calculated as Chi-square divided by the degree of freedom (DF). Kline (2015) has suggested that relative chi-square reflects an acceptable fit as 3 or less and a good fit as 2 or less. Table 4 reports the relative chi-square as 9.169, which is much higher than acceptable. There is still some distance from the measurement model to a sufficient model. It is reasonable to attempt to improve this model in SEM.

Table 7.6 Measurement model estimates: CFA model.

Fit Index	CFA model	Recommendation
Chi-square	220.049	N/A
Degree of freedom (DF)	24	N/A
P	0.000	<0.050
Chi-square/ DF	9.169	<5.000
GFI	0.971	>0.900
AGFI	0.945	>0.900
CFI	0.769	>0.900
RMSEA	0.049	<0.060

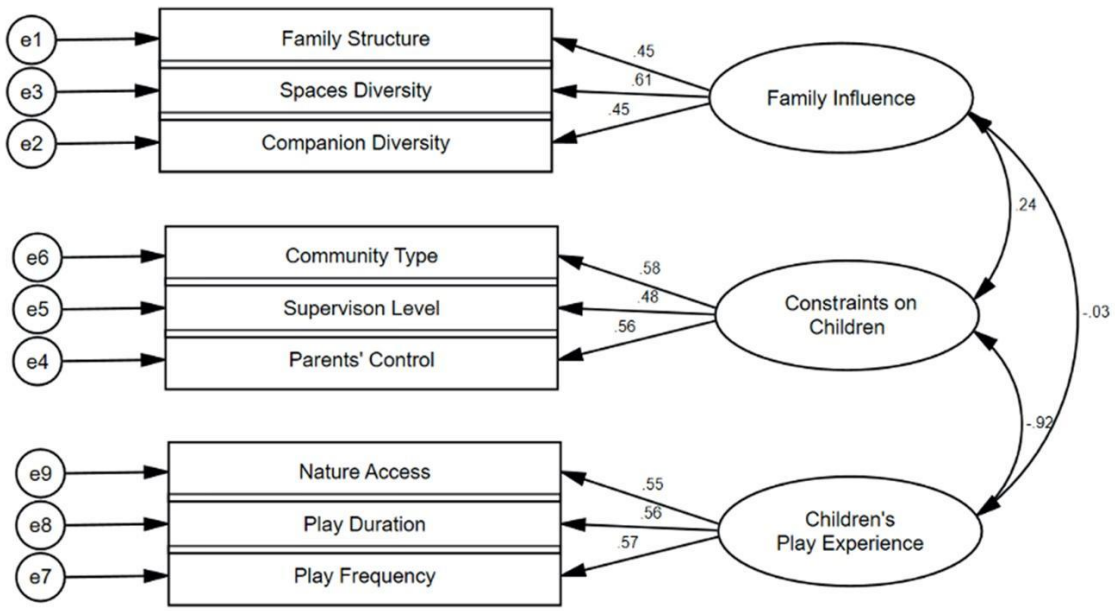


Figure 7.14 The measurement model in CFA.

Structural model testing

Yield measurement model of CFA could use structural equation modelling techniques in AMOS to determine the best fit model, and then analyse the relationships among latent variables and observable variables in the entire model (Kline, 2015). In order to improve the performance of the model, there are usually two ways to modify the structure.: 1) modify the path based on the value of factor loading, that is, delete the loading path that does not reach the significance level and delete unreasonable paths; 2) follow the modification indices derived from AMOS as shown in Table 7.6. The value of modification (M.I.) indicates that covariances will decrease and the model fit index will increase if the related path between two points has been added (Byrne, 2011). Armed with this knowledge, the ideal structure model could be obtained by iterative modifications.

Result and Discussion

The structural equation model is conducted using AMOS 25 based on the results of the EFA. In order to maximise correlations between variables and factors, it took principal component analysis as the extraction method and Varimax with Kaiser Normalization as the Rotation method (Hair, 2009). Figure 7.17 depicts a modified model, while it summarises the model fit index in Table 7.7. As the validity and reliability of the modified model basically reached requirements, it cannot reject that the modified model is accepted.

The result of the structural model demonstrates the interactions between the family influences, constraints on children, and children's play experiences. In the view of statistics, the constraints on children have a strongly negative influence on children's outdoor play, while family influence has a relatively lower impact on children's play experience. And it also indicates that there exists an ignorable mutual influence between family influence and constraints on children.

Although the structural model has been systematically developed and validated to be acceptable, there are still some limitations that need to be considered. Firstly, the questionnaire for this study is not originally designed to conduct SEM analysis. Hair (2009) suggested that at least three observable variables composed a factor, considering that some low loading variables should be deleted during CFA, thus four or more questions are recommended to scale one latent variable. Additionally, the data type of questions does not strictly satisfy SEM requirements, such as 7-level Likert scales. Therefore, this model has a slightly unsatisfied but basically acceptable performance. Thirdly, the lack of mature questionnaires about this research area makes it difficult to obtain ideal factor loading for this study. And in order to have a better understanding of children's play, more factors need to be designed and mediating effects should be considered. Future research can elicit more information on these aspects, and expectations may be introduced to aid in the model's validation.

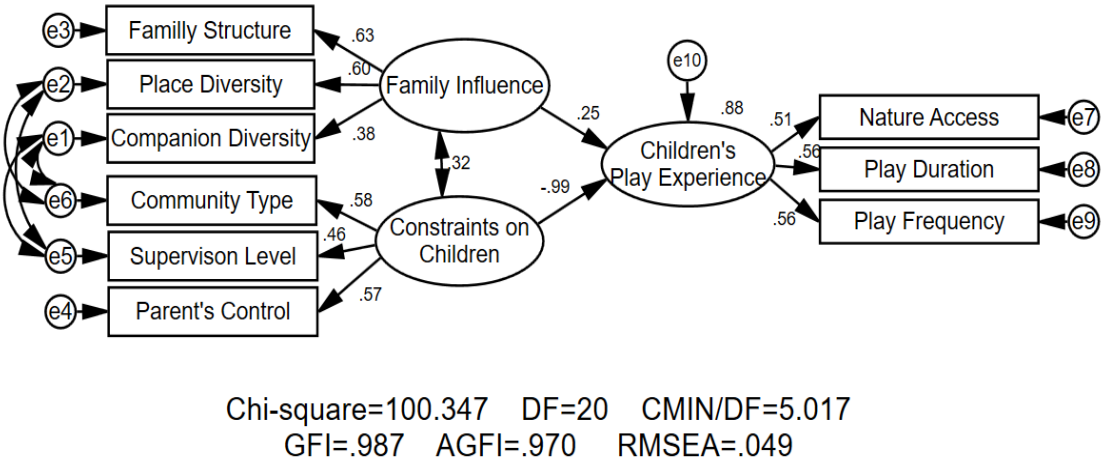


Figure 7.15 Modified structure model.

Table 7.7 Model Fit summary for the proposed research model

Fit Index	Modified model	Recommendation
Chi-square	100.347	N/A
Degree of freedom (DF)	20	N/A
P	0.000	<0.050
Chi-square/ DF	5.017	<5.000
GFI	0.905	>0.900
AGFI	0.970	>0.900
CFI	0.905	>0.900
RMSEA	0.049	<0.080

7.8 Summary

In summary, this chapter used recorded observations to reveal the time children played outside, activities they played and their interactions with other residents in their communities. It introduced space syntax to quantify the urban environment and took statistical tests to explore the relationship between spatial configuration and children's outdoor play. Parents' opinions had been considered to understand children's outdoor play in real life.

1. Does spatial configuration in the community influence children's outdoor play?
The result cannot fully tell whether the spatial configuration could shape children's movements in the community. From the results in Poly and Muxuling, children's movements were greatly affected by the traffic in the communities. Although there were positive results from the Ganghua 128 and Yucai, the pathways with higher integration values were connected with activity zones. Children are mainly attracted by the functional features of the spaces which determine what and how children could play there. However, this research recommends applying space syntax into practice with the location of children's play areas on the aspects of meeting with other people.

2. How did participants experience the landscape in their childhood play?
Most of the participants' childhood play memories linked to the natural world, the landscape elements formed diverse experiences in their outdoor time. Due to the natural water resources, a large number of participants expressed their play experiences with rivers, lakes and ponds. Participants who lived with abundant landscape elements tend to be more satisfied with their communities. Besides, children were found to love trees in this research.

3. How did children interact with other residents in their communities?
Children who lived in old town and urban villiages were observed to have more interactions with other children, while children in Danwei and CGC preferred to play with familiar friends. Although the children did not directly interact with the seniors at the gathering spaces in the communities, more seniors were outside correlated to more independent children playing outside. Supervision of the children who played outside by themselves

could be stressful for the adults, while children playing with other children could help release the adults' stress.

4. What are the parents' opinions towards current children's outdoor play?

Almost 80% of the parents supported their children to play outside by stating that children need to exercise, make friends and be close to nature in the outdoor world. However, the rest of the parents were worried about the safety of the current outdoor environment and some of them insisted children should spend more time on learning.

Chapter 8: Discussion

This chapter will respond to the research questions concerning the cross-generational differences in childhood outdoor play experiences in communities according to the exploration and analysis of the collected data from questionnaires, interviews, observations and diaries. This discussion chapter provides the essential interpretations with supporting evidence from chapters four, five, six and seven. It answers the research questions with the statements of the overall results and compares them with previous literature in Chapter two. This research focuses on the different childhood outdoor play experiences influenced by family, physical attributes, social environment and the policies under the context of a rapidly urbanised Chinese city. Through the reflection of the research process and findings, this chapter proposes recommendations for future research under a similar situation.

8.1 Research Question 1: How has children's outdoor play experience changed over three generations in Chinese communities?

Based on the discussions of the cross-generational study in Chapter 5, it was evident that current childhood outdoor play experience was very different compared to those of their parents and grandparents. In general, analysis from questionnaires and interviews show decreasing time, companions, contact with nature and home range that contemporary children experienced in daily outdoor play compared to their parents and grandparents. The questionnaires provided strong scientific evidence to the literature because there is limited research on children's outdoor play experience during the past decades under the process of urbanisation in Chinese cities. Findings in Chapter 5 broadly supported the same issue of decreasing children's outdoor play identified in prior cross-generational research within a global context (Gaster,1991; Karsten, 2005; Kinoshita, 2009; Woolley and Griffin, 2013; Soga et al, 2018). Meanwhile, the findings introduced the cross-generational changes in from questionnaires mainly started from the parents' generation to the children's generation since the 1990s, which was consistent with the progress of rapid urbanisation and urban construction in Wuhan analysed from archives and historical materials. The trend of changing childhood outdoor play experience across three generations will be discussed in the four specific aspects of the SPAT model as below.

Evaluation of the SPAT Model

The concept of the SPAT model emerged from the analysis of quantitative and qualitative data from questionnaires in this research, which was developed from the previous SPIT model (Woolley and Kinoshita, 2014). The SPAT model includes the four dimensions of playing spaces, people, activities and time, which were variously reflected in previous studies concerning children's outdoor play (Moore, 1990; Karsten and Vliet, 2006; Gill, 2008; Witten et al, 2013). This research applied the SPAT model to the comparison of childhood outdoor play experience by generation, who grew up in different types of communities and acknowledges children's individual differences. The SPAT model was successful because it was able to respond to the research questions with a rich understanding from the encouraging results.

Play Spaces

The changes in play spaces started from the grandparents' generation to the parents' generation and showed a decrease in visiting fields and lakesides; and escalated to current children's preference in playing in their communities, shopping malls, indoor playgrounds and parks near home. The generational difference of contemporary children playing in constructed places was likely to be related to the larger urban construction and expansion during the past thirty decades. Previous studies suggest the decreased area of lakes and the extended retail suppliers correspond with the rapid economic growth in Wuhan since the 1990s (Wu et al, 2019, Frank, 2015). The space where children play is likely to be changed by the process of buildings encroaching on lakes and fields for the new development of residential communities, shopping malls and urban parks in the city. The evidence that children have fewer opportunities to interact with nature has been argued by considerable research in other parts of the world, which sounds the alarm about decreased childhood natural experience which could disadvantage children's healthy development (Louv, 2008, Wells and Evans, 2003; Gill, 2014; Sobel, 1996; Bento and Dias, 2017). According to participants' descriptions about their childhood outdoor play experience, lovely memories were directly related to playing outdoors. Meanwhile, most of the adult participants emphasized their children lack access to nature and wished their children could spend more time outdoors as they did in their childhood.

Although the way of interaction with the Yangtze River has changed, the analysis of questionnaires suggested there was no significant difference in children playing along the Yangtze River across the three generations. The river culture was so deeply embedded in the citizens of Wuhan that today children still frequently visit the Hankou Riverfront Park along the Yangtze River from participants' responses in questionnaires and interviews. An implication of this is the possibility of preserving the traditional culture of residents' intimate contact with water in the past 1,800 years with the help of the new planning on the Yangtze Riverfront parks for the public realm.

The questionnaire shows there was a decline in current children playing on streets near their homes compared to their parents as children. From the behaviour mapping, diverse activities and interactions among children were observed on traffic-restricted streets inside the communities. This indicates that streets and sidewalks have consistently been an important place for outdoor play (Moore, 1987; Forrest et al., 1997). It is worth mentioning the findings of dramatic increases in vehicles during the past decades from the Wuhan annual reports. Research elsewhere has identified that urban streets and surrounding spaces have been transformed from lively spaces to vehicle-dominated areas in recent decades, which is not conducive for children to walk and play (Karsten and Vliet, 2006). This environment change has been accompanied by increasing anxiety about playing on the streets, reported by parents and children themselves with safety considerations (Valentine, 2004; Thompson and Thomas, 2004). It is almost certain that in China, traffic accidents cause fear of playing on the streets since road injuries are ranked as the second leading cause of death in children and adolescents in China (Liang, 2017).

Play Companions

The one-child policy could be responsible for the sharp fall of children playing outside with their siblings' companions. Conversely, more adult companions were reported in the questionnaires and observed in the communities to be involved in children's outdoor play, following the trend of grandparents' involvement in looking after grandchildren under the implementation of the one-child policy (He and Pan, 2015). Additionally, the generational changes in making friends from parents' interviews indicate contemporary parents were helping their children to make friends, especially those living in commercial gated communities, by socialising with other families before their children could have friends to play with in the communities. Important changes in family structures and the community environment have significantly influenced the peer interactions of children (Kimbro and Schachter, 2013; Kimbro et al., 2011; Aarts et al., 2010).

Play Activities

Things children played have also changed across the generations with parents and grandparents normally playing with things which could be found outdoors like branches and pebbles. While current children play with manufactured products like LEGO and other toys, previous generations showed their craft abilities to make toys by themselves, compared to the current children who bought play tools in shops. Besides, current children preferred to play with scooters and bikes with various functions rather than peg-top and rubber bands in the previous generation. This generational difference might be a result of the rapid economic growth in urban China accompanied by increased incomes meaning that residents are able to easily consume goods including children's toys and playthings.

Some traditional games have survived and been handed down during the process of urbanisation, especially chasing games that were children's favourite across the three generations. Although the name of some games has changed over time, the rules remain the same. Games that survived also adapted to new conditions, especially with the limited outdoor space during the process of urbanisation. Planners and designers need to support children's outdoor play by providing opportunities that accommodate children's needs for their preferred sports and high-intensity physical activities close to their homes.

In the context of modernization and globalisation, the influence of media and technology introduced new games. As a result, many traditional games, such as hoop rolling, sandbag throwing, and long rope jumping that grandparents used to play, are rarely mentioned by children. Comparison of the findings with other research confirms the influence of media and culture on children's games (Gee, 2018; Davies, 2010). From the childhood play games mentioned by the participants in questionnaires and interviews, it indicates the mainstream culture and media influence on children's play games at that time. It can be traced back to the grandparents' childhood "Tunnel Battles" inspired by TV shows and "Yangtze River Swims" influenced by river culture. The prevalence of video games in parents' childhoods and phone games in today's children reflects the popularity of computers and smartphones in Chinese families. These findings help explain how childhood culture is changing across three generations and give an insight into how technology has changed modern children's lives, as well as their playground games.

Play Time

The questionnaires showed that 78.4% of the children spent less than 60 minutes playing outside each day, and 52.1% of the children could only play outside on weekends. The reasons provided in the questionnaires for the decline in children's outdoor play time associated with academic burden corroborate earlier findings (Zhu et al., 2017). Current children would not be allowed to play outside because the parents had no time for supervision. It highlighted the importance of informal supervision, as children felt safe to play outside when being watched by other adults in the community (Hochschild, 1997). The cross-generational difference in play time also reports the phenomenon of current children playing outside as a day out on weekends compared to previous generations who enjoyed outdoor play in everyday life.

Increased Parental Control

Children's outdoor play has become much more restricted and controlled compared to previous generations, as a result of cultural, social and economic factors. Previous discussions of parental control in Chapter 6 reflect the same trend of higher supervision levels from adults when children play outside as in other research (Karsten, 2006; Kinoshita, 2009; Woolley and Griffin, 2015). According to the interviews and questionnaires, children's outdoor play is typically controlled by their parents and grandparents for specific areas and times when they play outside. Some children were facing intensive supervision with very limited time and space for outdoor play. With more adults getting involved in children's play, the activities that current children normally do and the places they visit have also changed.

Concepts of Home Range

The cross-generational changes in daily travel distance and destinations in childhood play memories can be explained in terms of habitual, frequented, and occasional range (Moore and Young, 1978).The reduction in contemporary children's habitual home range suggests that children have become more home-centred compared to their parents' and grandparents' childhoods (Karsten, 2005; Handy, 2018). The restrictions on children's independent mobility are related to increased traffic, environmental and social changes caused by urbanisation, the use of modern technology and parents' safety considerations (Valentine and McKendrick, 1997; Cahill, 1990). In the questionnaires, many parents responded to their restriction of their children's home range due to much more traffic dominating the streets and strangers in the urban environment as a consequence of urbanisation. Besides, the parents' replies confirmed the sedentary nature of playing with electronic equipment and that children's playing outdoors less with the development of new technology (Moss, 2012; Fletcher, 2017).

The questionnaire indicated the extension of the current children's frequented domain and occasional domain on weekends and holidays with the parents' companions by increased use of cars and other transport. Just a generation ago, flights were not affordable for most Chinese residents, and the metro system was only constructed in three major cities in mainland China before 1995. At that time, the metro station in Shanghai was a tourist attraction. As the most important transportation hub in central China, Wuhan has operated a metro system with a length of 360 kilometers since 2004 (Han and Wu, 2004) and opened

high-speed railway stations in 2009. With the advancement of technology and transportation in Wuhan, it is more convenient and economical for children today to travel with their families. This finding has important implications for suggestions about child-friendly travel systems both within cities and between cities.

In summary, discussions for research question one reflects similar trends reported in previous research in other parts of the world. It indicates that children's outdoor play has become more structured by playing in constructed places, playing with specific things and friends, and being involved in adult-directed social activities. It is hard for children today to wander freely in nature-based environments and explore the outdoor world as their parents and grandparents did in their childhood. It is worth noting the decline of children's outdoor play in the natural environment in China, which is positively linked to children's development, health, well-being, and learning.

8.2 Research Question 2: How are such changes different between different types of communities?

Outdoor play in communities is an economical and natural way for children to be physically active and socially connected. Social cognitive theories state that physical attributes and social environment influence children's physical activities (Davison and Lawson, 2006; Roemmich et al, 2014; Holt et al, 2008). Previous discussions in Chapter 6 revealed a significant relationship between children's outdoor play and environmental characteristics in the communities, including community type, urban form of the communities, household financial status, physical environmental determinants and social networks in the communities.

Community Type

Children's outdoor play experiences associated with community types differed between current and previous generations. Outdoor play was different from urban and rural play and was influenced by material conditions and the surrounding areas of the parents' and grandparents' generations. Urban children at that time shared similar childhood outdoor play experiences, such as numerous friends to play with within their communities, free movement and exploration in natural spaces. However, the urban environment has changed a lot since commodity housing became the dominant form of housing provision in the late 1990s (Wu, 2014). There was a great difference between communities in housing markets in terms of education resources, location and environmental quality (Wen et al., 2016; Logan et al., 2009). Children living in commercial gated communities had better access to green spaces and recreational facilities inside their communities. There was a greater chance for children to play in natural settings if their communities were located in developed areas with parks and transport infrastructure near their homes (Roemmich et al., 2006).

Community Form

Denser communities were related to more adults' physical activity (Frank et al., 2005), with a walkable distance between homes and many destinations. Similarly, observations and interviews identified children who play outside more with peers in dense communities like urban villages, old towns and Danwei. Children living in commercial gated communities with shorter block lengths also reported better connections with residents. These communities reflect neighbourhoods with overall good walkability with shorter travel distances inside the communities and adequate connections with shops, schools, and street networks outside the communities. However, children living in large-scale communities were restricted and failed to be socially connected through mixed streets in the communities. Despite the types of communities, both children's and parents' perceptions of safety for children playing in the community could be related to the small size of communities. The responses to safety perceptions in the questionnaires indicated it was easy for children to be familiar with the environment and their neighbors when they lived in small communities. In the child-led walks, shops in the communities were found to improve children's independent mobility by meeting friends there, socialising in front of the shops and playing on journeys to and from the shops. The mixed-methods of questionnaires, observation and interviews revealed children growing up in better connected, more compact, mixed-use communities are more likely to be physically and socially active to achieve well-being benefits has great child-friendly policy significance.

Residents' Satisfaction Towards Gated Communities

Chinese cities continue to undergo massive transformation under the process of urbanisation. The large-scale regeneration has important routes towards a prosperous city of the future, mostly in terms of demolition and rebuilding development involving direct displacement of urban landscapes and residents. However, the state dominance in urban demolition and redevelopment of gated communities has been globally criticised by researchers (Jacob, 1961; Power, 1993; Li and Song, 2009). It is worth mentioning that the redevelopment in China improved the deteriorated living conditions, poor facilities and overcrowded informal settlements in Chinese cities (Wu, 2015). The questionnaires provided newly built gated communities were popular with Chinese residents with their better living environment, developed infrastructure, sense of belonging and heightened security (Breitung, 2013).

Children and parents who participated in the questionnaires and interviews reported that they felt safe to play in today's commercial gated communities. Residents living in gated communities have strong neighborhood attachments based on their satisfaction with the physical environment and community services (Zhu et al., 2011; Lu et al., 2018). In the interviews, participants from the parents' generation shared their childhood experience of defending their play spaces with friends inside the communities. Negotiating with "outsiders" was a way of growing up and interactions with neighbours have increased their sense of belonging to their communities. In the observation, it was common for well-constructed outdoor spaces outside the commercial gated communities to provide spaces for residents outside the communities, which challenges the widely accepted view that gating exacerbates local social tensions.

Community Gentrification

Unlike the suburbanization of families with children in western contexts (Karsten, 2003), Chinese families prefer to live in inner cities and bigger cities for better educational resources. In addition, the school-gentrifying communities under the Chinese school district strategies have been powerful in reshaping urban demographic and socio-economic spaces (Hu et al., 2019). In China, housing consumption is becoming essentially a form of private consumption that defines a family's social status (Zhang, 2010). Parents' demand for high-quality educational resources and convenient public facilities also brings the city centre into a hotspot of community gentrification. The children's interviews highlight the necessity of play in the natural environment and the fundamentality of places for sports in children's lives. However, children from economically disadvantaged communities were found to have fewer opportunities to access these places close to home compared to children from affluent communities. The inequity in housing and facilitated resources between children from affluent families and lower-income families should be highlighted and the critical perspectives on gentrification are valuable regarding policy implications and urban development (He, 2010). Specifically, evaluation of spatial equity for green spaces was suggested to be conducted before the construction of parks and sports centres in the planning and design process.

8.3 Research Question 3: How has the transition of surrounding physical attributes and environment influenced cross-generational children's outdoor play experiences over time?

Prior theories regarding the powerful influence of the physical environment on human activity are influencing policy recommendations for the built environment. The variety of children's outdoor activities is particularly dependent on the quality of the physical environment built in the community (Gehl, 1987). And the spatial layout of urban spaces in communities relates to the way children move and interact with other residents in these spaces (Hillier and Hanson, 1984; Hillier, 1999). Therefore, a well-arranged and designed urban environment could give children a better life through play and meeting people in outdoor space. Regarding research question three, the analysis of historical archives, questionnaires, interviews, and behavior mappings provides a large set of significant clusters of physical environments related to the daily and social activities of childhood play in Wuhan over the past decades.

Urban Form and Children's Life in the City

City life in Wuhan has been tied to water and this forms the unique culture derived from centuries of living in a city with abundant lakes and rivers. In the questionnaires and interviews, most participants from the parents' and grandparents' generations shared their vivid childhood memories of interacting with water by swimming in ponds, playing by rivers, and taking water transport to cross the Yangtze River. The residents and lakes forged a symbiotic relationship until urbanization and urban expansion gradually separated the intimate water play from the children's daily lives in recent years. Currently, there is a rising conflict between development pressures and public demand for waterfront open

spaces due to soaring land prices and the decrease of lakes in the city (Xu et al., 2010). Meanwhile, the water-related culture is deeply embedded in Wuhan, and this research found children are still frequent visitors to public spaces along the river and lakes at weekends and holidays. In order to pass on Wuhan's river culture to the next generation, urban planners and designers should design more public waterfront parks to reconnect its people and lakes, providing a diversity of recreational experiences for children growing up in Wuhan.

The Transition of Communities and Children's Range

Consistent with the literature, the interviews found urban children who lived in the older parts of cities can have more environmental diversity than in new-developed residential areas (Moore, 1986). Children living in the old town and urban villages reported their frequent visits to surrounding parks, shopping malls and sports centres. Their communities share the walkable characteristics of short block length, dense intersections, low road speed, and inner retail (Frank, 2010), but there are fewer things to play in these old communities. Conversely, children living in large-scale commercial gated communities were found to primarily play in their own communities, which are more playable when constructed with sports fields, green spaces, and water bodies.

Urban construction has expanded the city and residential housing development has gradually transited from dense small blocks to big-scale gated blocks during the past decades. Previous research has indicated that children increase their home range and visit more places as they get older (Anderson and Tindal, 1972; Matthews, 1987). One unanticipated finding from the questionnaires was that there is very little difference in the home range of children between different age groups or genders. These findings are most likely related to parental control, as well as the constraints that all children face in their own communities. Despite the community type, the data of small blocks with internal mixed functions investigated in this research shows that children not only played in their communities but also frequently travelled to surrounding destinations. The relative diversity of environments within the neighbourhoods and the availability of access to these places are the most important factors for children's development (Bjorkild-Chu, 1977; Parkinson, 1985; and van Andel, 1990). These findings suggest the promotion of small-scale residential blocks in future planning of housing communities to support free movement and children's mobility in their communities and surrounding spaces.

Traffic and Children's Mobility Behaviours

The analysis of annual reports introduced there has been a rapid increase in the number of vehicles in Wuhan, from one hundred thousand to four million in the past 30 years. The car and parking areas have invaded and now dominate the community public spaces where previous generations used to play relatively safely within eyesight and earshot of home in their childhood (Hillman, 1988). The questionnaires and interviews confirmed that busy traffic and the fear of traffic accidents have reduced children's mobility and home range near their homes. Independent mobility is important in promoting children's sense of identity, self-esteem, creative minds, and the capacity to take responsibility for themselves (Kegerreis, 1993; Noschis, 1992). Most of children observed in the selected four communities owned bikes, scooters, or Segways. Previous research identified children

riding bikes as experiencing greater independent mobility and higher physical activity (Larouchea et al., 2016). However, it is challenging to use these low-speed mobility devices as transport to increase children's mobility in the current urban environment, which is dominated by cars. Acknowledged from questionnaires and interviews, many families owned cars and derived their children to further locations where they can interact with nature on weekends. This highlights the issue that should raise widespread public concern, that changing mobility habits have reduced social contact with neighbours and may contribute to a fear of strangers.

Play Areas

As previously discussed in questionnaires, children in previous generations were delighted a diversity of places to play close to their homes when they were children, such as streets, riversides, and abandoned rail yards. There would be little chance for children today to access these types of outdoor spaces nearby, resulting from urbanisation. By taking account of the community's needs for recreational space, playgrounds and play areas were provided in new-developed housing communities and the regenerated housing communities. The behavior mapping partially confirms that play facilities were positively associated with children's activities (Nielsen et al, 2010), and the popularity of play equipment like swings and slides offers a cost-effective way for young children under 6 to increase their physical activity in communities. Contrary to expectations, the observed difference in school-aged children between equipped communities and non-equipped communities was not significant in this research. School-aged children reported in the child-led walks and observed in the communities, were found to interact with the whole community, which supports previous research that shows children spend relatively short amounts of time playing in these formal play areas (Naylor, 1985; Ellis, 1973; Hole, 1966). Children appreciate having a diversity of places to play in communities, and their regular play places include squares, footpath networks, short culs-de-sacs, and the fronts of shops. The behavior mapping indicated a gathering point is essential for children where they can meet and play with other children, and pedestrian routes and sidewalks are very popular. The ability to walk, run, cycle or skate around the community using a footpath network, without having to cross a road to avoid the risk of traffic accidents, is greatly valued by children. Besides, children in the interviews expressed their requirements for spontaneous walks in natural settings and outdoor spaces for ball games, which were difficult with very limited public open spaces in some old communities.

Child-Friendly Communities Designed in China

Generally, playgrounds with swings and slides are automatically thought to be the solution to the problem of children's play in urban Chinese communities. During the process of selecting and visiting communities for study sites, some Chinese real estate companies were found to provide colourful playgrounds and facilitate equipment from an aesthetic perspective to attract house buyers. They have adopted play strategies to design formal facilities and spaces for different age groups of children. However, children beyond 10 years old were rarely seen in these play spaces during the site visits. Similar to other communities, the majority of school-aged children's play observed in these communities was informal and children were moving in the communities. To some extent, we should value the efforts of these housing developments in promoting outdoor play for children in

urban China. However, it should also consider children's wider play needs throughout the community in future design. There is currently no organisation for advice on children's outdoor play in China, and future experts should claim the importance of children's informal play for physical and social benefits rather than just play facilities.

Provision of Pocket Park for Equity

It has been previously discussed in community differences of children's outdoor play, children from large-scale commercial gated communities normally play inside their own communities with the restrictions of their long walking distance. Another explanation put forward for the community differences is that children living in these large-scale communities may be more advantaged with sufficient play spaces around their homes than those living in small communities. The constructed play spaces in these communities include playgrounds, grassy fields, sports pitches, and swimming pools. These activity-oriented places proved to be very popular with children (Parkinson, 1985). There is a need for children to seek outdoor places to play, and it evokes a sense of belonging when these places are close to home. For children living in communities located in developing areas, the interviews identified that urban parks could be their primary outdoor recreational activity in green spaces. And children from urban villages reported having to travel far to access urban parks, sports centers, and other public spaces due to the uneven spatial distribution of public facilities in the city. This is a critical issue for children growing up in Wuhan, and the evaluation of the spatial equity status of urban facilities by planners is necessary for social equity and future urban development (Chang and Liao, 2011). Previous research found that residents' preferred activities were influenced by the spatial arrangement of urban parks, rather than their size (Peschardt et al., 2014). In the questionnaires and interviews, children's responses towards improvements to their play areas clearly indicate that natural spaces, sports pitches, and other amenities for spending long periods outdoors are very important. Therefore, increasing pocket parks with green spaces and sports pitches in these high-density residential areas and low-income communities can increase the health-promoting potential for children and achieve increased equity in urban public facilities.

Natural Environment and Landscape Features

Large sets of research have uncovered the value of natural areas to children growing up in cities with its benefits to children's development and well-being (Lynch, 1976; Hart, 1979; Moore, 1980; Louv, 2008). In the questionnaires, natural elements such as rivers, lakes, woodlands, hills, and valleys dominate the scenes described by adult participants as being associated with childhood play. Many people use these natural contact memories as a source of strength and stability, as well as a sense of integration of human life and nature (Cobb, 1959; Sobel, 2002). Children frequently visited the natural environment and developed place attachments (Kreutz, 2015). The interviews reported that children valued and experienced a strong emotional response to natural settings in their communities. It was found in the child-led walks that children commonly relate their favourite play spaces to feeling relaxed and free, and they frequently identify landscape features. They shared positive attitudes towards their communities like sitting under a big tree, seeing plants bloom, and even having a view of trees from their window in the questionnaires. Caring relationships with nature and humans are essential for children's education as these spaces

also provide ecosystems that serve as habitats for other species (Nussbaum, 2011). Notably, natural environments are the only places where children can learn to live with concern for people, animals, plants, and the whole world.

8.4 Research Question 4: What are the linkages between the changes of cross-generational children's play experiences and the social structure and network?

Most parents and grandparents in the questionnaires and interviews reported having experienced a safer childhood with less traffic, fewer migrants, and simpler urban layouts compared to children today. The reported crimes in media associated with migrants and complex child-trafficking networks in the past twenty years have raised residents' safety concerns about strangers (Wang et al., 2018). In addition, many grandparents in the interviews emphasized the safety, equity and nice people in Mao's China. Under the collectivist atmosphere and limited material conditions, children at the time likely shared a simple and happy life without any difference between each other. As the participants explained in the interviews, the education aspirations and peer pressure could be related to parents' higher expectations of children's academic achievements in Chinese families. As a result of the dramatic socioeconomic and political transformation, the growing environment and parenting styles have changed a lot. In this comparative study across three generations and four communities, children and parents evaluated the social structure as being as important as the physical attributes in children's growing up environments. Social qualities and physical qualities are interdependent, and how the social environment relates to children's outdoor play will be discussed in this section.

From Acquaintance Society to Strange Society

The dominant acquaintance mode of thinking and association in social networking is a distinctive characteristic of Chinese society (Fei, 1992). Just one generation before, the social networks between neighbours identified from the questionnaires and interviews were still lived in communities based on acquaintance society. Participants experienced a safe childhood outdoors because they were looked out for by familiar people within the community when they played outside. With the commercialization of urban housing in China, the number of acquaintances in these communities has decreased. Even though it is now a strange society in the community, the essence of social association does not change in China. The questionnaires and interviews indicated that both the children and parents valued familiar neighbours in their communities and that knowing their neighbours was an important factor in increasing the satisfaction of their communities. Nowadays, both children and adults are in the process of adapting to and getting to know strangers in Chinese communities. These findings may help us to understand the way people think and behave in a Chinese community.

Family Influence

In the generational study, family members who accompanied children were found to be associated with outdoor play behaviours. The constraints on children's restricted playing time, places, and activities are mainly from their parents' safety considerations (Valentine and McKendrck, 1997; Gaster, 1991), as well as children's academic achievements, especially in the Chinese context. The questionnaires suggested children living with grandparents increase the frequency of playing outside, but reduce the travelling distances and the diversity of playing spaces. Notably, children who had siblings would encourage children's outdoor play on the dimensions of travelling further distances for play, spending longer time outdoors and frequently playing outdoors.

It is interesting to mention that female family members are involved more in children's outdoor play, with collective evidence from more questionnaire responses from the mothers and grandmothers, more female companions observed on the sites, and the gender difference that more girls played with siblings. These findings may help us to understand children's outdoor play as influenced by families in the Chinese context and have important implications for developing outdoor spaces with the rapid shift from a two-child policy to a three-child policy in China.

Fear of the Stranger

The constraints on children's outdoor play relate to the rise in parents' safety considerations of strangers and social dangers (Foster et al., 2013; Millward, 1989). Participants from interviews and questionnaires reported the increasing parents' fear may be contributed to the floating population and the development of modern transportation networks in current Chinese cities. Child abduction was regarded as a big social problem in China, and the stranger-danger discourse from the anti-trafficking considerations might have had a negative impact on children's physical, emotional, and social development (Valentine and McKendrck, 1997). This fear of strangers contradicts the increasing knowledge of child abductions and sexual assaults in China. Recent evidence indicates that the crimes mainly come from close acquaintances or family members rather than strangers (Chen, 2021; Huang and Weng, 2019).

Informal Community Supervision

Previous research confirms that informal social supervision is effective at reducing parents' fear of strangers and promoting their children's independent mobility (Valentine, 1997; Foster et al., 2013).The questionnaires and interviews supported previous findings that parents who have stronger relationships with their neighbours in their communities allow their children to play outside more frequently and travel farther (Prezza et al., 2005; Johansson, 2006; Prezza and Pacilli, 2007; Francis, 2017). Similarly, the questionnaires showed children from these families felt safe to play outside with the belief that other neighbours would look out for them. Meanwhile, the security services, lighting, and well-maintained play facilities in the community were found in the questionnaires to alleviate parental concerns about the safety of their children's outdoors.

When children played outside, parents were observed to become isolated and anxious in their role as their children's supervisors. In the questionnaires and interviews, some parents mentioned that they did not have time to take their children to play outside on weekdays. There is a need for housing development to acknowledge this issue and provide a supervision service to support social interaction and relieve parents' pressure. Thus, these findings suggest encouraging informal community supervision by neighbours and community staff in the communities.

Friends to Play

Both the findings from the interviews and observations revealed that children want to be where there is a very strong likelihood of meeting up with other children and playing with them. With higher integration values, these places like squares provide spaces for residents from different age groups, and they are the most widespread source of social activity (Gehl, 1987). In child-led walks and interviews, children valued these spaces because they make them feel safe, and they can make friends as well as passive contacts by seeing and hearing other people. This explains why safe and integrated spaces are very popular on the behaviour mappings, while they rarely use the public spaces on the backside of the communities from the observations. However, these back places were used by teenagers playing skateboards and adults walking dogs in the observations, who required isolated places away from children and seniors.

Children in the interviews mentioned the importance of friendship that contributed to the value of their play places in urban villages with poor physical environments. The continuity of their outdoor play is related to the presence of other children as well as some seniors. It can therefore be assumed that social factors are even more important predictors of the time children spend outdoors than the built environment.

8.5 Research Question 5: How have policy changes influenced cross-generational children's outdoor play experiences over time?

The questionnaires, interviews and archive research conducted in this research broadly support the notion that childhood outdoor play has changed dramatically across three generations of Chinese families. The participants have experienced a continuous and rapid transition in their physical and social environment, as well as wider political and socio-economic interference. Children's roles in the family have evolved from parents' assistants and academic achievers to precious children in the current 4-2-1 family structure. This section will discuss how policy implementations have changed the childhood outdoor play experience, which provides the critical contextual background for understanding these changes.

The Shift of Birth Policy in China

The introduction of the one-child policy in 1979, alongside market and neoliberal reforms, had a series of demographic and social consequences for parent-child relations. These changes led to a shift in the priorities within Chinese families from the tradition of favouring the elderly to child-centred relatedness (Fong, 2004; Goh, 2011; Naftali, 2016).

In a relatively short period, the number of children in a Chinese family has reduced, and children have become emotionally precious to their parents and grandparents. Thus, the policy contributes to parents' overprotection of children, which was identified in the questionnaires and interviews as the increasing parents' control of children's outdoor play. Furthermore, with the continuously increasing life expectancy of Chinese people, grandparents in the interviews expressed they were willing to and could be involved in looking after their grandchildren after retirement. Chinese parents and grandparents who spoiled children were broadly discussed for their negative effects on children's social and emotional growth.

The questionnaires indicated that sibling relationships can be beneficial in children's outdoor play, with positive associations for travel distance, frequency, and time spent outside. To mitigate the country's falling birth rate and encourage further ageing of the population, China has announced a new policy for three children in May 2021. Despite the country's having implemented a two-child policy in 2016, it experienced the lowest birth rate since 1960, and the census showed China had a fertility rate of just 1.3 (census, 2020). The financial pressure of raising a child, as well as the burden on personal quality of life, is discouraging parents from having more children in urban China. The questionnaires revealed the dramatic decrease in children's outdoor play and suggested the country take supportive measures to encourage a culture of socialising children in different ways in families, at schools, within neighbourhoods and in the general public to actively cope with the promotion of children's outdoor play.

Reduced Academic Pressure

The parents' generation in this research was born in an era when one child-policy was strictly implemented in urban China and during the economic boom in China. However, growing up with improved living standards, children have had immense pressure to become academic achievers because of parental expectations. Prior research has noted the positive effect of the one-child policy on children's education and gender equality in China, finding that parents invest more in their only child's education (Qian, 2004; Veeck et al., 2010; Lee, 2012). From the questionnaires and interviews, the reduction in time that children spend on outdoor play could be partly related to academic pressure. It is time to attract widespread public attention to promoting children's outdoor play with a new policy of reducing children's academic burden, which benefits children's development comprehensively.

Urban Development in Wuhan

Back in 1998, the city was described as the biggest town in China by Premier Zhu Rongji during his visit to Wuhan because of the severe flooding of the Yangtze River. The historical reports presented that Wuhan entered a new era of economic boom after the city started the construction of the metro system in 2000. To achieve significant outcomes from urbanisation, the city has witnessed massive changes in national and local policies on urban development. Spatial growth has shaped a new urban morphology and reformed the economic, social, and cultural capital of the city over time. Rapid spatial development has brought great challenges to local urban planning, including related issues of transport, migration, ecology, and residents' quality of life.

Wuhan set out enormous re-development projects of old communities and factories during its thirteenth five-year plan with the objective of removing all urban villages in the central city by 2020. Consequently, it was very difficult for the researcher to find study sites for the Danwei and urban villages under the demolition and reconstruction dominating process during that time. The urban development resulted in a housing market boom in Wuhan. Some residents became millionaires with the relocation, and some had to move farther from the central city for affordable housing. This left deeper problems behind, such as middle-class children being better facilitated while the poor are further marginalized due to unequal wealth distribution.

The housing demolition policy has been changed to a renovation approach later, to improve the living environments within the old communities in three years (Wuhan Office, 2020). The interviews and questionnaires provided the satisfaction of the adult participants with the new facilities and clean environment in the previous regeneration approaches of "Sponge City" and "National Fitness". However, some children were disappointed by the removal of their wilderness and adventurous play from the communities. Recently, Wuhan is now vigorously promoting country park projects and accelerating the construction of pocket parks. In general, we can infer that the city would promote the wellbeing of its residents with the implantation of these policies by providing green spaces in a short time. This study suggests that children should be invited to engage in the planning and design process of building playful public spaces. Multiple resources from mixed methods conducted in this research confirmed children's capacity to describe their experiences and express their thoughts about their daily lives. It is consistent with faith in children's ability and right to contribute to urban planning and design (Lynch, 1977; Moore, 1986; Hart, 2002).

8.6 Limitations and Reflections

This research focused on the understanding of cross-generational differences in children's outdoor play experiences in different types of Chinese communities. It involved a wide range of participants, represented by generations, community types in which they grew up, gender, and age. And the extensive use of self-completed questionnaires, interviews, observations and behavior mappings allowed for the variety of play experiences to be recorded. Through generational analysis of childhood outdoor play in four dimensions – space, people, activity, and time – these findings revealed a dramatic transition across three generations, which is influenced by the physical environment, family control, social context, and the one-child policy in urban China. However, there were several limitations to this study that might have hampered the results.

Sample Profile

Although this research has a representative sample size, there are limitations in the sample profile. It was planned to choose children as participants for interviews from the completed questionnaires who gave different answers towards outdoor play. However, this study was not able to get responses after contacting these participants. Therefore, this research interviewed children who played outside in the four different types of communities. In

order to generate a representative sample on the sites, children were selected for different kinds of phenomena, which were reflected through age, gender, different companions, a variety of places, and the time they played outside. Despite probability sampling being applied, the participants selected for interviews and observations might compromise the results, as they did not capture children who seldom play outside.

Community Selection

This study sought to comprehend the broader socioeconomic transformations of the growing up environment across three generations, and community type was used as a mechanism to select study sites to investigate the physical and social environment transitions. Community type is a well-established social structural variable in the Chinese context since it comprises a specific set of socio-historical experiences and environmental formations that define childhood circumstances and shape neighbourhood relationships. However, the findings regarding community types may be somewhat limited by the selection criteria of communities, which were much different from the sizes and other environmental variables of these communities. This research found limited evidence to examine the relationships between children's outdoor play and the community. More moderators were recommended to be added in future research for stronger statistical tests.

Access to Literature and Archieves

Previous research in children's outdoor play was a foundation for this research to be built upon to achieve the research objectives. However, there were few prior studies on this topic in a Chinese context when the research started in October 2016. Specifically, the children's participants in the dated research have become the parents' generation in this research. Thus, it could be difficult to identify the scope of this research in early steps and lead to a limitation of the questionnaires developed and statistical tests conducted in this research. This research has filled the research gap in children's outdoor play in urban China with abundant data. Despite the difficulty of accessing historical archives, this research has made a great effort to illustrate the historical transitions in Chapter Four with the limited academic materials.

Time

It took a year and a half to find study sites and collect all the data in this study, since accessing children in Chinese communities was very difficult. Then it took another year to do translation, transcription, and analysis of large sets of data. Due to the challenges of writing during a pandemic, the scope and depth of debates might be compromised when compared to the works of experienced scholars with a limited timeframe.

Chapter 9: Conclusions

This research aimed to examine how childhood outdoor play has changed in Chinese communities under the transition of family structures, physical environment, social context, and related policies. It was wholly fulfilled by answering the four research questions: (1) How has children's outdoor play experience changed over three generations in Chinese communities? (2) How are such changes different between different types of communities? (3) How has the transition of surrounding physical attributes and environment influenced cross-generational children's outdoor play experiences over time? (4) What are the linkages between the changes of cross-generational children's play experiences and the social structure and network? (5) How have policy changes influenced cross-generational children's outdoor play experiences over time? This final chapter will reflect the main research findings, give suggestions for the participants and the communities, make recommendations for future research, and suggest implications for future design, planning and related policies.

9.1 Reflection and Highlight the Research Findings

This research specifically targets school-aged children who live in different types of Chinese communities. Their parents and grandparents participated as well, in a cross-generational comparative study in Wuhan. The questionnaires and interviews identified that children's outdoor play experiences have a dramatic reduction in playing spaces, interaction with friends, playing time, and experiencing natural environments, compared to their parents and grandparents' childhoods. These findings strongly support previous research in other parts of the world, while offering new insights into the issue of children's outdoor play that is becoming increasingly important due to rapid urbanisation, both in China and within a broader global context. According to the guidelines issued by the World Health Organization, children between 5 and 17 years old need to do at least one hour of moderate-to-vigorous physical activity (MVPA) daily to grow up healthy (WHO, 2010). However, the questionnaires showed that 78.4% of the current children spent less than 60 minutes playing outside each day, and 52.1% of the current children could only play outside on weekends. Thus, the current data highlights the importance of outdoor play by warning of the lack for children's time in outdoor and physical activities in urban China.

What is important for children in this research is to be able to move freely around their physical and social environment and have a variety of interactions at different locations. The interviews provided children need a variety of outdoor spaces to stay physically active, socialise and cooperate with others, and develop their abilities in the natural environment. This generational study revealed the growing gap between children and the natural environment in urban communities, such that children have fewer opportunities to play in wild spaces compared to previous generations. The interviews and behavior mappings showed the lack of green spaces and sports fields in poorer communities and children's demand for trees in these communities. However, children from affluent communities were found to use green spaces in their communities and drive to natural spaces with their

parents on holidays. Despite this study lacking detailed measurements of the physical attributes in the communities, the interviews indicate children walk more if they live in communities with smaller blocks and narrower roads.

This child-led walks and behavior mappings contributed to the understanding of the built environment for children's outdoor play in Chinese communities by explaining how to create playful, inclusive and safe communities for all children to live, play and grow up in. The chances to meet and play with friends, the ability to walk around, the variety of play activities in which to participate, and the level of contact with nature are strong indicators of how a community is performing. There is a need for house developers and designers to change the way of thinking by simply providing playgrounds. The questionnaires identified that building a safe environment, as well as feeling safe to play outside are important factors. Safety consideration of strangers, traffic and accidents has deterred parents from allowing their children to play outside; these safety perceptions are similar to other countries. However, the underlying reasons may be different with the rapid urbanisation, environmental and social transition undertaken in China.

Lack of time due to busy school and work lives is also associated with the decrease in children's outdoor play. The older children in the interviews reported intense academic pressure, especially in transition grades from primary schools to middle schools. Although they reported less time spent outdoors and fewer visited places in the questionnaires, they still got regular recreation by walking and sitting in their communities. Children between 6 and 12 years old will begin to value friendships, and the most obvious finding to emerge from the questionnaires and interviews is that friends are very important to children in outdoor play. The findings shed new light on the need to encourage informal supervision in communities, where children were not allowed to play outside because parents had no time to accompany them. The interviews proved that social interaction can be operated and developed in communities with unfamiliar neighbours, which enhances residents' safety and satisfaction perceptions of their communities. Overall, the research confirmed that both children and parents are facing the challenge of re-emerging social cohesion in contemporary communities with unfamiliar neighbours.

In summary, these findings strengthen the idea of using generation as a mechanism to capture the transition of physical attributes, social networks, family structure, and broad policies under rapid urbanisation. This research suggests the important role the one-child policy has played in promoting parents' control of their precious children in Chinese families. It is unknown if the situation will change with the three-child policy. However, this research identifies the positive association between siblings and children's outdoor play. And the government should take supportive measures on housing, education, and public space to encourage parents' willingness to have more children. In general, this research is the first extensive investigation of cross-generational childhood play in Chinese communities. It is innovative to examine childhood outdoor play from a comprehensive perspective by using the SPAT model, focusing on the changes in space, time, companions, and activities across three generations. The findings from this research make several contributions to the current literature and fill the gap of the limited evidence available on this topic in the Chinese context.

9.2 Suggestions for Families, Schools and Communities

According to a recent medical report (Hu et al., 2021), the increasing rates of myopia and poor mental health are a direct result of children's limited time playing outdoors. Children were enclosed and spent more time playing indoors with many constraints from themselves, their families, and the outer world. It is necessary to raise public awareness of this issue and give suggestions for families, schools and communities.

Suggestions for families

The questionnaires indicated that parents' value outdoor play and contact with nature, and the majority of them wish their children could play as they did in their own childhood. To implement this, parents should encourage their children to spend time outside daily. Parents could limit the time children spend on sedentary activities and electronic devices to spend more time outdoors, like the way they control their children's spending time on their studies. Besides, parents could make family fitness outings as part of their regular routine for a healthy lifestyle. The result in 6.5.1 shows that childhood outdoor play behaviour could be inherited from generation to generation. Thus, family lifestyle patterns can be adapted to boost health gains by frequently spending time outdoors with their children.

Suggestions for schools

Children in higher grades reported that they were not allowed to go downstairs or play on the school grounds in the 10-minute break in the interviews. And it was a common phenomenon to avoid children getting hurt from the interviews of four schools in this study. The country has implanted a one-hour fitness break to strengthen children's physical development with aerobic activities in primary schools. However, children should spend more time on social interaction, free play, and contact with nature in schools. This research suggests schools take more responsibility for children's outdoor play and provide more opportunities for children to play and learn in natural settings.

Suggestions for communities

The questionnaires highlighted the importance of security staff and community service to enhance children's and parents' perceptions of safety in their communities. The observation suggested public supervision could be achieved through staff looking after children in popular spaces from 18:00 to 20:00 in the communities. This research also suggests that community management should promote neighbourhood relationships and cohesion with regular social events that enhance the residents' placemaking and sense of belonging. With the nature of acquaintance society in China, the role of the community should be emphasized to help with the social interactions among residents.

9.3 Recommendations for Future Research

This study is limited to the categorical and ordinal data from the questionnaires and interviews, it lacks stronger statistical tests to estimate causal relationships. However, this research suggests the mechanism in children's outdoor play is not a linear relationship. The play variables interact with children's personal ability, family influence, physical attributes and social contexts. Despite these limitations, this study certainly adds to our understanding

of how the physical and social environment has moderated children's outdoor experiences under the rapid urbanisation that has occurred in urban China during the past decades. As one of the first studies on this topic, this research focuses on a general relationship between children's outdoor play and a broad context. There are some suggestions for future research related to this study or in a similar context.

Investigate Children in a Chinese Context

This study could be repeated in other Chinese cities to give an overview of the cross-generational childhood outdoor play experiences in those cities. However, researching with children in China can be very difficult and time-consuming. This research suggested asking for help from other organisations, schools and communities as recommendations. This research finds that children were formal and disciplined when they were next to their parents and teachers, and they were authentic and active when they were alone or with their friends. The difference should be noticed when interviewing children with their parents, as well as ethical considerations. And researchers should be prepared to be rejected several times before gathering enough data from children.

Take Forward the Study

This research can be taken forward by adding quantity-related variables to outdoor play, the physical environment, and social evaluations. The outdoor play indicators could be measured with smartwatches that record the accurate time of children taking MVPA and track their routes in reality. Physical characteristics of the housing communities (such as the length of the roads or the quantity of green spaces) need to be measured to reveal whether a space or infrastructure can fulfil children's requirements for outdoor play. Future research could use self-assessment to explore residents' evaluations of their communities. Future research with quantitative indicators in this field would be of great help in giving detailed suggestions for practice.

Test New Relationship

Future research could assess the long-term influence of green spaces on children's wellbeing, with an increasing number of Chinese children experiencing lower mental wellbeing. An interest focused on biodiversity might produce dramatic findings that raise public attention to surrounding nature. This research focuses on communities. Future work is required to be conducted on the transportation system and children's mobility to address suggestions for children's proximity to public spaces in the city. This research recommends using analytical techniques linked to other disciplines for stronger evidence, such as psychological assessment scales and geographic data.

9.4 Recommendations for Practice and Policy

From the above, the conceptual framework functions well in this research by investigating children's outdoor play in Wuhan by providing a strong theoretical contribution and multiple scientific evidence. It emphasises the importance of childhood outdoor play and demonstrates the changes that urbanisation brings to the lives of children and their families. This research highlights how the design of the built environment can increase opportunities for children to take part in a variety of play activities and meet friends in their communities.

Hence, there is a definite need for Wuhan to build safe, active and playful spaces for children to grow up healthy in the city.

Child-Friendly Policies

There is a lot of potential for improving the lives of children and residents in Wuhan through child-friendly policies and built-environment interventions. The development of policies that facilitate the built environment to address children's free mobility in safe and playful places is a critical part of creating child-friendly communities. At the city and community levels, the policy can define criteria and coordinate the actions of designers and experts at the same time.

At the city level, they should set out a city-wide spatial development strategy to improve social, environmental, economic, and transportation development through various built-environment and public service interventions. The contextual issues need to be addressed in detail, particularly the restrictions from busy traffic, wide street layouts and poor links between play spaces. The child-led walks and behavior mappings proved streets to be important places for children to play and socialise with other residents. At the community level, this research advocates community reclaiming streets and sidewalks as their own spaces for children to gather, play, and socialise rather than having them occupied by parking (Karsten and Vliet, 2006). Meanwhile, public participation is important, especially in terms of involving children and young residents in the decision-making process.

Planners and Designers

It is crucial to create safe, playful and sociable spaces in urban communities to fulfill children's right to play. A child-friendly community should encourage children to play and move around their communities, and interact with friends and other residents. Planners and designers in Chinese communities should change their minds by considering a wider context for children to encourage informal and incidental play, rather than simply building playgrounds in communities. The key parts of the planning and design process are providing a full set of play affordances, identifying play spaces, and improving routes to connect these different spaces.

In terms of safety, shorter roads and narrow sections should be designed to reduce vehicle speed on residential roads. Public spaces should be integrated with other spaces for gathering and mixed functions to encourage a multi-generational mixture of uses. Children feel safe to be seen when they play or move around in their communities. Designing spaces with multiple functions to encourage social interactions and enable informal supervision is necessary for every community. Design interventions should aim to remove the danger from the community while keeping adventurous spaces and wild landscapes as important for children. Thus, biodiversity and green space should be incorporated into the design process to foster an understanding of ecology in everyday life. Nighttime conditions and weather protection should also be considered, as extra spaces should be provided for children to play in extreme weather conditions. Planners and designers should take the responsibility to design walkable communities for people rather than car priority, especially in large housing development projects in China.

Management and Maintenance

The questionnaires demonstrated that well-maintained outdoor spaces and facilities in the community have a critical impact on children's perception of safety and satisfaction with their communities. Appropriate management could support the long-term design performance, social cohesion, and property prices in housing markets in Chinese cities. Management plans should be considered at the early stages of housing development, and children's rights to be present and visit any public spaces in the communities should be granted.

Communities should dedicate budgets to regularly managing and maintaining the quality of children's play facilities and mobility infrastructure. This research also suggests that supervision services be provided by the management teams. The familiarity relationships of neighbours taking responsibility for other children in traditional communities have been weakened in contemporary commercial communities, with parents' increasing safety concerns. Children require some proportion of unsupervised time for outdoor play and independent mobility. This culture of care and informal supervision can be restarted by the management team to encourage natural surveillance in the communities. Besides, flexibility and social events should be encouraged in the use of public spaces. Outdoor shared spaces should support inclusivity, particularly sidewalks outside of commercial gated communities. Play, square dancing and other activities by residents from deprived communities should be permitted. They have the right to recreation and demand for public spaces, and their presence also encourages children's outdoor play in these affluent communities.

Children's Involvement

Children's lives could be changed by the development of the planning and designing process that is richly illustrated above. Children and young residents should be engaged at the early stage of the design and planning process to understand children's perceptions and everyday use of these outdoor spaces in their communities. Children's stories and descriptions could bring new insights to a place, which is valuable for urban development. The participation should focus on children's real-life experiences, and be delivered with help from professionals. Children's participation is not only a fundamental aspect of a child-friendly city but also highlights the social value of shaping children's responsibilities for their own communities.

9.5 Concluding Thoughts

Wuhan is a youthful city, with approximately 1.5 million residents under the age of 18. With the city's vision of accommodating 20 million people, this research will contribute to young residents' growing up in this city. The rapid growth of urbanisation and increasing urban construction have brought great challenges for the city as a whole and for children and young people in particular. These issues mainly exist in the built environment, where children's rights and requirements for outdoor play might be easily overlooked.

My cousin shared her five-year-old son's first-time catching grasshoppers in the grass fields, which are not easy to find in the grass fields nowadays. It was described as a unique play and an amazing experience by the boy this summer. However, it used to be my common childhood play experience every summer. The finless porpoise, also described as river-dolphins, used to live in the Yangtze River. When my parents were children, they were frequently seen when people used water transport or swam in the river. The first time I saw it was at the aquarium in 2016.

Described as' little empress ’and' little emperor ’by the Chinese media, we are always told how our material living conditions have improved. However, no one tells us what we have lost and what we have left for our children in the city. It should raise public awareness that contacting nature in daily life has gradually become a luxury for urban children in China. While nature is the only place where children can learn the meaning of life, caring for other species and people. I wish this research could contribute to promoting children's spending more time in nature and socialising outdoors. Through these ways, they could grow up healthily, independently, and confidently. As a result, better children could bring a better future for the city.

Figure 9.1 Children catching grasshopper

Figure 9.2 Freshwater finless porpoises

(Source: https://wwf.panda.org/wwf_news/?206686/Troubled-times-for-endangered-Yangtze-finless-porpoise)

Bibliography

Afifi, T.O., Ford, D., Gershoff, E.T., et al. (2017). Spanking and adult mental health impairment: The case for the designation of spanking as an adverse childhood experience. *Child Abuse & Neglect*, *71*, 24-31.

Alderson, P. (1995) *Listening to Children. Children, Ethics and Social Research*, London: Barnardos.

Amato, P.R., & Ochiltree, G. (1987). Interviewing children about their families: A note on data quality. *Journal of Marriage and the Family*, 669-675.

Anderson, J., & Tindall, M. (1972). The concept of home range: New data for the study of territorial behavior. *Environmental design: Research and practice*, *1*, 1-7.

Anderson, M. (1992). *Intelligence and development: A cognitive theory*. Blackwell Publishing.

Atkinson, R., & Flint, J. (2004). Fortress UK? Gated communities, the spatial revolt of the elites and time–space trajectories of segregation. *Housing Studies,19*(6), 875-892. doi:10.1080/0267303042000293982

Bafna, S. (2003). Space syntax: A brief introduction to its logic and analytical techniques. *Environment and behavior*, *35*(1), 17-29.

Bagaeen, S., & Uduku, O. (2013). *Gated Communities: Social Sustainability in Contemporary and Historical Gated Developments*. Gated Communities: Routledge.

Bai, X., Chen, J., & Shi, P. (2012). Landscape urbanization and economic growth in China: positive feedbacks and sustainability dilemmas. *Environmental science & technology*, *46*(1), 132-139.

Baran, P. K., Smith, W. R., Moore, R. C., Floyd, M. F., Bocarro, J. N., Cosco, N. G., & Danninger, T. M. (2014). Park Use Among Youth and Adults: Examination of Individual, Social, and Urban Form Factors. *Environment and Behavior,46*(6), 768-800. doi:10.1177/0013916512470134

Barker, J., & Weller, S. (2003). Geography of methodological issues in research with children. *Qualitative research*, *3*(2), 207-227.

Bartlett, S., Hart, R., Satterthwaite, D., de la Barra, X., & Missair, A. (2016). *Cities for children: children's rights, poverty and urban management*. Routledge.

Barton, J., & Pretty, J. (2010). What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental science & technology*, *44*(10), 3947-3955.

Batcho, K.I., Nave, A.M., & DaRin, M.L. (2011). A retrospective survey of childhood

experiences. *Journal of Happiness Studies*, *12*(4),531-545.

Batty, M; (2004) A new theory of space syntax. (CASA Working Papers). Centre for Advanced Spatial Analysis (UCL): London, UK

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological bulletin*, *107*(2), 238.

Björklid, P. (1994). Children-traffic-environment. *Architecture and Behaviour*, *10*(4), 399-406.

Bjorklund, E. M. (1986). The Danwei: Socio-Spatial Characteristics of Work Units in Chinas Urban Society. *Economic Geography,62*(1), 19. doi:10.2307/143493

Bland, J. M., & Altman, D. G. (1997). Statistics notes: Cronbach's alpha. *British Medical Journal, 314,* 572.

Blunt, A. (2007). Cultural geographies of migration: mobility, transnationality and diaspora. *Progress in human geography*, *31*(5), 684-694.

Brauer, M., Hoek, G., Van Vliet, P., Meliefste, K., Fischer, P. H., Wijga, A., ... & Brunekreef, B. (2002). Air pollution from traffic and the development of respiratory infections and asthmatic and allergic symptoms in children. *American journal of respiratory and critical care medicine*, *166*(8), 1092-1098.

Breitung, W. (2012). Enclave Urbanism in China: Attitudes Towards Gated Communities in Guangzhou. *Urban Geography,33*(2), 278-294. doi:10.2747/0272-3638.33.2.278

Bringolf-Isler, B., Grize, L., Mäder, U., Ruch, N., Sennhauser, F.H., & Braun-Fahrländer, C. (2010). Built environment, parents' perception, and children's vigorous outdoor play. *Preventive medicine*, *50*(5-6), 251-256.

Bryman, A. (2016). *Social research methods*. Oxford: Oxford university press.

Bunker, L. K. (1991). The role of play and motor skill development in building children's self-confidence and self-esteem. *The Elementary School Journal*, *91*(5), 467-471.

Burdette, H. L., & Whitaker, R. C. (2005). Resurrecting free play in young children: looking beyond fitness and fatness to attention, affiliation, and affect. *Archives of pediatrics & adolescent medicine*, *159*(1), 46-50.

Byrne, B. M. (2001). Structural equation modeling with AMOS, EQS, and LISREL: Comparative approaches to testing for the factorial validity of a measuring instrument. *International journal of testing*, *1*(1), 55-86.

Carpiano, R.M. (2009). Come take a walk with me: The "Go-Along" interview as a novel method for studying the implications of place for health and well-being. *Health & place*, *15*(1), 263-272.

Carr, S., & Lynch, K. (1968). Where learning happens. *Daedalus*, 1277-1291.

Carver, A., Timperio, A., Hesketh, K., & Crawford, D. (2010). Are children and adolescents less active if parents restrict their physical activity and active transport due to perceived risk?. *Social science & medicine*, *70*(11), 1799-1805.

Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate behavioral research*, *1*(2), 245-276.

Chan, K. W., & Zhang, L. (1999). The hukou system and rural-urban migration in China: Processes and changes. *The China Quarterly*, *160*, 818-855.

Charmaz, K. (2014). *Constructing grounded theory*. sage.

Chawla, L. (2015). Benefits of nature contact for children. *Journal of planning literature*, *30*(4), 433-452.

Chawla, L. (2016). *Growing up in an urbanizing world*. Routledge.

Chen, F. & Liu, G. (2012). The health implications of grandparents caring for grandchildren in China. *The Journals of Gerontology*, Series B: Psychological Sciences and Social Sciences, 67(1), 99–112, doi:10.1093/geronb/gbr132. Advance Access published on December 7, 2011

Chen, W., Wu, J., Cheng, G. and Mei, Z-F. (2018). *PLANNING WUHAN 100 YEARS*. 2nd ed. Wuhan: China Architecture & Building Press.

Chesworth, L. (2016). A funds of knowledge approach to examining play interests: listening to children's and parents' perspectives. *International Journal of Early Years Education,24*(3), 294-308. doi:10.1080/09669760.2016.1188370

Chi, X., Huang, L., Wang, J., & Zhang, P. (2020). The prevalence and socio-demographic correlates of depressive symptoms in early adolescents in China: Differences in only child and non-only child groups. *International Journal of Environmental Research and Public Health*, 17(2), 438.

China State Statistical Bureau (2021). *China Statistical Yearbook 2020*, Beijing: China Statistical Press. Available at: http://www.stats.gov.cn/tjsj/ndsj/2020/indexeh.htm (Accessed 20 August 2021).

Christensen, P., & O'Brien, M. (Eds.). (2003). *Children in the city: Home neighbourhood and community*. Routledge.

Clements, R. (2004). An investigation of the status of outdoor play. *Contemporary issues in early childhood*, *5*(1), 68-80.

Collins, D., & Coleman, T. (2008). Social geographies of education: Looking within, and beyond, school boundaries. *Geography Compass*, *2*(1), 281-299.

Coombes, E., van Sluijs, E., & Jones, A. (2013). Is environmental setting associated with the intensity and duration of children's physical activity? Findings from the SPEEDY GPS study. *Health & place*, *20*, 62-65.

Cosco, N.G., Moore, R.C., & Islam, M.Z. (2010). Behavior mapping: A method for linking preschool physical activity and outdoor design. *Medicine & Science in Sports & Exercise*, *42*(3), 513-519.

Cullen, J. (1993). Preschool children's use and perceptions of outdoor play areas. *Early Child Development and Care*, *89*(1), 45-56.

Davison, K. K., & Lawson, C. T. (2006). Do attributes in the physical environment influence children's physical activity? A review of the literature. *International journal of behavioral nutrition and physical activity*, *3*(1), 1-17.

De Leeuw, E.D., & Otter, M.E. (1995). The reliability of children's responses to questionnaire items; question effects in children's questionnaire data.

De Visscher, S., & Bouverne-De Bie, M. (2008). Recognizing Urban Public Space as a Co-Educator: Children's Socialization in Ghent. *International journal of urban and regional research*, *32*(3), 604-616.

Dong, N., Chen, Y., & Zhang, S. (2015). Intergenerational transformation of park recreation of children in downtown shanghai. *Chinese landscape architecture*, *9*, 38-42.

Driskell, D. (2017). *Creating better cities with children and youth: A manual for participation*. Routledge.

Durkin, M. S., Laraque, D., Lubman, I., & Barlow, B. (1999). Epidemiology and prevention of traffic injuries to urban children and adolescents. *Pediatrics*, *103*(6), e74-e74.

Edwards, B. (2006). Views of the village: Parents' perceptions of their neighbourhoods. *Family Matters*, (74), 26-33.

Ellen, I. G., & Turner, M. A. (1997). Does neighborhood matter? Assessing recent evidence. *Housing policy debate*, *8*(4), 833-866.

Evans, J., & Jones, P. (2011). The walking interview: Methodology, mobility and place. *Applied geography*, *31*(2), 849-858

Fagan, M. H., Neill, S., & Wooldridge, B. R. (2004). An empirical investigation into the relationship between computer self-efficacy, anxiety, experience, support and usage. *Journal of Computer Information Systems*, *44*(2), 95-104.

Feng, J., Wu, J., Xie, X., & Huang, J. (2011). To realize a city from demographic space: A case study of Wuhan. *Urban Studies*, *18*(2), 25-36.

Feng, X. T., Poston Jr, D. L., & Wang, X. T. (2014). China's one-child policy and the changing family. *Journal of comparative family studies*, *45*(1), 17-29.

Field, A. (2009). *Discovering statistics using SPSS*. London: SAGE.

Finlay, J., Franke, T., McKay, H., & Sims-Gould, J. (2015). Therapeutic landscapes and wellbeing in later life: Impacts of blue and green spaces for older adults. *Health & place*, *34*, 97-106.

Francis, M., & Lorenzo, R. (2006). 13 Children and city design: proactive process and the 'renewal'of childhood. *Children and their environments: Learning, using and designing spaces*, 217.

Frank, L. D., Schmid, T. L., Sallis, J. F., Chapman, J., & Saelens, B. E. (2005). Linking objectively measured physical activity with objectively measured urban form: findings from SMARTRAQ. *American journal of preventive medicine*, *28*(2), 117-125.

Fuertes, E., I. Markevych, A. von Berg, C.-P. Bauer, D. Berdel, S. Koletzko, D. Sugiri, and J. Heinrich. (2014). ''Greenness and Allergies: Evidence of Differential Associations in Two Areas in Germany.'' *Journal of Epidemiology and Community Health*, 68: 787–90. doi:10.1136/jech-2014-203903

Galster, G. C. (2012). The mechanism (s) of neighbourhood effects: Theory, evidence, and policy implications. In *Neighbourhood effects research: New perspectives* (pp. 23-56). Springer, Dordrecht.

Garbarino, J. (1995). *Raising children in a socially toxic environment*. Jossey-Bass Inc., Publishers, 350 Sansome Street, Fifth Floor, San Francisco, CA 94104-1342.

Gardner, P.J. (2011). Natural neighborhood networks—Important social networks in the lives of older adults aging in place. *Journal of aging studies*, *25*(3), 263-271.

Gaster, S. (1991). Urban children's access to their neighborhood: Changes over three generations. *Environment and behavior*, *23*(1), 70-85.

Gaster, S. (1995). Rethinking the children's home-range concept. *Architecture and Behavior*, *11*(1), 35-42.

Gehl, J. (1987). *Life between buildings* (Vol. 23). New York: Van Nostrand Reinhold.

Gehl, J. (2013). *Cities for people*. Island press.

General Office of Wuhan Municipal Government. (2021). The plan of landscape greening Wuhan in 2021. Available at: http://www.wuhan.gov.cn/zwgk/xxgk/zfwj/bgtwj/202102/t20210226_1639755.shtml (Accessed: 20 August 2021)

Gerbing, D. W., & Anderson, J. C. (1992). Monte Carlo evaluations of goodness of fit indices for structural equation models. *Sociological Methods & Research*, *21*(2), 132-160.

Gibson, J. J. (1977). The theory of affordances. Perceiving, Acting and Knowing. *Eds. Robert Shaw and John Bransford*.

Gill, T. (2014). The benefits of children's engagement with nature: A systematic literature review. *Children Youth and Environments*, *24*(2), 10-34.

Goix, R. L. (2015). Gated Communities. *International Encyclopedia of the Social & Behavioral Sciences (Second Edition),* 612-617. doi:10.1016/b978-0-08-097086-8.74012-8

Goldfeld, S., Woolcock, G., Katz, I., Tanton, R., Brinkman, S., O'Connor, E., ... & Giles-Corti, B. (2015). Neighbourhood effects influencing early childhood development: conceptual model and trial measurement methodologies from the Kids in Communities Study. *Social indicators research*, *120*(1), 197-212.

Goleman, D. (1996). Emotional intelligence. Why it can matter more than IQ. *Learning*, *24*(6), 49-50.

Groves, B. M. (1997). Growing up in a violent world: The impact of family and community violence on young children and their families. *Topics in early childhood special education*, *17*(1), 74-102.

Hadavi, S., Kaplan, R., & Hunter, M. C. R. (2015). Environmental affordances: A practical approach for design of nearby outdoor settings in urban residential areas. *Landscape and urban planning*, *134*, 19-32.

Hair Jr, J. F., Anderson, R. E., Tatham, R. L., & William, C. (1995). Black (1995), Multivariate data analysis with readings. *New Jersy: Prentice Hall*.

Hair, J. F. (2009). *Multivariate Data Analysis: A Global Perspective.* 7th ed. Upper Saddle River: Prentice Hall.

Han, S. S., & Wu, X. (2004). Wuhan. *Cities*, *21*(4), 349-362.

Hansen Sandseter, E. B. (2007). Categorising risky play—how can we identify risk-taking in children's play?. *European Early Childhood Education Research Journal*, *15*(2), 237-252.

Hardt, J., Sidor, A., Bracko, M., & Egle, U.T. (2006). Reliability of retrospective assessments of childhood experiences in Germany. *The Journal of nervous and mental disease*, *194*(9), 676-683.

Hart, R. (1979). *Children's experience of place*. Irvington.

Hart, R. (1984). The geography of children and children's geographies. *Environmental perception and behavior: An inventory and prospect*, 99-129.

Hart, R. (2002). Containing children: some lessons on planning for play from New York City. *Environment and Urbanization*, *14*(2), 135-148.

He, S. (2010). New-build gentrification in central Shanghai: demographic changes and socioeconomic implications. *Population, Space and Place*, *16*(5), 345-361.

Heft, H. (1988). Affordances of children's environments: A functional approach to environmental description. *Children's environments quarterly*, 29-37.

Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. *Educational and Psychological measurement*, *66*(3), 393-416.

Heseltine, P., & Holborn, J. (1987). Playgrounds: The planning and construction of play environments. *London: The Mitchell.*

Hillier, B. (2007). *Space is the machine: a configurational theory of architecture*. Space Syntax.

Hillier, B., & Hanson, J. (1984). *The social logic of space*. Cambridge, UK: Cambridge University Press.

Hillier, B., Penn, A., Hanson, J., Grajewski, T., & Xu, J. (1993). Natural movement: or, configuration and attraction in urban pedestrian movement. *Environment and Planning B: planning and design*, *20*(1), 29-66.

Hills, A. P., King, N. A., & Armstrong, T. P. (2007). The contribution of physical activity and sedentary behaviours to the growth and development of children and adolescents. *Sports medicine*, *37*(6), 533-545.

HOLE, V. & MILLER, A. (1966), Children's Play on Housing Estates. *Architects' Journal*, 22 (1966). 1529- 1537

Holloway, S. L., & Valentine, G. (2000). Children's geographies and the new social studies of childhood. *Children's geographies: Playing, living, learning*, 1-26.

Horton, J., & Kraftl, P. (2006). What else? Some more ways of thinking and doing 'Children's Geographies'. *Children's geographies*, *4*(01), 69-95.

Horton, J., Christensen, P., Kraftl, P., & Hadfield-Hill, S. (2013). 'Walking ... just walking': how children and young peoples everyday pedestrian practices matter.*Social & Cultural Geography,15*(1), 94-115. doi:10.1080/14649365.2013.864782

Horton, J., Kraftl, P., & Tucker, F. (2008). The challenges of 'Children's Geographies': a

reaffirmation. *Children's geographies*, *6*(4), 335-348.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, *6*(1), 1-55.

Hu, S., Song, W., Li, C., & Lu, J. (2019). School-gentrifying community in the making in China: Its formation mechanisms and socio-spatial consequences. *Habitat International*, *93*, 102045.

Islam, M. Z., Moore, R., & Cosco, N. (2014). Child-Friendly, Active, Healthy Neighborhoods: Physical Characteristics and Childrens Time Outdoors. *Environment and Behavior,48*(5), 711-736. doi:10.1177/0013916514554694

Jacobs, J. (1961). Jane jacobs. *The Death and Life of Great American Cities*.

Jacobs, J. (1961). The Death and life of Great American Cities. New York: Random House.

Jiang, Q., & Sánchez-Barricarte, J. J. (2011). The 4-2-1 family structure in China: a survival analysis based on life tables. *European journal of ageing*, *8*(2), 119-127.

Jones, O. (2003). 'Endlessly revisited and forever gone': On memory, reverie and emotional imagination in doing children's geographies. an'addendum'to"'to go back up the side hill": Memories, imaginations and reveries of childhood'by chris philo.

Karsten, L. (2005). It all used to be better? Different generations on continuity and change in urban childrens daily use of space. *Childrens Geographies,3*(3), 275-290. doi:10.1080/14733280500352912

Kim, J. H., Lee, C., Olvera, N. E., & Ellis, C. D. (2014). The role of landscape spatial patterns on obesity in Hispanic children residing in inner-city neighborhoods. *Journal of physical activity and health*, *11*(8), 1449-1457.

Kinoshita, I. (2009). Charting Generational Differences in Conceptions and Opportunities for Play in a Japanese Neighborhood.*Journal of Intergenerational Relationships,7*(1), 53-77. doi:10.1080/15350770802629O2

Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford publications.

Kowalski, K.C., Crocker, P.R., & Faulkner, R.A. (1997). Validation of the physical activity questionnaire for older children. *Pediatric exercise science*, *9*(2), 174-186.

Kusenbach, M. (2003). Street phenomenology: The go-along as ethnographic research tool. *Ethnography*, *4*(3), 455-485.Vancouver

Kyttä, M. (2002). Affordances of children's environments in the context of cities, small towns, suburbs and rural villages in Finland and Belarus. *Journal of environmental*

psychology, *22*(1-2), 109-123.

Kyttä, M. (2003). *Children in outdoor contexts: affordances and independent mobility in the assessment of environmental child friendliness*. Helsinki University of Technology.

Lee, M. H. (2012). The one-child policy and gender equality in education in China: Evidence from household data. *Journal of family and economic issues*, *33*(1), 41-52.

Li, S. M., & Song, Y. L. (2009). Redevelopment, displacement, housing conditions, and residential satisfaction: a study of Shanghai. *Environment and Planning A*, *41*(5), 1090-1108.

Lin, G. C. (2002). The growth and structural change of Chinese cities: a contextual and geographic analysis. *Cities*, *19*(5), 299-316.

Lin, G. C. (2007). Reproducing spaces of Chinese urbanisation: new city-based and land-centred urban transformation. *Urban Studies*, *44*(9), 1827-1855.

Lin, J., & Chen, Q. (1995). ACADEMIC PRESSURE AND IMPACT ON STUDENTS'DEVELOPMENT IN CHINA. *McGill Journal of Education/Revue des sciences de l'éducation de McGill*, *30*(002).

Liu, X., Yang, S., Ye, T., An, R., & Chen, C. (2021). A new approach to estimating flood-affected populations by combining mobility patterns with multi-source data: A case study of Wuhan, China. *International Journal of Disaster Risk Reduction*, *55*, 102106.

Logan, J. R., Fang, Y., & Zhang, Z. (2009). Access to housing in urban China. *International Journal of Urban and Regional Research*, *33*(4), 914-935.

Louv, R. (2005). Last Child in the Woods: Nature Deficit Disorder. *North Carolina: Algonquin Books of Chapel Hill*.

Louv, R. (2008). *Last child in the woods: Saving our children from nature-deficit disorder*. Algonquin books.

Lovasi, G. S., Jacobson, J. S., Quinn, J. W., Neckerman, K. M., Ashby-Thompson, M. N., & Rundle, A. (2011). Is the environment near home and school associated with physical activity and adiposity of urban preschool children? *Journal of Urban Health*, *88*(6), 1143-1157.

Lovasi, G. S., O'Neil-Dunne, J. P., Lu, J. W., Sheehan, D., Perzanowski, M. S., MacFaden, S. W., ... & Rundle, A. (2013). Urban tree canopy and asthma, wheeze, rhinitis, and allergic sensitization to tree pollen in a New York City birth cohort. *Environmental health perspectives*, *121*(4), 494-500.

Lynch, K. (Ed.). (1977). *Growing up in cities: Studies of the spatial environment of adolescence in Cracow, Melbourne, Mexico City, Salta, Toluca, and Warszawa*. MIT press.

Lynch, K. (1964). *The image of the city*. MIT press.

Ma, D.Y., & Lu, Y. Z. (2019). Information Exposure, Authoritarian Personality, Ideology, and Nationalism——The Analysis of the Causal Mechanism of Chinese Mass Political Attitudes. *Tsinghua Science and Technology*, 034(003):180-192.

Ma, L. J., & Wu, F. (2004). *Restructuring the Chinese city: Changing society, economy and space*. Routledge.

Ma, L., & Wu, F. (2005). Restructuring the Chinese City: Changing Society, economy and Space Routledge.

Malone, K. (2002). Street life: youth, culture and competing uses of public space. *Environment and urbanization*, *14*(2), 157-168.

Malone, K. (2007). The bubble-wrap generation: children growing up in walled gardens. *Environmental Education Research*, *13*(4), 513-527.

Malone, K., & Tranter, P. (2003). "Children's Environmental Learning and the Use, Design and Management of Schoolgrounds. *Children youth and environments*, *13*(2), 87-137.

Malone, K., & Hartung, C. (2009). Challenges of participatory practice with children. In *A handbook of children and young people's participation* (pp. 46-60). Routledge.

Matthews, H. (2003). Coming of age for children's geographies. *Children's Geographies*, *1*, 3-6.

Matthews, M. H. (1987). Gender, home range and environmental cognition. *Transactions of the institute of British Geographers*, 43-56.

Matthews, M. H. (1992). *Making sense of place: Children's understanding of large-scale environments*. Barnes & Noble Books.

McKendrick, J. H. (2000). The geography of children: an annotated bibliography. *Childhood*, *7*(3), 359-387.

McKendrick, J. H., Fielder, A. V., & Bradford, M. G. (1999). Privatization of collective play spaces in the UK. *Built Environment (1978-)*, 44-57.

McKenzie, T. L., Marshall, S. J., Sallis, J. F., & Conway, T. L. (2000). Leisure-time physical activity in school environments: An observational study using SOPLAY. *Preventive Medicine,* 30, 70-77.

McKenzie, T. L., Cohen, D. A., Sehgal, A., Williamson, S., & Golinelli, D. (2006). System for Observing Play and Recreation in Communities (SOPARC): reliability and feasibility measures. *Journal of Physical Activity and Health*, *3*(s1), S208-S222.

Measelle, J. R., Ablow, J. C., Cowan, P. A., & Cowan, C. P. (1998). Assessing young

children's views of their academic, social, and emotional lives: An evaluation of the self-perception scales of the Berkeley Puppet Interview. *Child development*, *69*(6), 1556-1576.

Miao, P. (2003). Deserted Streets in a Jammed Town: The Gated Community in Chinese Cities and Its Solution. *Journal of Urban Design,8*(1), 45-66. doi:10.1080/1357480032000064764

Mitchell, K., & Elwood, S. (2012). Mapping children's politics: the promise of articulation and the limits of nonrepresentational theory. *Environment and Planning D: Society and space*, *30*(5), 788-804.

Moore, R. (1986). Childhood's domain: Play and place in child development. (Vol. 6). *UK: Routledge*.

Moore, R. (1986). *Childhood's Domain: Play and Place in Childhood Development*. London: Croom and Helm.

Moore, R. (2014). Nature play and learning places. Creating and managing places where children engage with nature. National Wildlife Federation.

Moore, R. C. (2003). How cities use parks to help children learn. In *City Parks Forum Briefing Papers*.

Moore, R. C., & Cosco, N. G. (2010). Using behaviour mapping to investigate healthy outdoor environments for children and families. *Innovative Approaches Researching Landscape and Health Open Space: People Space*, *2*, 33-72.

Moore, R. C., & Wong, H. H. (1997). *Natural learning: Creating environments for rediscovering nature's way of teaching*. MIG communications.

Moore, R., & Cosco, N. (2014). Growing Up Green: Naturalization as a Health Promotion Strategy in Early Childhood Outdoor Learning Environments. *Children, Youth and Environments, 24*(2), 168. doi:10.7721/chilyoutenvi.24.2.0168

Moore, R., & Young, D. (1978). Childhood outdoors: Toward a social ecology of the landscape. In *Children and the Environment* (pp. 83-130). Springer, Boston, MA.

Morrow, V. and Richards, M. (1996) *'The ethics of social research with children: an overview',* Children and Society 10:90 – 105.

Nutbrown, C. (2011) *'Naked by the pool? Blurring the image? Ethical issues in the portrayal of Young Children in Arts-Based Educational Research'*, Qualitative Inquiry, 17,3, – 14.

Opie, I., & Opie, P. (1959). The language and lore of schoolchildren. Oxford: Oxford University Press.

Owens, P. E. (1988). Natural landscapes, gathering places, and prospect refuges: Characteristics of outdoor places valued by teens. *Children's Environments Quarterly*, 17-24.

Pallant, J. (2016). *SPSS Survival Manual: A Step By Step Guide to Data Analysis Using SPSS Program* (6th ed.). London, UK: McGraw-Hill Education.

Patterson, J. L. (2016). Traffic modelling in cities–Validation of space syntax at an urban scale. *Indoor and built environment*, *25*(7), 1163-1178.

Pawlowski, C. S., Andersen, H. B., Troelsen, J., & Schipperijn, J. (2016). Children's physical activity behavior during school recess: A pilot study using GPS, accelerometer, participant observation, and go-along interview. *PloS one*, *11*(2), e0148786.

Peponis, J., Hadjinikolaou, E., Livieratos, C., & Fatouros, D. A. (1989). The spatial core of urban culture. *Ekistics*, 43-55.

Pett, M. A., Lackey, N. R., & Sullivan, J. J. (2003). The use of factor analysis for instrument development in health care research.

Phillips, D. R., & Feng, Z. (2015). Challenges for the aging family in the People's Republic of China. *Canadian Journal on Aging/La Revue canadienne du vieillissement*, *34*(3), 290-304.

Pow, C. (2009). Gated Communities in China: Class, Privilege and the Moral Politics of the Good Life. London: Routledge. doi:10.4324/9780203876206

Pow, C. P. (2007). Constructing a new private order: gated communities and the privatization of urban life in post-reform Shanghai. *Social & Cultural Geography*, *8*(6), 813-833.

Pow, C. P. (2007). Securing the 'civilised' enclaves: Gated communities and the moral geographies of exclusion in (post-) socialist shanghai. *Urban studies*, *44*(8), 1539-1558.

Pow, C., & Kong, L. (2007). Marketing the Chinese Dream Home: Gated Communities and Representations of the Good Life in (Post-)Socialist Shanghai. *Urban Geography,28*(2), 129-159. doi:10.2747/0272-3638.28.2.129

Power, A. (1993). *Hovels to High Rise: State Housing in Europe Since 1850*. Psychology Press.

Puhl, J., Greaves, K., Hoyt, M., & Baranowski, T. (1990). Children's Activity Rating Scale (CARS): description and calibration. *Research quarterly for exercise and sport*, *61*(1), 26-36.

Punch, S. (2002). Interviewing strategies with young people: the 'secret box', stimulus

material and task-based activities. *Children & society*, *16*(1), 45-56.

Punch, S. (2002). Research with children: The same or different from research with adults?. *childhood*, *9*(3), 321-341.

Rana, N. P., & Dwivedi, Y. K. (2015). Citizen's adoption of an e-government system: Validating extended social cognitive theory (SCT). *Government Information Quarterly*, *32*(2), 172-181.

Rebok, G., Riley, A., Forrest, C., Starfield, B., Green, B., Robertson, J., & Tambor, E. (2001). Elementary school-aged children's reports of their health: a cognitive interviewing study. *Quality of life research*, *10*(1), 59-70.

Richardson, E. A. (2014). Do Mothers Living in Greener Neighbourhoods Have Healthier Babies?. *Occupational and Environmental Medicine*, 71 (8): 527–28

Roemmich, J. N., Epstein, L. H., Raja, S., Yin, L., Robinson, J., & Winiewicz, D. (2006). Association of access to parks and recreational facilities with the physical activity of young children. *Preventive medicine*, *43*(6), 437-441.

Rook, G. (2013). ‘‘Regulation of the Immune System by Biodiversity from the Natural Environment’’. *PNAS Proceedings of the National Academy of Sciences USA,* 110 (46): 18360–67.

Rowe, W. T. (1984). *Hankow: Commerce and society in a Chinese city, 1796-1889* (Vol. 1). Stanford University Press.

Sandseter, E. B. H. (2009). Affordances for risky play in preschool: The importance of features in the play environment. *Early childhood education journal*, *36*(5), 439-446.

Sandseter, E. B. H. (2009). Characteristics of risky play. *Journal of Adventure Education & Outdoor Learning*, *9*(1), 3-21.

Schmitt, N. (1996). Uses and abuses of coefficient alpha. *Psychological assessment*, *8*(4), 350.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of educational research*, *99*(6), 323-338.

Scott, J. (2000). Children as respondents: The challenge for quantitative methods. *Research with children: Perspectives and practices*, *2*, 87-108.

Shaffer, D., Fisher, P., Lucas, C. P., Dulcan, M. K., & Schwab-Stone, M. E. (2000). NIMH Diagnostic Interview Schedule for Children Version IV (NIMH DISC-IV): description, differences from previous versions, and reliability of some common diagnoses. *Journal of the American Academy of Child & Adolescent Psychiatry*, *39*(1), 28-38.

Skår, M., & Krogh, E. (2009). Changes in children's nature-based experiences near home: from spontaneous play to adult-controlled, planned and organised activities. *Children's Geographies*, *7*(3), 339-354.

Skelton, T., & Valentine, G. (Eds.). (1998). *Cool places: Geographies of youth cultures*. Psychology Press.

Smith, E. D., & Lillard, A. S. (2012). Play on: Retrospective reports of the persistence of pretend play into middle childhood. *Journal of Cognition and Development*, *13*(4), 524-549.

Smith, S. J. (1998). *Risk and our pedagogical relation to children: On the playground and beyond*. SUNY Press.

Smith, W. R., Moore, R., Cosco, N., Wesoloski, J., Danninger, T., Ward, D. S., ... & Ries, N. (2016). Increasing physical activity in childcare outdoor learning environments: the effect of setting adjacency relative to other built environment and social factors. *Environment and behavior*, *48*(4), 550-578.

Soga, M., Gaston, K. J., & Kubo, T. (2018). Cross-generational decline in childhood experiences of neighborhood flowering plants in Japan. *Landscape and Urban Planning*, *174*, 55-62.

Song, W. and Zhu, X. (2009). China gated communities: The negative social effects of social differentiation. *City Planner (Guihuashi),* Vol. 11, 82-86 (in Chinese).

Spencer, C., & Woolley, H. (2000). Children and the city: a summary of recent environmental psychology research. *Child: care, health and development*, *26*(3), 181-198.

Spencer, J. R., & Flin, R. H. (1990). *The evidence of children: The law and the psychology*. Blackstone Press.

Spilsbury, J. C. (2002). If I Don't Know Them, I'll Get Killed Probably' How Children's Concerns About Safety Shape Help-seeking Behavior. *Childhood*, *9*(1), 101-117.

Spilsbury, J. C. (2005). ‘we don't really get to go out in the front yard’—children's home range and neighborhood violence. *Children's Geographies*, *3*(1), 79-99.

Staub, A., & Yu, Q. (2014). The" New” Gated Housing Communities in China: Implications for Urban Identity. In *ARCC Conference Repository*.

Stephenson, A. (2003). Physical risk-taking: dangerous or endangered? *Early Years*, *23*(1), 35-43.

Sun, J., Dunne, M. P., & Hou, X. Y. (2012). Academic stress among adolescents in China. *Australasian Epidemiologist*, *19*(1), 9-12.

Sun, Z-S. (2011). *Nation-Building Strategy*. Wuhan: Wuhan Press.

Tabachnick, B.G. & Fidell, L.S. (2007). *Using Multivariate Statistics*. Boston: Pearson Education Inc.

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in science education*, *48*(6), 1273-1296.

Tandy, C. A. (1999). Children's diminishing play space: a study of inter-generational change in children's use of their neighborhoods. *Australian geographical studies*, *37*(2), 154-164.

Tappe, K. A., Glanz, K., Sallis, J. F., Zhou, C., & Saelens, B. E. (2013). Children's physical activity and parents' perception of the neighborhood environment: neighborhood impact on kids study. *International journal of behavioral nutrition and physical activity*, *10*(1), 1-10.

Thompson, C. W., Aspinall, P., & Montarzino, A. (2008). The childhood factor: Adult visits to green places and the significance of childhood experience. *Environment and behavior*, *40*(1), 111-143.

Tian, G., Liu, J., Xie, Y., Yang, Z., Zhuang, D., & Niu, Z. (2005). Analysis of spatio-temporal dynamic pattern and driving forces of urban land in China in 1990s using TM images and GIS. *Cities*, *22*(6), 400-410.

Treuth, M. S., Hou, N., Young, D. R., & Maynard, L. M. (2005). Validity and reliability of the Fels physical activity questionnaire for children. *Medicine and science in sports and exercise*, *37*(3), 488-495.

Tyler, F. B., Holliday, M. Y., Tyler, S. L., Echeverry, J. J., & Zea, M. C. (1987). Street children and play. *Children's Environments Quarterly*, 13-17.

UNICEF. Innocenti Research Centre. (2004). *Building child friendly cities: A framework for action*. UNICEF Innocenti Research Centre.

Valentine, G. (1997). " Oh Yes I Can."" Oh no you can't": Children and parents' understandings of kids' competence to negotiate public space safely. *Antipode*, *29*(1), 65-89.

Valentine, G., & Skelton, T. (1998). COOL PLACES an introduction to youth. *Cool places: Geographies of youth cultures*, 1.

Van Den Berg, M. (2013). City children and genderfied neighbourhoods: the new generation as urban regeneration strategy. *International Journal of Urban and Regional Research*, *37*(2), 523-536.

Veeck, A., Flurry, L., & Jiang, N. (2003). Equal dreams: The one child policy and the consumption of education in urban China. *Consumption, Markets and Culture*, *6*(1),

81-94.

Wadsworth, B. J. (1996). *Piaget's theory of cognitive and affective development: Foundations of constructivism*. Longman Publishing.

Wang, J., & Wang, X. (2012). Structural Equation Modeling: Applications Using Mplus. Hoboken, NJ: Wiley, Higher Education Press. https://doi.org/10.1002/9781118356258

Wang, X., Woolley, H., Tang, Y., Liu, H. Y., & Luo, Y. (2018). Young children's and adults' perceptions of natural play spaces: A case study of Chengdu, southwestern China. *Cities*, *72*, 173-180.

Ward Thompson, C., & Aspinall, P. A. (2011). Natural environments and their impact on activity, health, and quality of life. *Applied Psychology: Health and Well-Being*, *3*(3), 230-260.

Wen, H., Xiao, Y., & Zhang, L. (2017). School district, education quality, and housing price: Evidence from a natural experiment in Hangzhou, China. *Cities*, *66*, 72-80.

Woolley, H. (2006). Freedom of the city: Contemporary issues and policy influences on children and young people's use of public open space in England. *Children's Geographies, 4*(01), 45-59.

Woolley, H. E., & Griffin, E. (2015). Decreasing experiences of home range, outdoor spaces, activities and companions: changes across three generations in Sheffield in north England. *Children's Geographies*, *13*(6), 677-691.

Woolley, H., & Johns, R. (2001). Skateboarding: The city as a playground. *Journal of urban design*, *6*(2), 211-230.

Woolley, H., & Lowe, A. (2013). Exploring the relationship between design approach and play value of outdoor play spaces. *Landscape Research*, *38*(1), 53-74.

Woolley, H., Dunn, J., Spencer, C., Short, T., & Rowley, G. (1999). Children describe their experiences of the city centre: a qualitative study of the fears and concerns which may limit their full participation. *Landscape research*, *24*(3), 287-301.

World Wide Fund For Nature – China. (2012). *Troubled times for endangered Yangtze finless porpoise*. Available at: https://wwf.panda.org/wwf_news/?206686/Troubled-times-for-endangered-Yangtze-finless-porpoise (Accessed 20 December 2021).

Wu, F. (2012). The Great Urban Transformation: Politics of Land and Property in China. By You-tien Hsing. Oxford: Oxford University Press, 2010. xiv, 258 pp. 40.00. *The Journal of Asian Studies*, *71*(2), 526-527.

Wu, F. (2015). Commodification and housing market cycles in Chinese cities. *International Journal of Housing Policy*, *15*(1), 6-26.

Wu, F. (2016). State dominance in urban redevelopment: Beyond gentrification in urban China. *Urban Affairs Review*, *52*(5), 631-658.

Wu, F., & Webber, K. (2004). The rise of "foreign gated communities" in Beijing: Between economic globalization and local institutions. *Cities*, *21*(3), 203-213.

Wu, J., & Xie, H. (2011). Research on characteristics of changes of lakes in Wuhan's main urban area. *Procedia Engineering*, *21*, 395-404.

Wu, J., Luo, J., & Tang, L. (2019). Coupling relationship between urban expansion and lake change—A case study of Wuhan. *Water*, *11*(6), 1215.

Wu, Q., Zhang, X., & Waley, P. (2016). Jiaoyufication: When gentrification goes to school in the Chinese inner city. *Urban studies*, *53*(16), 3510-3526.

Wuhan Chorography office. (2018). *Wuhan Almanac – forty years of reform and opening up (1978-2018)*. Wuhan: Wuhan Press.

Wuhan Landscape and Forestry Bureau. (1987). *Wuhan Landscape (1840-1985)*. Wuhan: Wuhan University Press.

Wuhan Landscape and Forestry Bureau. (2006). *Wuhan Landscape Chronicles.* Wuhan: Wuhan University Press.

Wuhan Municipal Archives. (2018). *Forty years of reform and opening up in Wuhan 1978-2018*. Wuhan: Wuhan Press.

Wuhan Municipal Statistics Bureau (2021). *Wuhan Statistical Yearbook 2020*, Wuhan: China Statistics Press. Available at: http://tjj.wuhan.gov.cn/tjfw/tjnj/202102/P020210202594467579846.pdf (Accessed 20 August 2021).

Wuhan Municipal Statistics Bureau. (2021). Wuhan City Seventh National Census Bulletin (6th). Available at: http://tjj.wuhan.gov.cn/tjfw/tjgb/202105/t20210528_1707417.shtml (Accessed: 20 August 2021)

Wuhan Urban Planning Administration Bureau. (1999). *The Chronicles of Wuhan urban planning.* Wuhan: Wuhan Press.

Xia, Y., & Yang, Y. (2019). RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: The story they tell depends on the estimation methods. *Behavior research methods*, *51*(1), 409-428.

Xiao, Z. H., & Xu, C. (2021). The total number of vehicles in Wuhan exceeds 4 million (02 August 2021). Available at: https://www.sohu.com/a/481034368_121106908 (Accessed: 20 August 2021)

Xiaotong, F. (1992). From the soil: The foundations of Chinese society. *Trans. Gary G. Hamilton and Wang Zheng. Berkeley: University of California Press*.

Xinhua news agency. (2020). *Wuhan urban insight after one month lockdown.* Available at: http://www.gov.cn/xinwen/2020-05/10/content_5510322.htm#10 (Accessed 20 December 2021).

Ye, J-S. (2008). *Great achievements – Thirty years of reform and opening up in Wuhan*. Wuhan: Central Party Literature Press

Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). Sage.

Zamani, Z., & Moore, R. (2013). The cognitive play behavior affordances of natural and manufactured elements within outdoor preschool settings. *Landscape Research*, *1*, 268-278.

Zhang, C., & Chai, Y. (2014). Un-gated and integrated work unit communities in post-socialist urban China: a case study from Beijing. *Habitat International*, *43*, 79-89.

Zhang, J., Emery, T., & Dykstra, P. (2020). Grandparenthood in China and Western Europe: An analysis of CHARLS and SHARE. *Advances in Life Course Research*, *45*, 100257.

Zhang, L. (2001). *Strangers in the city: Reconfigurations of space, power, and social networks within China's floating population*. Stanford University Press.

Zhang, L. (2010). In search of paradise: middle-class living in a Chinese metropolis Cornell University Press. *Ithaca NY*.

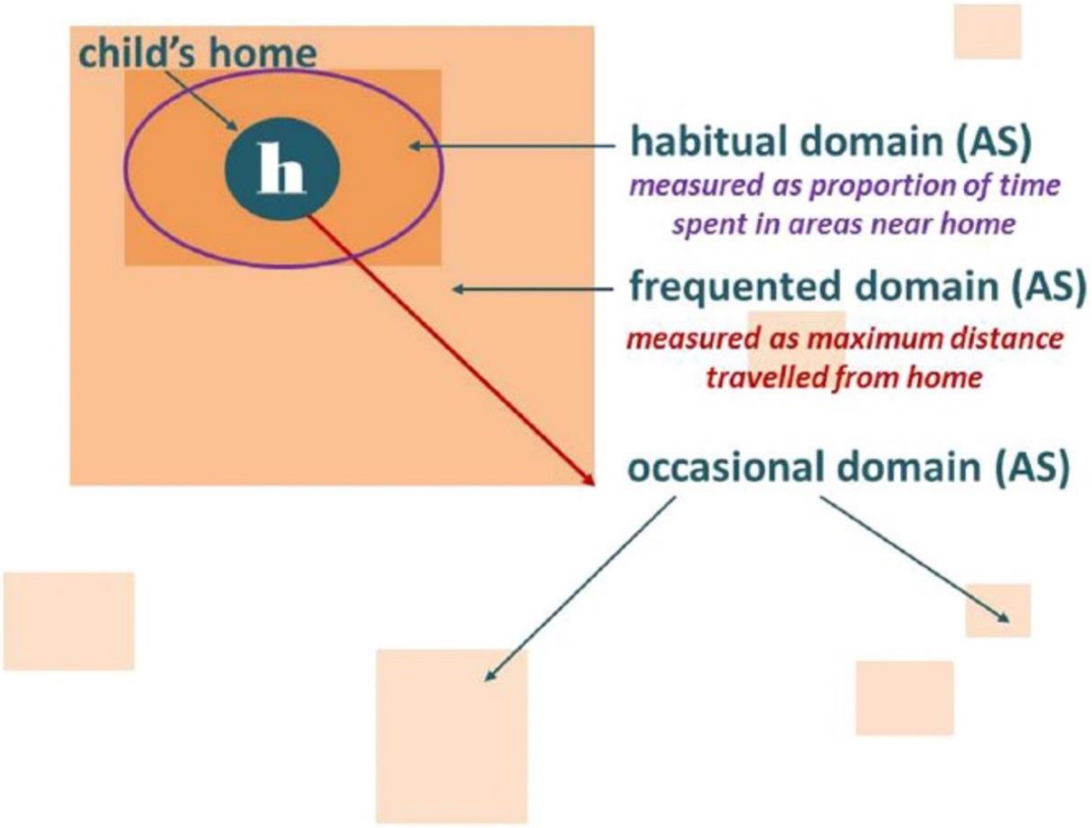
Zhao, L., & Shen, L. (2019). The impacts of rail transit on future urban land use development: A case study in Wuhan, China. *Transport Policy*, *81*, 396-405.

Zhu, D., & Kung, M. (2020). Revisioning the Sustainable Megacity: The Case of Wuhan. In *The Routledge Handbook of Planning Megacities in the Global South* (pp. 118-129). Routledge.

Zhu, Y., Breitung, W., & Li, S. M. (2012). The changing meaning of neighbourhood attachment in Chinese commodity housing estates: Evidence from Guangzhou. *Urban Studies*, *49*(11), 2439-2457.

Appendix

Appendix A1 Moore's concept of home range



Appendix B1 Information Letter - For Primary School

Department
of
Landscape

Information Letter - For Primary School

Research Project Title: An Exploration of Cross-generational Childhood Outdoor Play Experiences in Chinese Communities, Taking Wuhan as an Example

I am writing this letter to ask your permission for accessing participants and undertaking my research in your school. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether you will make consent or not. Thank you for reading this.

What is the purpose of this research?

Current children's outdoor play experiences had a dramatic reduction on children's playing time, frequency, and experiencing natural environments, as their parents and grandparents would have done in their childhood due to the rapid urbanization in China. The aim of this research is to develop an understanding of the changes of childhood play experiences across three generations in different types of communities in Wuhan.

This research has conducted fieldworks in different types of communities in Wuhan from July, 2017 and expects to be finished in February, 2019. The results will be used in the researcher's PhD thesis for an educational qualification.

Why the participants been chosen?

The study areas in this research has been divided into four community types, and the primary school was chosen as one which is close one community type. The participants in this research are randomly chosen as residents who grew up in one particular community type, nearly 120 of children from 7 to 12 years old would be randomly chosen from the school.

Do they have to take part?

It is up to the participants themselves to decide whether or not to take part. If they do decide to take part, they will be given an information sheet to keep (and be asked to sign a consent form or do a verbal consent) and they can still withdraw at any time without any negative consequences.

What will happen to the participants if they take part?

There are two ways to involve in this research, the participants will complete a questionnaire and then involve in an interview if they are willing to do.

1. Questionnaire: It will take the participant about 15 minutes to complete a questionnaire about their childhood play experiences in their community.

2. Interview: It will take the participant to do a 10 minutes' go-along interview to talk about their childhood play experiences in-depth in their own community.

What are the risks involved in this study?

It indicates that this research will not bring any discomforts, disadvantages or risks to the participants. As far as possible the participants' contribution to the data will be kept confidential, any personal information or images will not be showed to others.

What are the possible benefits of taking part?

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will make some suggestion for the planning and design principles of outdoor play spaces in the community, which will benefit the children in the future.

Will the participants taking part in this project be kept confidential?

All the information that we collect about the participants during the course of the research will be kept strictly confidential and will only be accessible to members of the research team. The participants will not be able to be identified in any reports or publications unless they have given their explicit consent for this.

What is the legal basis for processing the participants' personal data?

According to data protection legislation, we are required to inform you that the legal basis we are applying in order to process your personal data is that 'processing is necessary for the performance of a task carried out in the public interest'. Further information can be found in the University's Privacy Notice:
https://www.sheffield.ac.uk/govern/data-protection/privacy/general.

What will happen to the data collected, and the results of the research project?

Data collected from this research will be kept strictly confidential and will only be accessible to the researcher and her supervisors. The results will be used in the researcher's PhD thesis, and they are likely to be published in journals, presented at conferences or possibly anywhere in the world, the participant's personal details will not be included in any reports or publications.
Due to the nature of this research it is very likely that other researchers may find the data collected to be useful in answering future research questions. I will ask for your explicit consent for your data to be shared in this way.

Who is organising and funding the research?

This is a nun-funded research project, and the data will not be used by any member of the project team for commercial purposes.

Who is the Data Controller?

This is a University research project, The University of Sheffield will act as the Data Controller for this study. This means that the University of Sheffield is responsible for looking after the participants' information and using it properly.

Who has ethically reviewed the project?

This project has been ethically approved via the University of Sheffield's Ethics Review Procedure, as administered by Landscape department.

What if something goes wrong and the participants wish to complain about the research?

If the participants have any dissatisfaction with their participation in this research, they could contact my supervisor to raise a complaint. If the participants feel their complaint has not been handled to their satisfaction by my supervisor that they can contact the Head of Department, who will then escalate the complaint through the appropriate channels.

Contacts for Further Information

If you have any further questions or concerns about this research, please contact:

Name of researcher: Yuanyuan Shi
Full address: Floor 9, The Arts Tower, Sheffield, S10 2TN, UK
Tel: +86 15072561268, +44 7549644217
E-mail: yshi10@sheffield.ac.uk yyshi0512@163.com

You can also contact the researcher's supervisor:
Name of supervisor: Helen Woolley
Full address: Floor 12, The Arts Tower, Sheffield, S10 2TN, UK
E-mail: h.woolley@sheffield.ac.uk

Please read the accompanying information letter and then sign this form to certify that your approval for me to undertake my research in your school.

Thank you for taking part in the project.

The University Of Sheffield.

Primary School Consent Form

Title of Research Project: An Exploration of Cross-generational Childhood Outdoor Play Experiences in Chinese Communities, Taking Wuhan as an Example

Name of Researcher: Yuanyuan Shi

Please tick the appropriate boxes	**Yes**	**No**
Taking Part in the Project		
I have read and understood the project information sheet dated 12/09/2018 or the project has been fully explained to me. (If you will answer No to this question please do not proceed with this consent form until you are fully aware of what your participation in the project will mean.)	☐	☐
I have been given the opportunity to ask questions about the project.	☐	☐
I agree to take part in the project. I understand that taking part in the project will include completing a questionnaire, being interviewed and being recorded by audio.	☐	☐
I understand that my taking part is voluntary and that I can withdraw from the study at any time; I do not have to give any reasons for why I no longer want to take part and there will be no adverse consequences if I choose to withdraw.	☐	☐
How my information will be used during and after the project		
I understand my personal details such as name, phone number, address and email address etc. will not be revealed to people outside the project.	☐	☐
I understand and agree that my words may be quoted in publications, reports, web pages, and other research outputs. I understand that I will not be named in these outputs unless I specifically request this.	☐	☐
I understand and agree that other authorised researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I understand and agree that other authorised researchers may use my data in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I give permission for the __/__/____ that I provide to be deposited in data repository OF THIS RESEARCH so it can be used for future research and learning	☐	☐
So that the information you provide can be used legally by the researchers		
I agree to assign the copyright I hold in any materials generated as part of this project to The University of Sheffield.	☐	☐

Name of participant [printed] Signature Date

Name of Researcher [printed] Signature Date

Appendix B2 Information Letter - For Residential Committee

Department
of
Landscape

Information Letter - For Residential Committee

Research Project Title: An Exploration of Cross-generational Childhood Outdoor Play Experiences in Chinese Communities, Taking Wuhan as an Example

I am writing this letter to ask your permission for accessing participants and undertaking my research in your community. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether you will make consent or not. Thank you for reading this.

What is the purpose of this research?

Current children's outdoor play experiences had a dramatic reduction on children's playing time, frequency, and experiencing natural environments, as their parents and grandparents would have done in their childhood due to the rapid urbanization in China. The aim of this research is to develop an understanding of the changes of childhood play experiences across three generations in different types of communities in Wuhan.

This research has conducted fieldworks in different types of communities in Wuhan from July, 2017 and expects to be finished in February, 2019. The results will be used in the researcher's PhD thesis for an educational qualification.

Why the participants been chosen?

The study areas in this research has been divided into four community types, and the participants have been divided into three generations. The participants in this research are randomly chosen as residents who grew up in one particular community type, nearly 120 of participants from each generation would be randomly chosen in one community type.

Do they have to take part?

It is up to the participants themselves to decide whether or not to take part. If they do decide to take part, they will be given an information sheet to keep (and be asked to sign a consent form or do a verbal consent) and they can still withdraw at any time without any negative consequences.

What will happen to the participants if they take part?

There are two ways to involve in this research, the participants will complete a questionnaire and then involve in an interview if they are willing to do.

1. Questionnaire: It will take the participant about 15 minutes to complete a questionnaire about their childhood play experiences in their community.

2. Interview: It will take the participant to do a 10 minutes' go-along interview to talk about their childhood play experiences in-depth in their own community.

What are the risks involved in this study?

It indicates that this research will not bring any discomforts, disadvantages or risks to the participants. As far as possible the participants' contribution to the data will be kept confidential, any personal information or images will not be showed to others.

What are the possible benefits of taking part?

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will make some suggestion for the planning and design principles of outdoor play spaces in the community, which will benefit the children in the future.

Will the participants taking part in this project be kept confidential?

All the information that we collect about the participants during the course of the research will be kept strictly confidential and will only be accessible to members of the research team. The participants will not be able to be identified in any reports or publications unless they have given their explicit consent for this.

What is the legal basis for processing the participants' personal data?

According to data protection legislation, we are required to inform you that the legal basis we are applying in order to process your personal data is that 'processing is necessary for the performance of a task carried out in the public interest'. Further information can be found in the University's Privacy Notice:
https://www.sheffield.ac.uk/govern/data-protection/privacy/general.

What will happen to the data collected, and the results of the research project?

Data collected from this research will be kept strictly confidential and will only be accessible to the researcher and her supervisors. The results will be used in the researcher's PhD thesis, and they are likely to be published in journals, presented at conferences or possibly anywhere in the world, the participant's personal details will not be included in any reports or publications.
Due to the nature of this research it is very likely that other researchers may find the data collected to be useful in answering future research questions. I will ask for your explicit consent for your data to be shared in this way.

Who is organising and funding the research?

This is a nun-funded research project, and the data will not be used by any member of the project team for commercial purposes.

Who is the Data Controller?

This is a University research project, The University of Sheffield will act as the Data Controller for this study. This means that the University of Sheffield is responsible for looking after the participants' information and using it properly.

Who has ethically reviewed the project?

This project has been ethically approved via the University of Sheffield's Ethics Review Procedure, as administered by Landscape department.

What if something goes wrong and the participants wish to complain about the research?

If the participants have any dissatisfaction with their participation in this research, they could contact my supervisor to raise a complaint. If the participants feel their complaint has not been handled to their satisfaction by my supervisor that they can contact the Head of Department, who will then escalate the complaint through the appropriate channels.

Contacts for Further Information

If you have any further questions or concerns about this research, please contact:

Name of researcher: Yuanyuan Shi
Full address: Floor 9, The Arts Tower, Sheffield, S10 2TN, UK
Tel: +86 15072561268, +44 7549644217
E-mail: yshi10@sheffield.ac.uk yyshi0512@163.com

You can also contact the researcher's supervisor:
Name of supervisor: Helen Woolley
Full address: Floor 12, The Arts Tower, Sheffield, S10 2TN, UK
E-mail: h.woolley@sheffield.ac.uk

Please read the accompanying information letter and then sign this form to certify that your approval for me to undertake my research in the community.

Thank you for taking part in the project.

The University Of Sheffield.

Residential Committee Consent Form

Title of Research Project: An Exploration of Cross-generational Childhood Outdoor Play Experiences in Chinese Communities, Taking Wuhan as an Example

Name of Researcher: Yuanyuan Shi

Please tick the appropriate boxes	**Yes**	**No**
Taking Part in the Project		
I have read and understood the project information sheet dated 12/09/2018 or the project has been fully explained to me. (If you will answer No to this question please do not proceed with this consent form until you are fully aware of what your participation in the project will mean.)	☐	☐
I have been given the opportunity to ask questions about the project.	☐	☐
I agree to take part in the project. I understand that taking part in the project will include completing a questionnaire, being interviewed and being recorded by audio.	☐	☐
I understand that my taking part is voluntary and that I can withdraw from the study at any time; I do not have to give any reasons for why I no longer want to take part and there will be no adverse consequences if I choose to withdraw.	☐	☐
How my information will be used during and after the project		
I understand my personal details such as name, phone number, address and email address etc. will not be revealed to people outside the project.	☐	☐
I understand and agree that my words may be quoted in publications, reports, web pages, and other research outputs. I understand that I will not be named in these outputs unless I specifically request this.	☐	☐
I understand and agree that other authorised researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I understand and agree that other authorised researchers may use my data in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I give permission for the __/__/____ that I provide to be deposited in data repository OF THIS RESEARCH so it can be used for future research and learning	☐	☐
So that the information you provide can be used legally by the researchers		
I agree to assign the copyright I hold in any materials generated as part of this project to The University of Sheffield.	☐	☐

Name of participant [printed] Signature Date

Name of Researcher [printed] Signature Date

Appendix B3 Information Letter – Parents Should Read

Department
of
Landscape

Information Letter – Parents Should Read

Research Project Title: An Exploration of Cross-generational Childhood Outdoor Play Experiences in Chinese Communities, Taking Wuhan as an Example

Your children are being invited to take part in a research project. As gatekeeper, you have the authority to consent the children's involvement in this study. Please translate this information letter appropriately to your children. Before you and your children decide, it is important for you to help your children understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with your children. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not your children wish to take part. Thank you for reading this.

What is the purpose of this research?

Current children's outdoor play experiences had a dramatic reduction on children's playing time, frequency, and experiencing natural environments, as their parents and grandparents would have done in their childhood due to the rapid urbanization in China. The aim of this research is to develop an understanding of the changes of childhood play experiences across three generations in different types of communities in Wuhan.

This research has conducted fieldworks in different types of communities in Wuhan from July, 2017 and expects to be finished in February, 2019. The results will be used in the researcher's PhD thesis for an educational qualification.

Why has my child been chosen?

The study areas in this research has been divided into four community types, and the children participants in this research are chosen as residents who live in a selected community type, nearly 120 of children from 7 to 12 years old would be randomly chosen from one community type.

Does my child have to take part?

It is up to you and your children to decide whether or not to take part. If you and your children do decide to take part, you will be given this information sheet to keep (and be asked to sign a consent form) and your children can still withdraw at any time without any negative consequences. You and your children do not have to give a reason. If you or

your children wish to withdraw from the research, please contact me by telephone or wechat.

What will happen to my child if he/her take part? What do he/her have to do?

There are two ways to involve in this research, you will complete a questionnaire and then involve in an interview if you are willing to do.

1. Questionnaire: It will take about 15 minutes to complete a questionnaire about your child's play experiences in his/her community.

2. Child-led walks: It will take 10 minutes to involve in a go-along interview to talk about your child's play experiences in-depth in his/her own community.

3. Focus-group Interview: Your child and other four children in the same school would be invited to do a focus-group interview in their school. They will talk about their experiences in their school.

What are the possible disadvantages and risks of taking part?

It indicates that this research will not bring any discomforts, disadvantages or risks to the participants. As far as possible the participants' contribution to the data will be kept confidential, any personal information or images will not be showed to others.

What are the possible benefits of taking part?

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will make some suggestion for the planning and design principles of outdoor play spaces in the community, which will benefit your children in the future.

Will my taking part in this project be kept confidential?

All the information that we collect about the participants during the course of the research will be kept strictly confidential and will only be accessible to members of the research team. The participants will not be able to be identified in any reports or publications unless they have given their explicit consent for this.

What is the legal basis for processing the participants' personal data?

According to data protection legislation, we are required to inform you that the legal basis we are applying in order to process your personal data is that 'processing is necessary for the performance of a task carried out in the public interest'. Further information can be found in the University's Privacy Notice:
https://www.sheffield.ac.uk/govern/data-protection/privacy/general.

What will happen to the data collected, and the results of the research project?

Data collected from this research will be kept strictly confidential and will only be accessible to the researcher and her supervisors. The results will be used in the researcher's PhD thesis, and they are likely to be published in journals, presented at conferences or possibly anywhere in the world, the participant's personal details will not be included in any reports or publications.

Due to the nature of this research it is very likely that other researchers may find the data collected to be useful in answering future research questions. I will ask for your explicit consent for your data to be shared in this way.

Who is organising and funding the research?

This is a nun-funded research project, and the data will not be used by any member of the project team for commercial purposes.

Who is the Data Controller?

This is a University research project, The University of Sheffield will act as the Data Controller for this study. This means that the University of Sheffield is responsible for looking after your information and using it properly.

Who has ethically reviewed the project?

This project has been ethically approved via the University of Sheffield's Ethics Review Procedure, as administered by Landscape department.

What if something goes wrong and I wish to complain about the research?

If you have any dissatisfaction with your children's participation in this research, you could contact my supervisor to raise a complaint. If you feel your complaint has not been handled to your satisfaction by my supervisor that you can contact the Head of Department, who will then escalate the complaint through the appropriate channels.

Contacts for Further Information

If you have any further questions or concerns about this research, please contact:

Name of researcher: Yuanyuan Shi
Full address: Floor 9, The Arts Tower, Sheffield, S10 2TN, UK
Tel: +86 15072561268, +44 7549644217
E-mail: yshi10@sheffield.ac.uk yyshi0512@163.com

You can also contact the researcher's supervisor:

Name of supervisor: Helen Woolley
Full address: Floor 12, The Arts Tower, Sheffield, S10 2TN, UK

E-mail: h.woolley@sheffield.ac.uk

Please read the accompanying information letter and then sign this form to certify that your approval for your children's participation in this research.

Thank you for taking part in the project.

The University Of Sheffield.

Gatekeeper's Consent Form

Title of Research Project: An Exploration of Cross-generational Childhood Outdoor Play Experiences in Chinese Communities, Taking Wuhan as an Example
Name of Researcher: Yuanyuan Shi

Please tick the appropriate boxes	**Yes**	**No**
Taking Part in the Project		
I have read and understood the project information sheet dated 12/09/2018 or the project has been fully explained to me. (If you will answer No to this question please do not proceed with this consent form until you are fully aware of what your participation in the project will mean.)	☐	☐
I have been given the opportunity to ask questions about the project.	☐	☐
I agree my children to take part in the project by completing a questionnaire.	☐	☐
I agree my children to take part in the project by being interviewed.	☐	☐
I agree my children to take part in the project by recorded by audio.	☐	☐
I understand that my children's taking part is voluntary and that I can withdraw from the study at any time; I do not have to give any reasons for why I no longer want to take part and there will be no adverse consequences if I choose to withdraw.	☐	☐
How my information will be used during and after the project		
I understand my children's personal details such as name, phone number, address and email address etc. will not be revealed to people outside the project.	☐	☐
I understand and agree that my children's words may be quoted in publications, reports, web pages, and other research outputs. I understand that I will not be named in these outputs unless I specifically request this.	☐	☐
I understand and agree that other authorised researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I understand and agree that other authorised researchers may use my data in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I give permission for the __/__/____ that I provide to be deposited in data repository OF THIS RESEARCH so it can be used for future research and learning	☐	☐
So that the information you provide can be used legally by the researchers		
I agree to assign the copyright I hold in any materials generated as part of this project to The University of Sheffield.	☐	☐

Name of participant [printed]	Signature	Date
Name of Researcher [printed]	Signature	Date

Appendix B4 Information Letter for Children

Finding out about PLAY in your COMMUNITY

Share your play experiences!

You are invited to take part in a research project of children's outdoor play experiences in their communities. Before you decide whether you would like to or not it is important to understand why the research is being down and what it will involve. If you do not understand anything just ask me.

Information abour the Research Project:

I am the researcher at the University of Sheffield and I want to find out about how children play in their communities over three generations in Wuhan.

To conduct my research, I need your help to find out about your play experiences in your community.

Do I have to take part?

It is up to you to decide whether or not to take part. You can choose weather you want to take part and you can leave at any time without having to telling me why.

Who do I need to do?

There 3 ways to get involved in this research, you could choose what you like to do:

1.Questionnaire: It will take you 15 minutes to complete a questionnaire, you will tick the boxes, answer some questions and simply draw a picture.

2.Diary: Together with the questionnaire, there is a diary for you to record your daily routine. Please write the activities into corresponding time slots.

3.Child-led Walk: You and other children participants will be invited as a group of 5 to lead me in a 20 minutes' walk in your school or your community. During that walk, you will share your play experience.

Will I be recorded?

I would like to take photos and audio records during some activities, but I will ask for your improvement first. Only my supervisors and me would hear the records, and your face will not be showed in the photos.

What are the possible disadvantages and risks of taking part?

This research will not bring any discomforts, disadvantages or risks to you. As far as possible, your contribution to the data will be kept confidential, any personal information or images will not be showed to others.

What are the possible benefits of taking part?

There might be no immediate benefits for you participating in the project, it is hoped that this work will make some suggestion for building better outdoor play spaces in the community which will benefit you and other children in the future.

What will happen to the information collected from me?

All your views and experiences will be put together with the information collected from other children, they might be used in presentations and publications in different parts of the world. Your name will not be showed and linked with the other research materials.

Who is organising the research?

This is a university project held by University of Sheffield in UK, the data would be used in the researcher's PhD thesis for my educational qualification.

If you want to ask any questions you can get in touch with me here:

Researcher's Name: Yuanyuan Shi

Wechat/QQ : 176261314

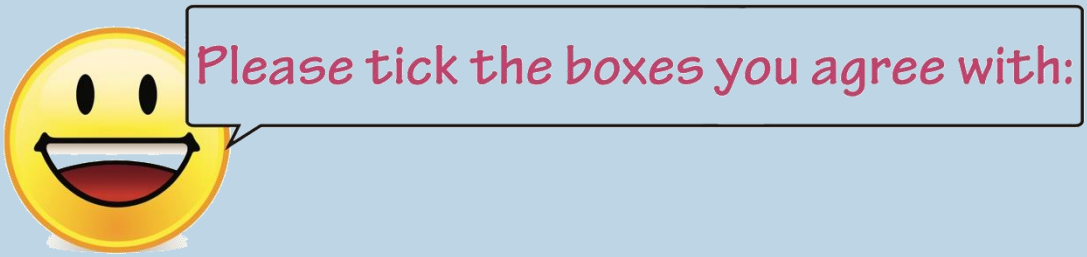
Tel: 15072561268

Email: yyshi0512@163.com

Consent Form

Title of Research Project: An Exploration of Cross-generational Childhood Outdoor Play Experiences in Chinese Communities, Taking Wuhan as an Example

Name of Researcher: Yuanyuan Shi



- ☐ I am happy to complete the questionnaire.
- ☐ I am happy to complete the diary.
- ☐ I am happy to be interviewed and lead a walk in my school.
- ☐ I am happy to be interviewed and lead a walk in my community.
- ☐ I am happy to be voice-recorded.
- ☐ I am happy to be photographed.

_____	_____	_____
Name of Participant (To be completed by researcher)	**Date**	**Signature**
_____	_____	_____
Researcher	**Date**	**Signature**

Appendix B5 Information Letter - For Adults

Department
of
Landscape

Information Letter - For Adults

Research Project Title: An Exploration of Cross-generational Childhood Outdoor Play Experiences in Chinese Communities, Taking Wuhan as an Example

You are being invited to take part in a research project. Before you decide whether or not to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

What is the purpose of this research?

Current children's outdoor play experiences had a dramatic reduction on children's playing time, frequency, and experiencing natural environments, as their parents and grandparents would have done in their childhood due to the rapid urbanization in China. The aim of this research is to develop an understanding of the changes of childhood play experiences across three generations in different types of communities in Wuhan.

This research has conducted fieldworks in different types of communities in Wuhan from July, 2017 and expects to be finished in February, 2019. The results will be used in the researcher's PhD thesis for an educational qualification.

Why have I been chosen?

The study areas in this research has been divided into four community types, and the primary school was chosen as one which is close one community type. The participants in this research are randomly chosen as residents who grew up in one particular community type, nearly 120 of children from 7 to 12 years old would be randomly chosen from the school.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep (and be asked to sign a consent form) and you can still withdraw at any time without any negative consequences. You do not have to give a reason. If you wish to withdraw from the research, please contact me by telephone or wechat.

What will happen to me if I take part? What do I have to do?

There are two ways to involve in this research, you will complete a questionnaire and then involve in an interview if you are willing to do.

1. Questionnaire: It will take you about 15 minutes to complete a questionnaire about your childhood play experiences in your community.

2. Interview: It will take you 10 minutes to involve in a go-along interview to talk about your childhood play experiences in-depth in your own community.

What are the possible disadvantages and risks of taking part?

It indicates that this research will not bring any discomforts, disadvantages or risks to the participants. As far as possible the participants' contribution to the data will be kept confidential, any personal information or images will not be showed to others.

What are the possible benefits of taking part?

Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will make some suggestion for the planning and design principles of outdoor play spaces in the community, which will benefit the children in the future.

Will my taking part in this project be kept confidential?

All the information that we collect about the participants during the course of the research will be kept strictly confidential and will only be accessible to members of the research team. The participants will not be able to be identified in any reports or publications unless they have given their explicit consent for this.

What is the legal basis for processing the participants' personal data?

According to data protection legislation, we are required to inform you that the legal basis we are applying in order to process your personal data is that 'processing is necessary for the performance of a task carried out in the public interest'. Further information can be found in the University's Privacy Notice:
https://www.sheffield.ac.uk/govern/data-protection/privacy/general.

What will happen to the data collected, and the results of the research project?

Data collected from this research will be kept strictly confidential and will only be accessible to the researcher and her supervisors. The results will be used in the researcher's PhD thesis, and they are likely to be published in journals, presented at conferences or possibly anywhere in the world, the participant's personal details will not be included in any reports or publications.

Due to the nature of this research it is very likely that other researchers may find the data collected to be useful in answering future research questions. I will ask for your explicit consent for your data to be shared in this way.

Who is organising and funding the research?

This is a nun-funded research project, and the data will not be used by any member of the project team for commercial purposes.

Who is the Data Controller?

This is a University research project, The University of Sheffield will act as the Data Controller for this study. This means that the University of Sheffield is responsible for looking after your information and using it properly.

Who has ethically reviewed the project?

This project has been ethically approved via the University of Sheffield's Ethics Review Procedure, as administered by Landscape department.

What if something goes wrong and I wish to complain about the research?

If you have any dissatisfaction with your participation in this research, you could contact my supervisor to raise a complaint. If you feel your complaint has not been handled to your satisfaction by my supervisor that you can contact the Head of Department, who will then escalate the complaint through the appropriate channels.

Contacts for Further Information

If you have any further questions or concerns about this research, please contact:

Name of researcher: Yuanyuan Shi
Full address: Floor 9, The Arts Tower, Sheffield, S10 2TN, UK
Tel: +86 15072561268, +44 7549644217
E-mail: yshi10@sheffield.ac.uk yyshi0512@163.com

You can also contact the researcher's supervisor:
Name of supervisor: Helen Woolley
Full address: Floor 12, The Arts Tower, Sheffield, S10 2TN, UK
E-mail: h.woolley@sheffield.ac.uk

Please read the accompanying information letter and then sign this form to certify that your approval for your participation in this research.

Thank you for taking part in the project.

The University Of Sheffield.

Adults' Consent Form

Title of Research Project: An Exploration of Cross-generational Childhood Outdoor Play Experiences in Chinese Communities, Taking Wuhan as an Example
Name of Researcher: Yuanyuan Shi

Please tick the appropriate boxes	**Yes**	**No**
Taking Part in the Project		
I have read and understood the project information sheet dated 12/09/2018 or the project has been fully explained to me. (If you will answer No to this question please do not proceed with this consent form until you are fully aware of what your participation in the project will mean.)	☐	☐
I have been given the opportunity to ask questions about the project.	☐	☐
I agree to take part in the project by completing a questionnaire.	☐	☐
I agree to take part in the project by being interviewed.	☐	☐
I agree to take part in the project by recorded by audio.	☐	☐
I understand that my taking part is voluntary and that I can withdraw from the study at any time; I do not have to give any reasons for why I no longer want to take part and there will be no adverse consequences if I choose to withdraw.	☐	☐
How my information will be used during and after the project		
I understand my personal details such as name, phone number, address and email address etc. will not be revealed to people outside the project.	☐	☐
I understand and agree that my words may be quoted in publications, reports, web pages, and other research outputs. I understand that I will not be named in these outputs unless I specifically request this.	☐	☐
I understand and agree that other authorised researchers will have access to this data only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I understand and agree that other authorised researchers may use my data in publications, reports, web pages, and other research outputs, only if they agree to preserve the confidentiality of the information as requested in this form.	☐	☐
I give permission for the __/__/____ that I provide to be deposited in data repository OF THIS RESEARCH so it can be used for future research and learning	☐	☐
So that the information you provide can be used legally by the researchers		
I agree to assign the copyright I hold in any materials generated as part of this project to The University of Sheffield.	☐	☐

Name of participant [printed]	Signature	Date
Name of Researcher [printed]	Signature	Date

Appendix B6 Questionnaire for children

Children's Questionnaire

☑ Please tick:

1. Children's Age _____

2. ☐ Boy ☐ Girl

3. Family members in the household

☐ Parents ☐Grandparents ☐Siblings ☐Others

4. I grow up in?

☐Rural ☐Urban Village ☐Old Town

☐Danwei ☐Commercial Gated Community

5. I usually play in (choose three)？

☐My community ☐Friends' community ☐School

☐Home

☐Way to school ☐ Street near home ☐Parks near home

☐Shopping Mall ☐Indoor playground in shopping mall

☐Yangtze River ☐Lakesides ☐Fields

Others:

6. I normally travel to play from my home:

☐ Beyond 1000m (outside my community)

☐ 500 – 1000 m (entrance of my community)

☐ 100 – 500 m (in the community)

☐ Within 100 (near home)

7. How often do I normally play outside in my community?

☐Almost Every day ☐ 3-4 times a week

☐Twice a week ☐ Weekends

8. I usually play outside in my community for:

☐ More than 2 hours ☐ 1-2 hours ☐ 30 -60 minutes

☐15 - 30 minutes ☐ 5 – 15 minutes ☐ Less than 5 minutes

9. Who play with me (multiple choice)？

☐Parents ☐Grandparents ☐Siblings ☐Other relatives

☐Alone ☐Friends（☐community ☐school ☐family）

10. I didn't play outside, because (multiple choice)：

☐Busy（☐homework ☐Interesting class ☐Parents busy）

☐No companions ☐No space ☐No facilities

☐Accessibility（☐ long distance ☐too many cars）

☐Weather（☐hot ☐cold ☐rain ）

☐safety consideration（☐strangers ☐injury ☐lost ）

☐Parents don't allow

(Why:_____)

Other：

11. I feel safe to play in the community ☐Yes ☐No

Why:

12. What do you regard as play (multiple choice)？

☐sports ☐walking ☐outdoor games ☐visiting friends

☐Hanging in the shop ☐indoor playgrounds

☐Pads, Phones, Video Games ☐Theme Parks

Other：

_____

13. Please share your memorable outdoor play experience?

14. What do you like to do in your community？

☐Sports ☐Go to shops ☐Meet friends ☐Picnic

☐Sit ☐Relax ☐Walk ☐ Take fresh air ☐Community events

☐**Play games (name of the game)**

_____

Others:

15. Do you like the natural spaces in your community？

YES	**No**
Why:	**Why:**

16.Do you feel satisfied with your community?

Yes	**No**
Why:	**Why:**

☐ Please tick if you would like to participate in the interview.

Community：	
Name:	**Phone:**

Appendix B7 Questionaire for Parents

Parents' Questionnaire

1. Age: _____

2. Gender: ☐Male ☐Female

3. You grew up with:

☐Parents ☐Grandparents ☐Siblings ☐Other relatives

4. The community where you grew up:

☐Rural ☐Urban Villiage ☐Old Town ☐Danwei

☐Commercial gated communities

5. Where did you normally play?

☐My community ☐Friends' community ☐School

☐Home

☐Way to school ☐ Street near home ☐Parks near home

☐Shopping Mall ☐Indoor playground in shopping mall

☐Yangtze River ☐Lakesides ☐Fields

Others:

6. How far did you travel to play?

☐withn 100m ☐100-500m ☐500-1000m ☐ Beyond 1000m

7. How often did you play outside？

☐Almost Every day ☐ 3-4 times a week

☐Twice a week ☐ Weekends

8. How long did you normally play outside？

☐ More than 2 hours ☐ 1-2 hours ☐ 30 -60 minutes

☐15 - 30 minutes ☐ 5 – 15 minutes ☐ Less than 5 minutes

9. Whom did you play with (multiple choice)？

☐Parents ☐Grandparents ☐Siblings ☐Other relatives

☐Alone ☐Friends（☐community ☐school ☐family）

10. What did you play as a child？

11. What's you most memorable childhood play experience？

12.Control degree from your parents when you played outside as a child:

1	2	3	4	5

13. How did they control you? Why?

14. Control degree to your children when they play outside:

1	2	3	4	5

15.How do you control your children? Why?

16.Do you hope your children play as the way you did?

☐ Yes ☐ No

Why:

17. Did you feel safe to play outside in your childhood?

Yes	**No**
Why：	**Why：**

18. Did you feel satisfy with the community you grew up in？ Why?

Yes	**No**
Why：	**Why：**

19. What do you regard as play (multiple choice)？

☐sports ☐walking ☐outdoor games ☐visiting friends

☐Hanging in the shop ☐indoor playgrounds

☐Pads, Phones, Video Games ☐Theme Parks

Other：

_____

20. Transport you children take when they play outside ？

☐I take my children by car ☐I walk with my children

☐We take public transport ☐They take public transport

☐They walk with friends ☐ By themselves

21. Reasons you don't allow your children to play outside:

☐Busy（☐homework ☐Interesting class ☐Parents busy）

☐No companions ☐No space ☐No facilities

☐Accessibility（☐ long distance ☐too many cars）

☐Weather（☐hot ☐cold ☐rain ）

☐safety consideration（☐strangers ☐injury

☐lost ）

☐Parents don't allow

(Why:_____)

Other：

22. Do you feel safe for your children to play in the current community？

Yes	**No**
Why：	**Why：**

23.Do you feel satisfied with your current community?

Yes	**No**
Why：	**Why：**

24. How to improve the opportunities for children to play outside？

Thank you for your participation!

☐ Please tick if you would like to participate in the interview.

Name:	**Phone:**

Appendix B8 Questionnaire for grandparents

Grandparents' Questionnaire

1. Age: _____

2. Gender: ☐Male ☐Female

3. You grew up with:

☐Parents ☐Grandparents ☐Siblings ☐Other relatives

4. The community where you grew up:

☐Rural ☐Urban Villiage ☐Old Town ☐Danwei

☐Commercial gated communities

5. Where did you normally play?

☐My community ☐Friends' community ☐School

☐Home

☐Way to school ☐ Street near home ☐Parks near home

☐Shopping Mall ☐Indoor playground in shopping mall

☐Yangtze River ☐Lakesides ☐Fields

Others:

6. How far did you travel to play?

☐Within 100m ☐100-500m ☐500-1000m ☐ Beyond 1000m

7. How often did you play outside？

☐Almost Every day ☐ 3-4 times a week

☐Twice a week ☐ Weekends

8. How long did you normally play outside？

☐ More than 2 hours ☐ 1-2 hours ☐ 30 -60 minutes

☐15 - 30 minutes ☐ 5 – 15 minutes ☐ Less than 5 minutes

9. Whom did you play with (multiple choice)？

☐Parents ☐Grandparents ☐Siblings ☐Other relatives

☐Alone ☐Friends（☐community ☐school ☐family）

10. What did you play as a child？

11. What's you most memorable childhood play experience？

12.Control degree from your parents when you played outside as a child:

1	2	3	4	5

13. How did they control you? Why?

14. Control degree to your children when they play outside:

1	2	3	4	5

15.How do you control your children? Why?

16.Do you wish your children play as the way you did?

☐ Yes ☐ No

Why:

17. Did you feel safe to play outside in your childhood?

Yes	**No**
Why：	**Why：**

18. How to improve the opportunities for children to play outside？

Thank you for your participation! □ Please tick if you would like to participate in the interview.

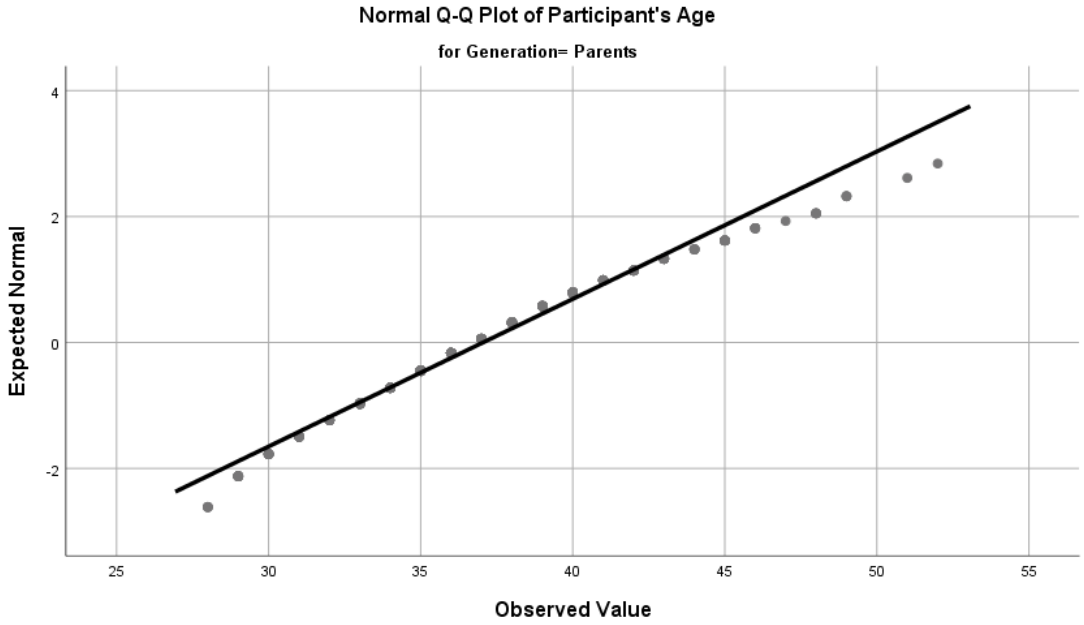
Name:	**Phone:**

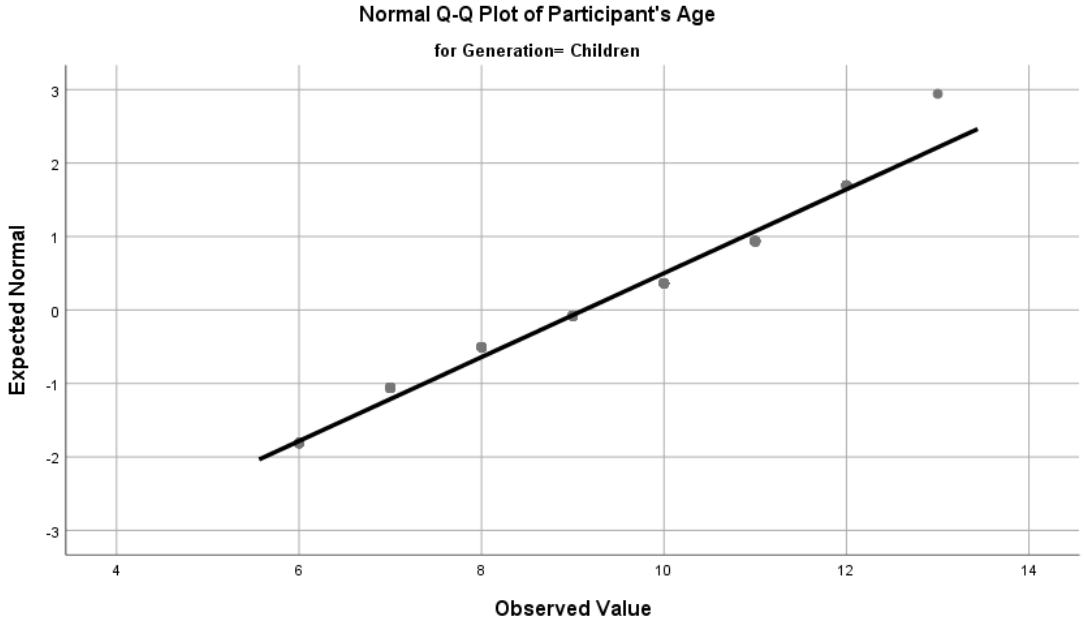
Appendix B9 Children's Diary

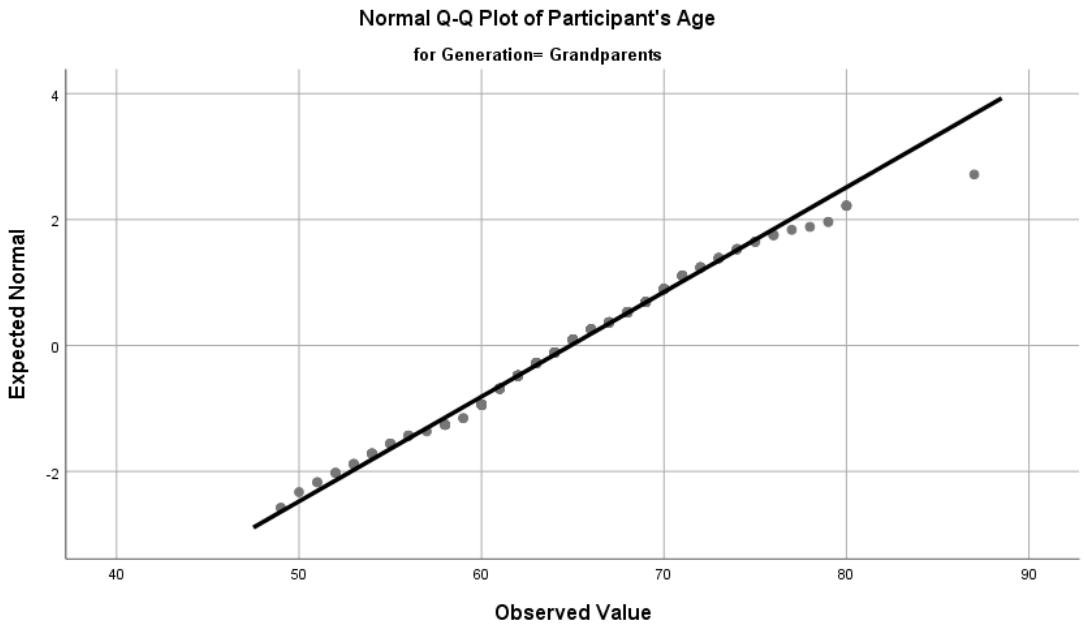
Children's One Day Diary				
Date:		Day:		Weather:
Time	Place	Activity	People	Happy
6:00				😊😊😊😊😊
7:00				😊😊😊😊😊
8:00				😊😊😊😊😊
9:00				😊😊😊😊😊
10:00				😊😊😊😊😊
11:00				😊😊😊😊😊
12:00				😊😊😊😊😊
13:00				😊😊😊😊😊
14:00				😊😊😊😊😊
15:00				😊😊😊😊😊
16:00				😊😊😊😊😊
17:00				😊😊😊😊😊
18:00				😊😊😊😊😊
19:00				😊😊😊😊😊
20:00				😊😊😊😊😊
21:00				😊😊😊😊😊
22:00				😊😊😊😊😊

Appendix C1 Normality tests

Inspection of the normal probability plots






Normal Q-Q Plot of Participant's Age
for Generation= Grandparents
Expected Normal
4
2
0
-2
40
50
60
70
80
90
Observed Value

Appendix C2 Chi-square tests for three generations

SPACE

Children

Pearson Chi-Square Tests

		Community grew up
$PlaySpaces	Chi-square	126.325
	df	48
	Sig.	.000*,b,c

Results are based on nonempty rows and columns in each innermost subtable.

*. The Chi-square statistic is significant at the .05 level.

b. More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

c. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

Parents

Pearson Chi-Square Tests

		Community grew up
$PlaySpaces	Chi-square	392.418
	df	48
	Sig.	.000*,b,c

Results are based on nonempty rows and columns in each innermost subtable.

*. The Chi-square statistic is significant at the .05 level.

b. More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

c. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

Grandparents

Pearson Chi-Square Tests

		Community grew up
$PlaySpaces	Chi-square	339.950
	df	48
	Sig.	.000*,b,c

Results are based on nonempty rows and columns in each innermost subtable.

*. The Chi-square statistic is significant at the .05 level.

b. More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

c. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

PEOPLE

Children

Pearson Chi-Square Tests

		Community grew up
$PlayCompanions	Chi-square	61.641
	df	40
	Sig.	.016*,b,c

Results are based on nonempty rows and columns in each innermost subtable.

*. The Chi-square statistic is significant at the .05 level.

b. More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

c. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

Parents

Pearson Chi-Square Tests

		Community grew up
$Companioan	Chi-square	256.688
	df	40
	Sig.	.000*,b,c

Results are based on nonempty rows and columns in each innermost subtable.

*. The Chi-square statistic is significant at the .05 level.

b. More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

c. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

Grandparents

Pearson Chi-Square Tests

		Community grew up
$PlayCompanions	Chi-square	135.266
	df	40
	Sig.	.000*,b,c

Results are based on nonempty rows and columns in each innermost subtable.

*. The Chi-square statistic is significant at the .05 level.

b. More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

c. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

ACITIVITY

Children

Pearson Chi-Square Tests

		Community grew up
$Activities	Chi-square	36.273
	df	40
	Sig.	.639[a]

Results are based on nonempty rows and columns in each innermost subtable.

a. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

Parents

Pearson Chi-Square Tests

		Community grew up
$PGPGames	Chi-square	211.295
	df	80
	Sig.	.000*

Results are based on nonempty rows and columns in each innermost subtable.

*. The Chi-square statistic is significant at the .05 level.

Grandparents

Pearson Chi-Square Tests

		Community grew up
$PGPGames	Chi-square	319.994
	df	80
	Sig.	.000*,b,c

Results are based on nonempty rows and columns in each innermost subtable.

*. The Chi-square statistic is significant at the .05 level.

b. More than 20% of cells in this subtable have expected cell counts less than 5. Chi-square results may be invalid.

c. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

Frequency

Children

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.317[a]	12	.106
Likelihood Ratio	19.343	12	.081
Linear-by-Linear Association	.033	1	.855
N of Valid Cases	598		

a. 4 cells (20.0%) have expected count less than 5. The minimum expected count is 1.28.

Parents

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	24.367[a]	12	.018
Likelihood Ratio	23.720	12	.022
Linear-by-Linear Association	3.368	1	.066
N of Valid Cases	596		

a. 6 cells (30.0%) have expected count less than 5. The minimum expected count is 1.00.

Grandparents

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	25.056[a]	12	.015
Likelihood Ratio	22.443	12	.033
Linear-by-Linear Association	4.091	1	.043
N of Valid Cases	446		

a. 9 cells (45.0%) have expected count less than 5. The minimum expected count is .13.

Duration

Children

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	19.085[a]	20	.516
Likelihood Ratio	20.049	20	.455
Linear-by-Linear Association	.433	1	.511
N of Valid Cases	596		

a. 9 cells (30.0%) have expected count less than 5. The minimum expected count is .47.

Parents

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	39.060[a]	20	.007
Likelihood Ratio	37.719	20	.010
Linear-by-Linear Association	5.013	1	.025
N of Valid Cases	582		

a. 15 cells (50.0%) have expected count less than 5. The minimum expected count is .09.

Grandparents

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	34.004[a]	20	.026
Likelihood Ratio	36.583	20	.013
Linear-by-Linear Association	.358	1	.550
N of Valid Cases	443		

a. 16 cells (53.3%) have expected count less than 5. The minimum expected count is .06.

Home Range

Children

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	31.792[a]	12	.001
Likelihood Ratio	33.143	12	.001
Linear-by-Linear Association	9.861	1	.002
N of Valid Cases	598		

a. 4 cells (20.0%) have expected count less than 5. The minimum expected count is 1.79.

Parents

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.482[a]	12	.488
Likelihood Ratio	13.178	12	.356
Linear-by-Linear Association	.153	1	.696
N of Valid Cases	599		

a. 5 cells (25.0%) have expected count less than 5. The minimum expected count is .99.

Grandparents

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	19.708[a]	12	.073
Likelihood Ratio	19.229	12	.083
Linear-by-Linear Association	.972	1	.324
N of Valid Cases	456		

a. 6 cells (30.0%) have expected count less than 5. The minimum expected count is .22.

Appendix D1 Control degree

Descriptives

Control Degree from parents

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Grandparents	302	1.76	1.080	.062	1.64	1.88	1	5
Parents	439	2.31	.996	.048	2.22	2.41	0	5
Children	584	3.21	.983	.041	3.13	3.29	0	5
Total	1325	2.58	1.172	.032	2.52	2.65	0	5

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Control Degree from parents	Based on Mean	4.223	2	1322	.015
	Based on Median	2.503	2	1322	.082
	Based on Median and with adjusted df	2.503	2	1070.511	.082
	Based on trimmed mean	2.650	2	1322	.071

ANOVA

Control Degree from parents

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	468.929	2	234.465	229.726	.000
Within Groups	1349.272	1322	1.021		
Total	1818.201	1324			

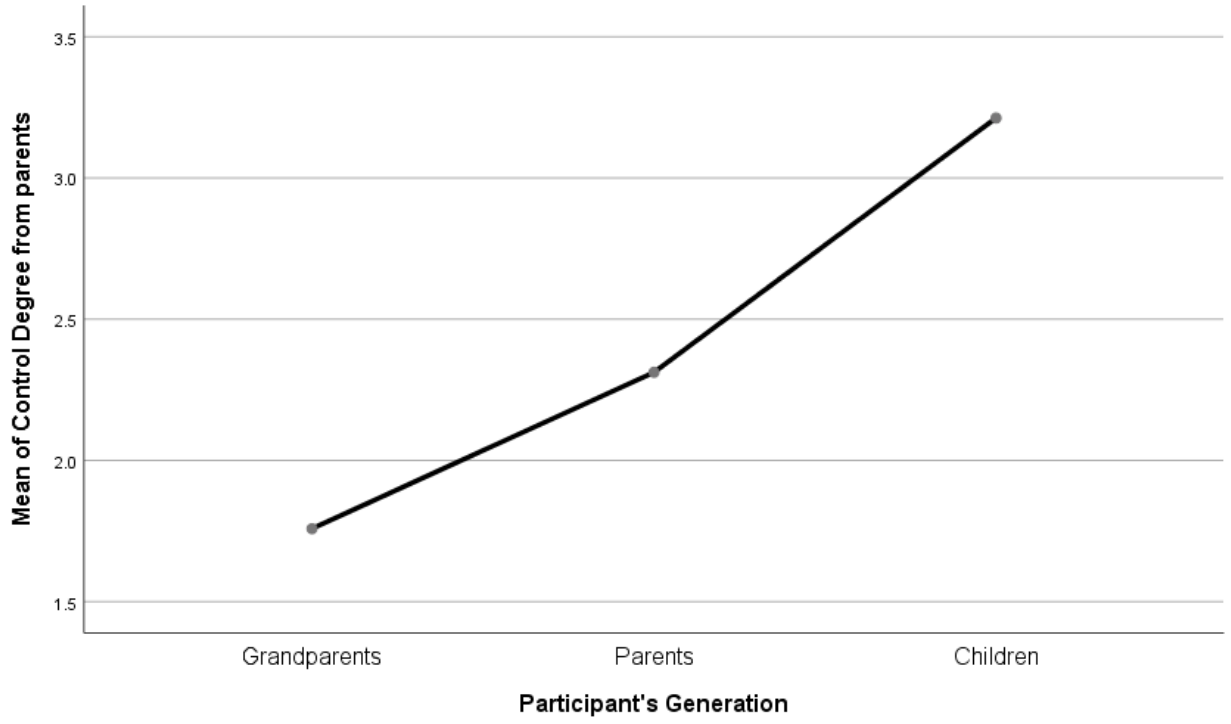
Multiple Comparisons

Dependent Variable: Control Degree from parents

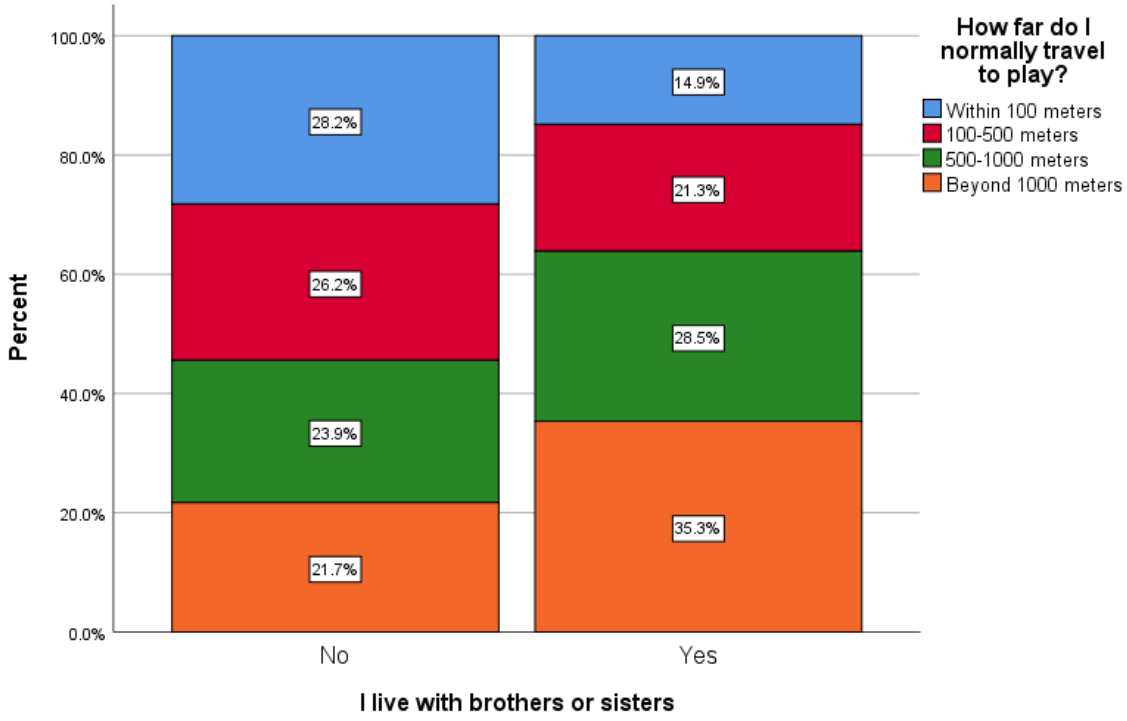
Bonferroni

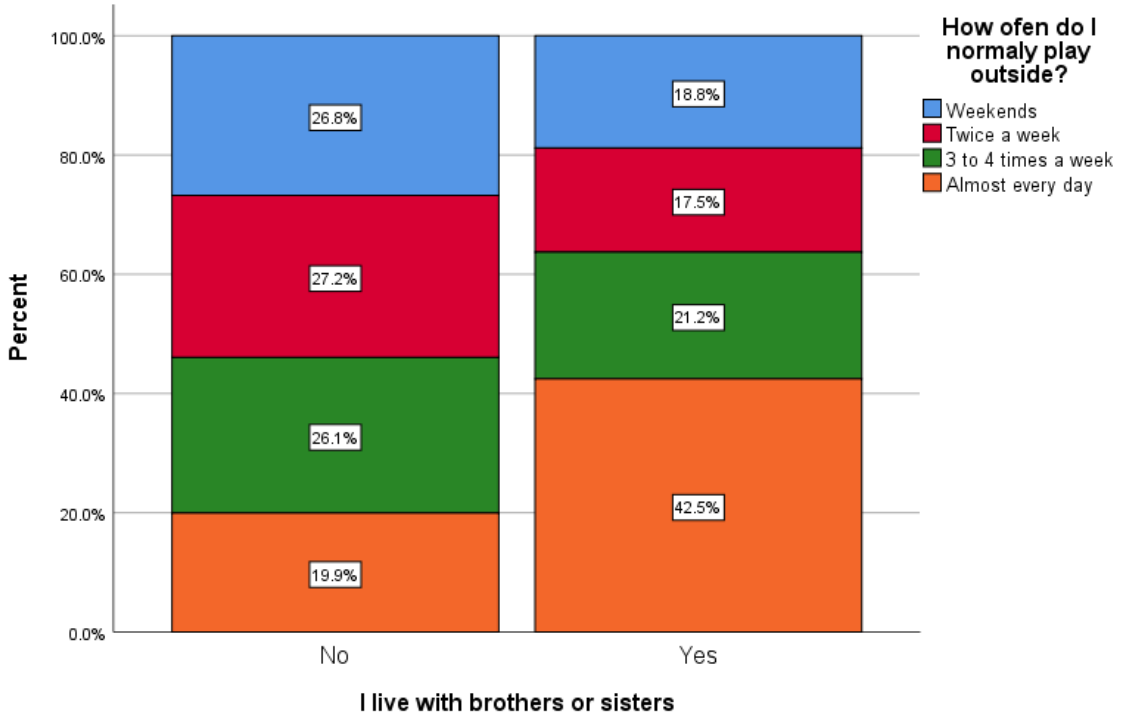
(I) Participant's Generation	(J) Participant's Generation	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Grandparents	Parents	-.554*	.076	.000	-.73	-.37
	Children	-1.454*	.072	.000	-1.63	-1.28
Parents	Grandparents	.554*	.076	.000	.37	.73
	Children	-.900*	.064	.000	-1.05	-.75
Children	Grandparents	1.454*	.072	.000	1.28	1.63
	Parents	.900*	.064	.000	.75	1.05

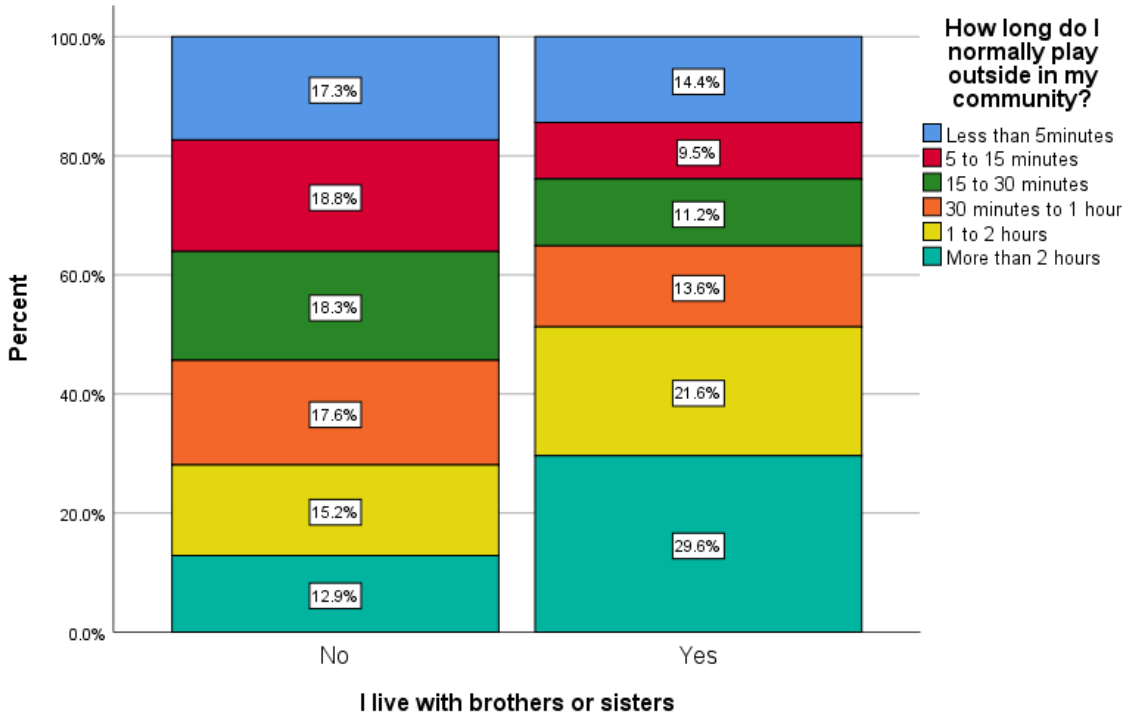
*. The mean difference is significant at the 0.05 level.

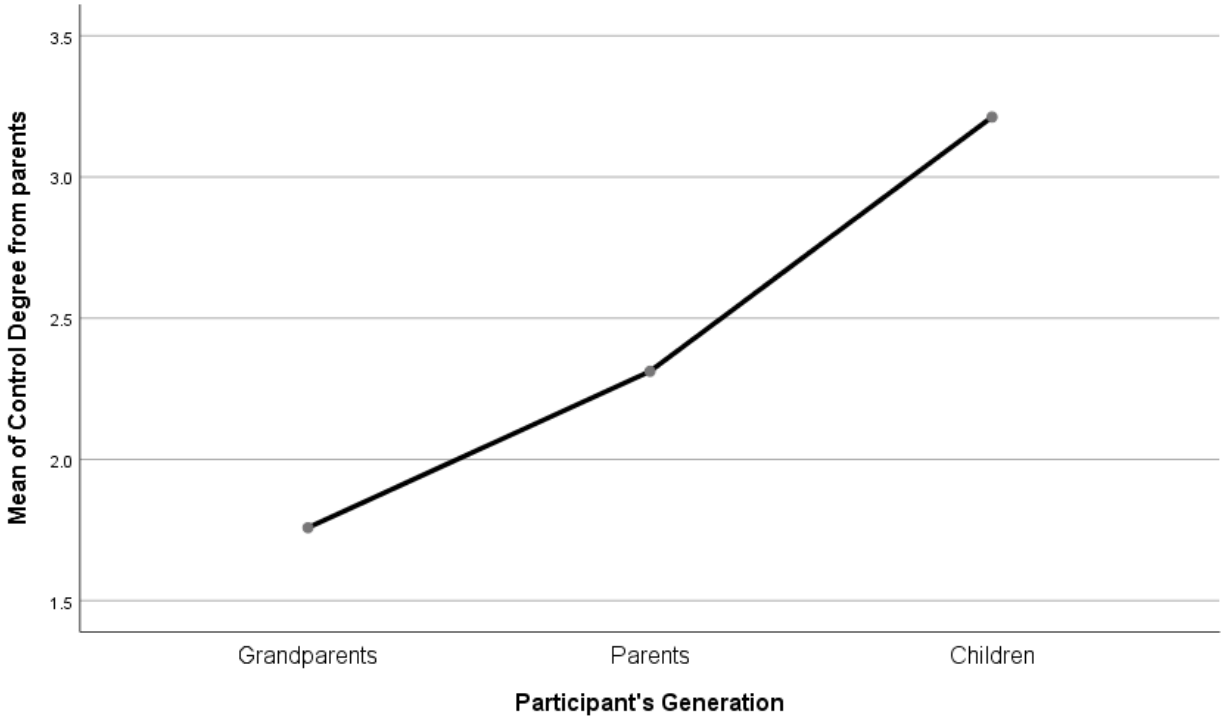


Appendix D2 Tests for siblings



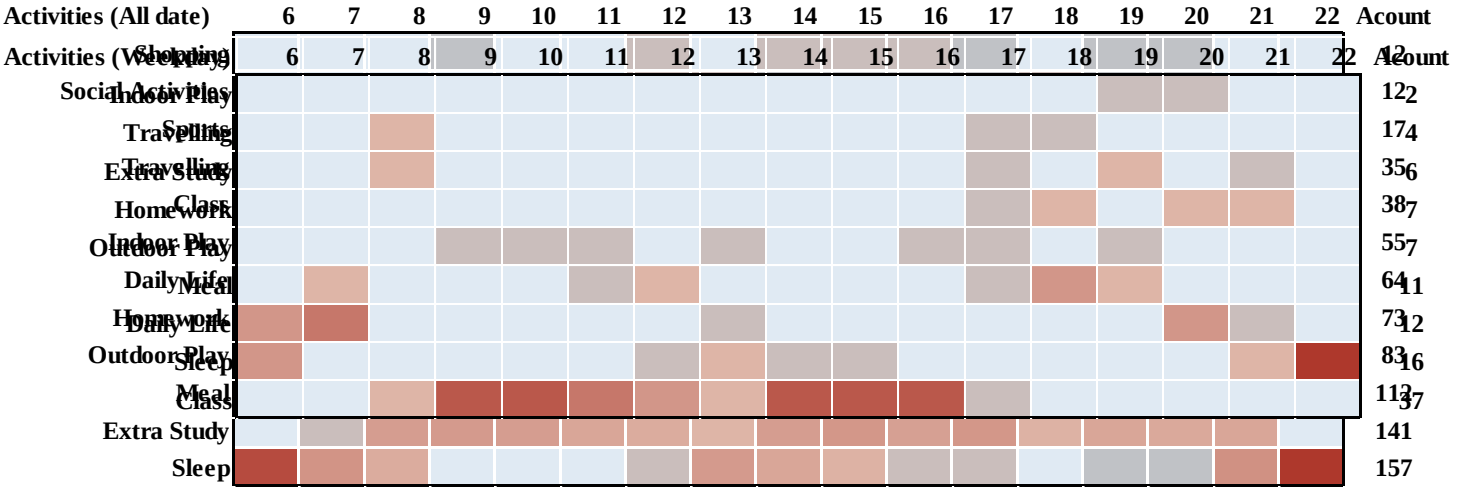



How long do I normally play outside in my community?
Less than 5minutes
5 to 15 minutes
15 to 30 minutes
30 minutes to 1 hour
1 to 2 hours
More than 2 hours
Percent
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
17.3%
18.8%
18.3%
17.6%
15.2%
12.9%
14.4%
9.5%
11.2%
13.6%
21.6%
29.6%
No
Yes
I live with brothers or sisters

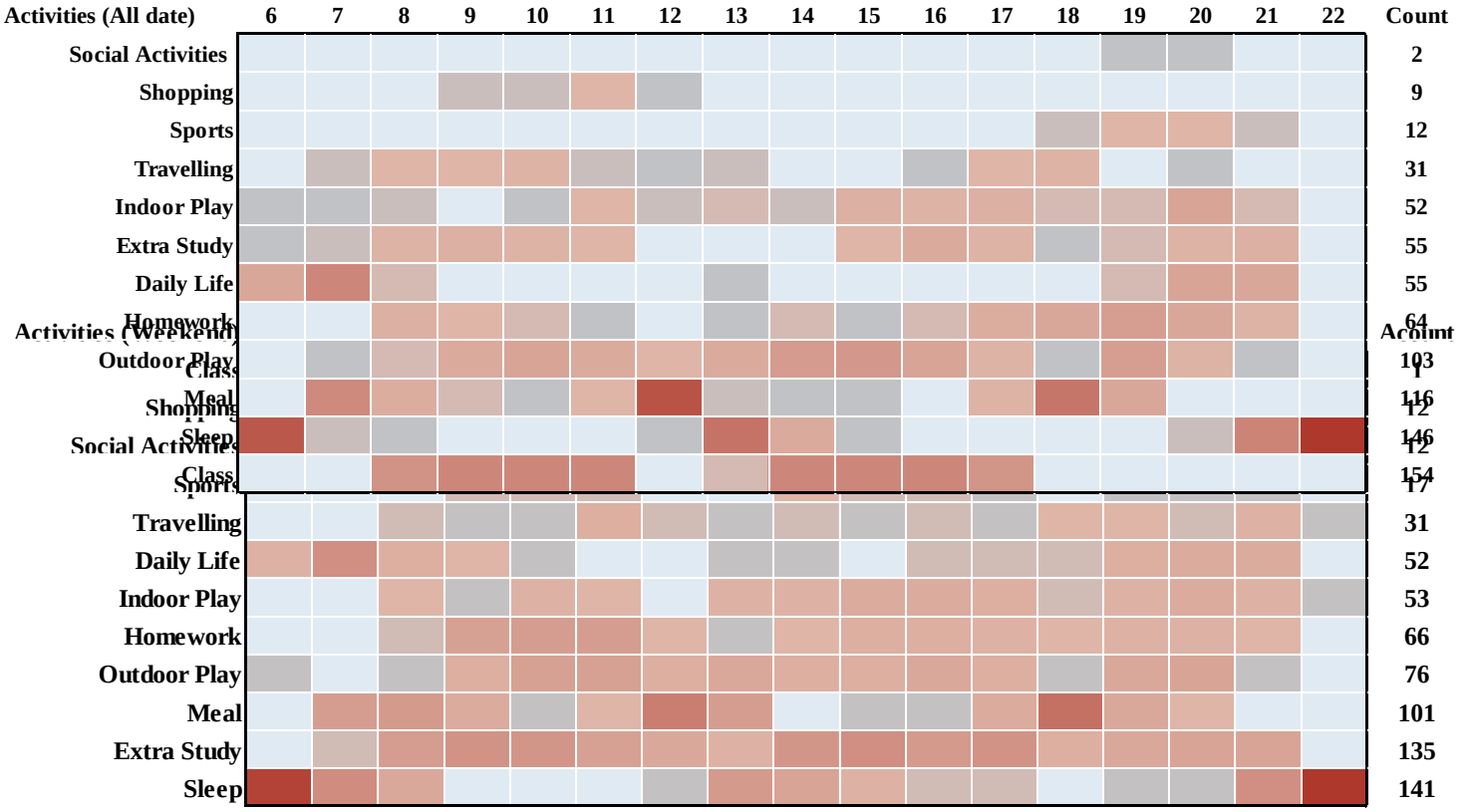

Mean of Control Degree from parents
3.5
3.0
2.5
2.0
1.5
Grandparents
Parents
Children
Participant's Generation

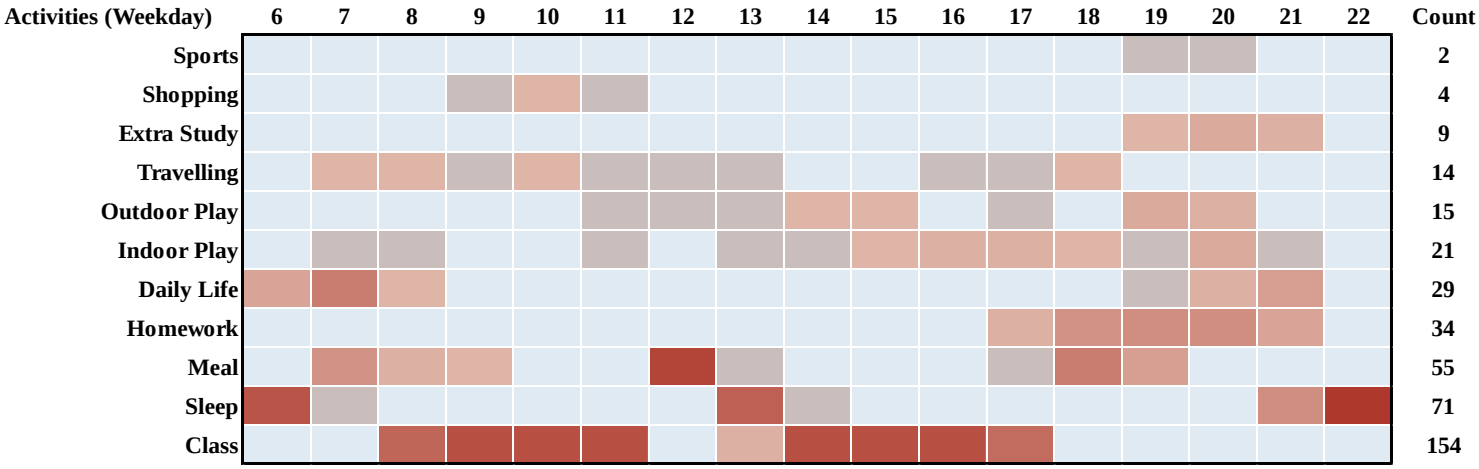
Appendix E Diaries from four schools

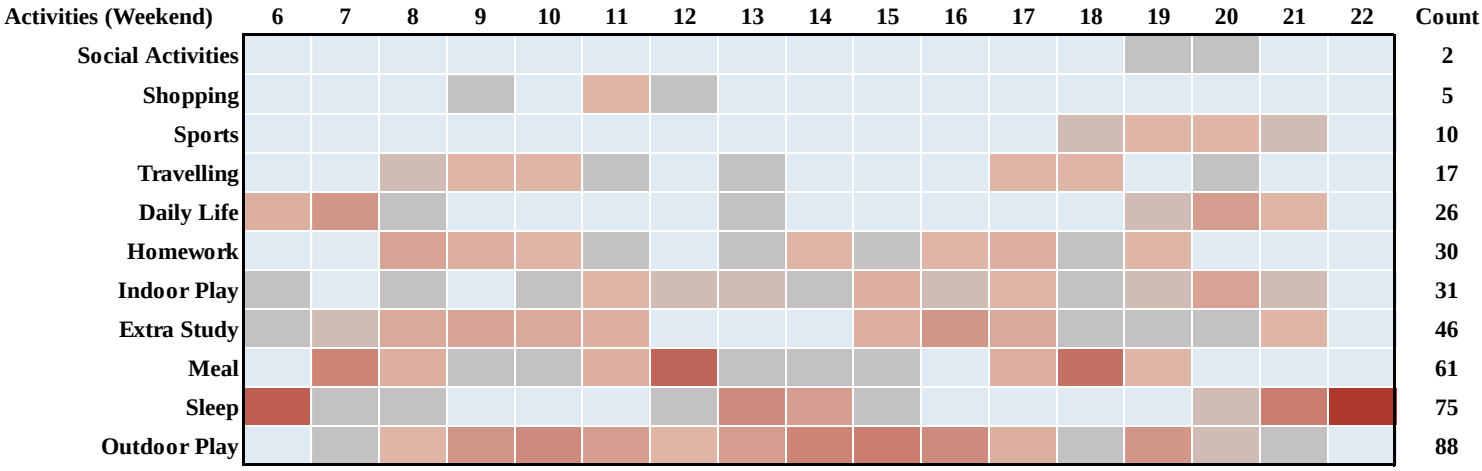
GH_HeatMap



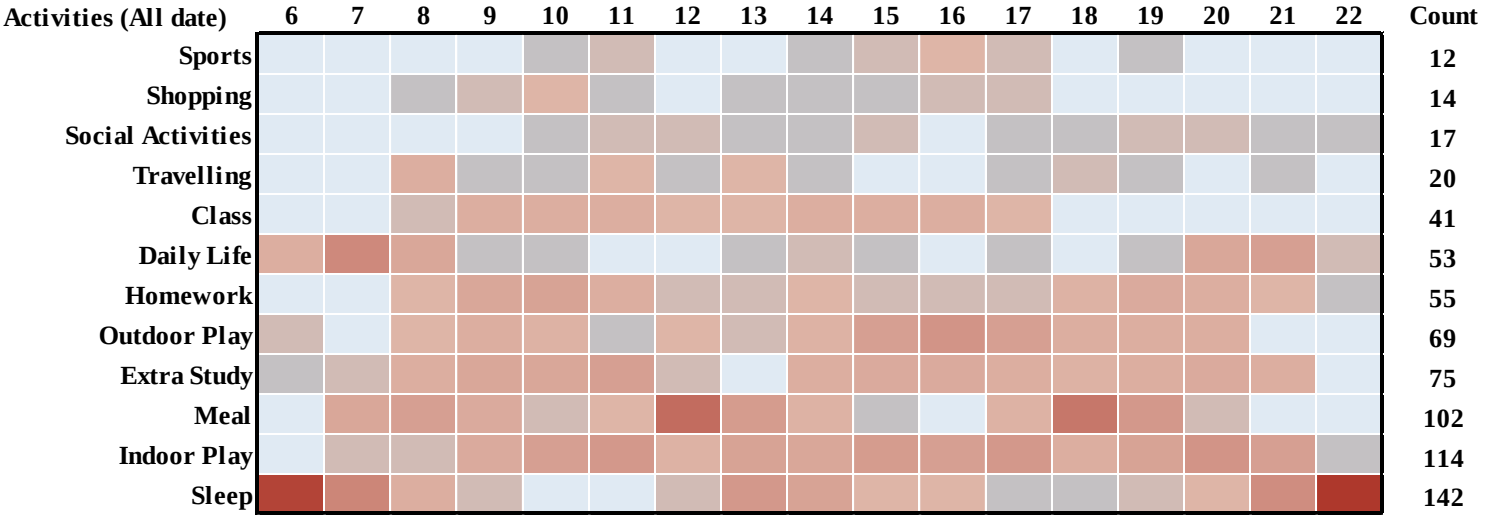
HQ_HeatMap

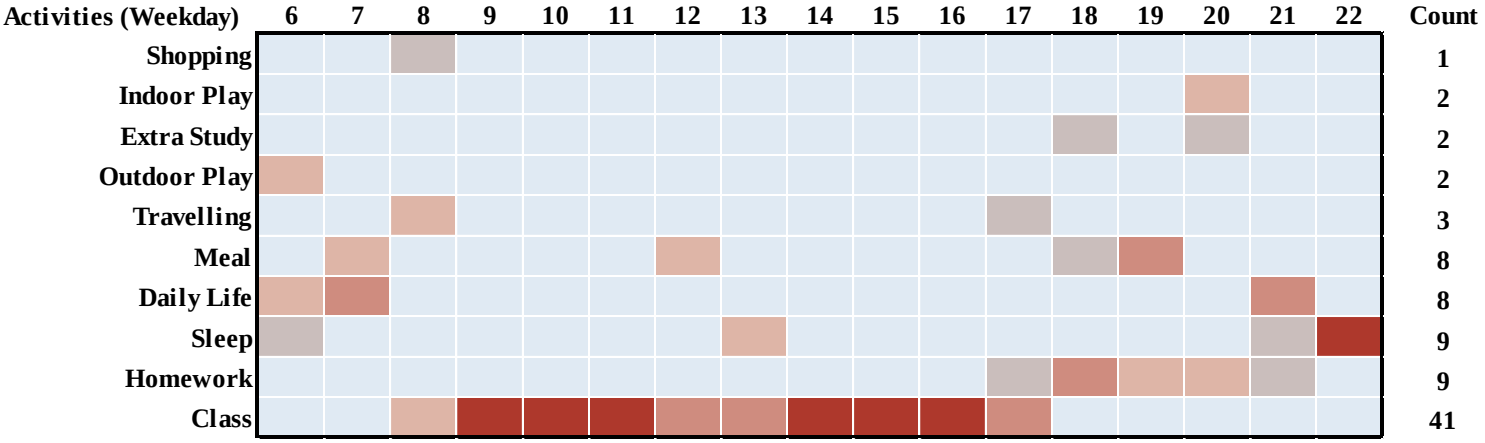


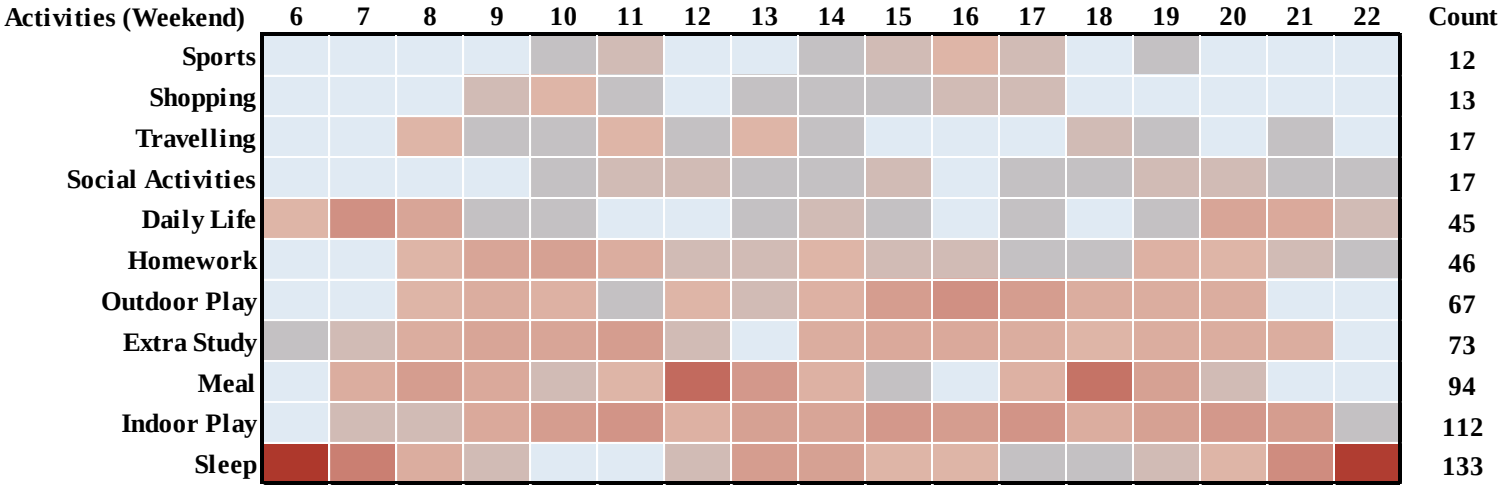

Activities (Weekday)
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Count
Sports 2
Shopping 4
Extra Study 9
Travelling 14
Outdoor Play 15
Indoor Play 21
Daily Life 29
Homework 34
Meal 55
Sleep 71
Class 154


Activities (Weekend)
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Count
Social Activities 2
Shopping 5
Sports 10
Travelling 17
Daily Life 26
Homework 30
Indoor Play 31
Extra Study 46
Meal 61
Sleep 75
Outdoor Play 88

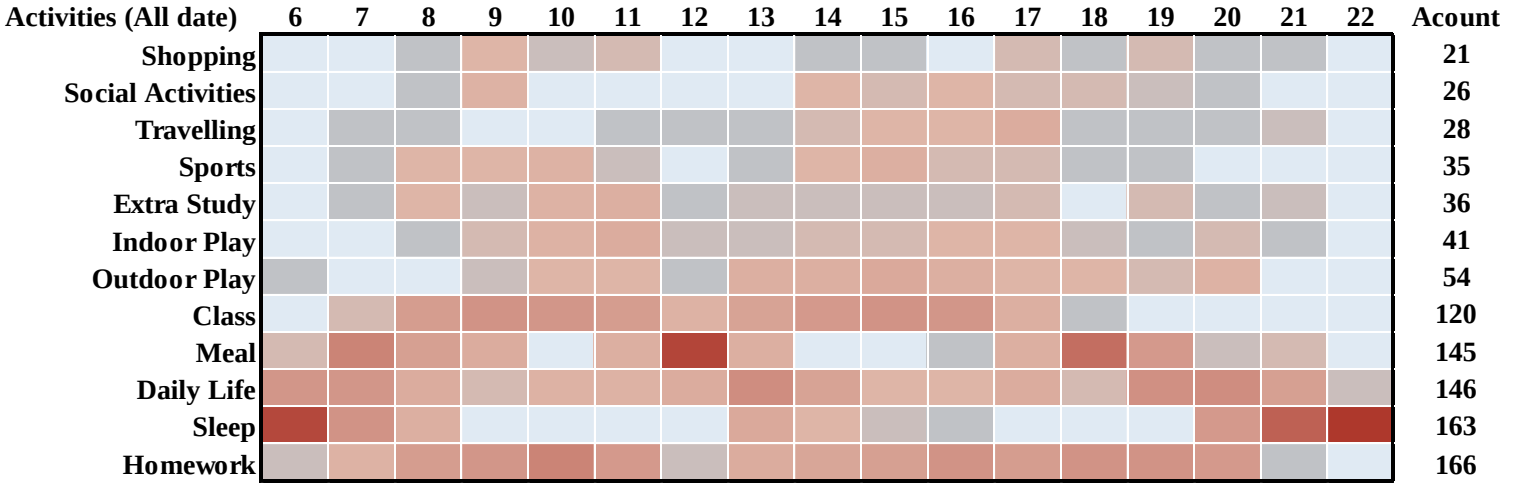
JD_HeatMap

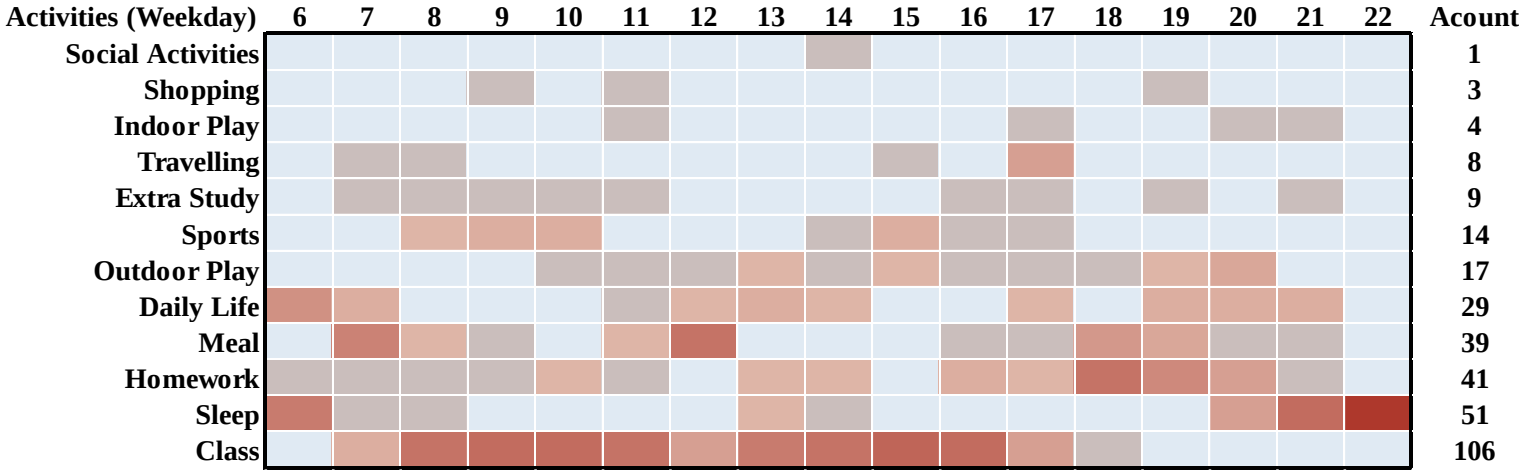

Activities (All date)
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Count
Sports 12
Shopping 14
Social Activities 17
Travelling 20
Class 41
Daily Life 53
Homework 55
Outdoor Play 69
Extra Study 75
Meal 102
Indoor Play 114
Sleep 142

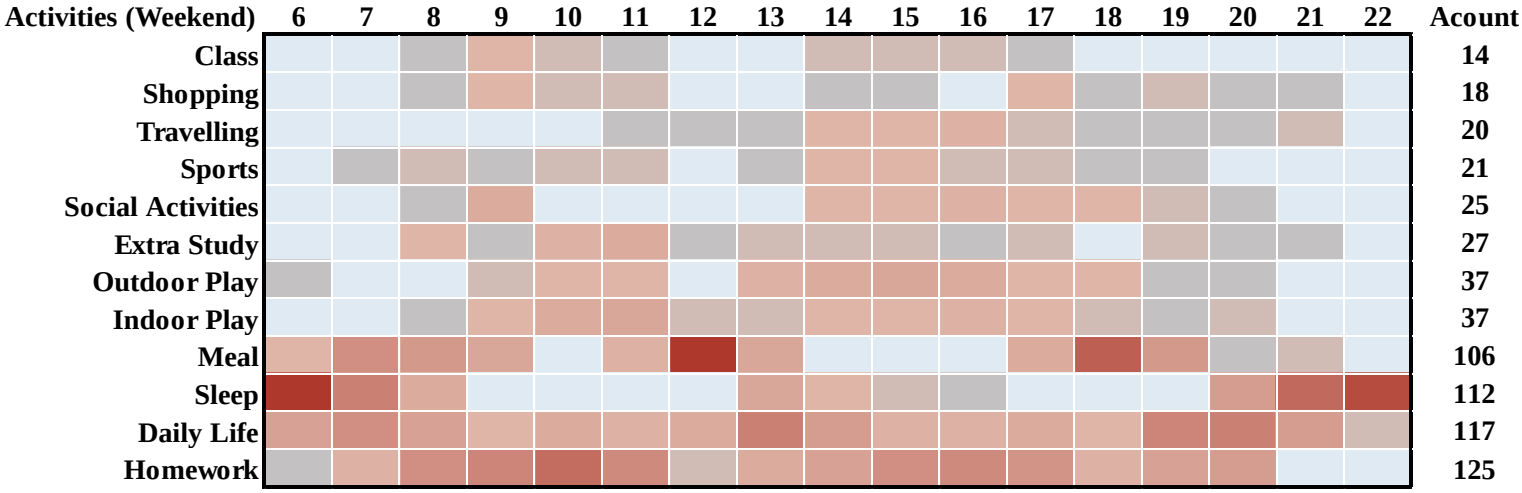

Activities (Weekday)
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Count
Shopping 1
Indoor Play 2
Extra Study 2
Outdoor Play 2
Travelling 3
Meal 8
Daily Life 8
Sleep 9
Homework 9
Class 41


Activities (Weekend)
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Count
Sports 12
Shopping 13
Travelling 17
Social Activities 17
Daily Life 45
Homework 46
Outdoor Play 67
Extra Study 73
Meal 94
Indoor Play 112
Sleep 133

YHL_HeatMap


Activities (All date)
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Acount
Shopping 21
Social Activities 26
Travelling 28
Sports 35
Extra Study 36
Indoor Play 41
Outdoor Play 54
Class 120
Meal 145
Daily Life 146
Sleep 163
Homework 166


Activities (Weekday)
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Acount
Social Activities 1
Shopping 3
Indoor Play 4
Travelling 8
Extra Study 9
Sports 14
Outdoor Play 17
Daily Life 29
Meal 39
Homework 41
Sleep 51
Class 106


Activities (Weekend)
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Acount
Class 14
Shopping 18
Travelling 20
Sports 21
Social Activities 25
Extra Study 27
Outdoor Play 37
Indoor Play 37
Meal 106
Sleep 112
Daily Life 117
Homework 125

Appendix F Tests for structural equation modelling

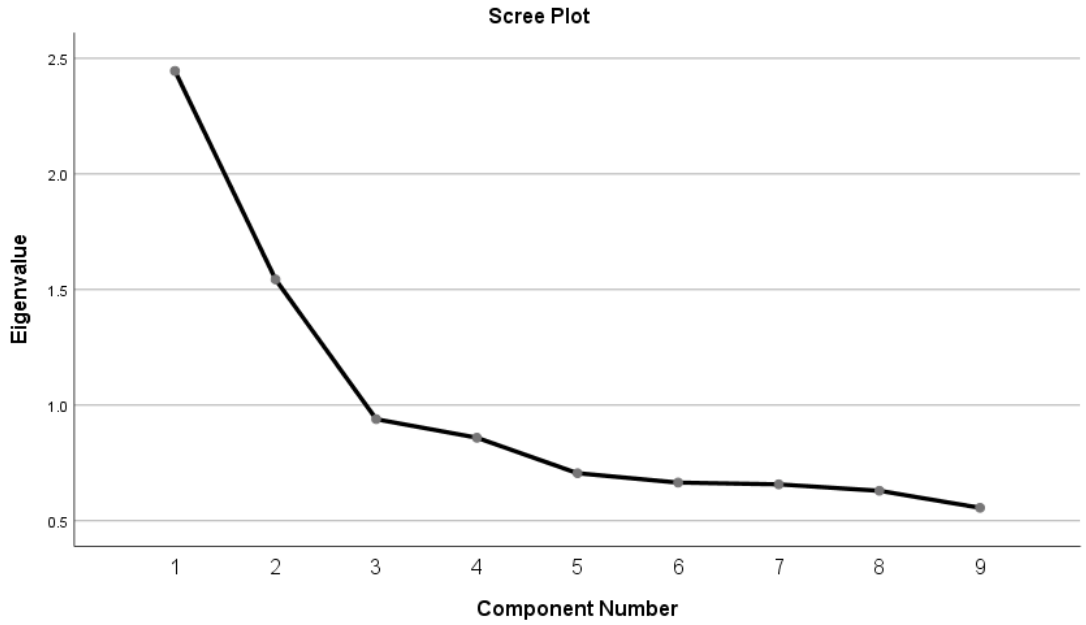


Figure F. The scree plot produced by SPSS.

Table F. The total variance explained with three principal components.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.496	27.739	27.739	2.496	27.739	27.739
2	1.583	17.593	45.331	1.583	17.593	45.331
3	.956	10.618	55.950	.956	10.618	55.950
4	.830	9.221	65.170			
5	.724	8.045	73.216			
6	.677	7.520	80.736			
7	.630	6.995	87.731			
8	.592	6.582	94.313			
9	.512	5.687	100.000			

Extraction Method: Principal Component Analysis.