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Does paternal involvement matter for early childhood development in rural China?

Lei Wang[a], Hui Li[a], Sarah-Eve Dill[b], Siqi Zhang[a], and Scott Rozelle[b]

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ABSTRACT

Research in developed countries has found that paternal involvement has positive and significant effects on early childhood development (ECD). Less is known, however, about the state of paternal involvement and its influence on ECD in rural China. Using data collected in Southern China that included 1,460 children aged 6–42 months and their fathers (as well as their primary caregivers), this study examines the association between paternal involvement and ECD. Although the results demonstrate that the average level of paternal involvement is low in rural China, paternal involvement is related to a significant increase in three domains of ECD (cognition, language, and social-emotional skills). Older children benefit significantly more than do younger children from paternal involvement in all domains of ECD. The results also show that, if the mother is the primary caregiver, the mother's higher educational level and the family's higher socioeconomic status are positively associated with paternal involvement.

Introduction

The first three years of life are critical for a child's lifelong cognitive and non-cognitive abilities (Almond & Currie, 2011; Attanasio et al., 2020; Huttenlocher, 1979; Knudsen, 2004; Knudsen et al., 2006). A large body of evidence demonstrates the positive relationship between parental involvement and ECD (Black et al., 2017; Francesconi & Heckman, 2016; Luo et al., 2016; Topping et al., 2013). Parental involvement, which includes both instrumental caregiving and cognitive/psychosocial stimulation, is a construct that is defined in the literature as including positive engagement activities, warmth and responsivity, as well as indirect care and process responsibility (Cabrera & Coll, 2004; Lamb et al., 1987; Leavell et al., 2012; Pleck, 2010).

Although parental involvements are clearly an important aspect of healthy ECD outcomes, the majority of the literature has focused only on maternal involvements in child life. In contrast to the rich literature on maternal involvements, although there are several important papers on the paternal involvement, scant research has focused on the paternal involvement in his child's ECD. In general, according to the literature, fathers are less likely to be involved in their child's life than are mothers (Cabrera et al., 2007; Cabrera et al., 2004; Cook et al., 2011; Duursma, 2014; Lamb, 1997; Malin et al., 2014; Shannon et al., 2002; Tamis-LeMonda et al., 2004). The level of involvement of the father, however, changes as the child ages. Research shows that fathers are more actively involved in their child's life as the child grows older (Cabrera et al., 2006; Cabrera et al., 2007; Planalp et al., 2013; Planalp & Braungart-Rieker, 2016).

Research on fathers in developed countries has shown that, when fathers do become involved in their child's development, there are positive associations between paternal involvement and child cognitive development, language development, and behavioral and emotional regulation (Cabrera et al., 2007; Duursma, 2014; Duursma et al., 2008; Fitzgerald & Bockneck, 2012; Lamb, 2004; Meuwissen & Carlson, 2015; Raikes et al., 2006; Rodriguez et al., 2009; Shears & Robinson, 2005). Cabrera et al. (2007) found that, in the United States, paternal involvement has a significant effect on a child's cognitive, language, and social-emotional development when the child is between 24 and 36 months old. Another U.S. study on infants aged 10 months also showed that higher

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paternal involvement is significantly related to better social-emotional development outcomes (Easterbrooks et al., 2014). The literature shows that children with fathers who are involved experience more positive cognitive and social-emotional achievement than do children with less-involved fathers (Bronte-Tinkew et al., 2006; Bronte-Tinkew et al., 2008; Cowan et al., 2009; Paquette, 2004). When comparing the effect of paternal involvement on child developmental outcomes between younger and older children, the literature indicates that paternal involvement has larger effects on older children (Cabrera et al., 2006, 2007; H. Wu et al., 2012; A. Xu & Zhang, 2008).

Studies in developed countries also have investigated the determinants of paternal involvement by identifying the household and child characteristics that are associated with the extent of paternal involvement. Previous research has found that the father's level of education, mother's level of education, and family income are all determinants of paternal involvement (Cabrera et al., 2011; Hofferth & Anderson, 2003; Planalp & Braungart-Rieker, 2016). For example, research shows that more-educated fathers, fathers in wealthier families, and men who have partners who also are more educated and involved in stimulation activities tend to become more highly involved in their child's life (Cabrera et al., 2007; Castillo et al., 2013; Coleman, 1988; Jeong et al., 2016; Leavell et al., 2012; Tamis-LeMonda et al., 2004; Yeh et al., 2021). In a cross-cultural study (conducted in the United States and Taiwan, among other countries), the authors found that, no matter which country the study was conducted in, the income of the father and his educational level were significant predictors of paternal involvement (Yeh et al., 2021). Leavell et al. (2012) also found that a father's higher level of education is associated with greater paternal involvement. Fathers with less than a high school education are involved less frequently in caregiving as compared to fathers with a high school diploma.

To date, few studies have examined paternal involvement in the first three years of a child's life and the associations between a father's involvement and ECD outcomes in low- and middle-income countries. One study, conducted in Pakistan, investigates the prevalence of a father's involvement in his child's life and the association between paternal involvement and ECD. The study found that the level of involvement of the father is low; in the study's sample areas, around 40% of fathers in the sample households interacted with their children (Maselko et al., 2019). In low- and middle-income countries, the low levels of paternal involvement could be an artifact of fathers' being expected to be the one who is responsible for earning the household income. Due to their families' low levels of income and wealth (Cabrera et al., 2007; Garfield & Mesman, 2016; Hamadani & Tofail, 2014; Jeong et al., 2016), the time spent in these endeavors may leave little time for interactions with their child (LeVine, 1974, 2004). The study also found that higher levels of paternal involvement were associated with higher child developmental scores (Maselko et al., 2019). One possible underlying reason of the positive effect of paternal involvement on child development might be that paternal involvement is an important protective factor in developing countries where children continue to be exposed to a host of risk factors of development (Jeong et al., 2016). Paternal involvement could offer an important opportunity for buffering against high-risk environments of inadequate enrichment (Jeong et al., 2016). Another reason might be that paternal involvement is a signal of co-parenting that would support their spouses and other caregivers to work together as a parenting "team" in caring their child. It would in turn influence the frequence and quality of their spouses and other caregivers parenting (Jeong et al., 2017; Jeong et al., 2018).

In rural China, there are high rates of children under 3 years old who have not reached their full developmental potential. In past decade, many studies conducted in rural China have shown high rates of developmental delays of children under 3 years old (Jin et al., 2007; Luo et al., 2019; Luo et al., 2015; Qian et al., 2020; Wang et al., 2019; Wei et al., 2018; W. Wu et al., 2011; Zhou et al., 2019). In a recent meta-analysis, the weighted average rates of child developmental delay in rural China are shown to be 45% for cognitive skills, 45% for language abilities, and 37% for social-emotional development (Emmers et al., 2021). Further, the rates of ECD delays in rural China are much higher than the rates found in the non-rural population (15%; Boyle et al., 1994).

Although positive associations between parental stimulation and ECD have been found, the engagement of caregivers with their young children in activities that have psycho-stimulating effects is low in rural China (Bai & Emmers, 2020; Luo et al., 2016, 2017; Tan et al., 2020; Wang et al., 2019, 2020; Yue et al., 2017, 2019; J. Zhang et al., 2018) According to these studies, only 32% of caregivers have read books to their young children, 35% have told them stories, and 50% have sung songs with their children (Emmers et al., 2021). Even though these studies provide a good picture of which children are receiving stimulation, unfortunately, they focus only on primary

caregivers, who are almost always either the child's mother or paternal grandmother (Lee & Park, 2010; Wang & Mesman, 2015). Paternal involvement in their young children (ages 0–3) was not included in any of these previous studies.

The literature—or lack thereof—raises the question of why so few studies have examined the role of fathers in China. To address this question, we first look at what the literature says in regard to expectations about the involvement of fathers in their child's development in rural China. Literature on cultural environment and norms indicates that, in traditional China, fathers were thought to play primarily the role of the provider for the family, with little room for becoming involved in parenting (Chao & Tseng, 2002; Ho et al., 2013; Shwalb et al., 2004; Yeung & Alipio, 2013). Influenced by a Confucian patriarchy set of norms, traditionally, Chinese fathers were expected to distance themselves from day-to-day child care, and their main responsibility was to be a provider (assuming that the father lived at home, which he often did when most families in China depended on farming) (Li, 2018; Li & Jankowiak, 2016; Li & Lamb, 2015; Santos & Harrell, 2017). Unfortunately, no empirical evidence of the impact of paternal involvement on ECD in rural China has been found.

In recent years, however, there have been dramatic changes in the social, economic, and cultural environment, and the literature shows, at least in urban areas, that fathers are beginning to play a more active role in their children's ECD. In urban areas, where many fathers have either professional jobs or work a 40 hours week in a labor market that is regulated and offers social benefits, Chinese fathers gradually have become more involved in their child's life as compared to their predecessors (Li & Lamb, 2013; Liong, 2017). Such changes are even more evident now that women in urban China have attained high rates of work force participation, both before and after childbirth (Goh, 2011; Ji et al., 2017; Kim et al., 2013; Li & Jankowiak, 2016; National Bureau of Statistics of China, 2020; Yeung & Alipio, 2013), and such trends have drawn fathers even more into the lives of their children.

Although some of the forces that brought change to urban China also have affected rural China, the extent to which rural fathers are taking a more active role in parenting is not clear. In rural China, only a small share of young men is engaged in farming (De Brauw et al., 2013), the traditional occupation that Confucian culture was built around. Women also are working more (L. Zhang et al., 2018). These trends suggest that rural fathers, like their urban counterparts, may be becoming more involved in their young children's lives. There are, however, counterforces that work against father's involvement in their young children's lives. The labor market in which rural men (and women) are working is fundamentally different from the urban labor market (Rozelle et al., 2020). Although the urban labor market is regulated and formal, the rural market is informal (Rozelle et al., 2020), and there are two types off-farm jobs that 20- to 40-year-old men can take. Some work and live away from home (as a migrant laborer), and others commute to work but live at home (De Brauw et al., 2013; Goh, 2011; Ji et al., 2017; Li & Jankowiak, 2016). Clearly, if a rural father lives and works away from home, he cannot be involved in parenting activities. It is also difficult for many rural fathers who live at home but work off-farm to become involved in raising their young children, as, in the informal labor market, many workers have to commute considerable distances, work long hours, and rarely have weekend days off. Fortunately, despite the high levels of participation of rural women in work force, unlike urban women, after giving birth, most rural women are full-time mothers who do not work in pre-birth jobs or on the farm (Brockerhoff, 1994; Yue et al., 2020). These economic forces suggest that there may increasing involvement of rural fathers in their young children's lives; nevertheless, they encounter certain barriers.

To the best of our knowledge, no study has examined fathers in rural China. The overall goal of this study is to examine the association between a father's involvement and ECD outcomes in rural China. To meet this broad goal, the following hypotheses are tested: a.) paternal involvement is positively associated with child developmental outcomes; b.) the effect of paternal involvement on child developmental outcomes is stronger for older children than for younger children; c.) the social economic status of the family is positively associated with paternal involvement; and d.) paternal involvement is positively associated with caregiver involvement (which is positively associated with a caregiver's child's development outcomes).

The remainder of this paper is structured as follows. Section 2 presents our methods, including sample selection, data collection, and statistical methods. Section 3 provides the results. Section 4 presents a discussion of the findings and concludes.

Methods

Ethical approval

This study received ethical approval from the Stanford University Institutional Review Board (Protocol ID 50901) and from the Kunming Medical University

Ethical Review Board. All caregivers in the study verbally agreed to allow themselves and their children to participate in the study. Participants were informed of the risks involved and understood that their participation was entirely voluntary.

Sample selection

The data used in this study were collected from a nationally designated rural poverty county in Yunnan Province, a southwest province of China. The province is a remote mountainous area with frequent natural disasters (Yunnan Provincial Bureau of Statistics, 2019). It is also one of the poorest regions in China. In 2019, the province per capita GDP was $7,067 (RMB 47,944), far lower than the national per capita GDP of $10,394 (RMB 70,892). The province ranked 24 out of 31 provinces in mainland China in terms of provincial GDP in 2019 (National Bureau of Statistics of China, 2020). Moreover, the sample county's population is comprised mainly of those of Han ethnicity (79%), which is the same ethnicity as 91% of China's overall population (National Bureau of Statistics of China, 2015). Other ethnic groups comprise 21% of the sample county (Yunnan Provincial Bureau of Statistics, 2020).

The sample was selected using a three-step sampling protocol. First, we randomly selected two townships within the sample county. We then used official government data to compile a list of villages from each township and included all villages in our sample framework. Finally, with the assistance of local family planning officials in each town, a list of all registered births in each village for the previous 42 months was obtained. All children in the target age range (6–42 months) and their fathers/caregivers participated in the study. The primary caregiver (typically either the child's mother or paternal grandmother) was identified in each family as the individual who is the most responsible for the child's care. This definition has been used in previous studies in China (Luo et al., 2017; Wang et al., 2021; Wang et al., 2019, 2020; Yue et al., 2017). Overall, the sample included 1,460 father/caregiver-child dyads in 191 villages.

Data collection

The data used in this study were collected in March 2019. Teams of trained enumerators collected information from questionnaires on paternal involvement and primary caregiver involvement as well as socioeconomic characteristics of all sample individuals in the household. We also collected data on the developmental outcomes of each sample child.

Paternal involvement and primary caregiver involvement

Paternal involvement was assessed using a series of questions created for the National Early Head Start Research and Evaluation Project (Cabrera & Coll, 2004). Fathers were asked to rate how frequently they participated in 31 activities with their child during the previous month. Examples of the questions are as follows: "How often did you read to your child?" "How often did you put your child to bed?" "How often did you take your child to visit relatives?" "How often did you help your child to get dressed?" and "How often did you play peek-a-boo with your child?" The items were rated on a 6-point scale (1 = never, 2 = almost never, 3 = a few times a month, 4 = a few times a week, 5 = once a day, 6 = several times a day). The score for each item ranges from 1 to 6, and higher scores indicate more frequent involvement. The series of questions were translated into Chinese by the research team and then back-translated into English and verified. The research team undertook extension pre-testing before the launching of the survey. The results of the pre-testing indicated that the series of questions included in the scale were understandable by most of the respondents and, as such, fit for measuring rural Chinese paternal involvement.

Following earlier studies (Cabrera & Coll, 2004; Lamb et al., 1987; Leavell et al., 2012), we divided the 31 items into four subscales of involvement: caregiving (8 items), physical play (11 items), didactic (4 items), and socialization (8 items). The score for each subscale is achieved by averaging the items of the subscale, and the total involvement score is the average score of the four subscales of involvement. In our sample, all four subscales of involvement demonstrated good internal consistency, with alphas that ranged from 0.87 to 0.95. For the portion of fathers in the sample who were working as a migrant laborer and not living at home, we valued their involvement score as 1, as per our scoring system. Therefore, the cutoff value of total father involvement score that divided fathers that were not involved and fathers that were involved was 1.

Based on the items of the four subscales of paternal involvement (caregiving, physical play, didactic, and socialization), we constructed a paternal involvement index that aggregated the items of the four subscales of involvement. Following the methodology of Heckman et al. (2010), we first estimated a

measurement system that related all items to a latent factor that captures the above four involvement subscales. We then extracted estimated means and factor loadings to predict each subscale score, using the Bartlett scoring approach (Bartlett, 1937). Next, we used a non-parametric regression method to internally standardize the factor scores over age to eliminate age effects (Rubio-Codina et al., 2016). We used an internal standardization method because we were not sure if the involvement of fathers varied across different month-ages of the sample children. In other words, factor scores were internally standardized by child month-age groups to eliminate such age effects.

We assessed primary caregiver involvement using the same questions as those for the fathers. During the survey, all family members at home were asked who was most responsible for the child's daily caregiving. The individual who was responsible for all (or almost all) caregiving activities of the child was identified the primary caregiver in our sample. Thus, we did not use the involvement subscale for caregiving. The total involvement score for each primary caregiver used in the analysis is the average score of three (of the four) subscales of involvement (physical play, didactic, and socialization). Although the alphas of primary caregiver involvement subscales are lower than those of the father in our sample, they still exhibit high internal consistency as compared to other studies (Bronte-Tinkew et al., 2008; Cabrera et al., 2004; Ong'ayi et al., 2020), ranging from 0.72 to 0.78. Using the same methodology that was used to create the paternal involvement index, we also constructed a primary caregiver involvement index that included physical play, didactic, and socialization.

Early childhood development

We assessed child development outcomes on cognitive, language, social-emotional, and motor development through the administration of the Bayley Scales of Infant and Toddler Development-Third Edition (Bayley-III), an internationally recognized method of assessing ECD (Weiss et al., 2010). The Bayley-III is generally considered to be the gold standard for assessing ECD outcomes of children aged 1 to 42 months. The results of the Bayley-III are categorized into five standardized scales, four of which were used in the present study: cognitive, language, social-emotional, and motor. The cognitive scale (91 items), which assesses information processing, counting, and number skills; the language scale (97 items), which assesses both receptive and expressive communication skills; and the motor scale (138 items), which assesses fine and gross motor skills. The cognitive, language, and motor scales were administered one-on-one to each child by trained enumerators using a standardized set of toys and a detailed scoring sheet. The enumerators evaluated the child based on his or her performance on a number of tasks, for example, "calms down when being picked up" (cognitive scale), "regards person momentarily" (language scale), "hands are fisted" (motor scale). All enumerators underwent a formal week-long training course, including 2.5 days of field training prior to the survey. All of the three scales were assessed in the home for each child. The caregiver was required to stay with the child but was not allowed to assist the child during the administration of the tests.

The social-emotional scale (175 items) is implemented by asking the child's primary caregiver a series of questions to assess the child's mastery of functional emotional skills, including self-regulation and interest in the world, communication needs, interacting and building relationships with others, using emotions in an interactive and purposeful manner, and using emotional signals or gestures to solve problems (Bayley, 2006). Each of the four subscales takes into account the child's gestational age and chronological age when calculating the final score. Upon completion of the test, raw Bayley-III scores were converted to composite scores in accordance with the Bayley-III guidelines (Bayley, 2006). A higher score indicates better development. Studies that examine the validity of the Bayley-III found that the four scales exhibit high inter- and intra-rater reliability agreement, high internal consistency, and high test-retest stability in multiple cultural contexts (Azari et al., 2017; Madaschi et al., 2016; Yu et al., 2013; Zakaria et al., 2012). Bayley-III was translated and adapted for Chinese settings by S. Xu et al. (2011), and it was shown to have high internal consistency (0.96–0.99) and high test-retest stability (0.71–0.83).

For our analysis, we standardized raw scores of cognitive, language, social-emotional, and motor development, using age-conditional means and standard deviations estimated by non-parametric regressions. This non-parametric standardization method yields normally distributed standardized scores with a mean of zero across the age range (in months; Attanasio, 2015). We defined delays in cognitive, language, and motor development as a score of more than one standard deviation (SD) below the mean of a healthily developed population. In a healthy population, the mean (SD) of composite cognition, language, and motor scores are expected to be 105 (9.6), 109

(12.3), and 107 (14.0), respectively (Bos, 2013; Lowe et al., 2012; Serenius et al., 2013). These cutoffs have been used in research by Emmers et al. (2021), Luo et al. (2019), Luo et al. (2019), and Wang et al. (2019).

Demographic characteristics

We also collected information on child and household characteristics for each family. Child characteristics included age (in months), gender (1 = male; 0 = female), whether the child was born prematurely (1 = yes; 0 = no), whether the child has siblings (1 = yes; 0 = no), and whether the child had a low birth weight (1 = yes; 0 = no). Household characteristics included the identity of the primary caregiver (e.g., mother or paternal grandmother), maternal age (1 = 25 years or older; 0 = less than 25 years old), paternal age (1 = 30 years or older; 0 = less than 30 years old), whether the mother had obtained at least a senior high school education (1 = yes; 0 = no), whether the father had obtained at least a senior high school education (1 = yes; 0 = no), whether the household was receiving social security support (1 = yes; 0 = no), and a household assets index. The household asset index was constructed using polychoric principal components in regard to whether the household owned the following items: a flush toilet, water heater, computer, internet, air conditioner, and/or car.

Among the sample children, the average age was 21 months (Table 1). Slightly more than half (51.0%) were male, and 72.7% had siblings. Only a small portion of children (5.2%) had been born prematurely, and 6.3% had a low birth weight. Most of the children in our sample are Han ethnicity (>90%). In terms of the household characteristics of the sample respondents, in the case of 74% of the sample children, the mother was the primary caregiver. In the case of the remaining 26% of the children, the paternal grandmother was most often the primary caregiver. Among the mothers in our sample, 60.1% were more than 25 years old. Half of the mothers had completed 9 or more years of schooling. Among fathers, 49.5% were more than 30 years old, and more than half (55.3%) had not attained 9 years of schooling. Of the sample families, 37.3% received social security support.

Statistical analysis

Based on the five research objectives, our statistical analysis includes five parts, one for each objective. First, we examine paternal involvement and primary caregiver involvement among the full sample, using the total involvement scores and scores of the subscales (caregiving, physical play, didactic, and socialization for the father and the last three subscales for the caregiver). To understand which subgroup (fathers or primary caregivers) had higher involvement, we also compare the scores of paternal involvement and primary caregiver involvement, using *t*-tests.

Second, we examine the prevalence of delays in several different domains of child development (including, cognition, language, social-emotion, and motor). We also explore if the prevalence of delays in each domain is different between children whose fathers were involved and those whose fathers were not involved, using *t*-tests.

To achieve the second objective, we construct an ordinary least square (OLS) model as follows to measure the correlation between paternal involvement and ECD outcomes, using Eq. (1):

$$\begin{aligned} Developmental\ outcomes_i = {} & \beta_0 \\ & + \beta_1 Paternal\ involvement_i \\ & + \beta_2 X_i + \varepsilon_i, \end{aligned} \tag{1}$$

where the dependent variable, $Developmental\ outcomes_i$, indicates the standardized Bayley-III test scores (cognitive, language, social-emotional, or motor scores) of child *i*. The variable $Paternal\ involvement_i$ represents the score of the paternal involvement of child *i*. We run regressions using continuous variables (total involvement score, score of each of four subscales, and paternal involvement index). X_i is a vector of covariates that captures demographic characteristics, including the child's age and gender, whether the birth was premature, whether the child has siblings, whether the child had a low birth weight, whether the mother is the primary caregiver, mother's age and educational level, father's educational level, and household asset index. ε_i is an error term. The model also controls for Bayley-III tester fixed effects.

Third, to investigate whether parental involvement has different effects on ECD for children of different ages, we use Eq. (2) to test for any heterogeneous effects (by child age) in our analysis.

$$\begin{aligned} Developmental\ outcomes_i = {} & \beta_0 + \beta_1 Paternal\ involvement_i \\ & + \beta_2 Older\ child_i \\ & + \beta_3 Paternal\ involvement_i \\ & * Older\ child_i + \beta_4 X_i + \varepsilon_i, \end{aligned} \tag{2}$$

In this equation, the variables and notations used are analogous to the variables and notations in Eq. (1). In addition, we include a new variable, $Older\ child_i$, which is a dummy variable that takes the value of 1 if

the child is older than 24 months, and the value of 0 otherwise. This variable also is used to create an interaction term by multiplying it by the paternal involvement variable ($Paternal\ involvement_i * Older\ child_i$).

Fourth, to identify the determinants of the father's involvement, we construct a multivariate regression model, using Eq. (3):

$$Paternal\ involvemnet_i = \beta_0 + \beta_1 Child_i + \beta_2 Household_i + \varepsilon_i, \quad (3)$$

where the dependent variable, $Paternal\ involvement_i$, represents paternal involvement of child *i*. We also run regressions, using different subscale measures of paternal involvement as in Eq. (1). $Child_i$ and $Household_i$ represent a series of variables that capture the individual child and household characteristics, as in Eq. (1). ε_i is an error term. We also control for Bayley-III tester fixed effects.

Finally, to achieve the fifth objective, we construct an OLS model as follows to examine the correlation between paternal involvement and caregiver involvement, using Eq. (4):

$$Caregiver\ involvement_i = \beta_0 + \beta_1 Paternal\ involvement_i + \beta_2 X_i + \varepsilon_i, \quad (4)$$

where the dependent variable, $Caregiver\ involvement_i$, represents the primary caregiver's involvement of child i. We run regressions, using the total score primary caregiver involvement and the primary caregiver involvement index. The independent variable, $Paternal\ involvement_i$, is the score of paternal involvement. As in Eqs. (1) and (2), we run regressions, using the total score of paternal involvement and paternal involvement index. X_i is a vector of covariates that captures the demographic characteristics, as in Eq. (1). ε_i is an error term.

Paternal involvement, primary caregiver involvement, ECD outcomes, and demographic characteristics were analyzed using means and standard deviations. All correlational analyses were performed using Stata 15.1. Standard errors account for clustering at the village level, and *p*-values below .05 were considered statistically significant.

Results

In this section, we report the results of the study based on the five research objectives. We present the (1) outcomes of paternal and primary caregiver involvement, (2) associations between paternal involvement and child developmental outcomes, (3) heterogeneous effects of paternal involvement on the child developmental outcomes by the age of the child, (4) determinants of paternal involvement, and (5) association between paternal and primary caregiver involvement.

Outcomes of paternal and primary caregiver involvement

The outcomes of paternal and primary caregiver involvement are shown in Table 2. The total score of paternal involvement (measured in standard deviations, SD) was 1.55 (0.85). Of the four subscales of paternal involvement, the scores (SD) were 1.67 (1.07) for caregiving, 1.74 (1.13) for physical play, 1.31 (0.68) for didactic, and 1.48 (0.77) for socialization. For all primary caregivers, the total score of involvement (SD) was 2.48 (0.70). Of the three subscales of primary caregiver involvement, the scores (SD) were 3.22 (0.87) for physical play, 1.87 (1.00) for didactic, and 2.35 (0.67) for socialization. When comparing each measure of involvement outcomes (total involvement scores, physical play scores, didactic scores, and socialization scores) between fathers and primary caregivers, significant differences between the two subgroups can be seen in all measures of involvement (all $ps < 0.01$).

Figure 1 shows the distribution of paternal involvement scores. We drew the distributions of paternal involvement for two sample groups. In the full sample ($N = 1{,}460$), many fathers were not living at home during the survey, and, as noted, we valued their involvement scores as 1. The subsample group included only those fathers who were at least somewhat involved in their child's life ($n = 525$). Overall, paternal involvement scores were very low, although, as seen in the figure, quite variable. As reported in Table 2, Figure 1 shows that the mean score of paternal involvement for the full sample was 1.55, and there was a large number of fathers who were not involved in their child's life (score = 1). For those involved in their child's life, the mean score of paternal involvement was 2.53. For the group of fathers who were involved in their child's life, the figure also illustrates that there is large variation in paternal involvement. There is a small proportion of fathers who have high involvement scores (above 4; 3.2%) and a considerable proportion of fathers who have low involvement scores (below 3; 77.1%). We also report the scores of each item in the subscales for paternal involvement for the full sample in Appendix A (Table A1) and the subsample (Table A2).

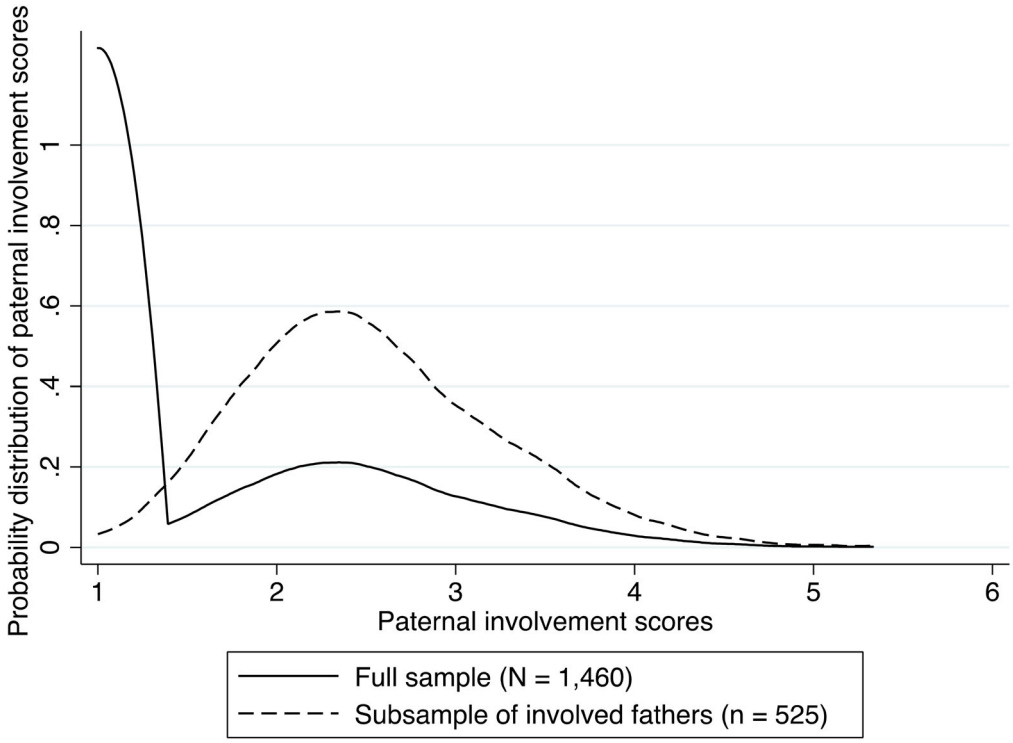

Figure 1. Distribution of paternal involvement. For the full sample ($N = 1{,}460$), the paternal involvement score was assigned the value of 1 when the father was not home or when the father was not involved in the child's life.

Child development outcomes

Table 3 presents the ECD outcomes of the 1,460 children in the sample. The results show overall high rates of developmental delays in cognitive, language, social-emotional, and motor development among the children. Specifically, 57% of the children exhibited cognitive delays, 47% had language delays, and 44% had social-emotional delays. About 25% of the sample children were delayed in motor development.

A comparison of child developmental delays (cognitive, language, social-emotional, or motor) between fathers who were involved in their child's life and fathers who were not involved shows that the rates of child developmental delays were higher in the subgroup in which fathers were not involved in their child's life, and the differences with respect to father's involvement were similar in all sub-domains of child development that we measured (Table 3, Columns 2 and 3). Specifically, rates of developmental delays for the subgroup in which fathers were involved in their child's life were 55%, 42%, 40%, and 22% for cognitive, language, social-emotional, and motor skills, respectively. In contrast, rates of the subgroup in which fathers were not involved in their child's life were 59%, 50%, 47%, and 27% for cognitive, language, social-emotional, and motor skills, respectively. We also found differences between the two subgroups in the rates of child developmental delays in language ($p < 0.01$) and social-emotional skills ($p < 0.01$), which were statistically significant (Column 4). In the case of the rate of cognitive delay ($p = 0.15$) and motor delay ($p = 0.06$), however, there were no statistically significant differences (Column 4).

Paternal involvement and child development outcomes

Table 4 provides the results of regressions of each paternal involvement measure (total paternal involvement score, four subscales scores, and paternal involvement index) on child development outcomes (cognitive, language, social-emotional, and motor skills) separately (7 regressions in total) to examine the association between paternal involvement and child developmental outcomes. The results indicate that each of the paternal involvement measures was positively correlated with at least one of the child developmental outcomes. Specifically, for measures of the total paternal involvement score, the four subscales scores, and the paternal involvement index, the correlations with three of the four child developmental outcomes (cognitive, language, and social-emotional skills) were significant (either $p < 0.05$ or $p < 0.01$), except for the correlation between the paternal caregiving subscale and language. There were no

Table 1. Characteristics of sample children ($N = 1{,}460$).

	Frequency (*n*)	Percentage (%)/Mean ± SD
Characteristic	(1)	(2)
Child		
Child age (months)	–	20.87 ± 9.44
Gender		
Male	744	50.96
Female	716	49.04
Ethnicity		
Han	1,316	90.14
Others	144	9.86
Whether the child is premature		
Yes	76	5.21
No	1,384	94.79
Whether the child had low birth weight		
Yes	92	6.30
No	1,368	93.70
Whether the child has siblings		
Yes	1,061	72.67
No	399	27.33
Household		
Mother is primary caregiver		
Yes	1,080	73.97
No	380	26.03
Maternal age (years)		
<25	582	39.86
≥25	878	60.14
Maternal educational level (years)		
<9	720	49.32
≥9	740	50.68
Paternal age (years)		
<30	738	50.55
≥30	722	49.45
Paternal educational level (years)		
<9	807	55.27
≥9	653	44.73
Family receives social security support		
Yes	544	37.26
No	916	62.74
Family asset index	–	−0.00 ± 1.10

Table 2. Paternal and primary caregiver involvement ($N = 1{,}460$).

	Paternal involvement Mean (SD)	Primary caregiver involvement Mean (SD)	Difference p-value (1)–(2)
Involvement	(1)	(2)	(3)
Total involvement score	1.55	2.48	<0.001
	(0.85)	(0.70)	
Subscale scores of involvement			
Caregiving	1.67	–	–
	(1.07)	–	
Physical play	1.74	3.22	<0.001
	(1.13)	(0.87)	
Didactic	1.31	1.87	<0.001
	(0.68)	(1.00)	
Socialization	1.48	2.35	<0.001
	(0.77)	(0.67)	
Involvement index	0.00	0.00	0.788
	(1.00)	(1.00)	

Note. Range is 1–6 for all items. We did not collect data on the caregiving subscale for primary caregivers.

statistically significant correlations (either $p < 0.05$ or $p < 0.01$) for the domain of motor skills (Column 4).

Table A3 presents the results when controlling for primary caregiver involvement. The results indicate that both paternal involvement and primary caregiver involvement have positive associations with child development. Importantly, however, the effect sizes of primary caregiver involvement were larger (and statistically significant) when compared to paternal involvement in the areas of language ability and social-emotional development. Interestingly, paternal involvement has a larger (and statistically significant) association with child cognitive development than does the effect of primary caregiver involvement.

Table 3. Child developmental outcomes.

	Full sample Mean (SD)	Father involved Mean (SD)	Father not involved Mean (SD)	Difference *p*-value (2)–(3)
Outcome	(1)	(2)	(3)	(4)
Cognition delay	0.57	0.55	0.59	0.153
	(0.49)	(0.50)	(0.49)	
Language delay	0.47	0.42	0.50	<0.001
	(0.50)	(0.49)	(0.50)	
Social-emotional delay	0.44	0.40	0.47	0.010
	(0.50)	(0.49)	(0.50)	
Motor delay	0.25	0.22	0.27	0.059
	(0.44)	(0.42)	(0.44)	
Observations	1,460	525	935	

Note. 1 = yes for all items.

Effects of paternal involvement on child developmental outcomes by child age

Table 5 presents the results in regard to the association between paternal involvement and the child developmental outcomes of younger children (24 months or younger) and older children (older than 24 months). To determine this association, we regressed paternal involvement on child developmental outcomes, using a model that included an interaction term (created by multiplying the total paternal involvement score times the child age dummy). Based on Eq. (2), the results demonstrate that the higher the paternal involvement score, the higher the child developmental outcomes. These results were statistically significant for children who were older than 24 months but not significant for children who were 24 months or younger. Specifically, compared to children who were 24 months or younger, when the total paternal involvement score was one unit higher, children who were older than 24 months had standardized scores that were 0.20, 0.18, 0.18, and 0.14 higher for cognition, language, social-emotion, and motor skills, respectively ($ps < 0.01$). In contrast, when the total paternal involvement score was one unit higher, children who were 24 months or younger had higher standardized scores in the four domains of development, but none was statistically significant. The coefficient on the interaction term in each regression

Table 4. Ordinary least squares estimates (multivariate regressions) of the association between paternal involvement and child development ($N = 1{,}460$).

	Standardized cognitive score	Standardized language score	Standardized social-emotional score	Standardized motor score
Involvement	(1)	(2)	(3)	(4)
Total paternal involvement	0.11**	0.06*	0.08**	0.04
score	(0.03)	(0.03)	(0.03)	(0.03)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.152	0.239	0.179	0.163
Subscales of involvement				
Paternal caregiving score	0.09**	0.03	0.06**	0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.151	0.237	0.178	0.163
Paternal physical play score	0.08**	0.04*	0.06**	0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.150	0.238	0.179	0.164
Paternal didactic score	0.07*	0.09**	0.07*	0.01
	(0.03)	(0.03)	(0.04)	(0.04)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.146	0.240	0.177	0.162
Paternal socialization score	0.14**	0.08*	0.09**	0.03
	(0.03)	(0.03)	(0.03)	(0.03)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.154	0.239	0.178	0.163
Paternal involvement index	0.10**	0.05*	0.07**	0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.153	0.239	0.180	0.163

Note. All standard errors (in parentheses) account for clustering at the village level.
*$p < .05$,.
**$p < .01$.

Table 5. Effects of paternal involvement on child development by child age ($N = 1{,}460$).

	Standardized cognitive score	Standardized language score	Standardized social-emotional score	Standardized motor score
Involvement	(1)	(2)	(3)	(4)
Total paternal involvement score	0.07	0.01	0.04	−0.02
	(0.03)	(0.03)	(0.04)	(0.04)
Child age (1 = >24 months)	−0.31*	−0.38*	−0.43**	−0.40*
	(0.14)	(0.15)	(0.14)	(0.17)
Total paternal involvement	0.14*	0.17**	0.14*	0.16*
score* Child age	(0.05)	(0.06)	(0.06)	(0.07)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.154	0.243	0.183	0.167
Effect of paternal involvement on ECD for children at different ages				
≤24 months	0.07	0.01	0.04	−0.02
	(0.03)	(0.03)	(0.04)	(0.04)
>24 months	0.20**	0.18**	0.18**	0.14**
	(0.05)	(0.05)	(0.05)	(0.05)

Note. All standard errors (in parentheses) account for clustering at the village level.
*$p < .05$,.
**$p < .01$.

suggests that the differences in the developmental outcomes between older children and younger children were positive and significant ($ps < 0.05$), showing that older children benefit significantly more than younger children from paternal involvement. The results presented in Table A4 also show that there were significant differences in paternal involvement (measured by total paternal involvement score and four subscales scores) between younger and older children ($ps < 0.01$).

Determinants of paternal involvement

Table 6 presents the results of the multivariate analysis that examined the child and household

Table 6. Ordinary least squares estimates (multivariate regressions) of the association between child and household characteristics and paternal involvement ($N = 1{,}460$).

	Total paternal involvement score	Paternal involvement index
Characteristic	(1)	(2)
Child		
Age (months)	0.00	−0.01
	(0.00)	(0.00)
Male (1 = yes)	−0.03	−0.03
	(0.05)	(0.05)
Premature (1 = yes)	0.10	0.08
	(0.13)	(0.15)
Low birth weight (1 = yes)	0.06	0.07
	(0.10)	(0.13)
Has siblings (1 = yes)	0.03	0.04
	(0.05)	(0.06)
Han (1 = yes)	−0.03	−0.04
	(0.06)	(0.08)
Household		
Primary caregiver (1 = mother; 0 = grandmother or others)	0.23**	0.30**
	(0.05)	(0.07)
Maternal age (1 = 25 years or higher)	0.09*	0.09
	(0.05)	(0.06)
Maternal educational level (1 = 9 years or higher)	0.13*	0.13*
	(0.05)	(0.06)
Paternal age (1 = 30 years or higher)	0.05	0.07
	(0.05)	(0.06)
Paternal educational level (1 = 9 years or higher)	0.07	0.04
	(0.06)	(0.06)
Family asset index	0.15**	0.17**
	(0.03)	(0.04)
Tester fixed effect	Yes	Yes
Adj. R^2	0.120	0.087

Note. Only one regression, which included child and household characteristics, was run. All standard errors (in parentheses) account for clustering at the village level.
*$p < .05$,.
**$p < .01$.

characteristics associated with paternal involvement. To identify which characteristics were associated with paternal involvement, we regressed child and household characteristics on each measure of paternal involvement (total paternal involvement score and paternal involvement index). The results indicate that mother as the primary caregiver, maternal educational level, and household asset index were positively and significantly correlated with paternal involvement.

Specifically, if the primary caregiver was the mother, the total paternal involvement score and paternal involvement index increased by 0.23 ($p < 0.01$) and 0.30 ($p < 0.01$), respectively. Compared to families in which mothers had less than 9 years of schooling, 13% of fathers were more likely to have high involvement with their child when the mother had more than 9 years of education ($p < 0.05$). Fathers from wealthier families also had higher total paternal involvement scores and a higher score for the paternal involvement index by 0.15 ($p < 0.01$) and 0.17 ($p < 0.01$), respectively. In contrast, the analysis found no significant correlations between other child and household characteristics and the paternal involvement outcomes.

Table 7. Association between paternal and primary caregiver involvement ($N = 1{,}460$).

	Primary caregiver involvement score	Primary caregiver involvement index
Involvement	(1)	(2)
Total paternal involvement score	0.13**	
	(0.02)	
Paternal involvement index		0.13**
		(0.03)
Controls	Yes	Yes
Tester fixed effect	Yes	Yes
Adj. R^2	0.260	0.240

Note. All standard errors account for clustering at the village level.
**$p < .01$.

Correlations between paternal and primary caregiver involvement

Table 7 presents the correlations between paternal and primary caregiver involvement. We ran regressions of each measure of paternal involvement (total paternal involvement score and paternal involvement index) on primary caregiver involvement measures (primary caregiver involvement score and primary caregiver involvement index). Overall, paternal involvement was significantly and positively correlated with primary caregiver involvement. Specifically, a one-unit increase in the total paternal involvement score is correlated with an increase in the involvement score of the primary caregiver of 0.13 ($p < 0.01$; Column 1). In addition, a one-unit increase in the paternal involvement index is correlated with an increase in the primary caregiver involvement index of 0.13 ($p < 0.01$; Column 2).

In Table A5, we present the correlations between primary caregiver involvement and child development outcomes. The findings indicate that each measure of primary caregiver involvement (total score of primary caregiver involvement, three subscales of primary caregiver involvement scores, and primary caregiver involvement index) was significantly and positively correlated with child development outcomes (cognitive, language, social-emotional, and motor skills) (all $ps < 0.01$).

Sensitivity analysis

To conduct a sensitivity analysis regarding the sensitivity of the results to including/excluding certain

items of paternal involvement that may not be culturally valid in rural China, we redid the results and excluded a number of variables such as "dance," "playing pattycake," "going out to eat," "take child shopping." and "attending activities at a community center." Paternal involvement measures were then reconstructed without those items. In other words, the subscales of physical play and socialization were made up of only 9 items instead of 11 items, 5 items instead of 8 items as in the original analysis, respectively. The constructs of the rest of two other subscales (i.e. caregiving and didactic) did not change. Thus, the scale of paternal involvement included 26 items instead of 31 items as in the original analysis. The results of the sensitivity analysis that used the new measure of paternal involvement, in fact, was quite similar to our original findings (and is included in Appendix A, Table A6). Specifically, when we used the original (full) scale (Table 4) or the scale with the 5 items dropped (Appendix A, Table A6), the findings of the association between paternal involvement and the child developmental outcomes were the similar.

Association between paternal involvement and the child developmental outcomes of younger children (24 months or younger) and older children (older than 24 months) were also examined using the new (reduced in size) measure constructs of paternal involvement (Appendix A, Table A7). Significant associations were seen between paternal involvement and cognitive outcomes of younger children (24 months or younger). Specifically, when the total paternal involvement score increased by one unit, children who were 24 months or younger had 0.05 SD increase in cognitive scores ($p < 0.05$). In the case of children who were older than 24 months, the effect was larger (0.16, $p < 0.05$). For the remaining domains of child development (language, social-emotion, and motor skills), associations were in line with findings previously reported in Table 5.

Discussion

The results of this study demonstrate that paternal involvement in rural China is relatively low, no matter whether we used the total paternal involvement score or the scores of the four subscales. Specifically, when statistically testing (using t-tests) for the difference between the results from our study with those of other findings on the role of fathers in the lives of their children (studies that are either in developed countries or in urban China), the level of paternal involvement in rural China is significantly lower than findings in previous studies (Leavell et al., 2012; Shears & Robinson, 2005).

A study conducted in poor communities in the United States, using the same measures of paternal involvement that we used in our study, found that the scores for paternal involvement in caregiving, physical play, didactic, and socialization activity (Shears & Robinson, 2005) were higher than the scores that we obtained. When comparing the paternal involvement found in our study with findings from studies conducted in other developing countries, however, we found that the levels of paternal involvement in rural China and in other developing countries are low (Jeong et al., 2016; Maselko et al., 2019). For example, fewer than half of the fathers in rural Pakistan engage in physical play activities and fewer than one-fifth of the fathers were involved in caregiving activities (Maselko et al., 2019).

When compared to studies that have been conducted of fathers in urban China, rural fathers also have less involvement. A. Xu and Zhang (2007) surveyed 892 urban and rural fathers in Shanghai and found that urban Shanghai fathers are involved with their children more than are rural Shanghai fathers. Chen and Liu (2012) also show higher involvement by urban fathers when comparing urban paternal involvement and migrant fathers (rural-to-urban) involvement. Clearly, the changes that have occurred in China's cities and within the labor markets in which urban fathers are working are more conducive to higher rates of father involvement in urban than in the case of rural China. Have these trends also been occurring in rural China? In a paper by Usdansky, it is argued that although women and men from the upper-middle-class express a greater desire to share home labor than their working-class counterparts, working-class couples might end up sharing the unpaid labors more equally (Usdansky, 2011). There are reasons to believe such insights are and are not descriptive of rural China today. On the one hand, in rural China, labor markets often demand workers to either live and work away from home or to work in jobs that require commuting and are often six to seven days per week and more than 12 hours per day (De Brauw et al., 2013). On the other hand, some rural fathers have been able to be more involved with their young children, a sign that the changes in urban China may be gradually affecting rural China. Hence, while the pattern of the low level of involvement of rural fathers with their children may look like it is the traditions of old that are constraining them from being more active, it is clear that there are forces that

are bringing more modern ideas of parenting to rural China and that the institutional constraints of the labor market are probably one of the biggest barriers to more progress.

In addition, a number of relatively modern institutional constraints, such as the *hukou* residency permit system (henceforth, hukou system) and the nature of China's rural labor markets, induce many rural families to choose a living situation in which the father lives and works away from home for long periods of time (Lee & Park, 2010; Wang & Mesman, 2015). Because of the hukou system, the children (parents) of rural families are unable to accompany their parents (children) to the city because most or all social services (e.g., education and health services) can only be accessed in an individual's home county. In addition, for many other rural fathers who live at home, commuting and long hours in the informal job market (meaning few regulations and low levels of social support) characterize their jobs. As in traditional society (although for different reasons), the rural man takes the role of the family's breadwinner (especially because, between pregnancy and the child's being only 1 to 2 years old, most rural mothers do not work). For these reasons, rural men often spending little to no time being involved in their child's life. The literature indicates that, due to job insecurity and pressure to financially support their families, the involvement of rural fathers (both migrant fathers and fathers who live at home and commute) is "swallowed" by the heavy burden of providing (Li & Lamb, 2015; Powell et al., 2008). Thus, albeit for other reasons, rural fathers are often characterized in the literature as being influenced more by Confucian culture, as they are more likely to remain in the traditional role of financial provider, which distances them from involvement in their child's day-to-day life (Cao & Lin, 2019; Li & Lamb, 2015).

The father's involvement in caregiving also appears to be low when compared to the level of involvement of the primary caregiver. Specifically, the data show that the overall level of paternal involvement is lower relative to that of the primary caregivers. In contrast to comparisons of the involvement of fathers in rural China versus fathers in other countries, as presented above, the finding that the involvement of the father is lower than that of the primary caregiver is consistent with a number of previous studies in the international literature (Cabrera et al., 2004; Cook et al., 2011; Duursma, 2014; Lamb, 1997; Malin et al., 2014; Tamis-LeMonda et al., 2004). According to these studies, primary caregivers (most often, mothers of the children) read to and play more frequently with their children and do more caregiving activities than do fathers.

Of course, not all fathers in rural China live away from their family. Further, although paternal involvement is low, in general, the data reveal that, when the father does become involved, his involvement is positively and significantly correlated with his child's cognitive, language, and social-emotional skills. This finding also is consistent with previous studies that have found that highly involved fathers promote higher levels of ECD (Bronte-Tinkew et al., 2008; Cabrera et al., 2007; Duursma, 2014; Meuwissen & Carlson, 2015). In these studies, conducted mainly in developed countries, such as the United States and the Netherlands, the correlation between paternal involvement and ECD outcome is statistically high and strong. In addition, a positive and significant association between paternal involvement and child developmental outcomes was seen in our data, even after controlling for caregiver involvement. In fact, this finding is consistent with previous studies that found fathers can make a unique contribution to their children's development (Cabrera et al., 2004; Lamb, 2004; Marsiglio et al., 2000). Although this paper does not allow us to fully understand the processes behind this association, the strong and consistent evidences of father's unique contribution implicated that fathers should involve in child life to improve the child's development.

Our study also provides insight into the way that the father's involvement affects ECD outcomes. Our results indicate that paternal involvement is associated with all of the developmental domains of the child, except the motor skill domain. Specifically, the data show that caregiving and physical play activities of paternal involvement are positively and significantly associated with child development in cognition, language ability, and social-emotional skills. Similar findings are seen in previous studies (Jeong et al., 2016; Lamb, 2004; Tamis-LeMonda et al., 2004). In addition, paternal involvement is more highly associated with one of the child development outcomes, cognitive skills, as compared to the involvement of the primary caregiver. These findings are in line with those of earlier studies (Cabrera et al., 2007; Shannon et al., 2002; Tamis-LeMonda et al., 2004). For example, Cabrera et al. (2007) found that paternal involvement affects the outcomes related to child cognitive abilities and language development but not social-emotional skills. It suggests that paternal involvement, such as reading, counting, and telling stories, could reinforce child

ability to identify letters and numbers, to be independent and focused learners, and to get along well with others (Jeong et al., 2016). This finding shows that paternal involvement uniquely contributes to some domains of child development but not others.

The findings of our study also demonstrate that the didactic activities of paternal involvement are positively associated with child cognitive and language development, a finding seen in the literature (Cabrera et al., 2007; Cowan et al., 2009; Duursma, 2014). Research has shown that paternal involvement in didactic activities, such as book reading, gives a child rich language experience and helps the child to acquire new information and develop higher-level cognitive and learning skills (Duursma et al., 2008; Raikes et al., 2006; Rodriguez et al., 2009).

The empirical findings of this study also show that socialization activities create strong, positive associations between paternal involvement and child cognition and social-emotional skills. According to the findings, a one-unit increase in the socialization activity score is correlated with a 0.15 SD increase in child cognition and a 0.09 SD increase in the child's social-emotional skills, which is consistent with previous studies. Researchers outside of China have found that, due to opportunities for experiencing high emotional arousal during father-child interactions during the first three years of life, fathers can play a particularly important role in shaping a child's social-emotional development (Cabrera et al., 2004, 2007; Fitzgerald & Bockneck, 2012). Other research shows that the father's involvement in socialization plays the role of opening the child to the outside world (Paquette, 2004), which, in turn, increases the child's ability to learn and his or her social-emotional skills.

The analysis also shows that paternal involvement is associated with higher child development outcomes and that these effects are statistically significant when children are older (i.e., older than 24 months). Such findings are consistent with those of other studies outside of China (Planalp et al., 2013; Planalp & Braungart-Rieker, 2016). These studies have found that fathers increase their involvement with their children (e.g., in terms of the intensity of their time playing with their children as well as increasing the number of caregiving activities as their children age from 3 to 20 months). Previous studies in urban China also have shown that Chinese fathers are more actively involved in day-to-day child care as their children grow older (Liong, 2017; A. Xu & Zhang, 2008). The lower level of paternal involvement when the child is younger might be due to the expected paternal responsibilities in Chinese families, influenced by the Confucian system. Under this system, fathers traditionally believed that they needed to be involved with their children only when the children were considered old enough to be instructed, and they regarded themselves as inept or inferior caregivers of their younger children (H. Wu et al., 2012). Further, the findings of the analysis by child age indicate that older children benefit more than younger ones from paternal involvement. This also is in line with previous studies that indicate that paternal involvement has different effects on the development of children as they age (Cabrera et al., 2006, 2007) and that paternal involvement is more effective with older children. While the analysis cannot identify a reason for this, the literature suggests that the underlying reason might be that older children interpret paternal involvement in a more positive way than younger children (e.g., Cabrera et al., 2007).

When we examined which characteristics of the sample children and households are associated with paternal involvement, there were a number of consistent findings. Specifically, the results show that (a) when the mother is the primary caregiver, (b) when the mother is more educated, and (c) when the father is from a higher-income family, fathers are more likely to have higher involvement. Other studies internationally have similar results (Cabrera et al., 2007; Castillo et al., 2013; Coleman, 1988; Jeong et al., 2016; Leavell et al., 2012; Tamis-LeMonda et al., 2004; Yeh et al., 2021). The findings of a study outside of China show that fathers with relatively higher socioeconomic status are more likely to be more involved with their child (Leavell et al., 2012). In a study that used data from the United States, Coleman (1988) found that fathers from higher-income families have more resources to invest in the home environment, which can lead to greater growth and learning by the child as compared to families of low-income fathers.

Our analysis also shows that paternal involvement is positively and significantly associated with the involvement of the primary caregiver, which, in turn, is positively associated with child development outcomes. The international literature has shown that paternal involvement also can influence child developmental outcomes indirectly by the father's being supportive to the child's caregiver (Easterbrooks et al., 2014; Lamb, 1997; Tamis-LeMonda et al., 2004). Specifically, according to these studies, a father can affect a child's development through his influence on the mother-child relationship. With more support, these mother-child engagements appear to have a

more positive impact on child developmental outcomes.

This study makes three contributions to the literature. First, this is the first study conducted in rural China that analyzes the state of paternal involvement (using multiple measurements: caregiving, physical play, didactic, and socialization) and examines the association between paternal involvement and ECD outcomes. Second, this study provides the first empirical evidence of the determinants of paternal involvement. Our finding that the characteristics associated with socioeconomic status have positive associations with paternal involvement can aid researchers and policymakers in their efforts to design more effective programs for improving ECD outcomes in rural China, as discussed below. Finally, the study offers important insight into the role that fathers can play in child development in low- and middle-income rural settings, where child development outcomes have been found to be low.

Implications

The results of this study have several implications for both policymakers and researchers. Considering that there are such low levels of paternal involvement in rural China and high rates of child developmental delays, policymakers need to take action to improve ECD outcomes. Based on our finding that paternal involvement increases ECD in many domains (cognition, language abilities, and social-emotional skills), it is clear that encouraging fathers to be involved in their child's life should be considered a key component of strategies for improving ECD. Information campaigns in the media and efforts by the medical personnel (during prenatal visits) may be two means to raise awareness. Due to the institutional constraints of father involvement in rural China, social policies (e.g., paid paternal leave; or training programs for fathers) that aim to address the absence of fathers need to be carried out.

The findings also show that parents with more education and higher socioeconomic families are more likely to have a high-involvement father, which enhances ECD outcomes, which suggests that programs that aim to increase the educational levels of fathers and that promote and encourage the involvement of fathers in the lives of their children may yield benefits for the child. Given that a number of ECD intervention trials that train caregivers to invest more in their young children have shown promising results in terms of higher ECD outcomes in rural China (Heckman et al., 2020; Luo et al., 2019; Sylvia et al., 2021), China's government should consider implementing a parenting training program, targeting not only mothers and paternal grandmothers, but also fathers, to more effectively improve ECD in rural China.

Limitations

We acknowledge three limitations of this study. First, this study relies on cross-sectional data, which do not allow us to draw causal conclusions about the relationship between paternal involvement and child development outcomes. Second, due to the lack of any domestic scale of paternal involvement in China, the study uses a measurement of paternal involvement developed in the United States. It is possible that such a scale includes certain items that might be based in cultural bias. The research team attempted to remove or adapt such items prior to using the scale in the field. Future research teams, however, should consider designing a measure of paternal involvement that could would be more appropriate in the context of Chinese culture. Third, even though the findings of this study are consistent with a number of studies in other countries, the study was conducted in only one province in China, and it possible that the sample is not representative of families in all of rural China. Therefore, one has to be careful in assigning external validity to the findings of the study. Future research should examine rural households in other parts of rural China, which can help to provide a more complete understanding of the state of paternal involvement across rural China.

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Data availability statement

The data that support the findings of this study are available from the corresponding author (L.W.), upon reasonable request.

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Appendix A

Table A1 . Descriptive statistics for involvement of full sample ($N = 1,460$).

Involvement Item	Mean	SD
Total Involvement score	1.55	0.85
Caregiving	1.67	1.07
Put child to bed	1.82	1.42
Give child a bath	1.57	1.08
Help to get child dressed	1.73	1.31
Help to change child's diaper	1.78	1.45
Help child to brush teeth	1.15	0.58
Prepare meals or bottles for child	1.69	1.42
Help child to eat/drink with a bottle	2.01	1.67
Get up with child when he/she wakes up during night	1.59	1.21
Physical play	1.74	1.13
Play peek-a-boo with child	1.63	1.27
Play pattycake with child	1.64	1.29
Dance with child	1.32	0.93
Play outside in the yard, park, or playground with child	1.94	1.52
Play chasing games with child	1.77	1.44
Try to tease child to get him/her to laugh	2.35	2.00
Take child for a ride on your shoulders or back	1.70	1.30
Turn child upside down or toss him/her in the air	1.47	1.09
Roll a ball, toss a ball, or play games with a ball with child	1.59	1.16
Go for a walk with child	1.92	1.53
Bounce child on your knee	1.79	1.45
Didactic	1.31	0.68
Sing songs with child	1.46	1.08
Read stories to child	1.23	0.73
Tell stories to child	1.27	0.76
Play together with toys for building things	1.28	0.77
Socialization	1.48	0.77
Have relatives visit child	1.50	0.95
Take child to visit relatives	1.48	0.87
Take child shopping	1.80	1.32
Take child to an activity at a community center	1.16	0.54
Go out to eat with child	1.46	0.88
Go to a public place with child	1.35	0.85
Visit friends with child	1.41	0.82
Take child to play with other children	1.68	1.27

Note. Range is 1–6 for all items.

Table A2. Descriptive statistics for involvement of fathers who are at home ($N = 525$).

Involvement Item	Mean	SD
Total Involvement score	2.53	0.70
Caregiving	2.86	0.99
Put child to bed	3.28	1.50
Give child a bath	2.59	1.27
Help to get child dressed	3.04	1.44
Help to change child's diaper	3.18	1.68
Help child to brush teeth	1.43	0.90
Prepare meals or bottles for child	2.91	1.80
Help child to eat/drink with a bottle	3.80	1.65
Get up with child when he/she wakes up during night	2.65	1.53
Physical play	3.06	0.93
Play peek-a-boo with child	2.76	1.59
Play pattycake with child	2.78	1.61
Dance with child	1.90	1.37
Play outside in the yard, park, or playground with child	3.61	1.43
Play chasing games with child	3.14	1.69
Try to tease child to get him/her to laugh	4.74	1.46
Take child for a ride on your shoulders or back	2.95	1.49
Turn child upside down or toss him/her in the air	2.31	1.49
Roll a ball, toss a ball, or play games with a ball with child	2.65	1.42
Go for a walk with child	3.57	1.52
Bounce child on your knee	3.19	1.67
Didactic	1.86	0.91
Sing songs with child	2.27	1.48
Read stories to child	1.65	1.10
Tell stories to child	1.76	1.12
Play together with toys for building things	1.77	1.13
Socialization	2.33	0.71
Have relatives visit child	2.39	1.12
Take child to visit relatives	2.34	0.99
Take child shopping	3.22	1.31
Take child to an activity at a community center	1.44	0.83
Go out to eat with child	2.27	1.06
Go to a public place with child	1.98	1.19
Visit friends with child	2.14	1.03
Take child to play with other children	2.88	1.48

Note. Range is 1–6 for all items.

Table A3. Association between paternal involvement and child development ($N = 1{,}460$).

	Standardized cognitive score	Standardized language score	Standardized social-emotional score	Standardized motor score
Involvement	(1)	(2)	(3)	(4)
Total paternal involvement	0.09**	0.04	0.05	0.02
score	(0.03)	(0.03)	(0.03)	(0.03)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.157	0.253	0.205	0.169
Subscales of involvement				
Paternal caregiving score	0.08**	0.02	0.04*	0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.157	0.252	0.206	0.169
Paternal physical play score	0.07**	0.03	0.04	0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.156	0.252	0.206	0.169
Paternal didactic score	0.04	0.05	0.01	−0.02
	(0.03)	(0.03)	(0.04)	(0.04)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.152	0.253	0.204	0.169
Paternal socialization score	0.13**	0.05	0.04	0.01
	(0.03)	(0.03)	(0.03)	(0.03)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.159	0.253	0.205	0.169
Paternal involvement index	0.09**	0.04	0.05*	0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.158	0.253	0.206	0.169

Note. Regressions include one additional control variable (primary caregiver involvement scores). All standard errors (in parentheses) account for clustering at the village level.
*$p < .05$,.
**$p < .01$.

Table A4. Paternal involvement by age group ($N = 1{,}460$).

	Full sample Mean (SD)	Child age (<24 months) Mean (SD)	Child age (>24 months) Mean (SD)	Difference (p-value) (2)–(3)
Involvement	(1)	(2)	(3)	(4)
Total paternal involvement score	1.55	1.47	1.72	<0.001
	(0.85)	(0.82)	(0.86)	
Subscale scores of involvement				
Caregiving	1.67	1.56	1.89	<0.001
	(1.07)	(1.04)	(1.11)	
Physical play	1.74	1.65	1.93	<0.001
	(1.13)	(1.14)	(1.10)	
Didactic	1.31	1.25	1.43	<0.001
	(0.68)	(0.65)	(0.74)	
Socialization	1.48	1.40	1.64	<0.001
	(0.77)	(0.75)	(0.79)	
Observations	1,460	991	469	

Note. Range is 1–6 for all items; standard errors are in parentheses.

Table A5. Association between primary caregiver involvement and child development ($N = 1{,}460$).

	Standardized cognitive score	Standardized language score	Standardized social-emotional score	Standardized motor score
Involvement	(1)	(2)	(3)	(4)
Total involvement score	0.14**	0.20**	0.28**	0.14**
	(0.05)	(0.04)	(0.04)	(0.03)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.152	0.252	0.204	0.169
Subscales of involvement				
Physical play score	0.09**	0.11**	0.25**	0.10**
	(0.03)	(0.03)	(0.03)	(0.03)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.149	0.245	0.214	0.169
Didactic score	0.08*	0.12**	0.14**	0.05*
	(0.03)	(0.03)	(0.03)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.149	0.247	0.190	0.164
Socialization score	0.13**	0.19**	0.14**	0.14**
	(0.05)	(0.04)	(0.04)	(0.04)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.149	0.248	0.181	0.169
Involvement index	0.09**	0.13**	0.20**	0.09**
	(0.03)	(0.03)	(0.03)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.150	0.249	0.206	0.168

Note. All standard errors (in parentheses) account for clustering at the village level.
*$p < .05$.
**$p < .01$.

Table A6. Sensitivity analysis of the association between paternal involvement and child development ($N = 1{,}460$).

	Standardizedcognitive score	Standardized language score	Standardized social-emotional score	Standardized motor score
Involvement	(1)	(2)	(3)	(4)
Total paternal involvement	0.09**	0.05*	0.06**	0.04
score	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.152	0.239	0.179	0.163
Subscales of involvement				
Paternal caregiving score	0.09**	0.03	0.06**	0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.151	0.237	0.178	0.163
Paternal physical play score	0.06**	0.03*	0.05**	0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.150	0.238	0.179	0.164
Paternal didactic score	0.07*	0.09**	0.07*	0.01
	(0.03)	(0.03)	(0.04)	(0.04)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.146	0.240	0.177	0.162
Paternal socialization score	0.07**	0.04*	0.04**	0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.154	0.239	0.178	0.163
Paternal involvement index	0.07**	0.04*	0.04**	0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.153	0.239	0.180	0.163

Note. All standard errors (in parentheses) account for clustering at the village level.
*$p < .05$,.
**$p < .01$.

Table A7. Sensitivity analysis of effects of paternal involvement on child development by child age ($N = 1{,}460$).

	Standardized cognitive score	Standardized language score	Standardized social-emotional score	Standardized motor score
Involvement	(1)	(2)	(3)	(4)
Total paternal involvement score	0.05*	0.01	0.03	−0.01
	(0.03)	(0.02)	(0.03)	(0.03)
Child age (1 = >24 months)	−0.28*	−0.35*	−0.39**	−0.37*
	(0.13)	(0.14)	(0.14)	(0.16)
Total paternal involvement	0.10*	0.13**	0.11*	0.12*
score* Child age	(0.04)	(0.05)	(0.05)	(0.05)
Controls	Yes	Yes	Yes	Yes
Tester fixed effect	Yes	Yes	Yes	Yes
Adj. R^2	0.154	0.243	0.183	0.167
Effect of paternal involvement on ECD for children at different ages				
≤24 months	0.05*	0.01	0.03	−0.01
	(0.03)	(0.02)	(0.03)	(0.03)
>24 months	0.16**	0.14**	0.14**	0.11**
	(0.04)	(0.04)	(0.04)	(0.04)

Note. All standard errors (in parentheses) account for clustering at the village level.
*$p < .05$,.
**$p < .01$.