Moderating covariances: practical

**Fig. 3.** Proportion of total Full-Scale IQ variance accounted for by A, C, and E plotted as a function of observed socioeconomic status (SES). Shading indicates 95% confidence intervals.
Current practical: Does SES modify variance components of IQ in 5 year old children?

Data:

<table>
<thead>
<tr>
<th>zyg</th>
<th>ses</th>
<th>iq1</th>
<th>iq2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>-0.88</td>
<td>-1.36</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>0.1</td>
<td>-0.11</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>1.14</td>
<td>0.44</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0.1</td>
<td>-0.18</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>-0.39</td>
<td>-0.74</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>0.1</td>
<td>1.7</td>
</tr>
</tbody>
</table>

N = 430 twin pairs (205 MZ, 225 DZ)

IQ scaled to have mean = 0 and variance = 1

SES measured on a 5-point scale (1 = low, 5 = high)

Is the magnitude of variance components modified by the children's SES?
Current practical: Does SES modify variance components of IQ in 5 year old children?

Model:
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Parameters to estimate:

\[ r_a = \frac{.5}{1} \quad r_c = 1 \]

\[ \begin{align*}
A_1 & \quad C_1 & \quad E_1 \\
\text{a+} & \, \beta_x \text{SES}_1 & \, \beta_y \text{SES}_1 & \, \beta_z \text{SES}_1 \\
\mu+ & \, \beta_M \text{SES}_1 & & \\
1 & \text{Twin 1} & & \\
\end{align*} \]
Current practical: Does SES modify variance components of IQ in 5 year old children?

Parameters to estimate:

- Magnitude of A effects on IQ
- Magnitude of C effects on IQ
- Magnitude of E effects on IQ
Current practical: Does SES modify variance components of IQ in 5 year old children?

Parameters to estimate:

- Moderation of $A$ effects on IQ by SES
- Moderation of $C$ effects on IQ by SES
- Moderation of $E$ effects on IQ by SES
Current practical: Does SES modify variance components of IQ in 5 year old children?

Parameters to estimate:

\[ IQ_1 = a + \beta_x SES_1 + c + \beta_y SES_1 + e + \beta_z SES_1 \]

\[ IQ_2 = a + \beta_x SES_2 + c + \beta_y SES_2 + e + \beta_z SES_2 \]

\[ \mu + \beta_m SES \]

\[ r_A = \frac{.5}{1} \]

\[ r_C = 1 \]
Current practical: Does SES modify variance components of IQ in 5 year old children?

Model:

\[ r_A = \frac{5}{1} \quad r_C = 1 \]

\[ A_1, C_1, E_1, A_2, C_2, E_2 \]

\[ a + \beta X M_1 \quad c + \beta M_1 \quad e + \beta z M_1 \]

\[ a + \beta X M_2 \quad c + \beta M_2 \quad e + \beta z M_2 \]

\[ \mu + \beta M M_1 \quad \mu + \beta M M_2 \]
Current practical: Does SES modify variance components of IQ in 5 year old children?

Model:

$\text{mean}(\text{IQ}_i|M_i) = (a + \beta_x M_i) \cdot \text{mean}(A_i) + (c + \beta_y M_i) \cdot \text{mean}(C_i) + (e + \beta_z M_i) \cdot \text{mean}(E_i) + (\mu + \beta_m M_i) \cdot 1$

$= (a + \beta_x M_i) \cdot 0 + (c + \beta_y M_i) \cdot 0 + (e + \beta_z M_i) \cdot 0 + (\mu + \beta_m M_i) \cdot 1$

$= \mu + \beta_m M_i$

for $i = 1, 2$ (twin 1, twin 2)
Current practical: Does SES modify variance components of IQ in 5 year old children?

Model:

Expectations for variances (conditional on the level of the moderator $M_i$):

$$\text{var}(\text{IQ}_i|M_i) = (a+\beta_x M_i)^2 \text{var}(A_i) + (c+\beta_y M_i)^2 \text{var}(C_i) + (e+\beta_z M_i)^2 \text{var}(E_i) + (\mu+\beta_M M_i)^2 \text{var}(\mu)$$

$$= (a+\beta_x M_i)^2 + (c+\beta_y M_i)^2 + (e+\beta_z M_i)^2 + 0$$

for $i = 1, 2$ (twin 1, twin 2)
Practical:

faculty/sanja/Boulder_2012/Moderating_covariances_IQ_SES/Practical