

Slides:

faculty/sanja/2016/Moderating_covariances_IQ_SES/Slides/Moderating_covariances_practical

Moderating covariances: practical

Turkheimer, E., Haley, A., Waldron, M., D'Onofrio, B., & Gottesman, I.I. (2003). Socioeconomic status modifies heritability of IQ in young children. *Psychological Science*, 14(6), 623-628.

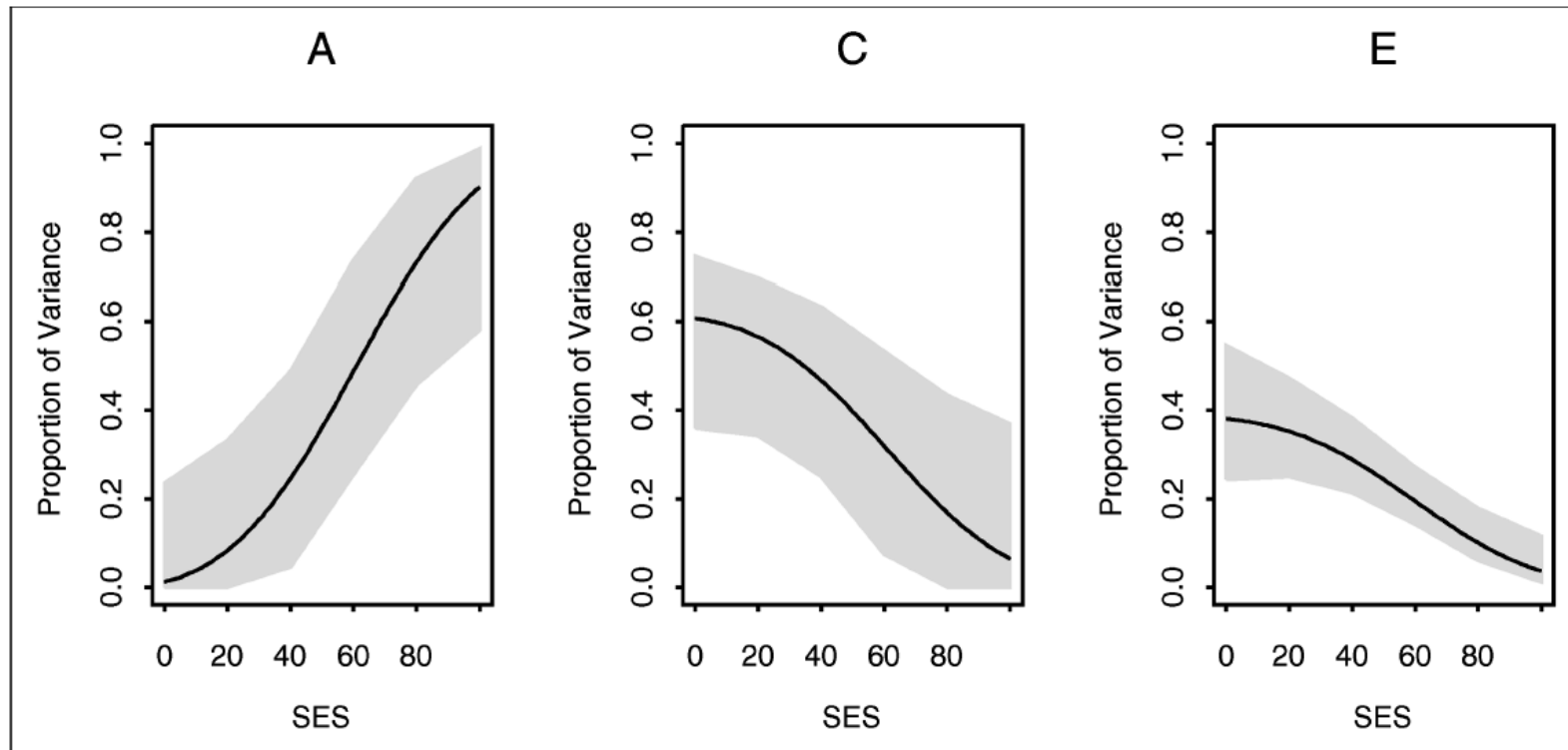


Fig. 3. Proportion of total Full-Scale IQ variance accounted for by A, C, and E plotted as a function of observed socioeconomic status (SES). Shading indicates 95% confidence intervals.

Practical: Does SES modify variance components of IQ in 5 year old children?

Data:

zygosity	socioeconomic status	IQ twin 1	IQ twin 2
zyg	ses	iq1	iq2
1	3	-0.88	-1.36
2	3	0.1	-0.11
2	3	1.14	0.44
2	2	0.1	-0.18
1	3	-0.39	-0.74
1	3	0.1	1.7
...			

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

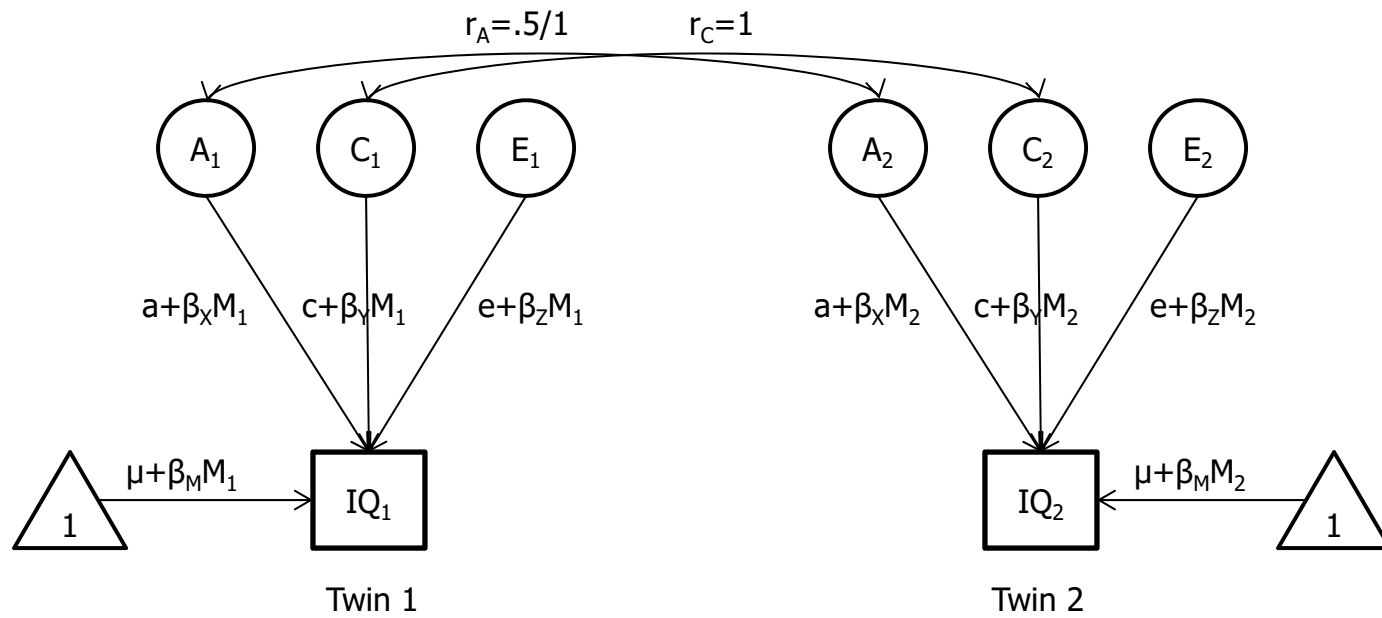
IQ scaled to have mean = 0 and variance = 1

SES measured on a 5-point scale (0 = low, 4 = high)

Is the magnitude of variance components modified by the children's SES?

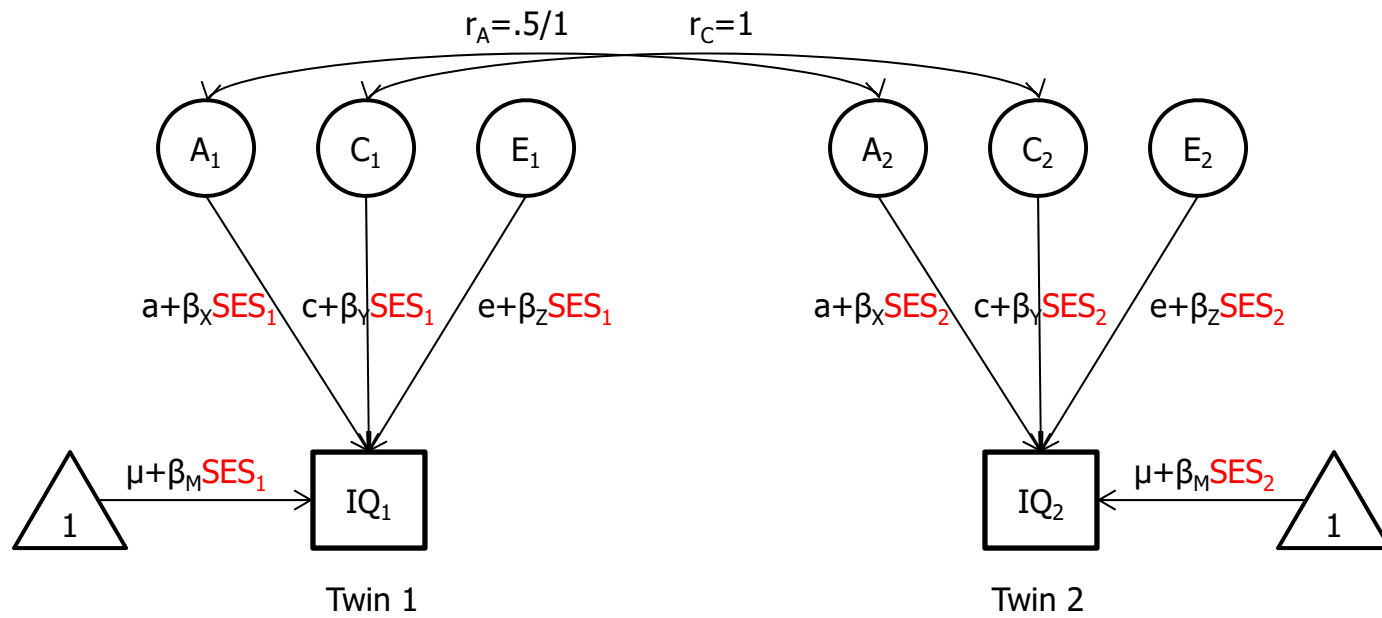
Practical: Does SES modify variance components of IQ in 5 year old children?

Model:



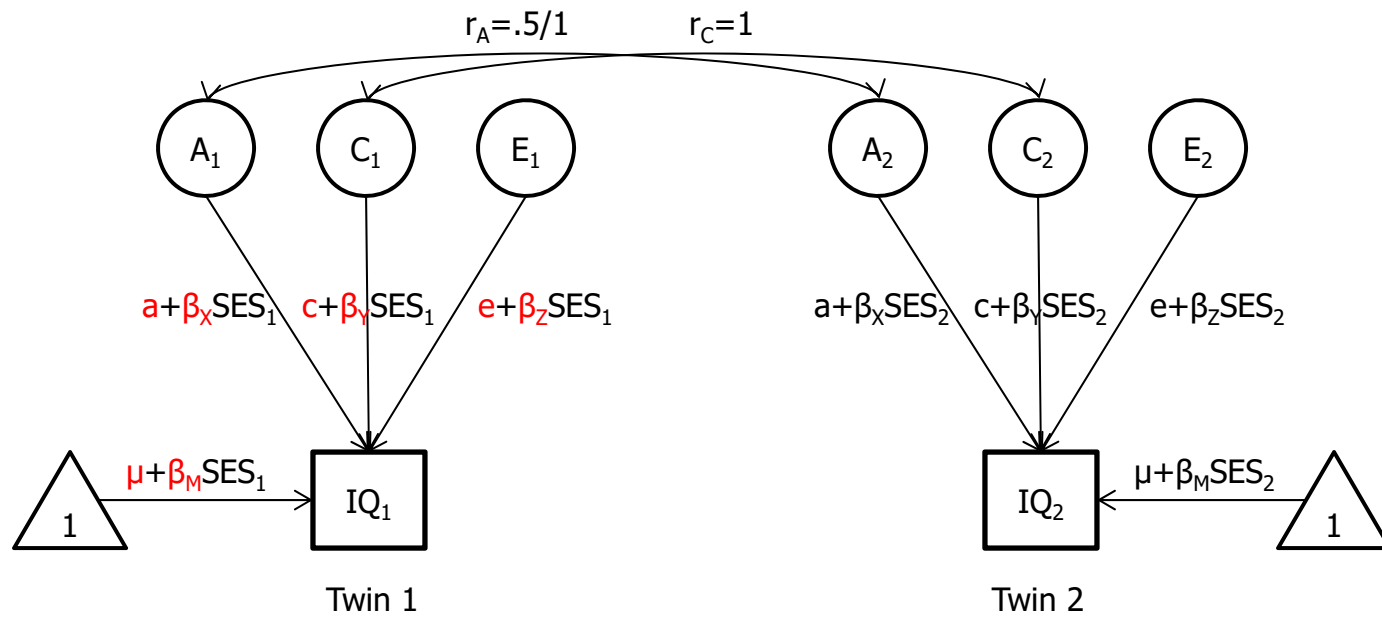
Practical: Does SES modify variance components of IQ in 5 year old children?

Model:



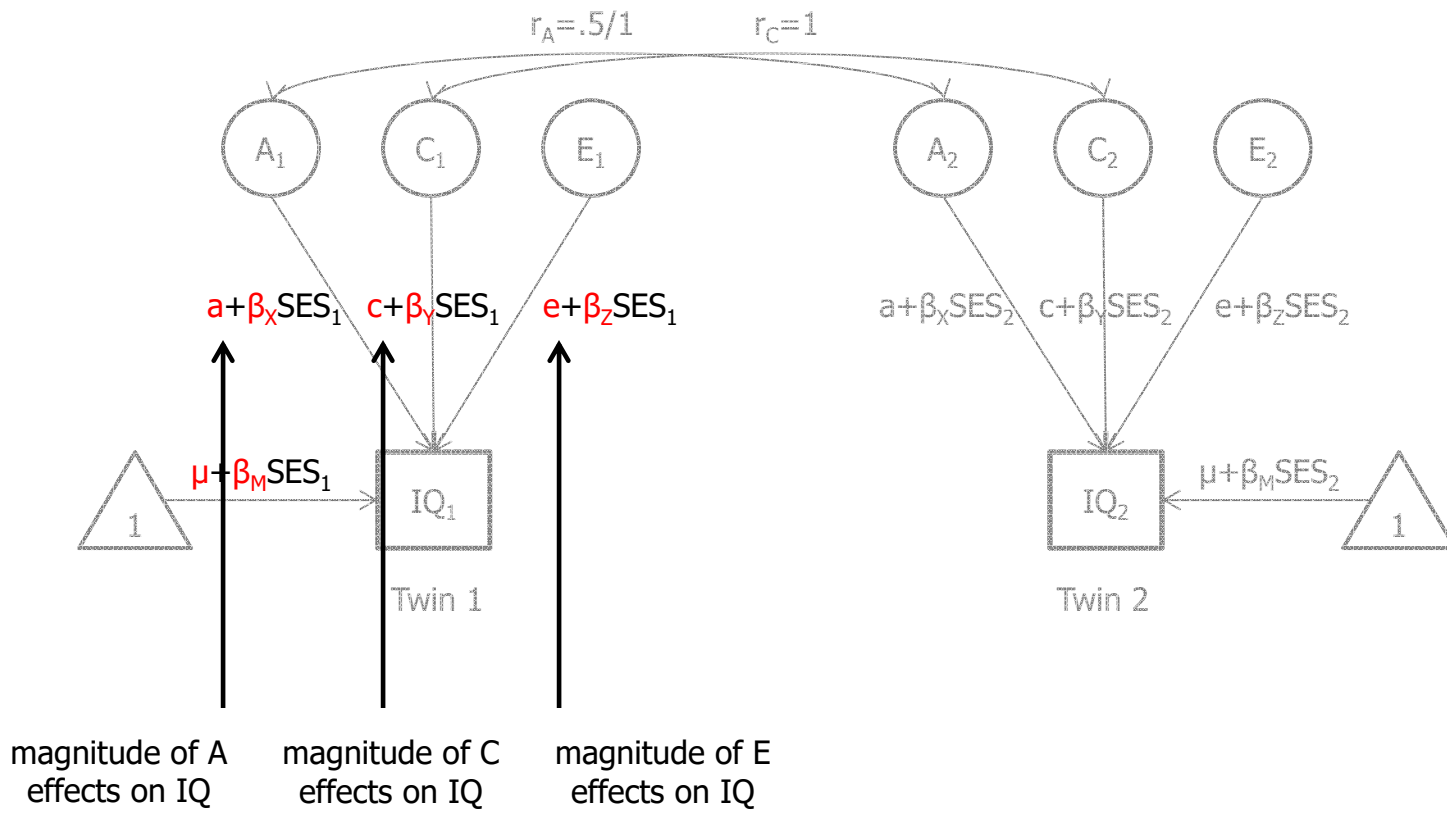
Practical: Does SES modify variance components of IQ in 5 year old children?

Parameters to estimate:



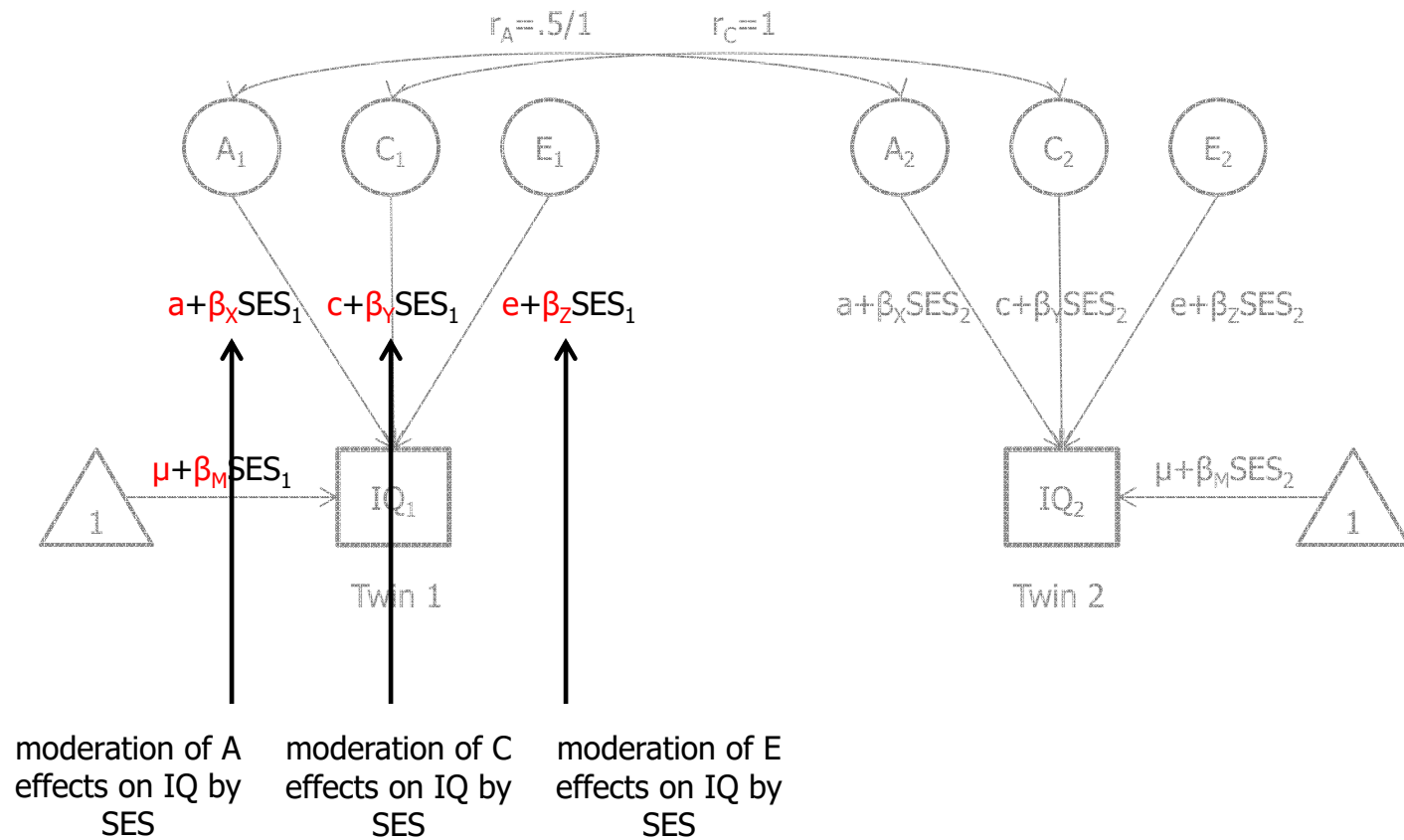
Practical: Does SES modify variance components of IQ in 5 year old children?

Parameters to estimate:



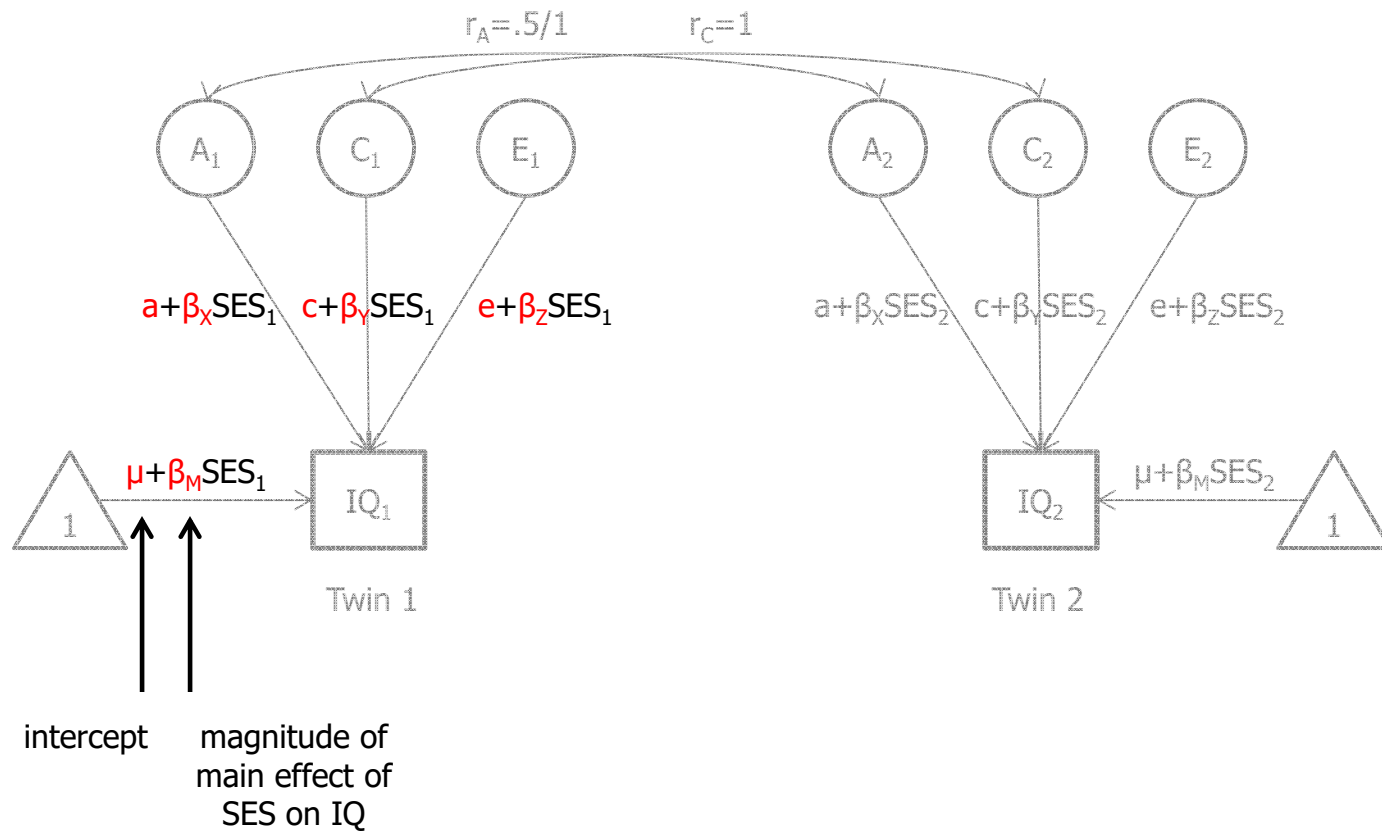
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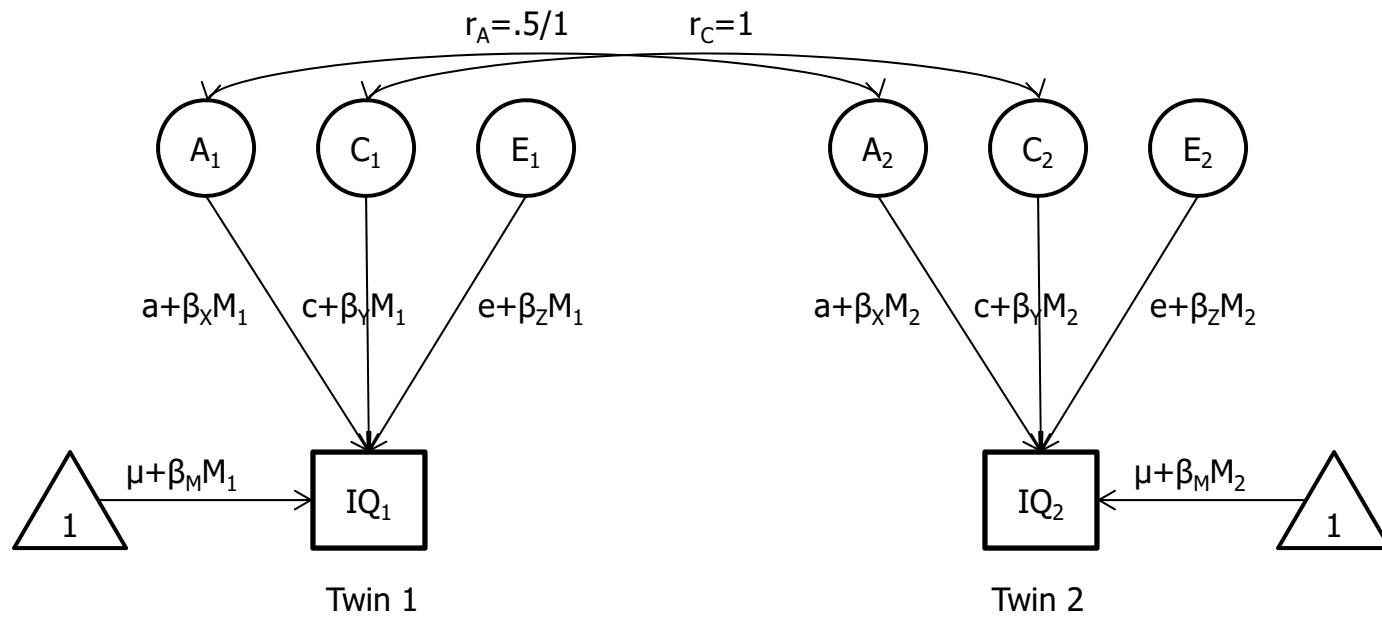
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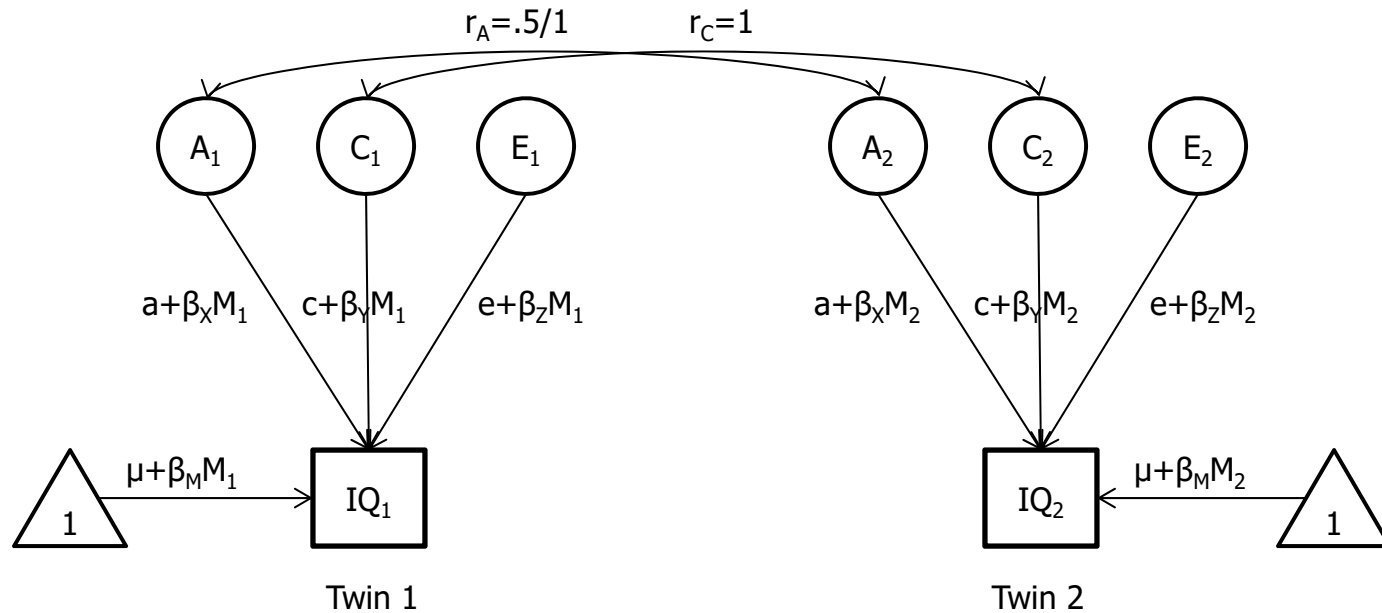
Practical: Does SES modify variance components of IQ in 5 year old children?

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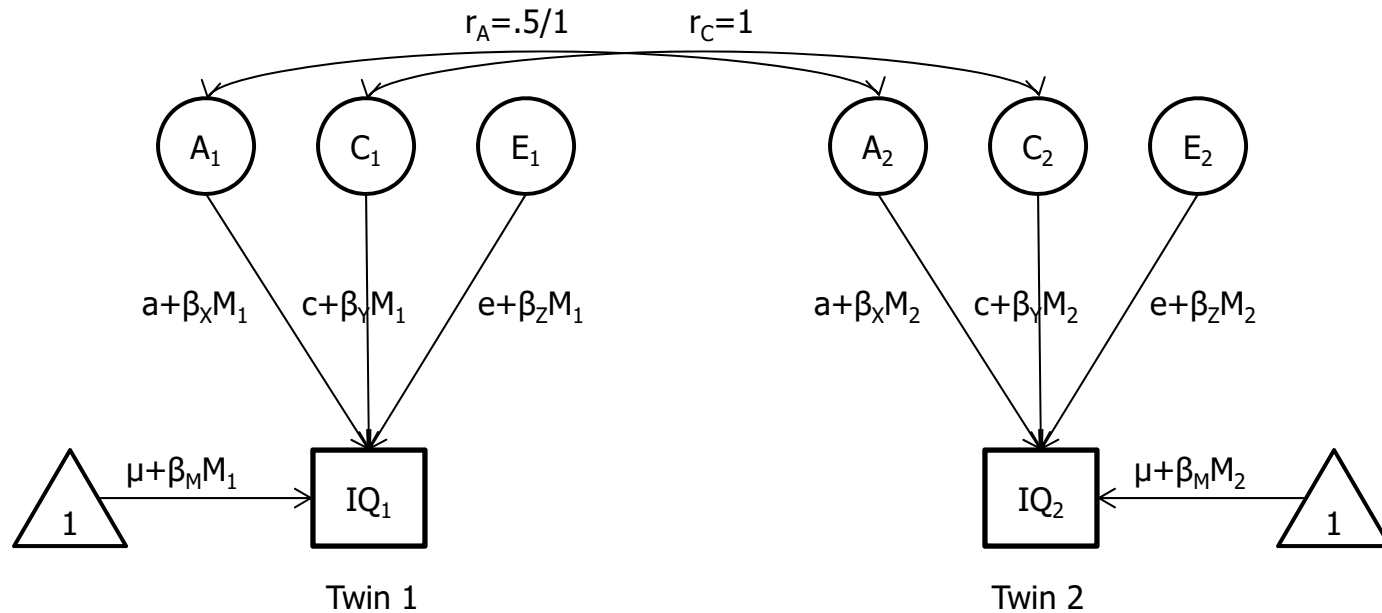
Expectations for means (conditional on the level of the moderator M_i):

$$\begin{aligned}
 \text{mean}(IQ_i|M_i) &= (a+\beta_x M_i) * \text{mean}(A_i) + (c+\beta_y M_i) * \text{mean}(C_i) + (e+\beta_z M_i) * \text{mean}(E_i) + (\mu+\beta_m M_i) * 1 \\
 &= (a+\beta_x M_i) * 0 + (c+\beta_y M_i) * 0 + (e+\beta_z M_i) * 0 + (\mu+\beta_m M_i) * 1 \\
 &= \mu + \beta_m M_i
 \end{aligned}$$

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

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):

$$\begin{aligned} \text{var}(IQ_i|M_i) &= (a+\beta_x M_i)^2 \text{var}(A_i) + (c+\beta_y M_i)^2 \text{var}(C_i) + (e+\beta_z M_i)^2 \text{var}(E_i) + (\mu+\beta_M M_i)^2 \cdot 0 \\ &= (a+\beta_x M_i)^2 \cdot 1 + (c+\beta_y M_i)^2 \cdot 1 + (e+\beta_z M_i)^2 \cdot 1 + 0 \\ &= (a+\beta_x M_i)^2 + (c+\beta_y M_i)^2 + (e+\beta_z M_i)^2 \end{aligned}$$

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

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