



## Effects of family socioeconomic status on home math activities in urban China: The role of parental beliefs

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### ABSTRACT

The present study examined the effects of family socioeconomic status (SES) on home math activities and the role of parental beliefs in the link between family SES and home math activities in urban China by using questionnaires of 885 young children's parents randomly sampled in Beijing. The results showed that family SES has a significantly positive association with the frequency of home math activities, a significantly negative association with parental beliefs on the importance of early math learning in both 'numeracy and quantity' and 'geometry and space', and a significantly negative association with parental beliefs on mastery age in the domain of 'geometry and space' only. The path analysis revealed that family SES has significant direct effects on the frequency of home math activities. Parental beliefs on the importance of early math learning had suppressing effects on the relationship between family SES and home math activities. In addition, parental beliefs on mastery age only partially mediated the relationship between family SES and home math activities in the domain of 'geometry and space'. The results implied that there are significant SES-related differences in home math activities, and different aspects of parental beliefs might play different roles in the association between family SES and home math activities currently in urban China.

### 1. Introduction

Extensive research has found that early math skills are a strong predictor of later math achievement and educational attainment (Anders et al., 2012; Duncan et al., 2007; Melhuish, Phan, et al., 2008; Melhuish, Sylva, et al., 2008; Siegler et al., 2012). However, young children of different socioeconomic status (SES) began their formal schooling with different early math skills (DeFlorio & Beliakoff, 2015) and such SES-related differences in math learning are persistent across their formal schooling (Garon-Carrier et al., 2018). The provision of home math activities, which refers to the interactions between parents and their children to stimulate children's math learning, is thought to contribute to the early SES-based developmental gap (Bradley, Corwyn, McAdoo, & Coll, 2001; Dearing et al., 2012; Skwarchuk & LeFevre, 2015). According to the life course perspective of educational inequality proposed by Lucas (1996), SES-related discrepancies have a more profound influence on younger children since students' dependence on parents declines as they grow up. Therefore, it is particularly important to uncover the mechanism by which SES may impact the home math activities in order to help young children lay a solid foundation for their later development and life and to improve the effectiveness and efficiency of policies and intervention practices to decrease

the SES-related gap.

According to family process and family system theories, parental beliefs are a key factor impacting parental behaviors and practice, as they guide parents' interpretation of children's behaviors and their decisions (Belsky, 1984; Musun-Miller and Blevins-Knabe, 1998) and reflect values and meanings of the cultures that they are embedded in (Lightfoot & Valsiner, 1992; Keller et al., 2006). Though the theories and empirical studies proposed that parental beliefs and expectations are the most proximal factors determining parenting practices (Eccles & Harold, 1996) and are one of mediators linking SES and parenting (Roubinov & Boyce, 2017), there are distinct gaps in the researches on SES, parental beliefs and home math activities in the early childhood field. First, the majority of studies examined the relationship between SES, parental beliefs and home math activities in isolation, few built the mediated pathway from SES to home math activities via parental beliefs (LeFevre, Polyzois, Skwarchuk, Fast, & Sowinski, 2010). Second, most of the studies on home math activity have centered on numeracy learning, while math is a comprehensive subject and the coverage of contents influences young children's early math learning. Third, most of studies have been done in western societies. Parenting practices are shaped by the interweaved influence of social culture and social structure (Bennett, Lutz, & Jayaram, 2012). The pattern of associations among

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family SES, parental beliefs and home math activities might vary among different societies and cultures because of differences in cultural logics and cultural capitals. Therefore, it still needs to further study whether parental beliefs play a role in the links between family SES and the home math activities and what role they play in non-western culture.

The present study was designed to address the above gaps in understanding of the precise predictors of the home math activities by examining the following two research questions using a sample of parents in urban China: (1) whether and how does family SES shape Chinese parents' home math activities, and (2) what is the role of parental beliefs in the links between SES and home math activities?

### 1.1. Home math activities and family socioeconomic status

The activities parents engage in to stimulate children's learning, as one of forms of home learning environment (Dearing et al., 2012), are the main focus of the extant studies on the home learning environment and experience (Kleemans, Peeters, Segers, & Verhoeven, 2012; Kluczniok, Lehl, Kuger, & Rossbach, 2013). There are two kinds of home activities studied in relation to early math learning. One is general activities which include a broad range of daily activities and are not divided into dimensions according to the contents of children's experiences. For example, the 14-items questionnaire of home learning environment used in the Effective Provision of Pre-school Education project covered play, reading, drawing, shopping and other activities, with only two items specifically relating to numbers/shapes (Sylva et al., 2008). This kind of measurement might miss the key activities specific to math learning and could not cover the comprehensive contents of early math learning. The other is domain-specific activities, which are specifically related to numeracy learning. LeFevre et al. (2009) differentiated numeracy activities into formal and informal types. The distinction between formal and informal activities mainly lies in the way that young children gain their numeracy experiences (Skwarchuk, Sowinski, & LeFevre, 2014). Compared to studies on general activities, studies on domain-specific activities could provide more specific information about which activities contribute more to children's math learning.

However, studies have revealed that the exposure to ranges and depth of contents would influence young children's early math learning. For example, Skwarchuk (2009) found that a higher frequency of parental involvement in complex activities (e.g., adding and subtracting objects, comparing, counting by 2's) predicted higher achievement scores on mathematic performance, whereas a higher frequency of basic activities (e.g., counting, reciting numerals, reading and writing numbers) predicted lower achievement scores. The professional standards suggested that both content standards and process standards were critical to children's mathematics knowledge and thinking (National Council of Teachers of Mathematics, 2000). The *Guidelines for 3–6-year-old Children Learning and Development* in China (Ministry of Education, 2012) suggested that the goals for 3–6-year-old children to learn mathematics included 'preliminarily experience the usefulness and interests of mathematics in life', 'perceive and understand numeracy, quantity and the relationship between numeracy and quantity' and 'perceive geometry and space'. Therefore, the studies on home math activities should also pay attention to the contents that young children are exposed to in activities, besides of the way of learning. The current study will examine the effect of SES on parents' engagement in home math activities with different contents and the role of corresponding parental beliefs between them.

According to family investment model, the quantity and quality of parental investment, especially home learning activities, are largely influenced by family SES, since the physical and mental resources that families could afford for children are varied from families to families due to different SES (Conger & Dogan, 2007; Sohr-Preston et al., 2013). Many studies examined the differences in home math activities among parents with different SES, yet produced inconsistent results. Some

researchers found advantages of higher SES over lower SES in frequency and complexity of home numeracy activities. Parents with higher SES provided more activities in daily life and play (Stipek, Milburn, Clements, and Daniels, 1992) and more complex instead of basic numeracy activities (Saxe et al., 1987; Dearing et al., 2012). However, other researchers found only minimal SES-related variation in mathematical support (DeFlorio & Beliakoff, 2015). This inconsistency may stem from the complexity of determinants of parental behaviors, as well it shows the needs to further study the pathway from SES to home math activities. According to family system theory, there are numerous factors impacting parental behaviors, including macro (such as social economic and cultural) and meso contextual factors (such as neighborhood community) and micro individual cognitive factors (such as beliefs about child learning and parental role) (Roubinov & Boyce, 2017). This paper focuses on the direct effect of contextual factors (SES) on parental behaviors relating to math learning and the indirect effect of SES through individual cognitive factors (parental beliefs).

### 1.2. Parental beliefs and home math activities

Parental beliefs are a key factor that is mostly studied to explain the variations in the home math activities. The specific beliefs relating to children's mathematical development that have been reported in the literature could be categorized into two sets: adult-related beliefs (the role of the home and preschool in early mathematical development, parental efficiency to teach children mathematics at home) and children-related beliefs (how important it is for young children to learn general or specific skills at what age and how young children learn math) (Galindo & Sonnenschein, 2015; LeFevre, Polyzoi, Skwarchuk, Fast, & Sowinski, 2010; Sonnenschein et al., 2012). Missall et al. (2015) found that there were small to moderate but significant correlations between parents' home math activities and child-related beliefs (about child math learning), but did not find significant correlations between adult-related beliefs (about the parent's personal experience and role in child math learning) and home math activities. Therefore, different aspects of parental beliefs might have different patterns of association with home math activities. The present study focuses on child-related beliefs, which we divide into two aspects: (1) importance judgment, which refers to the extent that parents think how important for young children to learn specific math skills; and (2) mastery age expectation, which refers to the age when parents expect young children to master specific math skills.

As a proximal variable influencing home math activities, parental beliefs reflect values and meanings of cultural world in which parents live, and then vary a lot across cultures. For example, Tobago Indo and mixed-ethnic caregivers have earlier expectations of developmental milestones than African Caribbean caregivers (Roopnarine, Logie, Davidson, Krishnakumar & Narine, 2015). Anglo Australian mothers expected young children to acquire certain skills earlier than Lebanese Australian mothers (Goodnow, Cashmore, Cotton, & Knight, 1984). Cultural norms and regulations define the standards about desirable qualities of children, and frame parents' goals and expectations for their children's learning and development, and guide parents' behaviors to interact with children (Bornstein, Cote, Haynes, Hahn, & Park, 2010). Therefore, the patterns of relationship between parental beliefs and home math activities vary among different societies and cultures. For example, LeFevre et al. (2010) found parents' personal attitudes toward mathematics were correlated with numeracy practices in both Greek and Canada, but parents' academic expectations only related to practices of Canadian parents. However, the existing literature base was established in the western world, and it is little know about the pattern of relationship between parental beliefs and home math activities in non-western world.

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