THE RELATIONSHIP BETWEEN HOME ENVIRONMENT, EXECUTIVE FUNCTION AND SCHOOL READINESS AMONG LEFT-BEHIND 5-6 YEAR-OLD CHILDREN IN RURAL HENAN PROVINCE OF CHINA

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LIST OF ABBREVIATIONS

LBC	Left-behind Children
Non-LBC	Non-left behind children
SR	School readiness
HE	Home environment
EF	Executive Function
WM	Working Memory
STM	Short Working Memory
CE	Caregiver Education
APM	Availability of printed materials
ATPM	Availability of toys and play materials
HBLA	Homed-based literacy activities
CAE	Caregiver attitude and expectations
EST	The Ecological System Theory
IDELA	The international development and learning assessment
EYT	The early years toolbox
CVI	Content Validity Index
UA	Universal Agreement
SES	Socioeconomic status
ECCD	Early Childhood Care and Development
LMIC	Low and middle-income countries
ECE	Early childhood education
IV	Independent variable
DV	Dependent variable
MV	Moderating/mediating variable

LIST OF APPENDICES

HUBUNGAN ANTARA PERSEKITARAN RUMAH, FUNGSI EKSEKUTIF DAN KESEDIAAN SEKOLAH DALAM KALANGAN KANAK-KANAK BERUMUR 5-6 TAHUN YANG DITINGGALKAN DI WILAYAH LUAR BANDAR HENAN, CHINA

ABSTRAK

Kajian ini meneroka hubungan antara persekitaran rumah (HE), fungsi eksekutif (EF), dan kesiapsiagaan sekolah (SR) dalam kalangan kanak-kanak yang ditinggalkan (LBC) berumur 5-6 tahun di luar bandar China. Secara khusus, kajian ini menyiasat bagaimana pelbagai aspek HE mempengaruhi SR akademik dan bukan akademik, peranan pengantara EF, dan sama ada status LBC mempengaruhi hubungan ini. Reka bentuk kajian keratan rentas digunakan, melibatkan 300 kanak-kanak prasekolah yang dipilih melalui persampelan rawak dari tadika di kawasan luar bandar Wilayah Henan. Data dikumpulkan menggunakan Penilaian Pembangunan dan Pembelajaran Awal Antarabangsa (IDELA) untuk SR, Alat Awal Tahun (EYT) untuk EF, dan soal selidik IDELA untuk HE.Hasil kajian menunjukkan bahawa HE yang kurang bernasib baik memberi kesan negatif terhadap EF dan SR, dengan EF menjadi faktor pengantara sebahagian dalam hubungan antara HE dan SR. LBC mencatat skor yang lebih rendah dalam EF dan SR berbanding rakan sebaya mereka yang bukan LBC, namun kesan moderater status LBC tidak signifikan secara statistik. Kajian ini menyimpulkan bahawa penambahbaikan HE untuk LBC boleh meningkatkan hasil SR mereka, mengurangkan cabaran yang berkaitan dengan pemisahan ibu bapa. Penemuan ini menyokong intervensi yang disasarkan kepada kanak-kanak luar bandar di China, termasuk dasar untuk memupuk persekitaran keluarga yang menyokong dan program awal kanak-kanak yang memenuhi keperluan khusus LBC.

THE RELATIONSHIP BETWEEN HOME ENVIRONMENT, EXECUTIVE FUNCTION AND SCHOOL READINESS AMONG LEFT-BEHIND 5-6 YEAR-OLD CHILDREN IN RURAL HENAN PROVINCE OF CHINA

ABSTRACT

This study explores the relationships among home environment (HE), executive function (EF), and school readiness (SR) in left-behind children (LBC) aged 5-6 years in rural China. Specifically, it investigates how different aspects of HE influence both academic and non-academic SR, the mediating role of EF, and whether LBC status moderates these relationships. A cross-sectional research design was employed, involving 300 preschool children selected through random sampling from kindergartens in rural Henan Province. Data were collected using the International Development and Early Learning Assessment (IDELA) for SR, the Early Years Toolbox (EYT) for EF, and the IDELA questionnaire for HE. The findings reveal that disadvantaged HE negatively impacts both EF and SR, with EF partially mediating the relationship between HE and SR. LBC scored significantly lower in EF and SR compared to their non-LBC peers, but the moderating effect of LBC status was not statistically significant. The study concludes that enhancing the HE of LBC can improve their SR outcomes, mitigating challenges associated with parental separation. These findings provide empirical evidence to support targeted interventions for rural children in China, including policy initiatives to foster supportive family environments and early childhood programs tailored to the needs of LBC.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Early childhood is a critical milestone in children's lives, laying the foundation for their future learning and development (Aikens et al., 2013; Magnuson et al., 2006). Research highlights that early childhood education (ECE) is a valuable investment, influencing children's developmental outcomes, cognitive-academic performance during school years, healthier lifestyles, economic contributions as productive workers, and reduced social costs (Heckman, 2012). Early childhood spans from birth to age 8, encompassing infants, toddlers, preschoolers, kindergarteners, and early primary-grade children (ESSA & Burnham, 2019). Notably, adverse early childhood environments can have lasting negative effects on development, with significant gaps observed between advantaged and disadvantaged children (Lv, 2018; Elango et al., 2016).

School readiness (SR) is one of the most important developmental outcomes during early childhood, encompassing early literacy, numeracy, motor skills, and social-emotional competencies. These skills are critical predictors of children's future academic success and social integration (Grissmer et al., 2010). However, disparities in SR remain evident, especially among children from vulnerable populations such as left-behind children (LBC).

UNICEF (United Nations International Children’s Emergency Fund) defines "left behind" as all children who suffer from inequalities in health, education, and well-being (UNICEF, 2014). Parental labour migration, a global phenomenon, contributes to the formation of vulnerable groups like LBC. This is particularly evident in

countries undergoing rapid urbanization, such as China, where the home environment (HE) and its quality play a crucial role in shaping children's developmental outcomes. HE includes factors like educational resources, parental involvement, and emotional support, all of which directly or indirectly influence SR (Melhuish et al., 2008). Parental labour migration is prevalent in various South and Southeast Asian, African and Eastern European nations, resulting in a significant number of children being left behind (Gassmann et al., 2018). Urbanization processes worldwide lead to the migration and relocation of rural populations, reflecting societal changes and urban growth (UNICEF, 2014). For example, Britain (2020) was one of the first countries to undergo significant industrialization. This event was promoted by the Industrial Revolution, which eventually led to the country's high level of urbanization (Heaverly & EWK, 2020); In Korea, the "New Countryside Movement" (2021) of the 1970s developed an urban-rural interactive model for urbanization. Labor migration reduces unemployment and increases economic efficiency in migrants' home countries. However, it also leads to the formation of transnational families, including particularly vulnerable groups such as left-behind children (LBC) and the elderly.

Another key variable in understanding SR is executive function (EF), a set of cognitive processes that include working memory, inhibitory control, and cognitive flexibility (Diamond, 2013). EF serves as a critical mediator between HE and SR, influencing how environmental factors translate into developmental outcomes (Raver & Blair, 2016). Despite its significance, the interplay between EF, HE, and SR, particularly for LBC in rural China, remains underexplored.

China's situation presents unique challenges compared to other countries due to its urban-rural dual system, known as the Household Registration System (Hukou).

This system restricts rural-to-urban migration, often preventing migrant workers from relocating with their families. Consequently, a substantial population of children remains in rural areas, separated from their parents for extended periods. These LBC face distinct challenges, including disrupted family structures and limited parental support, which may adversely affect their SR and EF.

Given the pressing need to address these issues, this study focuses on:

1. Investigating the differences in SR between LBC and non-LBC.
2. Examining the influence of HE on SR through EF.
3. Exploring the moderating role of LBC status in these relationships.

This study is grounded in several key theories that support its main variables. Bronfenbrenner's Ecological Systems Theory and the Toxic Stress Theory provide a foundation for understanding the environment and stressors affecting left-behind children (LBC). Diamond's Theory of Executive Function explains the cognitive processes related to school readiness, while Attachment Theory and Resilience Theory address the socioemotional development and adaptive capacity of LBC. These theories collectively inform the study's examination of home environment (HE), executive function (EF), and school readiness (SR).

1.2 Research Background

Left-behind children (LBC) in China are defined as individuals aged 18 and below whose parent/s is/are away from home for the purpose of work or study for at least 6 months of more (Duan & Zhou, 2005).

Research on left-behind children (LBC) has been conducted for decades. Economic and political factors led to earlier studies on LBC abroad compared to China, with each country focusing on different aspects and objectives based on their national interests (Wang, 2014). In fact, a lot researchers believe that many of the LBC associated education problems in China today are somehow attributable to the residence status of pupils or what is often referred to as the Household Registration System (Lei et al., 2019; Xie & Zhou, 2014; Yi et al., 2012; Zhang & Kanbur, 2003).

As China's urbanization accelerates, the number of rural labourers migrating to cities for work has surged (Lv et al., 2018). However, due to the *Hukou* system, most children of these rural migrant workers are forced to live apart from their parents. They are often left behind in rural areas under the care of one parent or in non-parental childcare arrangements. This situation raises concerns about the quality of education available to these children in rural areas. Compared to their urban counterparts, rural children are more likely to face lower socioeconomic status and its associated challenges, including poor quality education and reduced social opportunities (Heckman, 2012).

And school readiness has become one of the hot issues of preschool education at the international level because a large number of research conclusions have proved that the value of children's school readiness far exceeds the preschool education stage itself: school readiness is predictive for future learning and is lifelong learning and lifelong development are of great significance. The cognition, social emotion and neurophysiological development of children's school readiness are highly predictive of future academic success (Gredler, 1992). Children lacking school readiness are more prone to encounter difficulties in their early educational experiences in school

education than others, which leads to learning difficulties (Rimm-Kaufman et al., 2000). The difference in starting point may not only affect the success of school education, but also affect the growth and development of a lifetime (Fantuzzo et al., 2007; Mashburn & Pianta, 2006; Wright et al., 2001). In addition, inequalities in global development and increased poverty and hierarchical differentiation between and within countries remind us that school readiness is only part of a very large and complicated set of issues (Bloch & Swadener, 2015).The researchers (2015) also maintained that whether they have adequate nutrition, whether their mother's status is stable, and whether their family structure is healthy are all part of readiness for life. So, obviously, as think globally, it must be considered all the children who are in poverty and disadvantagedness, too.

In China, in a study involving 276 preschool children in kindergartens of rural areas, Kang et al. (2021) found a significant difference in school readiness（SR）between preschool left-behind children and non-left-behind children. The overall level of school readiness of left-behind children was found to lag behind that of non-left-behind children. Specifically, the differences were found to be significant in numeracy and social-emotional, and in motor skills and literacy, and the level of school readiness of left-behind children was found to be significantly and positively correlated with parents' education and socioeconomic status (SES). Most of the LBC are separated from their parents before age 3 year old (Duan, 2021; Duan, 2015).

Similarly, a large body of theoretical and empirical work suggests that the home environment can support or hinder the development of executive function, social-emotional skills, and academic skills (Bradley & Corwyn, 2002; Fan & Wu, 2020; Hughes & Ensor, 2009; Sun & Sun, 2019). Home learning environment (Soares,

2017; Sénéchal & LeFevre, 2002), caregiver education (Lee, 2017) and parental attitude (Harden et al., 2004; Li et al., 2020) have been found to exhibit a positive and significant correlation with positive child development and academic outcomes in the home environment. While many elements, such as parents' education level, socioeconomic status, school and community, influence pre-children's literacy development, research shows that home learning environment, as well as parents' attitudes, have a greater impact on preschoolers' literacy development (Fan & Wu, 2020; Mccoy & Cole, 2011).

Executive function refers to a broad set of cognitive processes, including inhibitory control, working memory, and cognitive flexibility, which govern goal-directed behaviours and adaptive responses to novel, complex, or unclear situations(Hughes et al., 2005). These functions start to develop in infancy, yet they do not fully mature until adulthood. Executive function abilities in early childhood are strong predictors of these skills in later life (McClelland et al., 2006; Moffitt et al., 2011). Well-developed executive function skills can significantly aid children in completing their education and establishing a foundation for future success (Griffin et al., 2016; Wang et al., 2022).

Children’s executive function has been identified as key to different kinds of skills development and successful transition to formal schools. Laying the foundation for a strong executive function plays a crucial role in determining a child's various developmental outcomes, including social and academic success (McClelland et al., 2006; Moffitt et al., 2011). Therefore, the earlier the intervention, the faster the establishment of a good executive function, the greater the impact on school readiness (SR) and future life, and the smaller the gap is between children.

Although, it is established that there is an important relationship between executive function skills and learning, these relationships are not only complex, but are also affected by the living context of young children (Blair & Raver, 2012). Notably, quite a few studies show that many young children, especially those who grow up in a at-risk family environment, such as those that LBC, lack strong executive function and lag far behind their peers in school (Cook et al., 2019; Li et al., 2018; Micalizzi et al., 2019; Trentacosta & Riggs, 2020). Executive function has been linked to various positive effects on approaches to learning, early achievement in language and literacy and, early mathematical achievement (Lohndorf et al., 2021). These early learning skills are also commonly known as school readiness in literature (National Education Goals Panel, 1991).

Researchers, for instance, Wang (2022) found that left-behind preschool children have a more disadvantageous situation (e.g., preschool-age left-behind children have more serious deviations in individual cognition, mental health, and behavioural performance) and lag behind non-left-behind preschool children in executive function. Executive function (EF) is closely related to the prefrontal lobe, and prefrontal development is heavily dependent on childhood early experiences (Miyake et al., 2000). So, children's early experiences influence the development of executive functions and executive function has a mediating role between home environment and school readiness. The current study wants to explore the development of executive function and school readiness of left-behind children living in rural China, during their study in kindergarten (5-6 years old), and the relationship between home environment, executive function, and school readiness.

In summary, past studies revealed that children raised, in a disadvantaged environment are compromised in the development of executive function and school readiness. This study will formulate a set of highly focused questions to explore the relationship between HE, SR and EF in LBC and non-LBC. Child data and family data will be combined to investigate how HE; SR and EF are related to each other. This study also will test whether the state of LBC and non-LBC has effect on the relationship between home environment and school readiness. By conducting a fine-grained analysis, it is hoped that this study can contribute towards the science of resilience for children who are separated from their parents.

To perform a comprehensive investigation into the relationship between school readiness, home environment, and executive function among preschool children in rural China, this study plans to use a series of measurement instruments to obtain relevant data. The three instruments utilized are the International Development and Learning Assessment (IDELA), the IDELA Caregiver Questionnaire, and the Early Years Toolbox (EYT). The IDELA assesses preschoolers' school readiness across four domains: literacy, numeracy, socioemotional, and motor skills. The IDELA Caregiver Questionnaire measures the home environment across three domains: Home learning environment, Caregiver education, and Caregiver attitudes and expectations. Similarly, the EYT assesses three domains of Executive function: Working Memory, Inhibitory Control, and Cognitive Flexibility. The selection of these instruments was based on their proven validity and reliability in previous research, as well as their suitability for the objectives of this study. The subsequent chapters will provide details on the contents and methods of application for these measuring devices.

The site chosen for the study is the Henan Province. According to the report of Henan Government (Henan Government, 2023a), Henan, a quintessential agricultural region in China's Central Plains, is characterized by its large population and abundant labour resources. As a leading agricultural province and a major hub for grain conversion and processing, the majority of Henan's residents are engaged in farming.

The phenomenon of left-behind children in rural area of Henan province is very prevalent among parents working in the urban areas surrounding their town. Therefore, most of LBC in rural areas are taken care of by their grandparents while their parents work in the cities. These urban-dwelling migrant parents return home to visit their families including their children once a year or even every two years.

The central region, where Henan is located represented the largest share (35.53%) of left-behind children in China (Yang et al., 2017).

Figure 1.1
Geographical Distribution of Province Henan in China

According to Figure 1, it can be seen that Henan Province is located in the middle zone.

Covering an area of 167,000 square kilometres, Henan ranks 17th in China and is home to 96.4 million people, making it the third most populous province after Guangdong and Shandong. In 2023, Henan's GDP was 580.5586 billion yuan, ranking

fifth in mainland China and first among central and western provinces. The province's terrain is elevated in the west and lower in the east, with a roughly equal distribution of mountains and plains.

Henan is a major agricultural province with a substantial population, resulting in a lack of resources and a serious imbalance in economic development, which has led to a large number of rural labourers going out to work in other provinces (Henan Government, 2023a). And due to the varied terrain, economic development in Henan province is uneven, particularly in rural areas which have developed slowly and lack economic resources. According to the China Floating Population Development Report (CFPDR) in 2016, the regional distribution of LBC in rural China indicated that the central region had the highest proportion (35.53%) of LBC. Henan province had the highest number of LBC, accounting for 12.14% of the country's total, totalling 6.64 million. This makes Hennan province a particularly representative choice for current research.

A series of other policies and systems derived from the *hukou*, such as education system, medical system, housing system, employment and social insurance system, social welfare policy, etc., have formed powerful institutional barriers that prevent farmers and their children from integrating into cities (Afridi et al., 2015; Wu, 2013). In particular, the education system and related education policies and regulations have long been associated with the *hukou* that is split between urban and rural areas. Some policies and regulations on the educational outcomes of left-behind children have highlighted the experiences of "farmers' children" unfairly treated in school (Huang, 2005; Xu, 2006).

Many studies including the latest by Wang (2022) have implied that education is a huge problem for the left-behind children residing in rural areas (Wang, 2011). Children aged between 0-11 years account for three-quarters of all left-behind children out of which, 30% of them are pre-school aged between 0-6 year. According to Duan et al. (2013), the sixth census in China, over 50% of children have been left behind in rural areas of Jiangsu Province. However, approximately 3% of these children have not received compulsory education, and some have experienced a delay in enrolment or have already dropped out of school at home. This indicates that the schooling age for children from low-income backgrounds in primary and middle school has been delayed, leading to significant educational setbacks. Additionally, since 2000, the dropout rate among low-income primary school children has slightly increased, leading to a higher percentage of this age cohort not receiving compulsory education in 2015 (Wu & Zhang, 2017).

Numerous studies indicate that school readiness holds particular significance for disadvantaged children (Connell & Prinz, 2002; Reardon & Portilla, 2016; Wright et al., 2000). The study found that children from low-income backgrounds exhibit lower levels of school readiness and academic performance compared to their higher SES schoolmates (Winsler et al., 2008). Hill (2001) examined the link between the socioeconomic status of parents and their children's school readiness, focusing on African-American families. Literacy and numeracy assessments were conducted to evaluate the school readiness of 103 African and European kindergarten children and their mothers. The study's findings suggested that parental involvement and behaviour in the home learning environment, along with parents' attitudes and expectations, impact low-income families. Zhou (2007) argues that the home learning environment of a family is a crucial determinant regarding children's school readiness in China..

Many studies have indicated that poverty detrimentally impacts child executive function, a subset of cognitive abilities implicated in many aspects of school readiness skills (Hu et al., 2020； Serdar, 2019; Wolf & McCoy, 2019). Unfortunately, most existing findings predominantly originate from Anglo-European, high-income countries. There is a significant lack of research focusing on children from non-Western, low- and middle-income countries (LMIC). In the recent years, a handful of studies on executive function was conducted in South Africa (Cook et al., 2019; Howard et al., 2020); but there were very few which originated from Asia (Lee, 2017; Zhang et al., 2018). Even far fewer studies were carried out in China (Duh et al., 2016; Lu et al., 2017; Zhang, 2016), a place where the problem of LBC is huge and critical.

So far, according to the latest report of Chinese biggest database, there were just 409 studies on preschool age left-behind children in rural China till 2023 (The CNKI, 2023). Existing literature has attested that the effects poverty on executive function are likely to be influenced by cultural practices and environments that vary across countries (Finders et al., 2021;Piotrkowski et al., 2000), suggesting that mediating factors that explain detrimental effects of economic disadvantage found in high-income Western settings may not be applicable in the Chinese context.

Additionally, gradients and severity of poverty may be more extreme in China given its vast population (Zheng & Yan, 2017) and its complex *hukou* system described earlier. Given this argument, research that informs the progression of executive function and its impact on school readiness in a large non-Western disadvantaged population with a different cultural and socio-political setting is crucial for a thorough understanding of this important construct (Serdar, 2019).

Given the scarcity of causal models, left-behind children in rural Henan China would serve as an ideal context to examine executive function explains how the home environment exerts its effect on school readiness. Essentially there is a need to test if the effects of home environment on school readiness is caused by executive function, and hence the need for the current study to clarify this relationship.

Another reason for investigating the interrelationships between home environment, executive function and school readiness in preschool children is because most of the past LBC studies involved older children in secondary schools (Chang et al., 2017;Ge et al., 2019). The studies that specifically studied preschool aged LBC were conducted by Hu et al. (2020) and Wang (2022). Neither study attempted to clarify the link between school readiness and executive function in LBC of preschool children.

So, this study is positioned to examine the younger age group of LBC, namely the preschool age children of which there is a scarcity of data. Given the salience of executive function in a range of school readiness skills, the goal of the current study is to contribute to knowledge aimed at clarifying the association between executive function and school readiness in LBC. Amalgamation of existing ideas based on current western findings on executive function needed to explore new dimensions from an Eastern context based on the current study. Such convergence of scholastic endeavours will benefit both Chinese and foreign researchers in forging better collective responses to the impact of child-parent separation.

Another strong argument for the current study is that despite the strong links between poverty and executive function, children living in poverty exhibit individual variability in executive function (Cook et al., 2019; Howard et al., 2020). Few recent

studies conducted by Chinese researchers that involves preschool children (Kang et al., 2021; Liu et al., 2013; Zhang, 2020), mostly focused on one or two components of school readiness and executive function in their research. These studies, failed to explicate the association between school readiness and executive function in Bronfenbrenner's ecological system. On a more significant note, the direct and indirect relationship between executive function, school readiness, and home environment, is even far less. The home environment is critical for children to develop healthy executive function and to achieve competent school readiness. The current study focuses on three distinct aspects of home environment during kindergarten. These include home learning environment, caregiver education and caregiver attitudes and expectations. A lot of literature has established home environment, especially in terms of the home learning environment, caregiver education, and caregiver attitudes expectations as a significant factor in predicting child outcomes, irrespective of family SES (Hughes & Ensor, 2009; Lee, 2017; Soares, 2017).

While several studies did attempt to identify individual characteristics of children, such as executive function as a potential mechanism that may mediate between home environment and school readiness (Sénéchal & LeFevre, 2002), some glaring deficiencies have been identified. Notable, past studies tend to focus on a narrow range of child outcomes, mainly language and literacy. As child development should ideally be viewed holistically, it is imperative that the interrelationships between different variables must also consider non-cognitive outcomes. Therefore, in order to address the current gaps in research, this study aims to examine the direct and indirect relationship between home environment and children's school readiness for both academic and non-academic domains. More significantly by using a mediation model, this study seeks to clarify the role of EF skills in explaining the complex

relationships between the home environment and child outcomes. The study also seeks to test the status of left-behind and non-left-behind in the effect relationship between home environment and school readiness through a moderation model. The findings derived from a non-Anglo European preschool population are hoped to generate a wider discourse on issue confronting vulnerable children.

1.3 Problem Statement

The developmental outcomes of left-behind children (LBC) in rural China, particularly in terms of school readiness (SR), remain a significant concern. Left-behind children, defined as those whose parents migrate for work and leave them in the care of relatives, face unique challenges that differentiate them from their non-left-behind counterparts (non-LBC). The phenomenon of parental migration is prevalent in Henan Province, contributing to a substantial population of LBC whose development is influenced by a range of factors, including home environment (HE) and executive function (EF).

Research has shown that school readiness (SR)—comprising early literacy, early numeracy, motor skills, and social-emotional skills—is critical for children's future academic and social success (Duncan et al., 2007). However, children in rural China, especially in Henan Province, face unique challenges stemming from socioeconomic disparities, the impact of parental migration, and limited access to educational resources. Studies indicate that LBC are at higher risk of delayed development due to prolonged parental absence (Chen et al., 2009). This disparity in SR between LBC and non-LBC is influenced by various factors, including disrupted family structures, reduced parental involvement, and the home environment. The home environment (HE) has long been recognized as a key determinant of SR outcomes.

Melhuish et al. (2008) highlighted that aspects such as parental engagement, emotional support, and access to material resources significantly shape early childhood development. Furthermore, executive function (EF)—which encompasses cognitive processes like working memory, inhibitory control, and cognitive flexibility—has been found to mediate the relationship between HE and SR (Raver & Blair, 2016). Despite these findings, the interaction between HE, EF, and SR, especially in the context of LBC versus non-LBC, remains underexplored. Existing studies have not sufficiently addressed how EF mediates the effects of HE on SR or whether LBC status moderates these effects.

While there is ample evidence regarding the impact of HE and EF on child development, less attention has been given to how these factors interact in the context of left-behind children. Research has yet to clarify the pathways through which HE influences SR via EF, nor has it explored how LBC status may alter these relationships. The gap in understanding how EF mediates the relationship between HE and SR for LBC is critical, as it has implications for intervention and policy development aimed at improving SR outcomes for disadvantaged children in rural China.

Additionally, there is a notable lack of studies focused on preschool-aged children, with much of the research on SR and EF targeting older children. This gap is particularly pronounced in the context of rural China, where preschool-aged LBC face unique developmental challenges due to limited parental involvement and exposure to fewer educational resources. A comprehensive examination of how HE and EF influence SR among preschool-aged LBC in rural China is therefore essential for developing targeted interventions.

Understanding these relationships is crucial for developing targeted educational interventions and policies aimed at improving SR among children in rural China, particularly LBC. Failing to address the unique needs of LBC may perpetuate educational inequalities and hinder their long-term academic and social development (Lu et al., 2016). By identifying the mediating and moderating effects of EF and LBC status, this research aims to provide actionable insights for educators, policymakers, and caregivers to enhance the educational outcomes of disadvantaged children in rural areas.

Existing literature identifies several key gaps in the research: (1) the differential impact of the home environment (HE) on SR through executive function (EF) among LBC and non-LBC; (2) the pathways through which HE influences SR via EF; (3) the moderating role of LBC status in these relationships; and (4) the limited focus on preschool-aged children in existing studies. These gaps underscore the need for research that specifically addresses the unique challenges faced by rural Chinese children, particularly those left behind by migrating parents.

This study aims to fill these gaps by: (1) comparing the SR levels of LBC and non-LBC in rural Henan Province; (2) investigating the influence of HE on SR through the mediating role of EF; and (3) examining the moderating role of LBC status in these relationships. By addressing these research questions, this study will contribute new insights into the interplay between home environment, executive function, and school readiness in LBC. Furthermore, it will provide evidence-based recommendations for educators, policymakers, and caregivers to enhance SR and overall well-being among vulnerable children in rural areas of China.

This study contributed significantly to the existing literature by elucidating the complex interplay between home environment, executive function, and school readiness among left-behind and non-left-behind children, thereby addressing a critical gap in the understanding of child development in the context of rural China, with a particular emphasis on preschool-aged children.

1.4 Research Objectives

This research primarily aims to explore the relationship between the home environment, executive function, and school readiness among left-behind children (LBC) and non-left-behind children (non-LBC) aged 5-6 in rural area of Henan province in China. The objectives of this study are stated as below specifically:

1. To identify the level of school readiness, home environment, and executive function of children in rural area.

2. To investigate the difference in school readiness between left-behind children and non-left-behind children in rural area.

3. To examine the influence of home environment aspects on school readiness of the child left behind in rural area.

4. To examine the influence of executive function on school readiness of the child left behind in rural area.

5. To examine the influence of the home environment aspects on executive function of the child left behind in rural area.

6. To examine the mediating effect of executive function on the relationship between home environment and school readiness of the child left behind in rural area.

7. To examine the moderating role of the child left and non-left behind - on the relationship between home environment and school readiness in rural area.

1.5 Research Questions

Based on the aforesaid objectives, this study attempts to answer the following research questions:

1. What is the level of school readiness, home environment, and executive function of children in rural area?

2. Is there any difference in school readiness between left-behind children and non-left-behind children in rural area?

3. Is there any influence of home environment aspects on school readiness of the child left behind in rural area?

4. Is there any influence of executive function on school readiness of the child left behind in rural area?

5. Is there any influence of home environment aspects on executive function of the child left behind in rural area?

6. Is there any mediating influence of executive function on the relationship between home environment and school readiness of the child left behind in rural area?

7. Does the status of being a child left behind or non-left behind aged 5-6-year-old moderate the relationship between home environment and school readiness in rural area?

1.6 Research Hypotheses

In line with the research question above, the following hypotheses will be assessed.

Ho1: There is no significant difference in school readiness between left-behind children and non-left-behind children in rural area.

Ho2: There is no significant influence predicator of home environment on school readiness of the child left behind in rural area.

Ho3: There is no significant influence of executive function on school readiness of the child left behind in rural area.

Ho4: There is no significant influence predicator of home environment on executive function of the child left behind in rural area.

Ho5: There is no significant mediating influence of executive function on the relationship between home environment and school readiness of the child left behind in rural area.

Ho6: The status of being a child left behind or non-left behind does not moderate the relationship between home environment and school readiness among children in rural area.

1.7 Significance of The Study

Firstly, this study addresses a critical gap in the existing literature by focusing on the school readiness, home environment, and executive function of left-behind children (LBC) aged 5-6 years in rural areas of Henan Province, China. Left-behind children in rural areas have long been a significant concern for Chinese society, yet prior research has largely concentrated on school-age children over seven years old. By investigating younger preschool-aged children, this study provides valuable insights into early developmental and learning processes among LBC. These findings aim to inform policies and practices to improve developmental outcomes for LBC and contribute to addressing the broader social concerns related to this vulnerable group.

Secondly, the findings of this study have important implications for policy and practice. By shedding light on the relationships between school readiness, home environment, and executive function, this study emphasizes the long-term benefits of supporting early childhood development, particularly among LBC. For instance, school readiness, especially in areas such as language and literacy development, is a strong predictor of future academic success and extends its influence into adulthood (Brooks-Gunn,2003; Baydar et al.,1993). These findings underscore the societal benefits of investing in early childhood education and development programs, particularly for disadvantaged populations like LBC.

Thirdly, this study extends theoretical frameworks by elucidating the complex interactions between executive function, home environment, and school readiness. These insights are valuable for families, schools, and government agencies in developing targeted interventions and policies to address the unique developmental challenges faced by LBC. By highlighting these relationships, the study provides a

foundation for evidence-based strategies that can enhance the early learning experiences and overall well-being of LBC.

Lastly, this study identifies areas for future research, encouraging further exploration of unresolved questions in early childhood development and education for LBC in rural areas. These directions include investigating other age groups, exploring the moderating effects of different family structures, and examining the efficacy of specific intervention programs.

In summary, this study benefits multiple stakeholders, including families, educators, policymakers, and researchers, by providing actionable insights to support the early development of left-behind children. Its findings are aimed at improving educational outcomes and informing interventions that promote the long-term well-being of LBC, ultimately addressing critical societal concerns.

1.8 Limitation of The Study

This study's focus on rural areas of Henan Province for children aged 5-6 may limit the generalizability of the findings to a broader context within China. Henan Province's unique socioeconomic and cultural characteristics might not fully represent the diverse experiences of children in other provinces. Although random sampling was employed to enhance representativeness, it may still introduce biases or fail to capture the full diversity of the population.

Additionally, this study applied only a quantitative research approach, which may limit the depth of understanding regarding the nuanced experiences and perspectives of children and their families. A mixed-methods approach, incorporating

qualitative data such as interviews or observations, could provide richer insights and complement the quantitative findings.

The sample restriction to Henan Province further limits the scope of the findings. To enhance generalizability, future research should include samples from various provinces, offering a more comprehensive view of children's school readiness, home environment, and executive function across different regions of China.

In conclusion, while this study provides valuable insights, these limitations should be considered when interpreting the results. Future research could address these constraints by incorporating a more diverse range of provinces and adopting mixed methods to improve the comprehensiveness and applicability of the findings.

1.9 Operational Definition

The following are the definition of terms that are used in this study.

1.9.1 Left-behind Children (LBC)

UNICEF defines "left behind" as all children who suffer from inequalities in health, education, and well-being (UNICEF, 2014). In China, LBC are defined as children aged 18 and below with one or both parents employed away from home for at least half a year (Chinese Ministry Education, 2004). However, because of the focus on preschool children in this study, LBC refers to children aged between 5 and 6 whose parents have been away for work for at least half a year —during the time of the data collection. For this study, the LBC was collected randomly from public kindergartens in the five cities in Henan province, China.

1.9.2 Executive Function (EF)

EF refers to a complex set of skills that are necessary for goal-directed and adaptive behaviours depend on the neural circuits that play a key role in the prefrontal cortex (Griffin et al., 2016). In current study, EF is defined by the EYT instrument (2017) as the ability to: (a) retain information in mind, use it, and act on it; (b) to control by resisting impulses and distractions, rather than strategically choosing more adaptable behaviour; and (c) to adapt flexibly to changing task needs and circumstances (Davidson et al., 2006; Diamond, 2013). These abilities are commonly, known as working memory (both Visual-spatial and Phonological), inhibitory control, and cognitive flexibility, respectively, which will be assessed appropriately by the EYT instrument in current study (Howard & Melhuish, 2017).

1.9.3 School Readiness (SR)

School readiness is defined the readiness of the individual child, the readiness of the school for the child, and the ability of the family and community to support the child's optimal early development (*National Education Goals Panel*, 1991). Gredler (2000) defines school readiness as a set of key characteristics or basic conditions required by preschoolers for future formal schooling. School readiness in China refers to the level of early outcomes that children are expected to achieve by the time they enter the first grade of primary school (Liu, 2006). In current study, these focused skills defined by the IDELA instrument include academic school readiness (i.e., early-literacy, and early-numeracy) and non-academic school readiness (i.e., socioemotional skills and motor skills (both gross and fine)) (Pisani et al., 2015). Motor skills will involve both fine motor skills (e.g., copying, drawing) and gross motor skills (e.g., hopping). Socioemotional skills will involve a child's self-awareness, empathy, perspective-taking, conflict resolution, and friendship formation. Early numeracy