

The Cumulative Effect of Health Adversities on Children's Later Academic Achievement



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ABSTRACT

OBJECTIVE: We aimed to determine whether the accumulation of physical, psychosocial, and combined health adversities measured at age 8 to 9 years predicts worsening of academic scores cross-sectionally at 8 to 9 and longitudinally at 10 to 11 years.

METHODS: Design: Longitudinal data from Waves 3 and 4 in the Longitudinal Study of Australian Children (83% of 4983 retained). Exposures (8–9 years): Physical health adversities (yes/no; summed range, 0–5): overweight, special health care needs, chronic illness, PedsQL Physical, and global health. Psychosocial health adversities (yes/no; summed range, 0–4): parent- and teacher-reported behavior, PedsQL Psychosocial, sleep problems. Combined health adversities (range 0–9). Outcomes (8–9, and 10–11 years): National academic standardized test scores. Analysis: Generalized estimating equations, accounting for multiple academic domains in each year and socioeconomic position and cognition.

RESULTS: At 8 to 9 years, 23.9%, 9.9%, and 5.3% had 1, 2, or ≥ 3 physical health adversities, respectively, while 27.2%, 9.5%, and 4.9% had 1, 2, or ≥ 3 psychosocial health adversities. For each additional health adversity at 8 to 9 years, academic scores fell incrementally in year 3 and year 5 (both $P < .001$), with reductions of at least 0.4 SDs for ≥ 3 health adversities. Number was more important than type (physical, psychosocial) of adversity.

CONCLUSIONS: The accumulation of health adversities predicts poorer academic achievement up to 2 years later. Interventions might need to address multiple domains to improve child academic outcomes and be delivered across the health-education interface.

KEYWORDS: child learning; cumulative health; health-education interface; physical health; psychosocial health

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WHAT'S NEW?

Accumulation of physical and psychosocial health adversities at 8 to 9 years is related to a stepwise reduction in academic achievement up to 2 years later. Improving academic outcomes might require multiple domains of health to be addressed across the health-education interface.

OPTIMIZING CHILDREN'S ACADEMIC achievement during the elementary school years is a national priority for many countries. Children who fail to reach their full educational potential are at greater risk of not completing school, as well as poor health literacy, unemployment, and risk-taking behavior in adulthood.¹ Supporting all children to reach their academic potential during the elementary school years could therefore reap a substantial legacy for life course outcomes. One factor that can potentially undermine children's school success is health issues. In this article we examine how the accumulation of health adversities relates to children's academic achievement. Addressing this aim will add to understanding of how

health and education systems can support children's academic development.

Cross-sectional as well as longitudinal research indicates that a child's health is strongly related to their academic outcomes. Children with chronic illness or special health care needs have poorer school readiness and developmental status at school entry,² and poorer academic trajectories persist throughout the elementary school years.³ Research on more specific conditions has also delineated relationships of sleep problems with poorer executive functioning and increased behavioral difficulties,^{4,5} behavioral problems with increased classroom disengagement and poorer peer relationships,⁶ and increased weight status with poorer cognitive function.⁷ Health conditions could influence academic outcomes through their effect on body functions and structures (eg, neurological functioning), activities of daily living (eg, self-care), social participation (eg, peer acceptance), and educational participation (eg, school attendance). Surrounding risk and protective factors at the genetic, child, family, and service system levels are likely to influence outcomes directly and/or have a strong mediating/

moderating role in the relationship between a child's health and therefore outcomes.⁸

Because of the clear relationship between children's health and learning, there is key international interest in how the health and education systems can work together to respond and promote children's optimal developmental outcomes. Working at the health-education interface is critical to supporting children's optimal developmental outcomes. In particular, schools provide a unique, near-universal framework to identify children with health difficulties and to ensure their health and education needs are met by services available within as well as outside the traditional school paradigm. Despite this growing recognition of the importance of working across health and education, interventions designed to support and/or address common health problems during the elementary school years often improve the targeted health condition and some comorbidities, but these benefits generally fail to translate to meaningful changes in children's academic achievement.^{9–11} This lack of transfer might reflect complex relationships between children's health and learning, because the umbrella term 'health' spans multiple elements of physical and psychosocial well-being.

One possibility is that health conditions could affect children's academic development in a way similar to other early adversities, such as exposure to family violence, poor nutrition, and financial hardship.¹² The number of such adversities that children face can help to explain differences in outcomes.^{13,14} For example, known dose-response relationships exist between physical lifestyle factors (ie, poor diet, low physical activity) and poorer child academic achievement,¹⁵ and stressful life events and poorer child mental health development.¹³ Analogously, one could expect that the accumulation of poor health—defined as the number of areas of difficulty experienced across the physical as well as the psychosocial health domains—might affect children's academic progress. Understanding this relationship could be informative for school health services in designing health interventions with sufficient breadth to yield academic benefits. If a relationship is found, it would also provide the basis for identifying risk and protective factors that can ameliorate this cumulative effect.

In this study we aimed to examine whether the accumulation of health adversities is associated with children's academic outcomes in a dose-response manner. We drew on cross-sectional and longitudinal data from the Longitudinal Study of Australian Children (LSAC) to address this question. The LSAC comprises a representative national sample and includes multi-informant reports of children's physical and psychosocial health, as well as repeated scores on a standardized and nationally administered assessment of academic achievement. We hypothesize that the number of 1) physical, 2) psychosocial, and 3) combined physical and psychosocial health adversities measured at age 8 to 9 years would predict a stepwise worsening of standardized academic achievement scores 1) cross-sectionally, in year 3 (8–9 years), and 2) longitudinally, in year 5 (10–11 years).

METHODS

STUDY DESIGN AND SAMPLE

Data were drawn from the third and fourth waves of the LSAC, a nationally representative cohort recruited in 2004. The sampling design and data collection methods have been described elsewhere.¹⁶ The LSAC was approved by the Australian Institute of Family Studies Ethics Committee and parents provided written informed consent. This study used data from the K-cohort, who were first recruited at age 4 to 5 years in 2004.

Briefly, the LSAC used a 2-stage cluster sampling design to recruit the cohort. In the first stage, postcodes were sampled after stratifying according to state and urban versus rural status to ensure proportional representation on the basis of residential location.

The second stage comprised approaching all children born between March 1999 and February 2000 and enrolled in the Australian Medicare database (98% of all 4-year-old children). Of the 8391 families invited to participate in 2004, written informed consent was received from parents of 4983 children (59%). Among those who declined to participate, there was a higher percentage of mothers who spoke a language other than English, and a higher percentage of mothers who did not complete high school. However, families that did and did not participate in the LSAC were similar across other demographic characteristics including number of parents in the household, number of children in the household, parents' income, sex of the study child, and whether the family lived in a metropolitan area.

The LSAC data collection occurs every 2 years. At wave 4 in 2010 when the children were 10 to 11 years of age, 4164 (84%) remained in the LSAC, although a small number of these had skipped 1 or 2 waves. Retention was marginally lower when parents had lower educational attainment or a non-English speaking background. The current study uses data from wave 3, when children were aged 8 to 9 years, and from wave 4, when children were aged 10 to 11 years; at these successive waves, most children were in year 3 and year 5 of elementary school, respectively.

PROCEDURES AND INCLUSION CRITERIA

At each LSAC data collection, trained researchers administered face-to-face primary caregiver and child interviews in the home, as well as brief, direct child assessments. Written questionnaires were completed by the primary and secondary caregiver and, wherever possible, the child's elementary school teacher. Parents also consented to enduring data linkage to access their federal government administrative data, including their child's national academic assessment scores.

MEASURES

The primary outcome was child academic achievement in years 3 and 5 of elementary school. This was measured using scores from the Australian National Assessment Program – Literacy and Numeracy (NAPLAN), with data

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