Available online at www.sciencedirect.com

SCIENCE DIRECT®

Intelligence 32 (2004) 445–460

INTELLIGENCE

Chaos in the home and socioeconomic status are associated with cognitive development in early childhood: Environmental mediators identified in a genetic design

Stephen A. Petrill[a,b,*], Alison Pike[c], Tom Price[d], Robert Plomin[e]

[a]*Department of Biobehavioral Health, The Pennsylvania State University*
[b]*Center for Developmental and Health Genetics, The Pennsylvania State University, 101 Army Gardner House, University Park, PA 16802, United States*
[c]*Psychology Department, Sussex University, UK*
[d]*Wellcome Trust Center for Human Genetics, Oxford University, UK*
[e]*Social, Genetic, and Developmental Psychiatry Research Centre, Institute of Psychiatry, London*

Received 4 August 2003; received in revised form 8 June 2004; accepted 25 June 2004

Abstract

The current study examined whether socioeconomic status (SES) and chaos in the home mediate the shared environmental variance associated with cognitive functioning simultaneously estimating genetic influences in a twin design. Verbal and nonverbal cognitive development were assessed at 3 and 4 years for identical and same-sex fraternal twin pairs participating in the Twins Early Development Study (TEDS). Verbal and nonverbal skills were measured using the McArthur Scales of Language Development (VERBAL) and the Parent Report of Children's Abilities (PARCA), respectively. SES and chaos were assessed via questionnaire. Results suggest that SES and CHAOS mediate an independent and significant, but modest, portion of the shared environment for VERBAL and PARCA at Ages 3 and 4.

Keywords: Chaos; Socioeconomic status; Genes

* Corresponding author. Center for Developmental and Health Genetics, The Pennsylvania State University, 101 Army Gardner House, University Park, PA 16802, United States. Tel.: +1 814 865 1717; fax: +1 814 863 4768.
E-mail address: sap27@psu.edu (S.A. Petrill).

0160-2896/$ - see front matter © 2004 Elsevier Inc. All rights reserved.
doi:10.1016/j.intell.2004.06.010

1. Introduction

For decades, socialization theorists have attempted to draw links between aspects of the environment and early cognitive development (see Wachs, 1996). By far, the most common approach has been to identify educational, behavioral, or societal environmental risk and protective factors that are correlated with cognitive development. These studies have been influential in demonstrating that family-level risk factors have a negative impact on children's cognitive functioning, independent of individual-level factors (e.g., Leventhal & Brooks-Gunn, 2000).

One factor is familial socioeconomic status (SES), which generally correlates between r=.30 and .40 with general cognitive ability (for a review, see Brody, 1992, or Jensen, 1998). In fact, this relationship is so robust cross culturally and across different types of measurement that it is standard practice to include SES as a covariate in studies of ability, rather than to focus on the effect of SES itself (e.g., Andersson, Sommerfelt, Sonnander, & Ahlsten, 1996; Martin, 1995).

The process by which SES impacts cognitive ability constitutes a central focus of inquiry in the developmental literature. Research has suggested that lower economic status is associated with less access to potential goods and services, as well as enhancing experiences, and greater exposure to harmful experiences and substances (e.g., Bradley & Whiteside-Mansell, 1997; Duncan & Brooks-Gunn, 1997; Huston, McLoyd, & Garcia Coll, 1994). As a result, researchers have attempted to examine the characteristics of the home environment that mediate the relationship between SES and cognitive outcomes. The HOME (Bradley & Caldwell, 1976, 1980; Caldwell & Bradley, 1978, 1984) is a set of tester-rated instruments that indexes multiple aspects of the home environment, which includes learning stimulation, parental responsiveness, spanking, as well as more physical aspects, such as the number of books on the shelves, cleanliness of the home, and crowding. Cherny (1994) suggested that this measure correlated r=.22 with general cognitive ability in childhood.

More recently, the degree of organization and calm in the household versus chaos has received attention (Matheny, Wachs, Ludwig, & Phillips, 1995). Using a parent report questionnaire, this construct has demonstrated modest to moderate links with children's general cognitive ability (Pike, Iervolino, Eley, Price, & Plomin, submitted for publication). This finding is particularly striking because the prediction from chaos held when controlling for SES, as well as eight additional environmental 'risk' variables such as parenting style and life events.

While the socialization literature has attempted to better understand individual differences in cognitive development by examining the taxonomy of the family environment, behavioral genetic research has attempted to better understand cognitive ability by estimating the relative importance of genetic, shared, and nonshared environmental influences. Numerous twin and adoption designs involving family members living together and apart have suggested that shared environmental influences approach zero by adolescence. However, in early childhood, the shared environment (e.g., growing up in the same home), along with genetics and the nonshared environment (and error), is important to cognitive ability in early childhood (Boomsma, 1993; McCartney, Harris, & Bernieri, 1990; McGue, Bouchard, Iacono, & Lykken, 1993; Plomin, 1986; Plomin, Fulker, Corley, & DeFries, 1997). Similarly, behavioral genetic research has suggested that the shared environment, as well as genetics, are important to the stability of cognitive skills in early childhood (see Petrill, 2002, for a review).

Until recently, socialization and behavioral genetic theories of development have employed very different methodologies. Socialization research has typically examined the environment in samples in which family members (parents and children) share genes as well as environments. Thus, these studies