



## Original Article

## Resource and extrinsic risk in defining fast life histories of rural Chinese left-behind children

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## ABSTRACT

Food and safety are essential for survival and their environmental constraints, levels and variations of resources and extrinsic risks shape life history (LH) trade-off strategies. Based on a longitudinal sample of 206 Chinese adolescents living in rural areas, half of whom were children living with older relatives away from their migrant worker parents, this study is one of the first to test how both resources and extrinsic risks effect LH strategies. Structural equation modeling and other correlational results showed that the environmental constraints of safety and food were negatively and positively, respectively, associated with slow LH strategy, which in turn was negatively associated with pubertal status as well as such behavioral outcomes as present orientation, impulsivity, risky and externalizing behavior, and academic underperformance. The puberty-inducing effects of paternal and biparental absence were also observed. These results support the evolutionary conception that human development responds to environmental cues about resources and extrinsic risks in regulating LH and behavior.

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## 1. Introduction

Food and safety are essential for survival. Their acquisitions are constrained by the environment resulting in different levels and fluctuations of resources and different rates and stochastic variations of extrinsic risks, all of which shape birth rates and death rates (Brown & Sibly, 2006) and life history (LH) trade-off strategies (Ellis, Figueredo, Brumbach, & Schlomer, 2009). These two sets of environmental conditions that drive intraspecific (e.g., Lucas, 2001) and interspecific (e.g., Sibly & Brown, 2007; Wilbur, Tinkle, & Collins, 1974) differences in LH have been extensively studied in other animals. However, human LH studies have focused only on one environmental condition, partly because the relatively uniform modern day living environment limits sufficient variation in food and resources, especially at the survival threshold level (Chang & Lu, 2017). The present study employed a special population, namely “left-behind” children in rural China, to expand the variations of resources and extrinsic risk and investigate their effects on human LH and development.

China has nine million left-behind children, referring to those who have remained in their rural hometowns after both parents have moved to cities to seek employment as migrant workers (Ministry of Civil Affairs of China, 2016). Such children do not always live with their parents from as early as their birth and for as long as their entire

childhoods (National Women's Confederation, 2013). During the long period of parental absence, they live with older relatives such as grandparents and often change residence to live with different family members. Such children usually come from the poorest rural regions in China, which have high population densities and few economic opportunities. However, these rural regions tend to have strong traditional values, few sociocultural changes, and relatively stable family structures. In this wider context of high sociocultural stability and few economic resources, left-behind children are provided with windfalls of abundant resources as a result of the higher city wages remitted by their migrant parents, while facing the disruption of family stability by becoming parentless. A comparison of left-behind children with those who live with both parents and with limited economic means but high family stability provides a wide range of environmental conditions to examine the LH of these children as functions of resources and extrinsic risk.

## 1.1. Human LH research and the missing link

Conventional LH models of organism development incorporate two sets of environmental conditions to predict a fast versus slow LH trade-off strategy and related physiological and psychological outcomes (Sibly & Brown, 2007). One set comprises resource levels and fluctuations, which are density dependent as defined by the r-K selection theory (Ellis et al., 2009; MacArthur & Wilson, 1967; Pianka, 1970; Reznick, Bryant, & Bashey, 2002; Rushton, 1985). The other set comprises the rates and stochastic variations of extrinsic risks such as predation,

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disease, and intraspecific violence, all of which cause mortality and morbidity independently of individuals' survival efforts (Ellis et al., 2009). These effects are age-specific and are derived from the fast–slow LH framework (Ellis et al., 2009; Promislow & Harvey, 1990; Stearns, 1992). When resources are sufficient for supporting organisms living in a specific habitat or when they fluctuate under good and bad conditions, species under good conditions tend to freely exploit these rich resources for rapid development and early reproduction to produce many offspring, who subsequently receive little parental investment in terms of teaching and learning because they can survive and thrive in a resource-rich, competition-free environment (MacArthur & Wilson, 1967; Pianka, 1970). When the high reproductive rate increases the population density to the point that resources become limited, a species adopts a slow LH strategy, which involves shifting energetic investment from mating and offspring quantity to nurturing select high-quality young, who adopt slower development to learn the skills required to compete for the limited resources. Similarly, high frequencies and variations of extrinsic causes of mortality and morbidity that are insensitive to the survival efforts of adults or children lead to the adoption of fast LH because natural selection favors accelerated development and reproduction before extrinsic mortality or morbidity occurs (Promislow & Harvey, 1990; Stearns, 1992).

As shown in numerous investigations involving human LH studies (e.g., Doom, Vanzomeren-Dohm, & Simpson, 2016), the contingent coupling of environmental conditions with fast–slow LH trade-off strategies that has been selected during evolution continues to regulate individuals' responses to their current environments (Pepper & Nettle, 2017). The early childhood environment is especially salient in effecting fast–slow LH strategies. Existing human LH studies have focused exclusively on the extrinsic risk dimension of the childhood environment, which is represented by microenvironmental proxies such as low family socioeconomic status (SES) (Belsky, Steinberg, & Draper, 1991), residential mobility (Crowder & Teachman, 2004), homelessness (Herbers et al., 2012), shorter life expectancy (Low, Hazel, Parker, & Welch, 2008), and paternal absence (Belsky et al., 1991). These indicators of early environmental risks have been associated with such fast LH characteristics as early menarche (Belsky et al., 1991), early commencement (Simpson, Griskevicius, Kuo, Sung, & Collins, 2012) and high frequency (Baumer & South, 2001) of sexual activity, social deviance and substance use (Brumbach, Figueredo, & Ellis, 2009; Gibbons et al., 2012), aggression and externalizing behavior (Doom et al., 2016; Simpson et al., 2012), and academic underperformance (Obradović et al., 2009). In particular, paternal absence has been extensively documented as a facilitator of early menarche (Ellis, 2004) and other fast LH manifestations such as problematic behavior (Ellis et al., 2003; Newcomber & Udry, 1987). According to our review of the relevant literature on paternal absence, no study has systematically examined the effects of paternal, maternal, and biparental absence on both girls and boys.

The other environmental condition, resource, has not been empirically investigated in the literature on human LH (Chang & Lu, 2017). A few studies have used childhood family SES to represent resource availability; however, from a conceptual perspective, they have mistakenly associated resource scarcity with fast rather than slow LH (e.g., Griskevicius, Delton, Robertson, & Tybur, 2011). Most other related studies have examined family SES not as an indicator of resource availability but as one of the potential for extrinsic risks and mortality and morbidity threats (e.g., Belsky, Schlomer, & Ellis, 2012; Doom et al., 2016; Ellis et al., 2009; Simpson et al., 2012). This is because most studies have been conducted in urban and metropolitan areas, where family SES represents neighborhood conditions, with low SES associated with drugs, crime, and violence, all of which indicate mortality and morbidity (Pepper & Nettle, 2017). As an indicator of mortality and morbidity, low SES in these studies correlated with fast LH manifestations (Pepper & Nettle, 2017) but not slow LH manifestations, as would be predicted by the resource dimension of an environment. SES did not register the resource-predicted effect largely because, in most of existing studies

conducted in resource-rich developed societies, SES variations have mainly occurred in the upper income levels far above the resource-depleting threshold that predicts slow LH (Pianka, 1970; Reznick et al., 2002).

## 1.2. Present study

In contrast to the findings of previous studies, SES variations in rural China occur mostly at lower economic levels that should provide the necessary range for predicting the fast–slow LH continuum. In rural parts of China that are much smaller in size and more uniform in infrastructure and safety than are the metropolises, SES is unlikely to be confounded by crime or the extent of rundown infrastructure reported in metropolitan areas. The present study investigated family income as an indicator of the resource dimension of the environment and parental absence as an indicator of the extrinsic risk dimension of the environment in effecting LH strategies and related behavioral outcomes. We also examined the rationale that a combination of higher income, indicating sudden resource abundance, and parental absence, indicating extrinsic risk and unpredictability, sets left-behind children on a fast LH track. The investigations were conducted by testing a model with resource availability and extrinsic risk as two latent constructs associated with the fast LH strategy, which was associated with pubertal status and a latent composite consisting of such fast LH manifestations as present orientation, impulsivity, risky and externalizing behavior, and poor academic performance. By conducting tests on a longitudinal sample of rural Chinese children, half of which were left-behind, we hypothesized that compared with children living in the same village with both parents present, left-behind children not living with either parent exhibited fast LH characteristics of these outcome measures and the early onset of puberty.

## 2. Method

### 2.1. Sample and data collection procedure

A community sample was taken from a randomly selected rural county in Henan Province, which registers the highest number of left-behind children (National Women's Confederation Study Group, 2013), the highest population density (National Bureau of Statistics, 2016), one of the lowest per capita incomes (National Bureau of Statistics, 2016), and the highest number of high school graduates (China Educational News Website, 2016) and among the lowest divorce rates in China (Su, Liu, & Peng, 2015). Based on power analysis, we targeted 100 left-behind children and 100 non-left-behind children. Left-behind children were defined as those whose parents had been repeatedly absent for at least 6 months per absence for 3 years or longer at the time of the first data collection (Time 1), and non-left-behind children were those who had not been apart from either parent for >6 months at a time. The sample obtained in Time 1 contained 109 left-behind (69 male) and 105 non-left-behind (59 male) children, and equal numbers of parent and nonparent guardians. The average ages of the left-behind and non-left-behind children were 10.78 (standard deviation (*SD*) = 0.74) and 10.69 (*SD* = 0.85), respectively, and those of the guardians were 55.89 (*SD* = 11.29) for left-behind and 44.18 (*SD* = 10.71) for non-left-behind children. The second data collection (Time 2) was conducted 18 months later, when the sample contained 103 (67 male) left-behind and 100 (54 male) non-left-behind children and their guardians. In Time 2, we obtained child behavioral and academic performance measures from the children and their homeroom teachers. The measures discussed below were obtained from the children, their guardians, and their homeroom teachers. For the children and guardians, the Time 1 measures were collected through face-to-face interviews conducted individually between the participants and same-sex interviewers. These were structured interviews where the interviewer helped the participant read the questions

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