Relationship between Poor Family Environment and Early Childhood Development in Rural Areas and Recommendations

Tianyi WANG[1,2]*

1. Institute of Geographic Sciences and Resources, Chinese Academy of Sciences, Beijing 100101, China; 2. University of Chinese Academy of Sciences, Beijing 100049, China

Abstract In order to provide a policy basis for improving the early development of poor rural children, this paper uses quantitative data and quantitative research methods to study the early development of children in poor rural areas and the impact of family environmental quality on such development. The results show that the early development of poor rural children, especially the ability of social emotion is not perfect, and the quality of family environment has a significant impact on the early development of poor rural children. Therefore, in order to improve the early development of rural children, it is necessary to attach importance to the improvement of family environment and increase the interaction with children. The government needs to establish and improve the mechanism of providing early development services, increase investment and find more efficient service model.

Key words Poor rural areas, Family environment, Children, Early development

1 Introduction

The first five years of human life are a very important stage of development. During these five years, individual innate inheritance and acquired environmental factors interact to shape the structure and function of the brain through the processes of neuronogenesis, axon and dendritic growth, synaptic formation and pruning, myelin sheath and glial cell formation, *etc.*[1]. This stage lays the foundation for the later academic and social performance, economic productivity and social contribution of individuals[2]. More and more economists and psychologists begin to pay attention to the influencing factors of early childhood development. They find that family is the main place of early childhood, and its environmental quality plays an important role in the development of early childhood abilities, such as language and sports ability[3-4]. Many studies have shown that the stimulation of family environment, including parenting behavior, has a significant impact on the early development of children[5-6]. The main provider of the family environment is the parent-dominated caretaker, whose basic objective of parenting is to promote the healthy development of the child[7]. Therefore, in addition to guaranteeing the survival of children, it is also necessary to educate children, such as reading with children, telling stories and singing songs to children. These parenting activities can promote the development of children's early cognitive, linguistic and socio-emotional abilities[7-8]. "Early intervention" refers to a series of stimulating and training activities for all types of infants and young children[9]. International experience shows that interventions in early childhood have a significant positive impact on their development[10]. Some existing researches on the environmental quality of poor rural families in China show that there is still a big gap between rural children and urban children, which is mainly embodied in the aspects of material environment, cognitive environment, emotional environment and social environment[11]. There are also some studies focusing on the early development of poor rural children, and it is found that the early capacity development of poor rural children in China is not rosy[12] and compared with the urban peers there is a large gap[13]. However, there are few studies on the impact of the environmental quality of poor rural families on the early development of children in China, even less on the use of quantitative data and quantitative analysis. Therefore, the purpose of this study is to use quantitative analysis methods such as econometric model to study the impact of environmental quality of poor rural families on early childhood development.

2 Data sources and objects of study

Zhanyi County and Laishui County were selected as the sample counties in Qujing City of Yunnan Province and Baoding City of Hebei Province, respectively. The method of random sampling was used to select one township in two sample counties, respectively. In September 2015, all 6 - 18 months old children in the sample towns became the sample children in the base period of the survey. The research group made a follow-up survey on all sample children in September - October of the following year (2016). The training included the introduction of the study, the law of early childhood development, the scale and questionnaire used in the study, and how to communicate with the babies and caregivers of the sample families. Before each survey, researchers need to take part in a week of theoretical training and field research. In the 2015 base survey, the research group collected a wealth of information. The main information related to this study is as follows: the information of birth date, birth weight and so on obtained from

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* Corresponding author. E-mail: wangty3426@163.com

birth certificate; the information of sample child's birth order, sample child's mother and family economy collected by structured questionnaire; the information of early childhood capacity development collected by Ages & Stages Questionnaires: Social Emotional (ASQ:SE). In the 2016 follow-up survey, in addition to re-gathering basic information on children, their mothers and their families and early childhood capacity development information, Family Care Indicators (FCI) was also used to gather information on the quality of family upbringing. The number of children in the two surveys was 390, and there was missing information about the survey of 5 children and their families, so the number of children in the effective samples was 385. Among the effective samples of children, 174 (45.19%) were from Yunnan Province and 211 (54.81%) from Hebei Province.

The basic information of the valid sample children in the base period (sex, age, birth order, low birth weight), the basic information of the mother (age, education and whether to care for children at home) and the financial situation of the family (whether it is low-income family or not) are shown in Table 1. For the sample children, the proportion of males (51.43%) was slightly larger than that of females (48.57%), the proportion of the first child was about 40% (40.78%), and the proportion of the low birth weight children was about 6% (5.97%); about 70% of the children were taken care of by their mothers at home (76.10%); most of the children had less than 9 years of education (73.25%), and the majority of the children were aged 25 years and above (77.66%); 11.95% of the sample children lived in the rural low-income families.

Table 1 Statistics of basic information for children

	Children's basic personal information										Mothers and family economy							
	Sex		Age months		Birth order		Low birth weight		Ethnic minority		Whether mothers at home or not		Education level of mothers//years		Age of mothers years		Low-income families	
	Male	Female	<12	≥12	1	≥2	Yes	No	Yes	No	Yes	No	<9	≥9	<25	≥25	Yes	No
Number of people	198	187	170	215	157	228	23	362	101	284	293	92	282	103	86	299	46	339
Percentage//%	51.43	48.57	44.16	55.84	40.78	59.22	5.97	94.03	73.77	26.23	76.10	23.90	73.25	26.75	22.34	77.66	11.95	88.05

Data source: author survey.

3 Research methods and tools

The study uses the Chinese version of the third edition of Ages & Stages Questionnaires (ASQ) and the Chinese version of Ages & Stages Questionnaires: Social-Emotional (ASQ: SE) to obtain the early development information of the sample children. The Chinese version of the third edition of Ages & Stages Questionnaires (ASQ) divides the early childhood development into five functional areas: communication, fine motor, gross motor, problem-solving, personal-social. Each functional area includes six items to describe the early childhood development. Three options are provided for each test item, wherein the option "yes" indicates that the child is able to perform the behavior described in this item regularly or skillfully; the option "sometimes yes" indicates that the child sometimes can complete or has just completed the behavior described in this item, but it is not yet proficient; the option "no" indicates that the child is not yet able to complete the behavior described in this item. For each test item, we select "yes" to score 10 points, "sometimes yes" to score 5 points, and "no" to score 0 point. The sum of 6 item scores is the corresponding module score, and the module scores is the total ASQ scores.

ASQ: SE is a monitoring and screening scale for 3 – 66 months old children's social-emotional development, which is used in conjunction with the third edition of ASQ. The number and content of social-emotional scales for children of different age groups are not the same. Each test item has three options, "yes in most of the time", "sometimes yes" and "little or no", assigned a value of 0, 5, 10 respectively. The caregivers answer questions according to the matching between description of the behavior and the child's current performance; on the basis of feedback from the caregivers, they are asked if the situation of the children is worrying, and if the caregiver thinks it is "worrying", additional 5 points will be assigned. The scores of all the test items are summed up to get the total score of social-emotional scale, and the higher score represents more difficulties and risks faced by the sample children in developing their social-emotional ability.

In this study, FCI (Family Care Indicators) is used to collect the information on the quality of family environment. Information on the family environment is collected through the Family Care Indicators (FCI). The FCI is a survey-based household environmental quality indicator for children developed by UNICEF experts. It consists of 21 items and 5 modules: the number of books read by adults in the home (1 item); the number of magazines or newspapers in the home (1 item); the toy categoly (7 items); the source of toys (4 items); the play activities (6 items). Among them, there are seven kinds of toys: musical toys; painting and writing toys; picture book (not textbook) toys; construction toys (such as building blocks); toys that can roll around (such as balls); toys that distinguish shapes and colors and toys for playing roles (such as over-the-counter, puppets and hand dolls). There are four sources of toys: home items; outdoor items; toys purchased; home-made toys. FCI has a score for each module, and the respective scoring criteria are as follows: If the family does not have an adult-read book, the "books for adults in the family" module scores 1, if the number of books for adults in the family is 1 – 2, then the module of "books for adults in the family" gets 2 points, if the number of books for adults in the family is 3 – 5, then the module of "books for adults in the family" gets 3 points, if the number of books for adults in the family is 6 or more, then the module of "books for adults in the family" gets 4 points; if there are no magazines or newspapers at home, then the module of "magazine or newspaper in the family" scores one point, if there are 1 – 2 kinds of magazines or newspapers in the family, the mod-

ule of "magazine or newspaper in the family" scores 2 points, if there are 3 – 5 kinds of magazines or newspapers in the family, the module of "magazine or newspaper in the family" scores 3 points, if there are 6 kinds of magazines or newspapers or more in the family, the module of "magazine or newspaper in the family" scores 4 points; if there are items described in the home toy category, the item scores 1, if not, the item is assigned 0, and the scores of toy category-related items are summed up to get the score of "toy category" module; if the family has a toy source in the description of the item, the item gets a score of 1, if not, the item is assigned a score of 0, and the scores of toy source-related items are summed up to get the score of "toy source" module; if the keeper took the game activities described in the items in the past three days, the corresponding item gets a score of 1, if not, it gets a score of 0, and the scores of game activity-related item are summed up to get the score of the "game activities" module. The scores of all modules are summed up and the total scores of the household upbringing environment survey are obtained. The higher the score of each module, the better the quality of the family environment corresponding to the module; similarly, the higher the total score, the better the quality of the child's family environment.

Survey and test data are entered by professional data companies. Stata 14.0 is used to analyze the data. The metrological data are expressed as mean ± standard deviation ($\bar{x} \pm s$), and the differences of early ability development scores of children with different characteristics are compared by single factor analysis. Counting data are represented by the numbers and the percentage [N (%)], and the comparison between groups is made by *T*-test method. Multivariate linear regression model is used to analyze the influencing factors of early childhood development. *P* value less than 0.05 means statistically significant.

4 Results and analysis

Table 2 shows the Ages & Stages Questionnaires and age and developmental process of the sample children: as for the scores of the social-emotional questionnaire, the scores of communication, fine motor, gross motor, problem solving, personal social of the sample children in 2015 and 2016 were significantly different; the communication score, fine motor score and gross motor score in 2016 were significantly higher than those in 2015, indicating that the development of communication and exercise ability of the sample children in 2016 was significantly better than that in 2015, but their social-emotional scores in 2016 were also significantly higher than that in 2015, indicating that the social-emotional problems of the sample children increased significantly with the increase of the age of the sample children.

Table 2 Early development score of the sample children

	2015 (mean ± standard deviation)	2016 (mean ± standard deviation)	*T* test results (*P* value)
Communication	40.22 ± 13.54	49.50 ± 11.97	0.00
Fine exercise	45.71 ± 12.99	47.90 ± 12.22	0.01
Coarse exercise	47.31 ± 14.26	51.51 ± 9.22	0.00
Problem-solving	45.91 ± 13.23	46.10 ± 11.16	0.81
Individual-society	44.10 ± 12.36	45.08 ± 10.36	0.19
Social-emotion	39.85 ± 25.16	58.07 ± 37.54	0.00

Note: $P < 0.05$ means statistically significant; data are from author survey.

Table 3 shows the results of the sample children's family environment survey (FCI). It can be seen that the category of toys and the source of toys of the sample children have high scores, but the score of children's play activities that the caregivers take part in is low, and there are few books read by the parents and magazines or newspapers in the family, which leads to low FCI scores, that is to say, there are some problems in the environmental quality of the sample children's family.

Table 3 FCI (Family Care Indicators) scores for the sample children

	Mean ± standard deviation	Scoring rate (%) [100 × average/full score]
Total score of FCI scale	15.51 ± 4.58	62.04
books for adults in the family	2.17 ± 1.25	54.25
Family-owned magazines or newspapers	1.64 ± 1.04	41.00
Type of toys	2.87 ± 0.96	75.00
Source of toys	5.19 ± 1.71	74.14
Game activity	3.62 ± 1.78	60.33

Data source: author survey.

In this study, multiple regression analysis is used to exclude the impact of personal characteristics, maternal characteristics and family economy, and to systematically assess the impact of family environmental quality on early childhood capacity development. The multivariate regression analysis model is constructed as follows:

$$Outcome_{2016i} = | + Outcome_{2015i} + \beta | Score_i + \Upsilon | X_i + \varepsilon_i$$

In the model, the dependent variable $Outcome_{2016i}$ is the ASQ and ASQ: SE evaluation score for the sample children in 2016. Since the early development of children's ability is an accumulative process, the early development of ability is the prerequisite and basis of the later growth of ability, the evaluation scores of children's corresponding ability development in 2015 ($Outcome_{2015i}$) are controlled in the multivariate regression analysis model. The most important independent variable in this study is

FCI score ($Score_i$), and the empirical analysis model controls the basic characteristics of the sample children, mothers and families, as well as the provincial dummy variables (X_i).

Multivariate regression analysis shows that the quality of family environment has a significant impact on early childhood development (Table 4). The better the family environment, the better the development of communication, fine exercise, coarse exercise, problem-solving and individual-society ability of children, the less the social problems in social-emotional aspects. In addition, the regression results show that the 2015 competency scores have a significant positive impact on 2016 scores, validating the conclusion that early childhood development is an accumulative process. There are some regional differences in early childhood development. The children's coarse exercise, problem-solving and social-emotional ability development in Hebei Province is better than that of children in Yunnan Province. The older children have better communication skills, but at the same time they face greater risks in developing problem-solving abilities; the communication and social-emotional development of female children is better than that of male children. The risk of early development is greater for the sample children who is the first one to be born or is light during birth. Interestingly, the communication ability of minority sample children is stronger than that of Han sample children. The regression results also show that there is no significant correlation between the basic status of mothers or the economic status of the family and the early childhood development.

Table 4 The impact of family environment on early childhood development

Variables	Communication	Fine exercise	Coarse exercise	Problem-solving	Individual-society	Social-emotional situation
FCI questionnaire score	0.59***	0.78***	0.48***	0.82***	0.76***	−0.98**
	(0.147)	(0.158)	(0.094)	(0.108)	(0.137)	(0.384)
Corresponding capacity score in 2015	0.16***	0.05	0.07*	0.09**	0.13***	0.33**
	(0.037)	(0.041)	(0.032)	(0.032)	(0.038)	(0.088)
Provinces (Hebei Province = 1)	−1.69	2.03	3.37*	4.14**	−1.94	−13.62**
	(1.275)	(1.333)	(1.375)	(1.348)	(1.656)	(5.040)
Age (month)	0.99***	−0.31	−0.05	−0.62***	0.08	1.11
	(0.170)	(0.192)	(0.139)	(0.158)	(0.163)	(0.554)
Sex (female = 1)	2.41	0.74	−0.64	0.24	0.99	−7.37*
	(1.205)	(1.106)	(0.906)	(0.908)	(0.974)	(3.553)
Low weight (yes = 1)	0.56	−6.05**	1.30	2.11	1.44	−8.29
	(2.042)	(2.086)	(2.204)	(1.833)	(2.322)	(7.124)
Birth order (first child = 1)	1.43	−0.57	−0.34	−4.16***	−2.18*	7.23
	(1.019)	(1.424)	(1.242)	(1.029)	(1.082)	(4.052)
Minorities (yes = 1)	3.56**	1.52	−0.06	0.11	0.23	−4.75
	(1.030)	(1.153)	(1.060)	(1.392)	(1.193)	(4.857
Mother's years of education	1.11	1.34	−0.27	0.63	−0.94	−0.52
	(1.492)	(1.098)	(0.831)	(0.856)	(1.058)	(4.409)
Mother's age (years)	−0.02	1.23	0.07	−1.85	−0.99	−0.83
	(1.397)	(1.639)	(1.476)	(1.210)	(1.274)	(5.202)
Mothers at home (yes = 1)	1.67	0.50	−1.02	−2.59*	−1.01	1.14
	(1.427)	(1.329)	(1.134)	(1.158)	(1.040)	(4.714)
Low-income families (yes = 1)	0.43	−0.63	0.45	−2.76	0.36	10.70
	(1.754)	(1.864)	(1.351)	(1.590)	(1.214)	(6.860)
Intercept	5.93	38.38***	41.42***	47.22***	28.68***	41.23***
	(5.155)	(4.057)	(3.586)	(3.025)	(4.240)	(13.860)
R^2	0.238	0.157	0.132	0.226	0.147	0.170

Note: Regression coefficient is reported, * means $P<0.1$, ** means $P<0.05$, *** means $P<0.01$; the standard deviation is in brackets; data are from author survey.

5 Conclusions and recommendations

5.1 Conclusions Based on the survey data of poor rural areas in Yunnan and Hebei provinces, the factors affecting the early development of rural children are studied, focusing on the environmental quality of poor rural families and its impact on the early development of children. The environmental quality of the poor rural sample families is not high. Although the sample children have more kinds of toys and toy sources, the number of books, newspapers or magazines read by the adults in the family is relatively small, and they are less involved in children's games in the process of raising children. The quality of family environment is significantly correlated with the development of children's communication, fine exercise, coarse exercise, problem-solving, individual-society and social-emotional abilities, which indicates that improving the quality of family environment can promote the development of children's abilities. The study also finds that low birth weight and first birth are also risk factors for capacity development in children.

5.2 Recommendations Based on the above research results, in order to effectively promote the early development of poor rural children, and improve the quality of human capital in rural areas,

the following recommendations are put forward:

(i) Paying attention to the rural children's family rearing environment, and improving the quality of family rearing environment. The children aged 0 – 3 are mainly cared for by their parents, and the main place to live is the home. Moreover, there are some problems in the rural family's raising environment, such as the low degree of caregivers' participation, ignoring the education of the children. It is necessary to make the rural caretakers realize their importance to the early development of the children through publicity and guidance, and increase their participation in the development of the children: to accompany the children to play more games, tell stories to the children, read and draw books and so on. (ii) Improving early childhood development services in rural areas. At present, there are no special institutions and departments responsible for the provision of early childhood development services in rural areas. However, the situation of early childhood development in rural areas and the growing gap between urban and rural education urgently require the provision of early childhood development services in rural areas. It is necessary to mobilize social forces for the active participation and gradually integrate rural early childhood development services into the provision of rural basic public services. Where conditions permit, early childhood development services should be provided either through the establishment of early childhood development activity centers or through home entry guidance to offset the negative impact of low quality family rearing environments on early childhood development. (iii) Increasing investment in early childhood development studies. Scientific measures can promote early childhood development with half the effort, so it is necessary to increase investment and construct a scientific and effective model of providing early childhood development services.

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(From page 95)

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