

Decomposing the Causes of the SES-Health Gradient with Biometrical Modeling.

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The consistent relationship between socioeconomic status (SES) and health has been widely covered in both the popular media and scientific journals. These articles argue that physical health inequalities are caused by material disadvantage directly (e.g., access to medical care) or indirectly (e.g., chronic environmental stress). Such explanations account for differences between those who have resources and those who do not, but they do not account for the finely stratified health differences that exist across the entire range of SES.

Recent theories to explain the SES-health gradient have grappled with limitations and contradictions of early models, and have implicated very different pathways to explain the gradient. For example, articles in differential epidemiology have argued that individual differences are the ‘fundamental cause’ of the gradient, acting through genetic sources. Other perspectives like the Risky Family model implicate the early home-environment. Surprisingly, little research has applied behavior genetic modeling to understanding the sources of the SES-health gradient.

The purpose of this paper is to narrow the scope of fundamental causes, by untangling the sources of variance associated with the gradient. Specifically, we decompose the gradient into genetic (a^2), shared-environmental (c^2), and non-shared environmental (e^2) pathways (ACE), using data from the National Longitudinal Survey of Youth. Monozygotic-twin, dizygotic-twin, full-sibling, half-sibling, and cousin pairs from validated kinship links are used in the current study (4018 pairs; Rodgers et al., 2016).

Three stages of analyses were conducted: (1) Univariate ACE models, (2) Bivariate Correlated Factors ACE models, and (3) Trivariate Correlated Factors ACE models. Only the final Trivariate model is reported here (see Figure 1). The estimates of a^2 , c^2 , and e^2 were similar across analysis stages. The genetic correlation between SES and physical health (PCS) was .66 (95% CI [.41,.98]), which is 90.9% of the total correlation (95% CI [.74,1]), while the shared-environmental correlation between SES and mental health (MCS) was .95 (95% CI [.06,1]), which includes virtually all of the total correlation (95% CI [.97,100]).

We decomposed the relationship between SES and health at age 40 into its biometrical components. Mental health’s relationship with SES was explained by the shared-environment, which is consistent with the Risky Family model, whereas physical health’s relationship with SES is primarily explained by genetic effects. Classic gradient theorists would interpret this finding as evidence that the gradient is caused by third variables. Rather, this finding suggests that genes are a distal cause of the physical health gradient.

Reference

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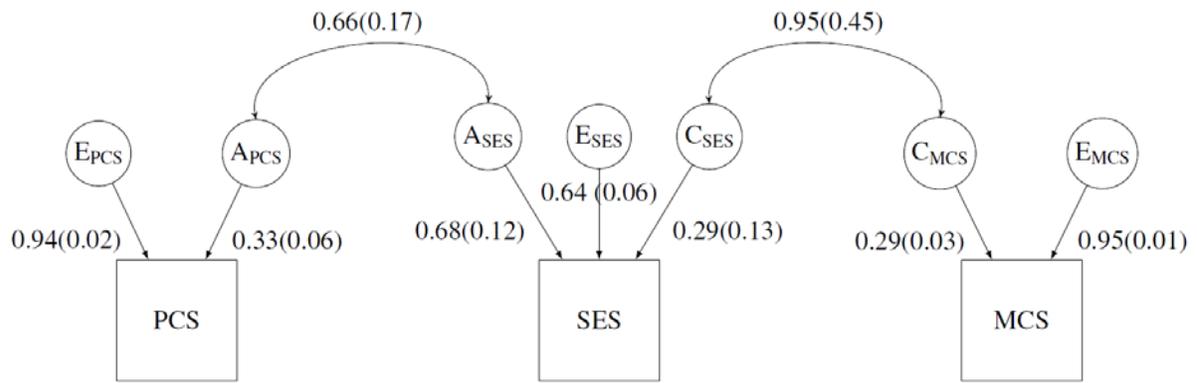


Figure 1. Trivariate Correlated Factors ACE model of Socioeconomic Status (SES), Physical Health (PCS), and Mental Health (MCS) at Age 40. The diagram is simplified to only include one member of the kin pair. A denotes the additive genetic factor; C, shared-environmental factor; E, non-shared-environmental factor.