



Infant temperamental reactivity, maternal and grandparental sensitivity: Differential susceptibility for behavior problems in China



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ARTICLE INFO

Article history:

Received 29 January 2016

Received in revised form 16 August 2016

Accepted 28 August 2016

Keywords:

Maternal sensitivity
Grandparental sensitivity
Grandmaternal sensitivity
Temperamental reactivity
Behavior problems
Differential susceptibility

ABSTRACT

Background: The differential susceptibility hypothesis suggests that children's innate characteristics and their rearing experiences interact differentially during development. Recently, the study of interactions between infants' temperament and rearing experiences has become a research hotspot. In China, grandparental care is a very common phenomenon, with many infants taken care of by grandparents while mothers are out for work. **Aim:** To investigate whether the associations between maternal and grandmaternal sensitivity, and behavior problems were moderated by infant temperamental reactivity, while the infants were raised by both their mothers and grandmothers.

Subjects: A total of 71 infants (average age of 17.6 months), their mothers and grandmothers were included in this study.

Outcome measures: Maternal sensitivity and grandmaternal sensitivity were assessed with the Maternal Behavior Q-sort-Chinese Version, infants' temperamental reactivity was measured with Carey's Toddler Temperament Questionnaire-Chinese Revision, and infants' behavior problems were measured with the Infant-Toddler Social and Emotional Assessment-Chinese Version.

Results: Maternal sensitivity significantly predicted infants' impulsivity and aggression. Infants' temperamental reactivity moderated the effect of maternal sensitivity on infants' general anxiety. In addition, infant temperamental reactivity moderated the impact of grandmaternal sensitivity on infants' separation distress.

Conclusions: Our results support the differential susceptibility hypothesis to some extent. Infants with high temperamental reactivity not only suffer more from low maternal and grandmaternal sensitivity, but also benefit more from high maternal and grandmaternal sensitivity as compared to those infants with low temperamental reactivity.

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1. Introduction

Externalizing and internalizing behavior problems may co-occur during early childhood, and these problems are moderately stable over time [1]. Early onset has been associated with increased risk of negative relationships with peers, lower academic performance and school dropout [2]. Such behavior problems can result in considerable strain for individuals, families, and societies [1,3]. Accordingly, there are ongoing efforts to refine understanding of developmental antecedents to early behavior problems by examining variations in predisposition and quality of care experienced.

One of the most influential concepts in explaining associations between children's development and their experiences of the caregiver environment is the developmental niche [4]. The developmental niche is posited as the composite of three interacting subsystems: the physical and social settings in which the child lives every day, the customs and practices of child rearing, and the psychology of the caretakers who play a direct role in actual parenting practices. These three subsystems operate in synchrony to influence child development [5].

Caregiver sensitivity refers to the caregiver's ability to accurately recognize baby's cues, and to react quickly and appropriately [6,7]. Following developmental niche theory, we would expect that a caregiver's sensitivity could have a significant influence on their child's development. A large body of research has identified a negative correlation between maternal sensitivity and children's subsequent internalizing and externalizing behavior problems [8–10]. However, the strength and direction of such direct associations have been questioned [11,12], and

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increasing attention has been paid to the interaction of other factors [13, 14]. Moreover, no previous research has carefully examined the relationship between maternal sensitivity and children's behavioral problems within a Chinese cultural context.

Grandparents rearing children is a common phenomenon in China. With rapid and ongoing socio-economic and cultural development, an increasing proportion of mothers enter into the labor market. Many families have three generations - children, parents, and grandparents - living together in a single dwelling, or living in very close proximity. Based on traditional Chinese family practices, most grandparents regard care for grandchildren as their responsibility. A 2010 survey of Chinese families found that nearly 60% of infants experienced grandparental care, and 30% lived with their grandparents [15].

This adaptive family strategy enables personal development for mothers and provides families with better financial security [16]. Within the developmental niche framework, we might expect grandparental sensitivity to play a unique role in child development. However, few studies have examined the influence of grandparental sensitivity on children's behavior. Therefore, in the present study we simultaneously examine the influence of maternal and grandparental sensitivity on infants' behavior, in order to better understand the predictors of problems across multiple developmental contexts in China.

The present study also examines for the possibility of differential susceptibility to the effects of caregiver sensitivity on behavioral outcomes [17]. According to Belsky's differential susceptibility hypothesis, which is based on an evolutionary perspective of development, children with high susceptibility not only suffer more from negative rearing experience, but also benefit more from supportive and enriched conditions, compared with less susceptible children who are less affected by their rearing experience [17–20]. The ways in which inherent attributes and rearing experiences interact in shaping individual development continue to gain increasing attention [21–23]. Recent studies have suggested that temperamental reactivity, due to a highly sensitive neurobiological system, may be a marker of developmental susceptibility [24,25]. That is, when exposed to environmental adversities such highly reactive infants may be at elevated risk for adverse outcomes, but they may also be predisposed to maximum benefits if they find themselves in a supportive and enriched environment [26–28].

Increasing evidence suggests that infants with high temperamental reactivity may be more susceptible to the variations in quality of rearing experience. For example, van den Berg and Bus have found that, compared to infants showing low temperamental reactivity, infants with high temperamental reactivity would benefit more from parent-infant verbal interactions and exhibit a higher level of language skills [28]. Another study indicated that attachment security among highly reactive infants was more strongly impacted by interventions aimed at increasing maternal sensitivity compared to lower reactive infants [29]. However, to date no research has been conducted to simultaneously examine infant temperamental reactivity as a moderator of the associations between maternal and grandparental sensitivity, and behavior problems.

The aim of our study was to identify differential susceptibility to caregiver sensitivity among Chinese infants being raised by multiple caregivers, as is commonplace in China. To do this we examined whether any associations between caregiver sensitivity and behavior problems were moderated by infants' temperamental reactivity. We hypothesized that highly reactive infants would exhibit less internalizing and externalizing behavior problems when cared for by highly sensitive mothers or grandparents by comparison to lower reactive infants. By contrast, we hypothesized that highly reactive infants raised by low sensitive mothers or grandmothers would show more internalizing and externalizing behavior problems compared to those infants with lower temperamental reactivity.

2. Subjects and methods

2.1. Subjects

Participants were 72 families recruited through information posted on websites and in large communities in Beijing. The selection criteria were: (a) the child be the first-born in the family; (b) pregnancy was full-term (i.e., at least 37 weeks of gestation) and child had no physical and mental disability; (c) the child be between 12 and 24 months of age; (d) the mother is employed outside of the home; and (e) the child is cared for by their paternal or maternal grandmothers for >10 h per week when their mother went out for work (based on the time boundary of non-maternal care defined by the NICHD [30]).

Due to missing data, only 71 families (37 boys and 33 girls) are reported upon in the current study. The average age of infants was 17.6 months ($SD = 3.73$). In this sample, 61.1% of mothers had received university education and 25% had received graduate education, with only 13.9% having received no more than high school education. The distribution of average monthly family income was as follows: 34.7% had incomes no >6000 Yuan, 37.5% had incomes from 6000 to 10,000 Yuan, and 27.8% had incomes >10,000 Yuan. The Research Ethics Committee of the School of Education Science of Capital Normal University approved the study. Informed consent was obtained from all participating mothers and grandmothers.

2.2. Assessments

2.2.1. Maternal/grandmaternal sensitivity

Maternal sensitivity and grandmaternal sensitivity were assessed using the Maternal Behavior Q-sort-Chinese Version (MBQS), which is an observational coding instrument to assess caregiver responsiveness timeliness, and warmth to infant cues [31,32]. The MBQS contains 72 cards, each representing a particular behavior. Observers sort each card into nine piles of eight cards, each ranging from “most like” to “least like” mother. The caregiver sensitivity score is calculated by correlating the sort of a particular caregiver with a prototypically ideal sort. This yields a sensitivity score ranging from -1.00 (an extremely insensitive caregiver) to 1.00 (an extremely sensitive caregiver). In the current study, two trained graduate students in psychology independently coded the videotapes of mother-child and grandmother-child interaction: inter-coder reliability for mother-child interactions was 0.72 and for the grandparent-child interactions was 0.93.

2.2.2. Infants' temperamental reactivity

Temperamental reactivity refers to the sensitivity of the individual to external stimulus and the intensity of their response to stimulus [33]. Infants' temperamental reactivity was assessed by using 20 items which were included in the Intensity of Reaction and Threshold of Responsiveness subscales of Carey's Toddler Temperament Questionnaire-Chinese Version (TTQ-CV) [34]. The intensity of reaction describes the energy level of response and the threshold of responsiveness measures the intensity level of stimulation that is necessary to evoke an infant's response [34]. In the current study, mothers completed 20 items to describe infant's behavior on a 7-point scale ranging from “almost never” to “almost always”. The score of infants' temperamental reactivity was the average of the two subscale scores. The internal consistencies of the intensity of reaction subscale and the threshold of responsiveness subscale were 0.65 and 0.71 respectively.

2.2.3. Behavior problems

The Infant-Toddler Social and Emotional Assessment-Chinese Version (ITSEA-CV) measures social-emotional/behavioral problems and competencies in 1 to 3-year olds across four domains of behavior (Internalizing, Externalizing, Dysregulation and Competencies) [35]. In order to address the hypotheses of the present study only the internalizing and externalizing domains are used in analyses. The internalizing

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