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## Journal of Experimental Child Psychology

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# Formal and informal home learning activities in relation to children's early numeracy and literacy skills: The development of a home numeracy model



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### ARTICLE INFO

#### Article history:

Received 11 March 2013

Revised 15 November 2013

Available online 22 January 2014

#### Keywords:

Early numeracy

Early literacy

Home environment

Kindergarten readiness skills

Parental involvement

Parent attitudes

### ABSTRACT

The purpose of this study was to propose and test a model of children's home numeracy experience based on Sénéchal and LeFevre's home literacy model (*Child Development*, 73 (2002) 445–460). Parents of 183 children starting kindergarten in the fall (median child age = 58 months) completed an early home learning experiences questionnaire. Most of the children whose parents completed the questionnaire were recruited for numeracy and literacy testing 1 year later (along with 32 children from the inner city). Confirmatory factor analyses were used to reduce survey items, and hierarchical regression analyses were used to predict the relation among parents' attitudes, academic expectations for their children, reports of formal and informal numeracy, and literacy home practices on children's test scores. Parental reports of formal home numeracy practices (e.g., practicing simple sums) predicted children's symbolic number system knowledge, whereas reports of informal exposure to games with numerical content (measured indirectly through parents' knowledge of children's games) predicted children's non-symbolic arithmetic, as did numeracy attitudes (e.g., parents' enjoyment of numeracy). The home literacy results replicated past findings; parental reports of formal literacy practices (e.g., helping their children to read words) predicted children's word reading, whereas reports of informal experiences (i.e., frequency of shared reading measured indirectly through parents' storybook knowledge) predicted children's vocabulary.

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These findings support a multifaceted model of children's early numeracy environment, with different types of early home experiences (formal and informal) predicting different numeracy outcomes.

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## Introduction

Large-scale longitudinal studies have shown that children's early literacy and numeracy skills are strong predictors of academic success (Aunio & Niemivirta, 2010; Aunola, Leskinen, Lerkkanen, & Nurmi, 2004; Claessens, Duncan, & Engel, 2009; Duncan et al., 2007; LeFevre, Fast, et al., 2010; Melhuish et al., 2008). Children who start school with poor knowledge and skills in literacy (Hooper, Roberts, Sideris, Burchinal, & Zeisel, 2010) and numeracy (Jordan, Kaplan, Locuniak, & Ramineni, 2007) are unlikely to catch up to their peers. Individual differences in literacy and numeracy skills are evident at school entry—prior to formal instruction—suggesting that children acquire fundamental skills at home or in child care. Thus, in the current study, we examined children's home experiences as predictors of academic outcomes. Our goal was to adapt the home literacy model proposed by Sénéchal and LeFevre (2002) to describe children's home numeracy experiences and link those experiences to early numeracy outcomes.

### *Home learning activities and children's academic outcomes*

Researchers have found relations between the general quality of the home environment and children's social and academic outcomes (cf. Bakermans-Kranenburg, van IJzendoorn, & Bradley, 2005; Melhuish et al., 2008). Although the specific home experiences that predict early literacy have been explored in great depth (e.g., Evans, Shaw, & Bell, 2000; Scarborough & Dobrich, 1994; Sénéchal & LeFevre, 2002), fewer studies are available on the early experiences relevant for numeracy acquisition (cf. Blevins-Knabe, 2008).

### *Home activities and children's literacy outcomes*

In the home literacy model proposed by Sénéchal and LeFevre (2002; see also Sénéchal, 2006; Sénéchal & LeFevre, 2001; Sénéchal, LeFevre, Hudson, & Lawson, 1996; Sénéchal, LeFevre, Thomas, & Daley, 1998), two distinct pathways link children's experiences to their acquisition of early literacy skills. In one pathway, children's exposure to shared reading with parents, known as informal experiences, correlates with vocabulary knowledge (Sénéchal, 2006; Sénéchal & LeFevre, 2002) and are indirectly associated (via a mediating association with vocabulary) with reading ability in Grade 2 (Hood, Conlon, & Andrews, 2008), Grade 3 (Sénéchal & LeFevre, 2002), and Grade 4 (Sénéchal, 2006). In the second pathway, direct or formal literacy experiences, as indexed by parents' reports of teaching-specific early literacy skills (e.g., letter recognition, word reading), predicted kindergarten children's alphabet knowledge (Sénéchal, 2006) and word reading in all early school grades (Hood et al., 2008; Sénéchal, 2006; Sénéchal & LeFevre, 2002). Critically, these pathways are uncorrelated (Sénéchal, 2006; Sénéchal & LeFevre, 2002). The home literacy model has been supported by many studies (e.g., Evans & Shaw, 2008; Reynolds, Wheldall, & Madeline, 2011; Rodriguez & Tamis-LaMonda, 2011; Slavin, Lake, Davis, & Madden, 2011). In the current study, the home literacy model was adopted as the framework for a home numeracy model. We assessed both formal and informal home numeracy activities and examined whether these two types of practices differentially predicted children's early numeracy outcomes.

### *Home activities and children's numeracy outcomes*

In comparison with research on home literacy, evidence linking children's early numeracy learning to home experiences is more recent and less thorough—and, as a result, is less conclusive. Inconsistent results may indicate that researchers have not developed a clear distinction between informal and formal activities (also known as indirect and direct; LeFevre et al., 2009) that are related to numeracy (see

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