

Getting more from multivariate data: Multiple raters (or ratings)

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Getting more from multi rater data

- Specific raters might contain unique information on a phenotype.
- But either of the multiple raters might also be biased in his/her rating.
- Examples:
 - A father and mother separately rating their child.
 - Robo dialed vs live interviewer measures of political opinion.
 - Subscales of a Test

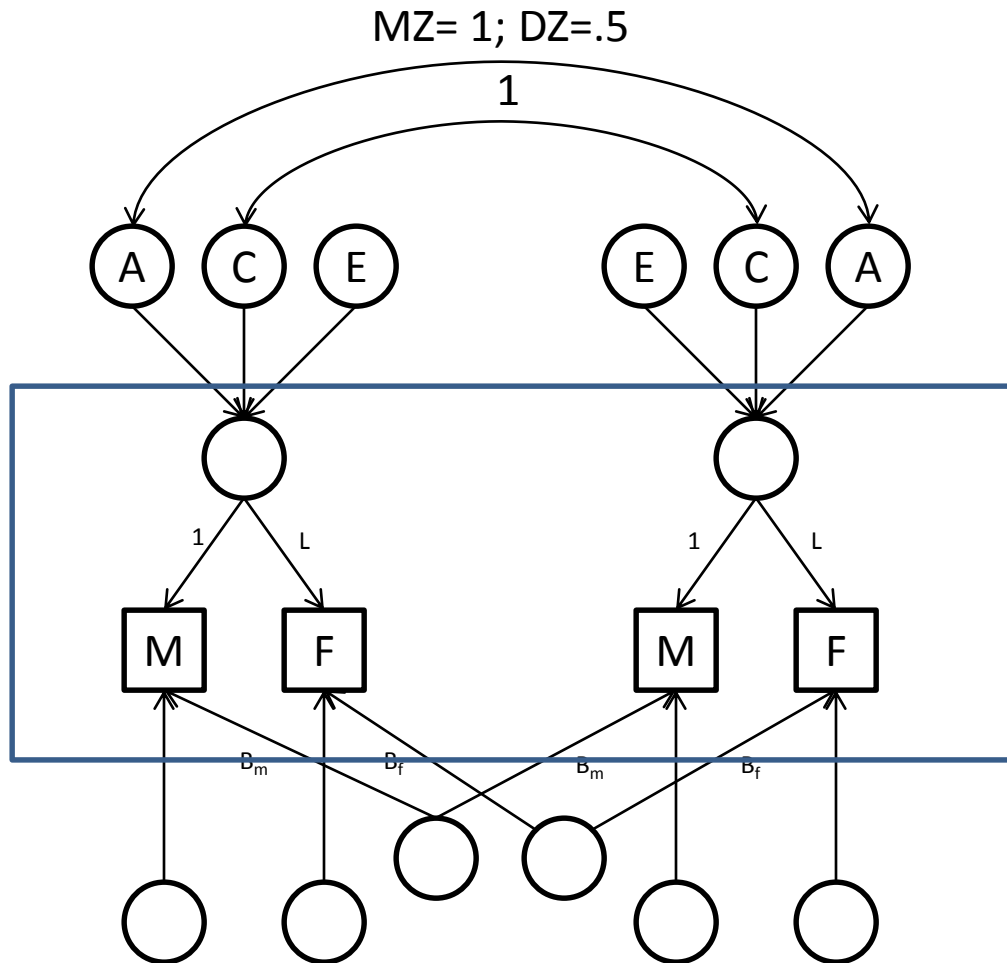
First step

- Is there a bias in either of the measures?

Can you use this?

- Think of your own data, does it contain multiple ratings of the same construct?
- If yes, you can use this model!

Rater bias model

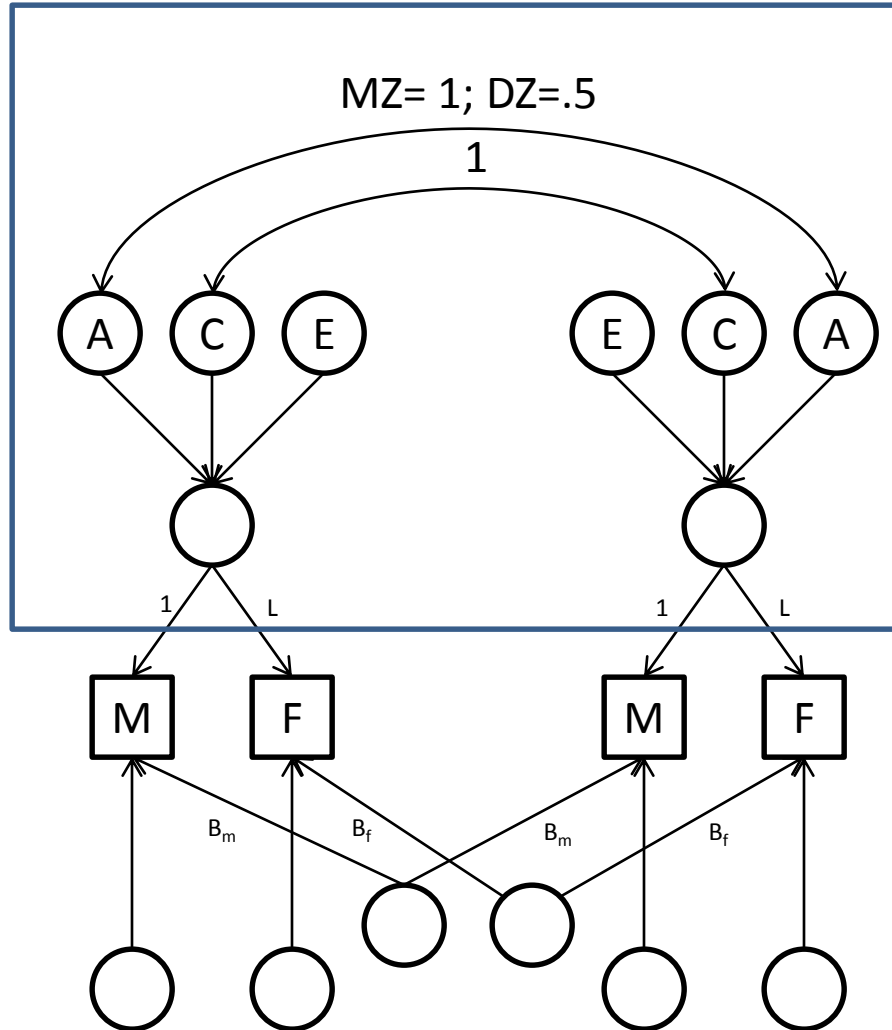


Factor loadings are Specified on line 45 to 65 of the Rater bias script.

We model a latent variable, which is a function of the "agreement" between our two raters

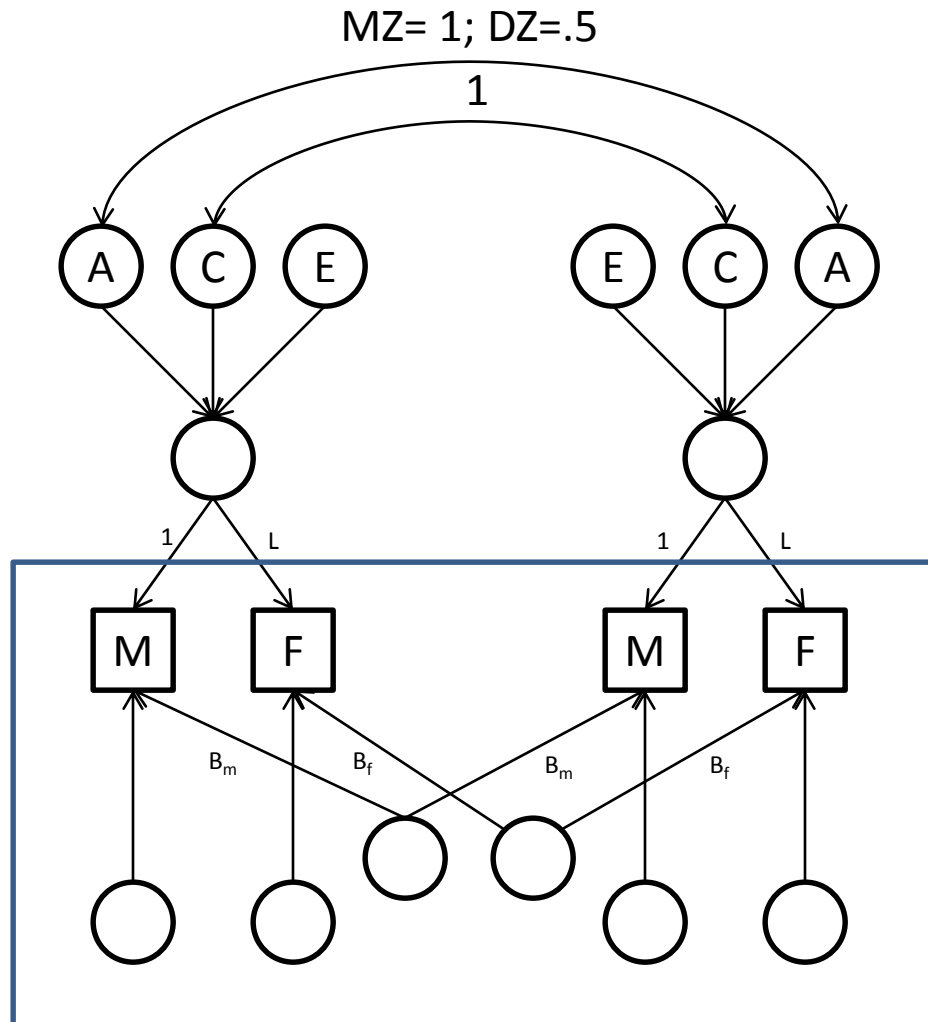
Rater bias model

The covariance algebra is specified on line 69 to 76 of the rater bias script. Matrices a,c and e are specified on line 34 to 43.



We can decompose the covariance between the latent variable for Twin pairs in a, c and e parameters for The behavior as agreed upon by two raters or measures

Rater bias model



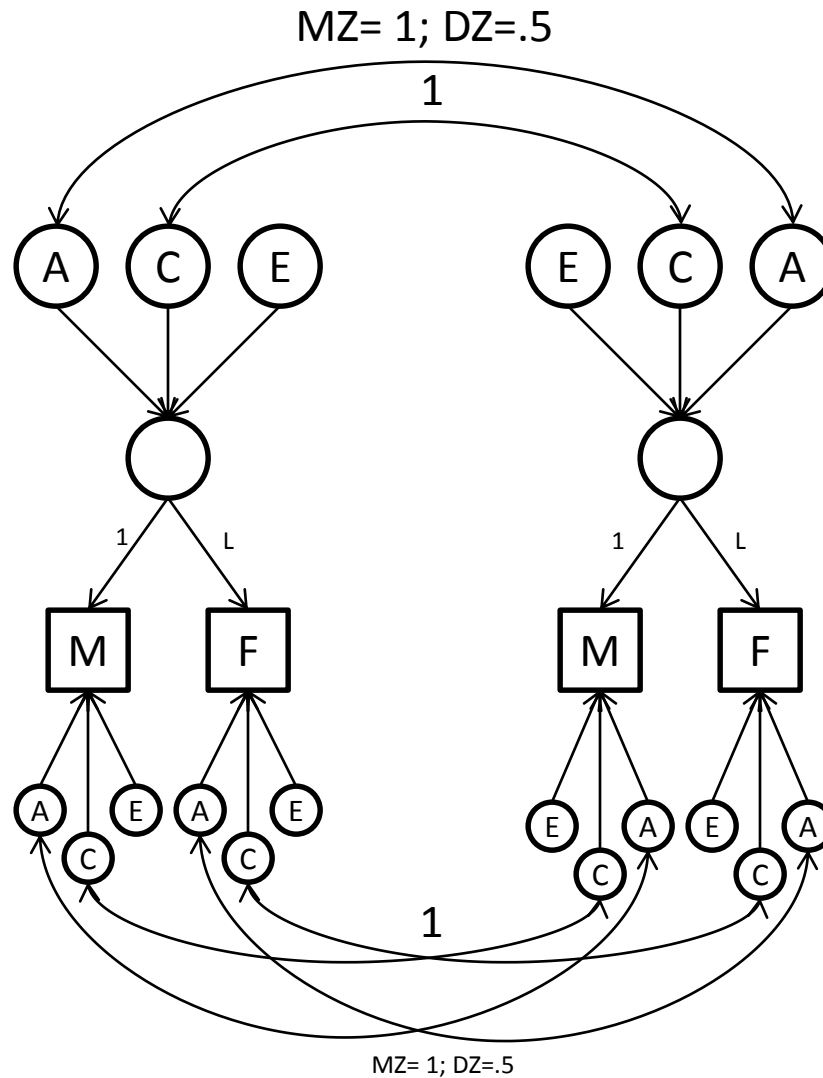
The residuals and rater bias parameters are specified on line 79 to 97 of the rater bias script

We estimate residuals, also we estimate a parameter which loads on the father ratings of both twins and one which loads on both mother ratings

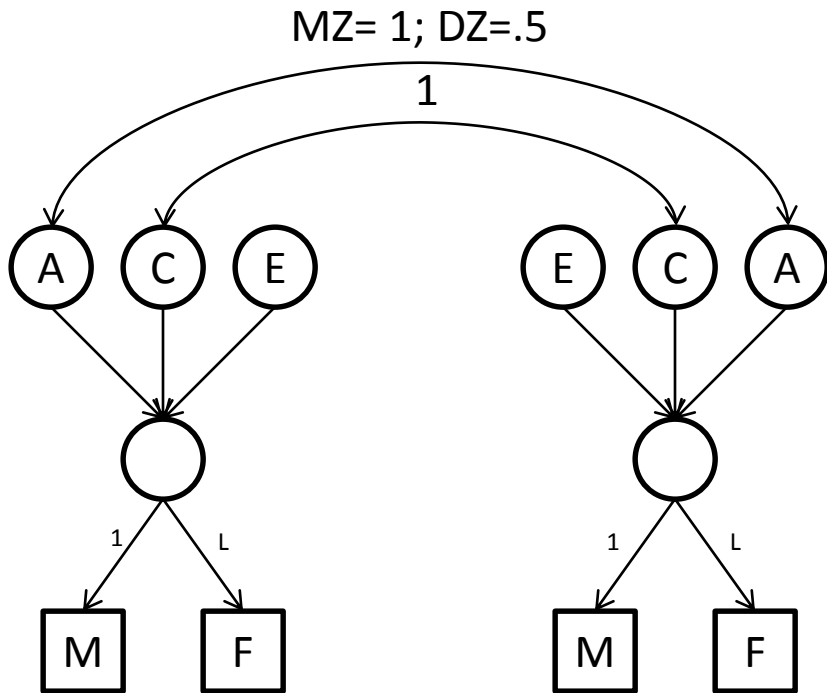
Second step

- Does the Bias imply a unique perspective provided by a specific rater?
- OR:
- Is the bias really just that, bias.

Psychometric model



Rater agreement

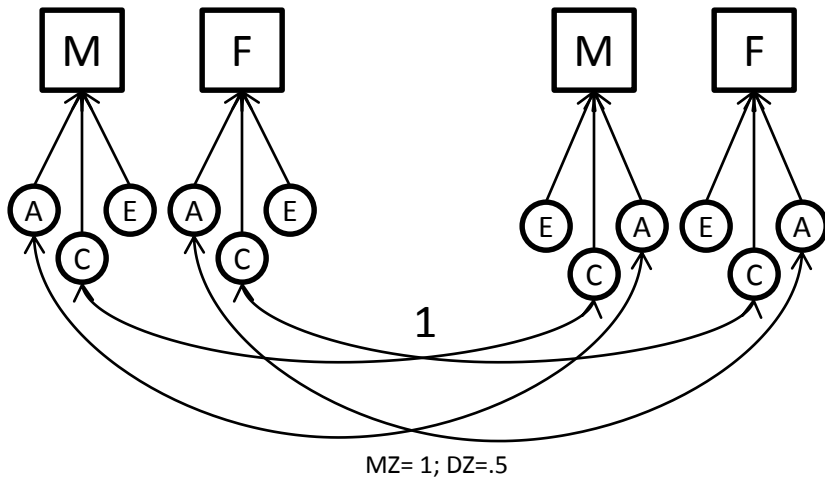


$$\text{var}(ra) = a^2 + c^2 + e^2$$

$$\text{covMZ}(ra) = a^2 + c^2$$

$$\text{covDZ}(ra) = .5*a^2 + c^2$$

Rater disagreement



$$\text{Var}(\text{rd}) = (a^2_m + m^2 c^2_m + n^2 e^2_m) + (1-m)^2 c^2_m + (1-n)^2 e^2_m$$

Unique rater perspective:
 $(a^2_m + m^2 c^2_m + n^2 e^2_m)$

Rater bias:
 $(1-m)^2 c^2_m + (1-n)^2 e^2_m$

a^2 is always reason to believe raters have a unique and valid perspective
 c^2 could be bias, but again also a valid unique perspective
 e^2 could be measurement error, but again also a valid unique perspective

To summarize:

- Multivariate ratings can be used to detect, or at least get closer to, Bias
- Each rater or rating can contribute unique information of a subject and on the relation between two twins.

Literature

- Bartels, Meike, et al. "Young Netherlands Twin Register (Y-NTR): a longitudinal multiple informant study of problem behavior." *Twin Research and Human Genetics* 10.01 (2007): 3-11.
- Hoyt, William T. "Rater bias in psychological research: When is it a problem and what can we do about it?." *Psychological methods* 5.1 (2000): 64.
- Hewitt, John K., et al. "The analysis of parental ratings of children's behavior using LISREL." *Behavior Genetics* 22.3 (1992): 293-317.