



Interrelationships of parental belief, parental investments, and child development: A cross-sectional study in rural China

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ABSTRACT

Background: Parental investments are associated with early child outcomes, and some evidences outside China suggest that parental belief might affect parental investments. However, the interrelationships of parental belief, parental investments, and early child development has not been well documented in China.

Aims: This paper aims to study the interrelationships between the caregiver's parental belief, the caregiver's parental investments, and the child's early developmental outcomes in rural China.

Methods: A total of 1787 sample households in an undeveloped rural area of western China are enrolled in the cross-sectional study. A parental belief questionnaire, the Family Care Indicators (FCI), the Bayley Scales of Infant Development version III (BSID-III), and a socioeconomic questionnaire were used to measure the caregiver's parental belief on parenting practices, the caregiver's parental investments, the child's early developmental outcomes, and the socioeconomic characteristics of sample households, respectively. The mediation model was then applied to estimate the interrelationships.

Results: The results find that the caregiver's parental investments significantly mediate in the relationships between the caregiver's parental belief and the child's early developmental outcomes. Through parental investments, one standard deviation (SD) increase in the caregiver's parental belief is corresponding to 3% of one SD increase in the child's four developmental outcomes (cognition, language, motor, and social-emotion) respectively.

Conclusions: For future studies aimed at designing targeted interventions on early child development in rural China, the key findings of this paper might be informative. Early interventions aimed at strengthening the caregiver's subjective belief on parenting practices and increasing the parental investments in the household might be effective to improve the development of rural children.

1. Introduction

Early developmental delay has been a significant problem for children living in rural China. As estimated by a recent study, in four major subpopulations of rural China, 85% of the children aged 0–3 years do not reach their full development potential in at least one kind of outcome (Wang et al., 2019). As early developmental outcomes build the foundations for one's lifelong welfare, such as incomes (Huggett et al., 2011; Gertler et al., 2014), health (Heckman, 2007; Campbell et al., 2014), social mobility (Heckman & Mosso, 2014), and other adult outcomes (Heckman, 2006; Cunha & Heckman, 2007), such drastic developmental delays inevitably hinder the long-term human capital development and even economic growth of the country (Li et al., 2017).

Previous studies in China have focused on the poor parental

investments in rural areas. Parental investments are parental expenditures that benefit the offspring, which further include material investments and time investments (Clutton-Brock, 1991). On the one hand, in terms of material investments, there are few play materials in rural households (Wang & Zheng, 2019; Wang & Yue, 2019). On the other hand, in terms of time investments, only 13.8% of caregivers in rural households tell stories to the children (Luo et al., 2017), and only 12.6% read with the children (Yue et al., 2017). The children in rural households play alone for over 2.5 h per day on average, which also indicates the absence of interactive parenting activities between the caregivers and the children (Yue et al., 2019). Furthermore, the studies also found that poor parental investments are highly correlated with poor child outcomes in rural areas (Luo et al., 2017; Yue et al., 2017, 2019; Wang & Zheng, 2019; Wang & Yue, 2019; Zhong et al., 2020a).

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Recent work outside China has revealed that the parental belief might be one key factor which could affect the caregiver's parental investments. Parental belief refers to the caregiver's subjective belief on engaging in the stimulating parenting practices for child development (Attanasio et al., 2019). In Columbia, the mother's subjective belief is positively correlated with parental investments on the child during early childhood (Attanasio et al., 2019). In the USA, maternal subjective belief also strongly predicts the investments and the child's cognitive skill formation (Cunha et al., 2013). These findings documented that parental investments might work as mediators in the link between the caregiver's parental belief and the child's developmental outcomes. As far as we know, however, in rural China, for lack of the public survey data on caregivers and children, the mediation effects of parental investments on the relationships have not been estimated by a standard mediation model.

The overall goal of this paper is to study the interrelationships of parental belief, parental investments, and early childhood development in rural China. This study has three specific objectives as follows: first, identifying the relationships between the caregiver's parental belief and the child's developmental outcomes; second, investigating whether the caregiver's parental investments have mediation effects on the relationships; third, estimating the mediation effects of various parental investments on different developmental outcomes.

To achieve these objectives, this paper proposed the following study hypotheses: first, the caregiver's parental belief is associated with the child's developmental outcomes; second, the caregiver's parental investments play the mediator role in relationships between parental belief and early child development; third, the mediation effects of different parental investments vary across developmental outcomes.

The study might contribute to the existing literature by identifying the relationships between parental belief and early child development, and estimating the mediation effect of parental investments on the relationships in rural areas of China. This could provide the necessary information and serves as a firm foundation for the targeted public policies designed to improve early child development there.

2. Methods

2.1. Sampling

The field survey was conducted in 22 poor counties in Shaanxi Province, which is a relatively undeveloped province located in the northwest of China. In the year 2016, this province ranked below the median among all provinces, in terms of per capita income.

The protocol to choose the study sample is as follows. First, after excluding the towns located in the county seat, there are 245 towns in total in the sample counties. Second, based on the sample size calculated for a randomized controlled trial, 118 towns were randomly selected from the list of all towns, using a random number generator. In each sample town, one village was randomly chosen into the baseline survey. Finally, in each sample village, a list of all registered births was obtained from the local official. All households with children aged 6–24 months old were sampled in this study.

Before participating in the study, all participants gave their informed consent for inclusion, which was in accordance with the Declaration of Helsinki. The Ethics Committee of Stanford University, Stanford, CA, USA approved the study (No. 35921).

2.2. Data collection

In the 2016 fieldwork, the survey data was collected from all sample households, which consisted of: (1) the participant's socioeconomic characteristics; (2) the caregiver's parental belief; (3) the caregiver's parental investments; and (4) the child's early developmental outcomes.

The following survey instruments were used in the data collection:

- (1) Socioeconomic survey. For each sample child, the caregiver who takes the most responsibility on daily care was identified as the primary caregiver. The questionnaire was then administered to each primary caregiver to collect the socioeconomic information, which includes the gender of the child, the age of the child, whether the child is born with low birth weight, the age of the caregiver, the completed education level of the caregiver, and whether the child's mother is the primary caregiver.
- (2) Parental belief survey. The questionnaire was administered to the primary caregivers to evaluate their parental beliefs. The questionnaire includes five items: "the caregiver believes that it is fun to interact with the child"; "the caregiver believes that it is important to play with the child"; "the caregiver believes that he/she knows how to play with the child"; "the caregiver believes that it is important to read stories to the child"; and "the caregiver believes that he/she knows how to read stories to the child". Caregivers used the seven-point scale (from 1 = "absolutely disagree" to 7 = "absolutely agree") to score each item. The reliability coefficient is 0.64, indicating the questionnaire's adequate internal consistency in the sample (Nunnally, 1978). The total score of the caregiver's parental belief was calculated by summing up the item scores. A higher total score is corresponding to the higher parental belief of the caregiver.
- (3) Family Care Indicators (FCI). Designed by the UNICEF experts (Frongillo et al., 2003), the FCI was an international widely-used tool to measure parental investments, with both validity and reliability (Hamadani et al., 2010). Previous studies have translated the FCI into the Chinese language to adapt to the local context in rural areas (Wang & Zheng, 2019; Wang & Yue, 2019). The FCI was administered to the primary caregivers to evaluate their parental investments. As shown in Table A1, there are 19 items in five subscales. The items in three subscales, including "sources of play materials", "varieties of play materials", and "play activities", were scored by the 0–1 binary-choice, i.e., 1 denotes the presence of play material or activity, while 0 denotes absence. The items in the other two subscales, including "household books" and "magazines and newspapers", were scored by the four-point scale according to their real quantity (1 = "none"; 2 = "1–2"; 3 = "3–5"; 4 = "> =6"). The Cronbach's alpha coefficient of the inventory is 0.75, indicating the inventory's adequate internal consistency in the sample (Nunnally, 1978). The total score was calculated by summing up the relevant item scores. A higher total score of FCI is corresponding to higher parental investments of the caregiver.
- (4) Bayley Scales of Infant Development version III (BSID-III). Developed by Bayley (2006), the BSID-III is a golden-standard instrument to assess the child's early development under age three, including cognitive development, language development, motor development, and social-emotional development. Previous studies have formally translated the BSID-III into the Chinese language to adapt to the local context in rural areas (Wang et al., 2019). The scores based on the child's successful completion of the tasks assess the child's cognitive, language, and motor development, while the score based on the caregiver's responses to questions adapted from the Greenspan Social-Emotional Growth Chart (Greenspan, 2004), assess the child's social-emotional development. According to Bayley (2006), although the BSID-III social-emotional scale is an adaptation of the Greenspan Social-Emotional Growth Chart, the scaled scores provided by the BSID-III are different from the cut scores provided by the Greenspan Social-Emotional Growth Chart. Before the fieldwork, the trained enumerators had taken a week-long training course on how to administer the test, but they were all blind to the study. During the fieldwork, the enumerators used a detailed scoring sheet and a standardized set of toys to administer the test for each sample child when their caregiver was present, but the caregiver was not allowed to help the child. The scale reliability coefficients are all above 0.8, indicating the scales' good internal consistency in the sample (Nunnally, 1978). Higher scale scores are

corresponding to better development of the child.

2.3. Statistical analysis

To estimate the interrelationships between the caregiver’s parental belief, parental investments, and the child’s developmental outcomes, the following mediation model was employed:

$$development_i = \alpha + \beta_1 belief_i + \beta_2 investment_i + \gamma X_i + u_j + \varepsilon_i \quad (1)$$

$$investment_i = \alpha + \beta_3 belief_i + \gamma X_i + u_j + \varepsilon_i \quad (2)$$

where the dependent variable *development_i* is child’s scores in the four scales of BSID-III; the independent variable *belief_i* is the total score of the caregiver’s parental belief; the intermediate variable *investment_i* is the caregiver’s total score of FCI; the covariates *X_i* are the socio-economic characteristics, including the gender of the child, the age of the child, whether the child is born with low birth weight, the age of the caregiver, the completed education level of the caregiver, and whether the child’s mother is the primary caregiver; in addition, the village fixed effects (village FE) *u_j* were controlled to account for the unobserved village heterogeneity; and ε_i is the random error term. The coefficient β_1 captures the direct effect of parental belief on the child’s development outcomes, and the product term $\beta_2\beta_3$ captures the indirect effect through the parental investment.

Furthermore, to explore which subscale of FCI is a strong mediator, the five subscale scores were then used to replace the total score as intermediate variables in the mediation model, and the indirect effects through these mediators were estimated again.

Following Preacher & Hayes (2008), the bootstrap method was used to compute the standard errors (S.E.) of the indirect effects. To test the statistical significance of the indirect effects, three types of 95% confidence interval (CI), including the percentile CI, the bias-corrected (BC) CI, and the bias-corrected and accelerated (BCa) CI, were computed. The indirect effect is statistically significant if the zero does not fall into the range of the CIs. The statistical software Stata 15.0 was used for the statistical analysis.

3. Results

3.1. Descriptive statistics

1788 households were invited to participate in the study. However, one sample household did not finish the interview. Hence, a total of 1787 sample households were included in the analysis.

Table 1 reports the descriptive statistics. The mean ± SD of children’s BSID-III scale scores in the sample are 96.0 ± 12.6, 92.5 ± 13.5, 97.3 ± 16.5, and 86.0 ± 15.3, respectively. In terms of socioeconomic characteristics, slightly over half (52%) of children were male. On average, children were slightly over 14 months old. Four percent of children had low birth weight. Caregivers were around 35 years old on average and completed approximately eight years of schooling on average. The mother was the primary caregiver in only 69% of the households.

3.2. Mediation effects of parental investments

Table 2 reports the estimates of the interrelationships between the caregiver’s parental belief, the caregiver’s parental investments, and the child’s early developmental outcomes. As shown in column (4), the direct effect of the caregiver’s parental belief on the child’s social-emotional development is significantly positive at the 1% significance level with an effect size of 0.14 standard deviation (SD). By contrast, the direct effects of parental belief on the other three developmental outcomes are not statistically significant at the 5% level.

The caregiver’s parental investments, however, are positively and significantly associated with the child’s four developmental outcomes at

Table 1
Descriptive statistics (N = 1787 for all variables).

Variable	Definition	Mean ± SD	Min	Max
Dependent variable				
Cognition	cognitive score in BSID-III	96.0 ± 12.6	55	135
Language	language score in BSID-III	92.5 ± 13.5	50	135
Motor	motor score in BSID-III	97.3 ± 16.5	46	148
Social-emotion	social-emotional score in BSID-III	86.0 ± 15.3	55	145
Intermediate variable				
Belief	total score of parental belief	24.1 ± 5.0	5	35
Independent variable				
Investment	total score of FCI	12.8 ± 4.5	2	25
Covariates				
Male	dummy, 1 = male	0.5 ± 0.5	0	1
Month	child’s age in months	14.4 ± 5.4	6	24
Low birth weight	dummy, 1 = child has low birthweight	0.04 ± 0.2	0	1
Age of Caregiver	caregiver’s age	35.4 ± 12.3	17	76
Education of Caregiver	caregiver’s year of schooling	8.1 ± 3.3	0	16
Mother is the primary caregiver	dummy, 1 = mother is the primary caregiver	0.7 ± 0.5	0	1

Data source: Authors’ survey.

the 1% level. A one SD increase in the FCI total score is corresponding to the increase in the child’s four developmental scores by 11%, 10%, 12%, and 12% of one SD, respectively. As shown in Column (5), the caregiver’s parental belief is positively and significantly associated with parental investments at the 1% level. A one SD increase in the parental belief score is accompanied by a 0.23 SD increase in the FCI total score on average. The results in Table 2 indicate that the mediation effects of parental investments might exist in the links between the caregiver’s parental belief and the child’s developmental outcomes.

Table 3 reports the estimated indirect effects of the caregiver’s parental belief on early child development through parental investments. As shown in column (1), the point estimates are significantly larger than zero, and the effect sizes of indirect effects on the child’s four developmental outcomes are all 3% of one SD. Furthermore, as shown in columns (3) – (5), zero does not fall into the corresponding 95% CIs, which strongly suggests that the indirect effects through parental investments are statistically significant for the child’s early developmental outcomes.

3.3. Mediation effects of different parental investments

Table 4 reports estimates of the indirect effects of parental belief through different parental investments on the child’s cognitive development. The variety of play materials is the strongest mediator, through which a one SD increase in the caregiver’s parental belief is associated with a 0.02 SD increase in the child’s cognitive score at the 1% level. In addition, the indirect effects through the number of play activities, the number of household books and the number of magazines and newspapers, are also statistically significant at the 5% level, but the effect sizes are much smaller.

Table 5 reports estimates of indirect effects through different parental investments on the child’s language development. Three out of the five subscales are significant mediators: the varieties of play materials and the number of play activities are the strongest ones, with indirect effects of 0.02 SD both at the 1% level, followed by the number of magazines and newspapers, with indirect effects smaller than 0.01 SD.

Table 6 reports estimates of indirect effects through different parental investments on the child’s motor development. Except for sources of play materials, the other four subscales are all significant mediators. The varieties of play materials and the number of play activities are both the strongest mediators, with indirect effects of 0.02 SD at the 1% level.

Table 2
Correlations between parental belief, parental investments, and developmental outcomes.

	Cognition (1)	Language (2)	Motor (3)	Social-emotion (4)	Investment (5)
Belief	0.03 (0.03)	0.04 (0.03)	0.01 (0.02)	0.14 *** (0.03)	0.23 *** (0.02)
Investment	0.11 *** (0.03)	0.10 *** (0.02)	0.12 *** (0.02)	0.12 *** (0.03)	
Male	-0.08 (0.05)	-0.25 *** (0.05)	-0.04 (0.04)	-0.02 (0.06)	-0.08 * (0.05)
Month	-0.003 (0.005)	0.03 *** (0.004)	0.09 *** (0.005)	0.006 (0.004)	0.03 *** (0.005)
Low birth weight	-0.39 *** (0.14)	-0.30 ** (0.14)	-0.22 ** (0.11)	-0.27 * (0.15)	-0.12 (0.13)
Age of Caregiver	-0.004 (0.004)	-0.003 (0.004)	-0.004 (0.004)	0.001 (0.004)	0.001 (0.004)
Education of Caregiver	0.02 * (0.01)	0.03 *** (0.01)	0.02 ** (0.01)	-0.001 (0.01)	0.08 *** (0.01)
Mother is the child's primary caregiver	-0.26 *** (0.11)	-0.13 (0.11)	-0.23 ** (0.09)	-0.19 * (0.10)	0.17 (0.10)
Village FE	Yes	Yes	Yes	Yes	Yes
Observations	1787	1787	1787	1787	1787
R ²	0.19	0.23	0.42	0.21	0.29

Notes: (i) Standardized coefficients are reported in the table, and robust standard errors clustered at the village level are presented in parentheses. (ii) *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 7 reports estimates of indirect effects through different parental investments on the child's social-emotional development. Three subscales are significant mediators: the number of play activities, the varieties of play materials, and the number of household books, through which a one SD increase in the caregiver's parental belief is associated with a 0.03 SD, 0.02 SD, and 0.01 SD increase in the child's social-emotional score, respectively.

In a word, the indirect effects through different parental investments vary across different developmental outcomes. Compared with other subscales, however, the variety of play materials is the strongest mediator for the child's cognitive development, while the number of play activities is the strongest one for the child's social-emotional development. Also, they both have strong mediation effects for the child's language and motor development.

3.4. Heterogeneous mediation effects of parental investments across maternal migration

Table 8 reports estimates of heterogeneous indirect effects through parental investments across whether mother is the child's primary caregiver. Panel A presents indirect effects of the caregiver's parental belief on the child's cognitive development through parental investments. For the child whose mother is the primary caregiver, a one SD increase in the caregiver's parental belief is significantly associated with a 0.03 SD increase in the child's cognitive score at the 1% level; while for the child whose mother is not the primary caregiver, a one SD increase in the caregiver's parental belief is only associated with a 0.02 SD increase in the child's cognitive score at the 5% level.

Panel B presents indirect effects of the caregiver's parental belief on the child's language development through parental investments. The indirect effects through parental investments are 0.03 SD and 0.02 SD at the 1% level, for the families with mother as caregiver and those without mother as caregiver, respectively.

Panel C presents indirect effects of the caregiver's parental belief on the child's motor development through parental investments. The indirect effects through parental investments are 0.04 SD for families with

mother as caregiver at the 1% level, while they are not statistically significant at the 5% level for those without mother as caregiver.

Panel D presents indirect effects of the caregiver's parental belief on the child's social-emotional development through parental investments. The indirect effects through parental investments are 0.04 SD for families with mother as caregiver at the 1% level, while they are not statistically significant at the 5% level for those without mother as caregiver.

4. Discussion

This paper studies the interrelationships of the caregiver's parental belief, parental investments, and the child's early developmental outcomes in rural areas. Caregiver's parental belief is directly associated with the social-emotional development, but not with other developmental outcomes of the child. Caregiver's parental investments have significant mediation effects on the relationships between the caregiver's parental belief and the child's four developmental outcomes. The mediation effects of different parental investments vary across developmental outcomes. The varieties of play materials have the strongest mediation effects for the child's cognitive development, while the number of play activities does for the child's social-emotional development. As for the child's language and motor development, both the varieties of play materials and the number of play activities are strong mediators.

As revealed by recent work, the child's social-emotional development could not only improve his/her cognitive development in adolescence (Heckman et al., 2013) but also have more lasting effects on his/her lifetime welfares in adulthood, compared with the cognitive development (Francesconi & Heckman, 2016). Consider the benefits that a child's early developmental outcomes bring to himself/herself (Heckman, 2006, 2007; Cunha & Heckman, 2007; Huggett et al., 2011; Gertler et al., 2014; Campbell et al., 2014; Heckman & Mosso, 2014) and even sustainable economic development of the country (Li et al., 2017). The findings of this study strongly suggest that the caregiver's subjective belief on engaging in the stimulating parenting practices is

Table 3
Estimates of the indirect effects of parental belief on developmental outcomes through parental investments.

Indirect Effect	Point Estimate (1)	Bootstrap S. E. (2)	95% CI (Percentile) (3)	95% CI (BC) (4)	95% CI (BCa) (5)
Belief on cognition through investment	0.03 ***	0.007	(0.02, 0.04)	(0.02, 0.05)	(0.02, 0.05)
Belief on language through investment	0.03 ***	0.006	(0.02, 0.04)	(0.02, 0.04)	(0.02, 0.04)
Belief on motor through investment	0.03 ***	0.006	(0.02, 0.04)	(0.02, 0.04)	(0.02, 0.04)
Belief on social-emotion through investment	0.03 ***	0.007	(0.02, 0.04)	(0.02, 0.05)	(0.02, 0.05)

Notes: (i) The dependent variables are the child's four developmental scores. The independent variable is the caregiver's parental belief score. The mediator is the caregiver's FCI total score. (ii) Bootstrap standard errors reported in column (2) are based on resampling with 1000 replications. (iii) *** $p < 0.01$.

Table 4
Estimates of indirect effects of parental belief through different parental investments on cognitive development.

Indirect Effect	Point Estimate (1)	Bootstrap S. E. (2)	95% CI (Percentile) (3)	95% CI (BC) (4)	95% CI (BCa) (5)
Belief on cognition through source	0.002	0.002	(-0.001, 0.01)	(-0.001, 0.01)	(-0.001, 0.01)
Belief on cognition through variety	0.02 ***	0.006	(0.01, 0.03)	(0.01, 0.03)	(0.01, 0.03)
Belief on cognition through activity	0.01 **	0.006	(0.001, 0.02)	(0.001, 0.02)	(0.001, 0.03)
Belief on cognition through book	0.01 **	0.004	(0.001, 0.02)	(0.001, 0.02)	(0.001, 0.02)
Belief on cognition through magz	0.006 **	0.003	(0.002, 0.01)	(0.0001, 0.01)	(0.0001, 0.01)

Notes: (i) The dependent variable is the child’s cognitive score. The mediators are the FCI seven subscales: sources of play materials (source), varieties of play materials (variety), number of play activities (activity), household books (book), and magazines and newspapers (magz). Others are the same as Table 3. (ii) *** $p < 0.01$; ** $p < 0.05$.

indeed essential for the child development during early childhood, and builds stable foundations for the long-run development of both the individual and the country.

The findings indicate that the effects of caregiver’s parental belief on child’s cognitive, language, and motor development are fully mediated by parental investments, while the effect of caregiver’s parental belief on the child’s social-emotional development is partly mediated by parental investments. There are two possible reasons that might help to explain it. On the one hand, it is possibly because the child’s social-emotional development was assessed by a different method, and its score was higher than the other three developmental outcomes. To be more specific, the child’s social-emotional development was assessed by caregiver’s responses to the BSID-III social-emotional scale whose questions were adapted from the Greenspan Social-Emotional Growth Chart (Greenspan, 2004), while the other three developments were assessed by child’s successful completion of the tasks. On the other hand, the other possible reason is that, during early childhood, the child’s social-emotional development has greater malleability than other development outcomes (Bloom, 1964; Francesconi & Heckman, 2016). Child’s social-emotional development could be influenced by many aspects in the nurturing care, while the other three developments are mainly influenced by the parental investments in caregiver-child interaction (Francesconi & Heckman, 2016).

Then, the findings also indicate the mediator role of parental investments in the relationships between parental belief and early childhood developmental outcomes. The caregiver who has a stronger subjective belief on the interactive parenting practices would invest more in the child, which in turn, is accompanied by better child development. This is highly in line with the growing evidence about the importance of parental investments on early childhood development i.e., more parental investments are corresponding to better developmental outcomes of the child, including cognition, personality, and behaviors (Cunha et al., 2006; Francesconi & Heckman, 2016).

Moreover, the findings reveal the heterogeneous roles of different parental investments between parental beliefs and different developmental outcomes. For one thing, there are poor material investments like play materials in rural households, which is detrimental to child development (Wang & Zheng, 2019; Wang & Yue, 2019). The findings show that the caregiver with stronger parental belief, however, tends to provide more varieties of play materials to the child, which in turn

benefits the child in all of four early developmental outcomes. Sources of play materials, however, do not have significant mediation effects on the child’s developmental outcomes. Hence, the sources where play materials come from would not exhibit significant difference for child development. This is consistent with Hamadani et al. (2010), which found that the relationships between sources of play materials and child development are also not statistically significant in Bangladesh.

For another thing, in addition to material investments, existing studies in both developed contexts like the UK (Del Bono et al., 2016) and Australia (Fiorini & Keane, 2014), and developing contexts like rural China (Luo et al., 2017; Yue et al., 2017, 2019), have all documented that time investments in the caregiver-child interactions at the early stage could bring high returns to cognitive development of the child. The findings show that the caregiver with a stronger parental belief is likely to engage in more play activities, which are significantly associated with the improvement of the child’s development in language, motor, and social-emotion, besides cognitive development. The findings add to the emerging literature about the key roles of play-based learning for the early child development (Synodi, 2010).

Finally, the findings show the heterogeneity in mediation effects of parental investments across maternal migration. For households with mother as the child’s primary caregiver, parental investments strongly mediate in the relationships between parental belief and early child development, while for households without mother as caregiver, the mediation effects of parental investments are weaker. This is in line with the existing findings that maternal migration could be detrimental to parental investments in the households, which in turn would hinder rural children’s development outcomes (Yue et al., 2020; Zhong et al., 2020b).

Although the key findings of this study are informative, it still faces a few limitations. In terms of the study sample, the sample households were selected from only one rural area located in western China, so the findings might not be simply generalized in other contexts. In addition, the estimates based on the mediation model do not necessarily state the causality between the caregiver’s parental belief, parental investments, and the child’s early developmental outcomes, although they are indeed helpful to understand the interrelationships.

Table 5
Estimates of indirect effects of parental belief through different parental investments on language development.

Indirect effect	Point estimate (1)	Bootstrap S. E. (2)	95% CI (Percentile) (3)	95% CI (BC) (4)	95% CI (BCa) (5)
Belief on language through source	0.002	0.002	(-0.001, 0.005)	(-0.001, 0.005)	(-0.001, 0.005)
Belief on language through variety	0.02 ***	0.005	(0.01, 0.03)	(0.01, 0.03)	(0.01, 0.03)
Belief on language through activity	0.02 ***	0.007	(0.01, 0.03)	(0.01, 0.03)	(0.01, 0.03)
Belief on language through book	0.005	0.003	(-0.002, 0.01)	(-0.002, 0.01)	(-0.002, 0.01)
Belief on language through magz	0.005 **	0.002	(0.001, 0.01)	(0.001, 0.01)	(0.001, 0.01)

Notes: (i) The dependent variable is the child’s language score. Others are the same as Table 4. (ii) *** $p < 0.01$; ** $p < 0.05$.

Table 6
Estimates of indirect effects of parental belief through different parental investments on motor development.

Indirect Effect	Point Estimate (1)	Bootstrap S. E. (2)	95% CI (Percentile) (3)	95% CI (BC) (4)	95% CI (BCa) (5)
Belief on motor through source	0.002	0.002	(-0.001, 0.01)	(-0.001, 0.01)	(-0.001, 0.01)
Belief on motor through variety	0.02 ***	0.004	(0.01, 0.03)	(0.01, 0.03)	(0.01, 0.03)
Belief on motor through activity	0.02 ***	0.006	(0.01, 0.03)	(0.01, 0.03)	(0.01, 0.03)
Belief on motor through book	0.008 ***	0.003	(0.003, 0.02)	(0.003, 0.02)	(0.003, 0.02)
Belief on motor through magz	0.004 **	0.002	(0.001, 0.01)	(0.001, 0.01)	(0.001, 0.01)

Notes: (i) The dependent variable is the child’s motor score. Others are the same as Table 4. (ii) *** $p < 0.01$; ** $p < 0.05$.

Table 7
Estimates of indirect effects of parental belief through different parental investments on social-emotional development.

Indirect effect	Point estimate (1)	Bootstrap S. E. (2)	95% CI (Percentile) (3)	95% CI (BC) (4)	95% CI (BCa) (5)
Belief on social-emotion through source	0.002	0.002	(-0.001, 0.005)	(-0.001, 0.005)	(-0.001, 0.005)
Belief on social-emotion through variety	0.02 ***	0.005	(0.01, 0.03)	(0.01, 0.03)	(0.01, 0.03)
Belief on social-emotion through activity	0.03 ***	0.007	(0.01, 0.04)	(0.02, 0.04)	(0.02, 0.04)
Belief on social-emotion through book	0.01 ***	0.003	(0.003, 0.02)	(0.004, 0.02)	(0.004, 0.02)
Belief on social-emotion through magz	0.003	0.002	(-0.001, 0.01)	(-0.001, 0.001)	(-0.001, 0.001)

Notes: (i) The dependent variable is the child’s social-emotional score. Others are the same as Table 4. (ii) *** $p < 0.01$.

5. Conclusion

In summary, this paper demonstrated that the caregiver’s parental investments strongly mediate in the link between the caregiver’s parental belief and the child’s early developmental outcomes in rural households of western China. The findings have important policy implications to utilize the mediation effect of parental investments on the relationship between parental belief and children development. For the households with low level of parental investments, early interventions aimed at strengthening the caregiver’s subjective belief on parenting practices could be necessary and effective to increase the parental investments in the households, such as variety of play materials and number of play activities, which in turn could further foster early child development in rural China.

CRedit authorship contribution statement

Jingdong Zhong: Methodology, Formal analysis, Writing - original draft, Writing - review & editing. **Jingjing Gao:** Project administration, Supervision, Validation. **Tianyi Wang:** Visualization, Writing - review

& editing. **Yang He:** Software, Methodology. **Chengfang Liu:** Funding acquisition, Writing - review & editing. **Renfu Luo:** Conceptualization, Writing - review & editing, Investigation, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Table 8
Estimates of the indirect effects of parental belief on developmental outcomes through parental investments across maternal migration.

Indirect Effect	Point Estimate (1)	Bootstrap S. E. (2)	95% CI (Percentile) (3)	95% CI (BC) (4)	95% CI (BCa) (5)
Panel A. Belief on cognition through investment					
Mother is the child’s primary caregiver	0.03 ***	0.009	(0.01, 0.05)	(0.01, 0.05)	(0.01, 0.05)
Mother is not the child’s primary caregiver	0.02 **	0.01	(0.004, 0.04)	(0.008, 0.05)	(0.009, 0.05)
Panel B. Belief on language through investment					
Mother is the child’s primary caregiver	0.03 ***	0.01	(0.008, 0.05)	(0.01, 0.05)	(0.01, 0.05)
Mother is not the child’s primary caregiver	0.02 ***	0.006	(0.007, 0.03)	(0.008, 0.03)	(0.008, 0.03)
Panel C. Belief on motor through investment					
Mother is the child’s primary caregiver	0.04 ***	0.008	(0.02, 0.05)	(0.02, 0.06)	(0.03, 0.06)
Mother is not the child’s primary caregiver	0.01	0.009	(-0.004, 0.03)	(-0.003, 0.03)	(-0.003, 0.03)
Panel D. Belief on social-emotion through investment					
Mother is the child’s primary caregiver	0.04 ***	0.008	(0.02, 0.05)	(0.02, 0.05)	(0.02, 0.06)
Mother is not the child’s primary caregiver	0.02 *	0.009	(-0.002, 0.03)	(0.001, 0.03)	(0.003, 0.04)

Notes: (i) The dependent variables are the child’s four developmental scores. The independent variable is the caregiver’s parental belief score. The mediator is the caregiver’s FCI total score. (ii) Bootstrap standard errors reported in column (2) are based on resampling with 1000 replications. (iii) *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table A1
Family Care Indicators (FCI).

Subscale	
Sources of play materials	
1. Home-made toys.	
2. Household objects.	
3. Things from outside.	
4. Toys bought from store.	
Varieties of play materials	
5. Things which make/play music.	
6. Things for drawing/writing.	
7. Picture books (not school-books).	
8. Things meant for stacking, constructing, building (blocks).	
9. Things for moving around (balls, bats, etc.).	
10. Toys for learning shapes and colors.	
11. Things for pretending (dolls, tea-set, etc.).	
Play activities	
12. Read books or look at picture-books with child.	
13. Tell stories to child.	
14. Sing songs with child.	
15. Take child outside home place.	
16. Play with the child with toys.	
17. Spend time with child in naming things, counting, drawing.	
Household books	
18. Number of books in the home, excluding picture books for children.	
Magazines and newspapers	
19. Number of magazines and newspapers in the home.	
Cronbach's Alpha for the whole instrument	0.75

Appendix

A. 1: Family Care Indicators (FCI)

See Table A1

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.childyouth.2020.105423>.

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