



# Early educational milestones as predictors of lifelong academic achievement, midlife adjustment, and longevity<sup>☆</sup>

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## ABSTRACT

This study gathered follow-up data from the Terman Life Cycle Study ( $N = 1023$ ) to examine how age at first reading and age at school entry relate to grade school academic performance, lifelong educational attainment, midlife health and mental adjustment, and longevity across eight decades. Early reading was associated with early academic success, but less lifelong educational attainment and worse midlife adjustment. Early school entry was associated with less educational attainment, worse midlife adjustment, and most importantly, increased mortality risk. Personality, midlife adjustment, and educational attainment partially mediated the school entry-longevity association (controlling for age, sex, personal characteristics, and home environment factors). Although the sample is limited in some respects and care should be taken in generalizing the results, findings do confirm the importance of lifespan approaches in understanding the effects of education on individual patterns within social contexts.

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## 1. Introduction

Learning to read and entering school are important early educational milestones. Reading is one of the most valuable skills developed during childhood, but is also one of the most cognitively challenging proficiencies to acquire (Lyon, 1998). Although reading is formally introduced and cultivated in the primary grades, some children begin to read before starting school, while others struggle throughout elementary school. Many believe that early success may set a positive life-course trajectory, leading to good academic and psychosocial outcomes, whereas hampered reading skills may lead to less desirable outcomes (e.g., Butler, Marsh, Sheppard, & Sheppard, 1985; Senechal & LeFevre, 2002; Stainthorp & Hughes, 2004; Wagner, Torgesen, Rashotte, Hecht, & Barker, 1997).

In a related vein, there is much debate on the optimal age of initiating school attendance. Despite numerous studies and multiple policy changes throughout the 20th century, the field remains divided (Jones, 2001; Sharp, 1998). The appropriate timing of school entry is necessarily a complex issue with no clear answers, due to the host of influences involved. One approach to advancing our understanding is to consider which factors may be relevant to important later life outcomes. This study uses a lifespan analysis to explore long-term academic and psychosocial correlates of the ages of learning to read and initiating formal schooling.

<sup>☆</sup> This paper is one of a series developed from our multi-year, multidisciplinary project on psychosocial predictors of health and longevity (supported by NIA grant AG08825) using data partly derived from Terman's Life-Cycle Study archives (1922–1999), and partly collected by us as a follow-up to Terman's study. All relevant findings are included in each manuscript to the extent feasible and prior publications from our project are cited when appropriate; care should be taken not to include overlapping findings in meta-analyses or other reviews. Note also that sample sizes change from paper to paper, as old data are refined, new data or death certificates are gathered, or time periods change.

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### 1.1. Precocious reading ability

Some studies have found that early reading abilities are both directly and indirectly related to long-term reading success (Butler et al., 1985; Lonigan, Burgess, & Anthony, 2000; Senechal & LeFevre, 2002; Stainthorp & Hughes, 2004; Wagner et al., 1997). Reading abilities measured in kindergarten are predictive of reading achievement through the fourth and sixth grades (Butler et al., 1985; Stainthorp & Hughes, 2004; Wagner et al., 1997). Nonetheless, at least one study found that differences in emergent literacy abilities did not distinguish reading ability by second grade when the first grade program explicitly focused on developing reading skills (Crone & Whitehurst, 1999).

Long-term correlates of early literacy, beyond elementary school, have not been fully explored (Torrey, 1979; Wagner et al., 1997). One possibility is that early ability offers a distinct advantage that continues throughout the educational career, resulting in better grades, greater interest in school, and higher levels of overall achievement, even among individuals of above-average intelligence. Conversely, any advantages of precocious ability may dissipate over time, or worse, although a child may be advanced academically, socio-emotional skills may not keep pace, leading to worse psychosocial adjustment (Callahan, 2006; Keitel, Kopala, & Schroder, 2003). One purpose of this study, therefore, is to extend the existing developmental research on early reading achievement to academic and psychosocial outcomes across the lifespan.

### 1.2. Age at school entry: chronological age vs. relative age

One concern for both parents and policy makers revolves around school readiness. The age at which children enter school is primarily dictated by state and district laws, but parents may choose to push their child ahead or delay entry until the child is deemed “ready.” Such practices have led to kindergarten and first grade classes in which students differ in over a year of age (Meisels, 1992). Consequently, it remains unclear whether outcomes associated with school entry age relate to chronological age and the accompanying maturity levels or whether these are driven by a student’s age relative to his or her peers.

Questions regarding readiness and school entry age have existed since the 1930s (Bigelow, 1934) and, as with precocious reading, findings are mixed. Academically, some studies have found later entry is associated with better academic performance (e.g., Brenitz & Teltsch, 1989; Carter, 1956; Crossner, 1991; Dickinson, 1963; Hallwell & Stein, 1964; Jones & Mandeville, 1990; Maddux, Stacy, & Scott, 1981; Sweetland & De Simone, 1987), whereas others have found that early differences dissipate over time (e.g., Baer, 1958; Crone & Whitehurst, 1999; Davis, Trimble, & Vincent, 1980; Mayer & Knutson, 1999; Russell & Startup, 1986; Stipek & Byler, 2001; Warren, Levin, & Tyler, 1986).

Psychosocially, young age (relative to peers) has been associated with worse outcomes, including lowered self-esteem (Thompson, Barnsley, & Battle, 2004) and higher risk of attempted suicide during adolescence (Thompson, Barnsley, & Dyck, 1999; Uphoff & Gilmore, 1986). Several studies have suggested that older entrants are better adjusted socially (Baer, 1958; Bigelow, 1934; Gagne & Gagnier, 2004; Langer, Kalk, & Searls, 1984; Teltsch & Brenitz, 1988). Conversely, delaying school entry or slowing a child’s progress may relate to increased psychosocial problems (Byrd, Weitzman, & Auinger, 1997; Malone, West, Flanagan, & Park, 2006; Miller & Norris, 1967) suggesting that postponing school entry may not be the optimal solution (Graue & DiPerna, 2000; Shepard & Smith, 1988). A second purpose of the present study, therefore, is to examine the long-term effects associated with chronological age of school entry and the relative age match with peers.

### 1.3. Home environment and personal characteristics

Individual patterns of readiness and literacy necessarily take place within specific social contexts, determined at both individual and social levels. At an individual level, personal characteristics such as personality, intelligence (IQ), and gender may differentiate when children begin to read, their perceived readiness, and early academic and adjustment outcomes. For example, some children may be more motivated to achieve, appear more “ready”, and enter the school environment earlier than others (Durkin, 1966). Precocious reading ability and early school entry are commonly perceived as markers of intelligence, yet they are not necessarily related (Dickinson, 1963; Jackson, 1988; Kundert, May, & Brent, 1995). In addition, girls and boys mature at different rates. Numerous studies have found lower achievement levels and more adjustment problems for boys than for girls (e.g., Crossner, 1991; Dietz & Wilson, 1985; DiPasquale, Moule, & Fiewelling, 1980; Gagne & Gagnier, 2004; Hirst, 1970; Langer et al., 1984).

At the social level, socioeconomic status, attributes of the home environment, and parental attitudes and styles may create a context for learning and influence the child’s literacy interests (Fitzgerald, Spiegel, & Cunningham, 1991), which in turn may affect later academic achievement (National Institute of Child Health & Development, 2005; Ortiz, Stowe, & Arnold, 2001; Scarborough & Dobrich, 1994) and psychosocial outcomes (Berlin, Brooks-Gunn, & Aber, 2001; Burgess, Hecht, & Lonigan, 2002). Literacy achievement in the early school years appears to be rooted in early childhood experiences with activities such as storybook reading, having books available in the home, and engaging in literary activities with older family members (DeBaryshe, Binder, & Buell, 2000; Evans & Carr, 1985; Lonigan et al., 2000; Senechal & LeFevre, 2002; Sigel, McGillicuddy-DeLisi, & Goodnow, 1992). Personal attributes and early home factors are potentially influential in early educational milestones and subsequent academic and psychosocial outcomes; thus, these characteristics were included in the present study as baseline control variables.

### 1.4. The present study

One of the best ways to consider long-term consequences and trajectories is through longitudinal research that follows a group over many years. The Terman Life Cycle Study was initiated in 1922 by Lewis M. Terman as a study of gifted children in California

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