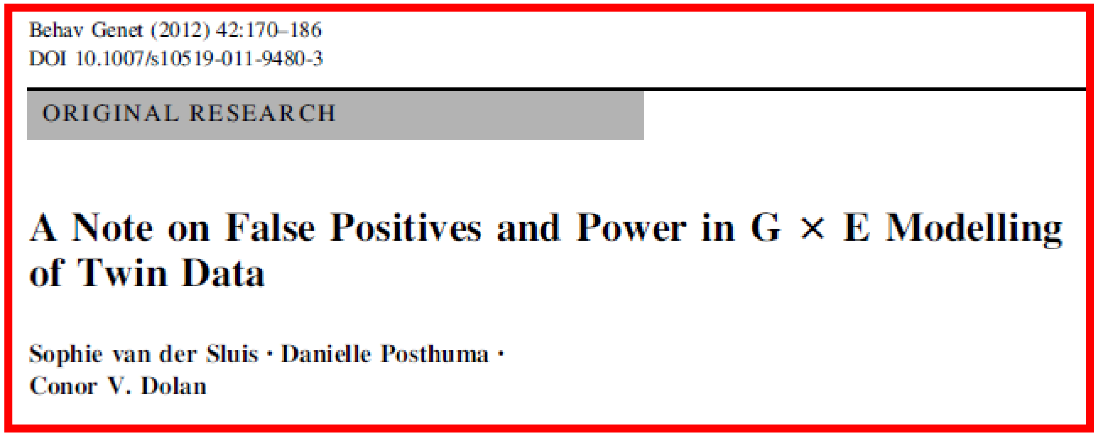
Type I errors Purcell model


Behav Genet (2012) 42:170–186
DOI 10.1007/s10519-011-9480-3

ORIGINAL RESEARCH

A Note on False Positives and Power in G × E Modelling of Twin Data

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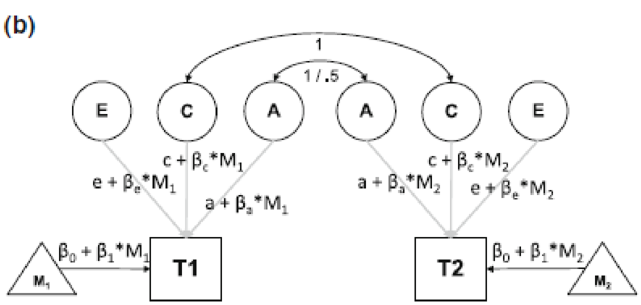
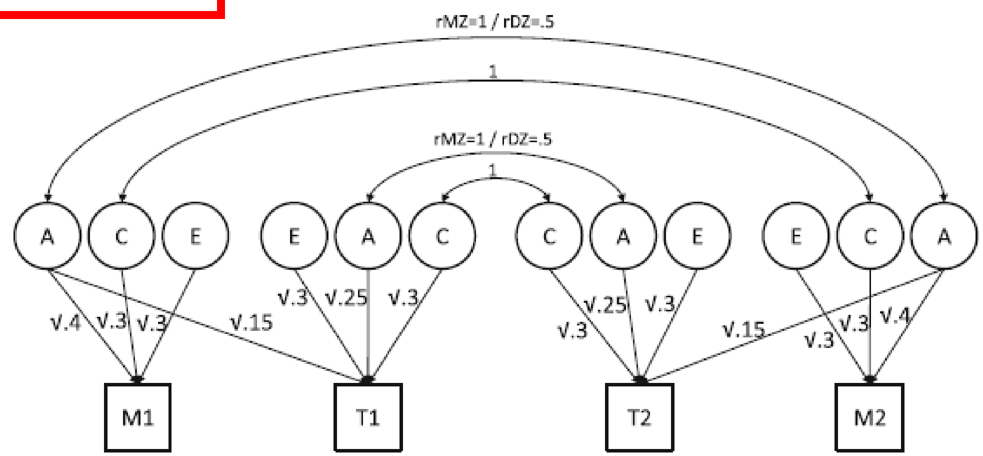
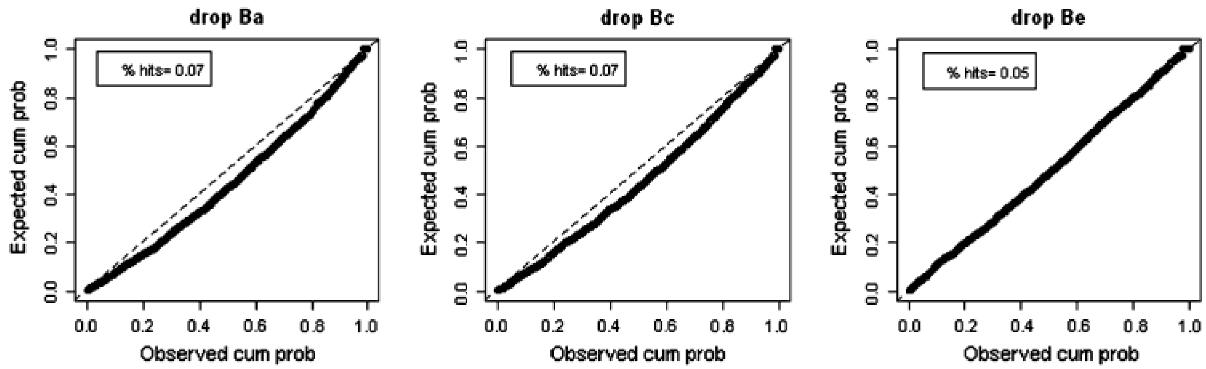




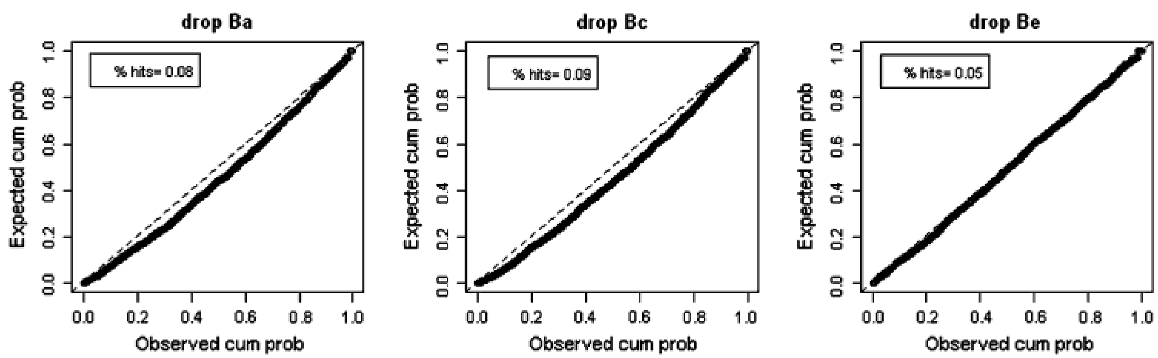
If M and T are correlated (eg via A), **and** M is correlated between twins as well, then the original specification of the Purcell moderation model can yield a large number of false positives

Results simulation study type I error

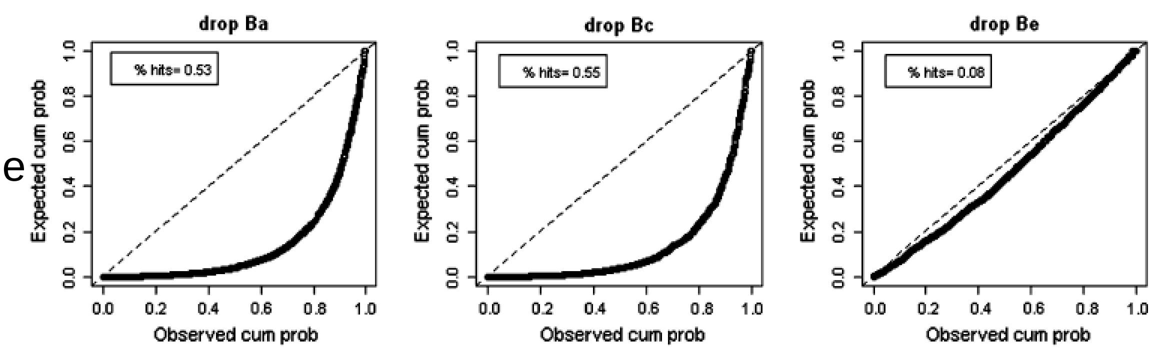
M and T correlated via A
Type I increased for Ba and Bc



M and T correlated via C
Type I increased for Ba and Bc

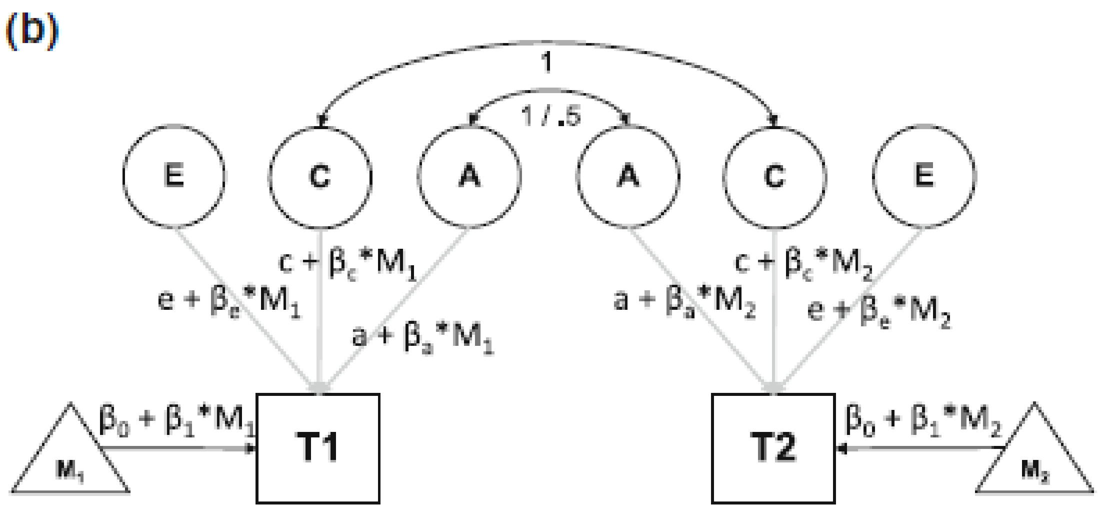


M and T correlated via E
Type I increased for Ba, Bc and Be



Extension means model

Original model



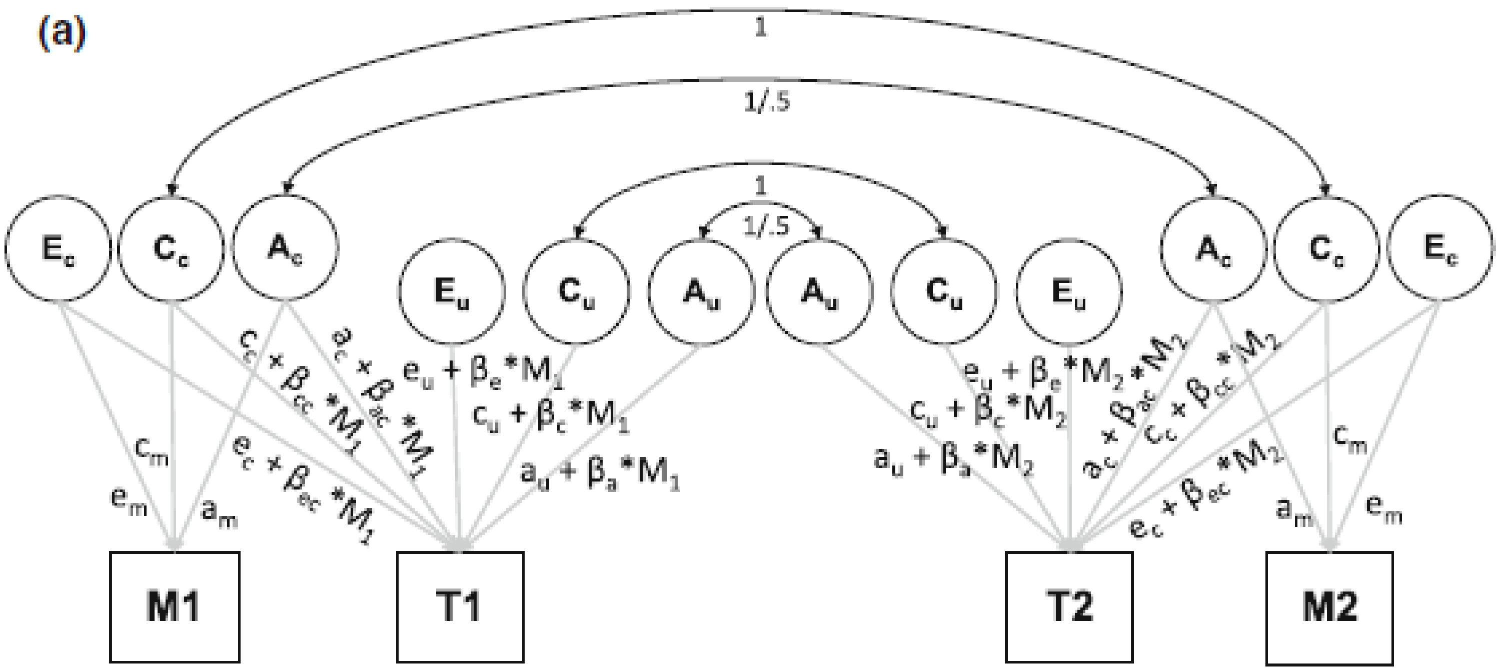
Extension means model

$$\text{MZ:} \quad T_1 = \beta_{0,mz} + \beta_{1,mz} * M_1 + \beta_{1,mz} * M_2 \,,$$
$$T_2 = \beta_{0,mz} + \beta_{1,mz} * M_2 + \beta_{2,mz} * M_1 \,,$$

$$\text{DZ:} \quad T_1 = \beta_{0,dz} + \beta_{1,dz} * M_1 + \beta_{2,dz} * M_2,$$
$$T_2 = \beta_{0,dz} + \beta_{1,dz} * M_2 + \beta_{2,dz} * M_1 \,.$$

Unless…

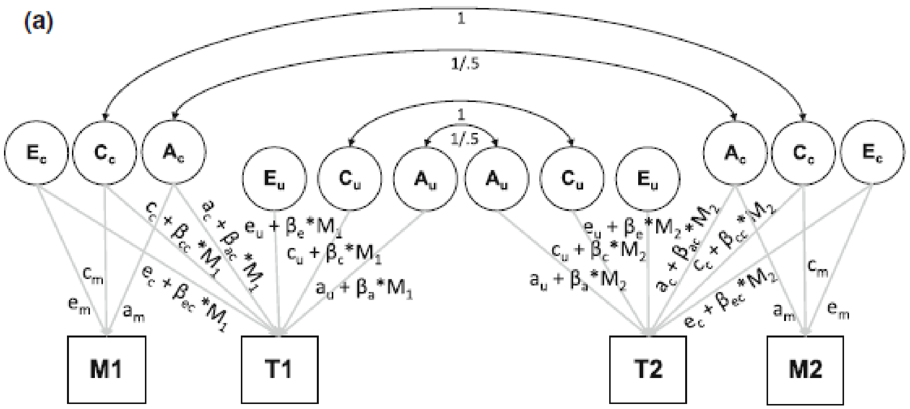
(a)



Unless the covariance between M and T is subject to moderation as well.
Then the univariate parameterization should not be used
(again increased false positive rate)

Conclusion

(a)



1. **<u>Always</u>** first fit the bivariate moderation model.

2. If moderation on covariance M and T is ***present***:
   stick to bivariate moderation model

3. If moderation on covariance M and T is ***absent***:
   proceed with *<u>extended</u>* univariate parameterization (more powerful!)