

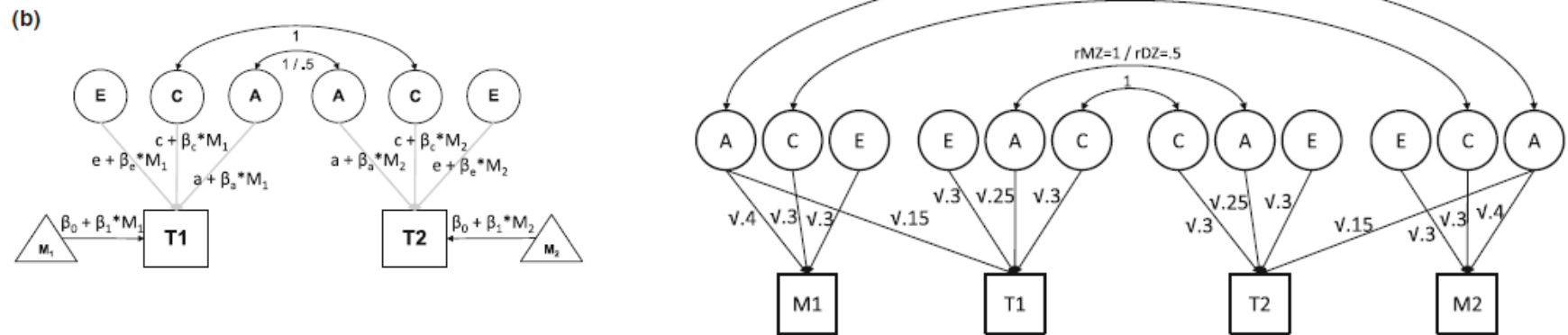
# Type I errors Purcell model

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

ORIGINAL RESEARCH

## A Note on False Positives and Power in $G \times E$ Modelling of Twin Data

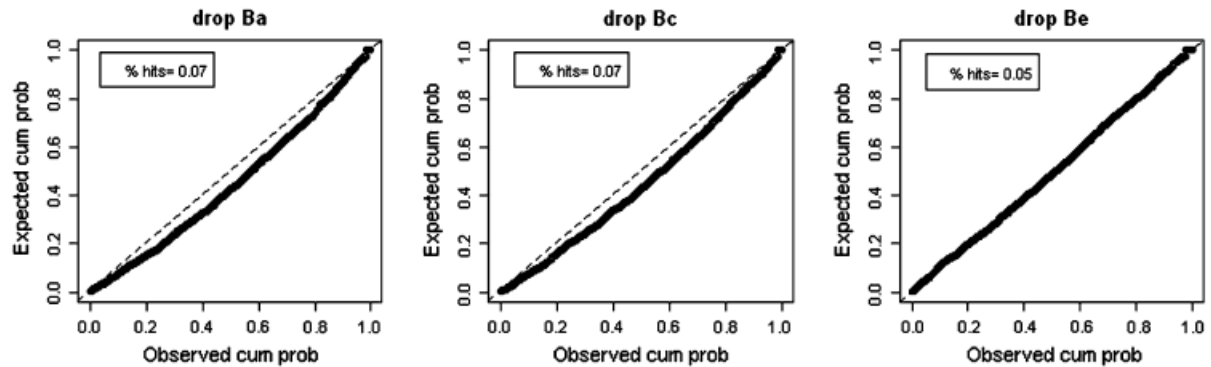
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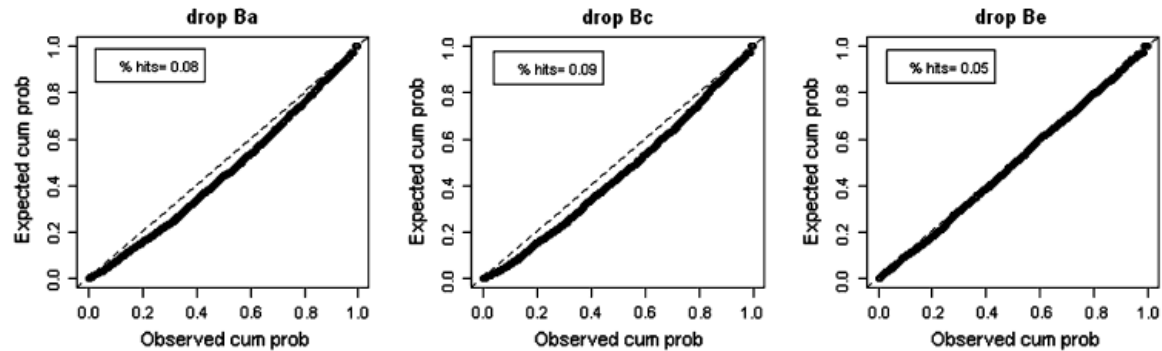
If M and T are correlated (eg via A), **and** M is correlated between twins as well, then the original specification of the Purcell moderation model can yield a large number of false positives

# Results simulation study type I error

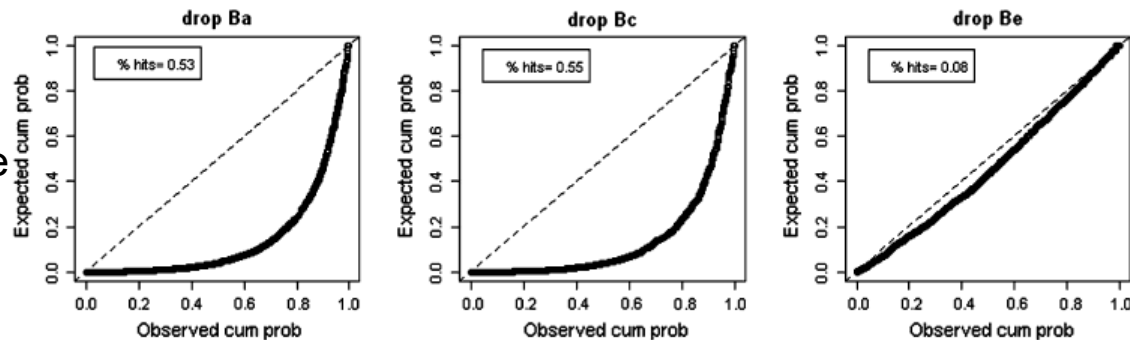
M and T correlated via A  
Type I increased for Ba and Bc



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

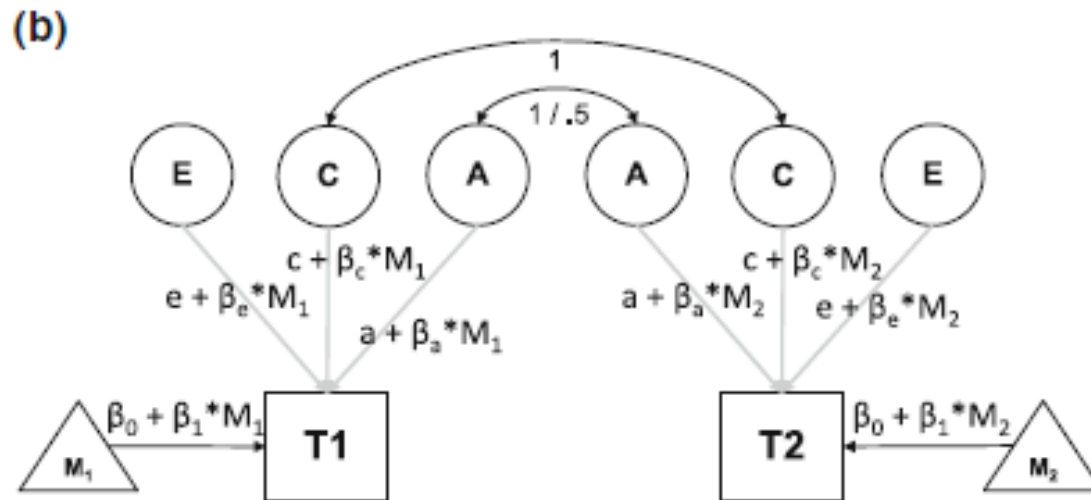


M and T correlated via E  
Type I increased for Ba, Bc and Be



# Extension means model

Original model



Extension means model

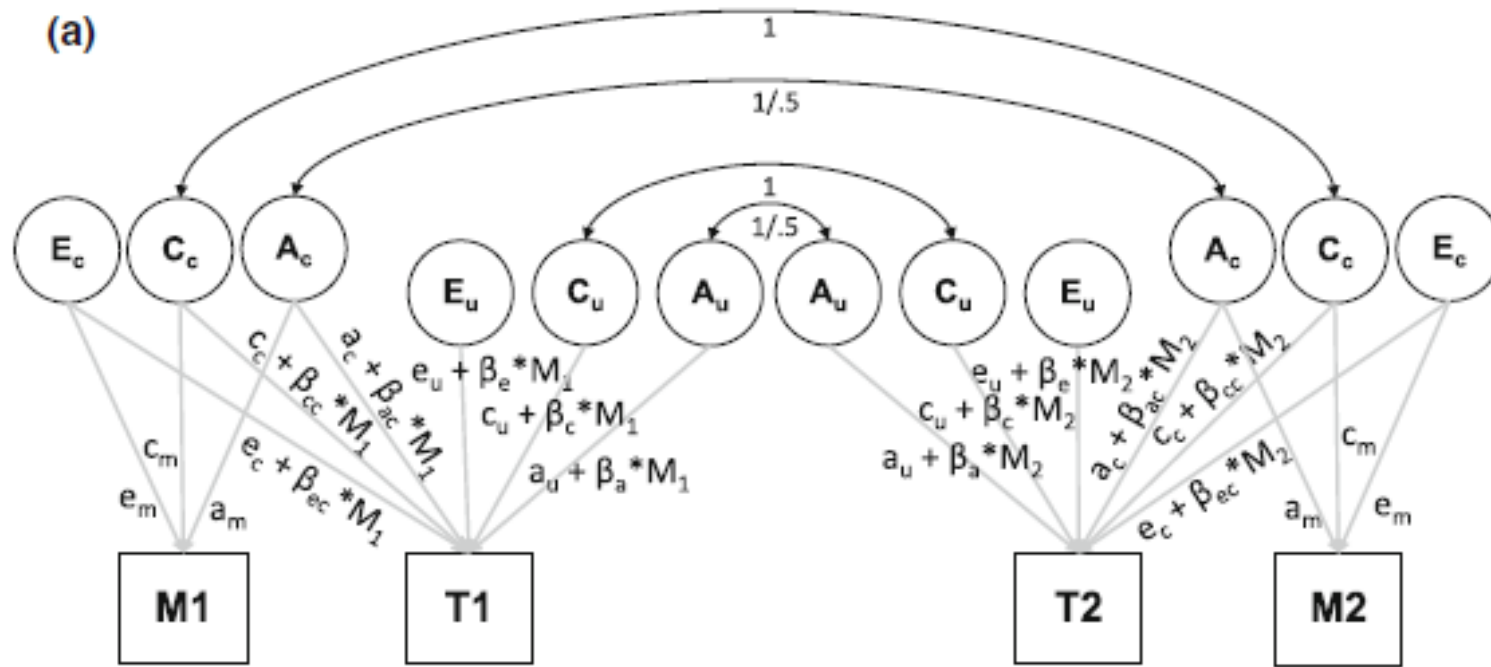
$$\text{MZ: } T_1 = \beta_{0,mz} + \beta_{1,mz} * M_1 + \beta_{1,mz} * M_2,$$

$$T_2 = \beta_{0,mz} + \beta_{1,mz} * M_2 + \beta_{2,mz} * M_1,$$

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

$$T_2 = \beta_{0,dz} + \beta_{1,dz} * M_2 + \beta_{2,dz} * M_1.$$

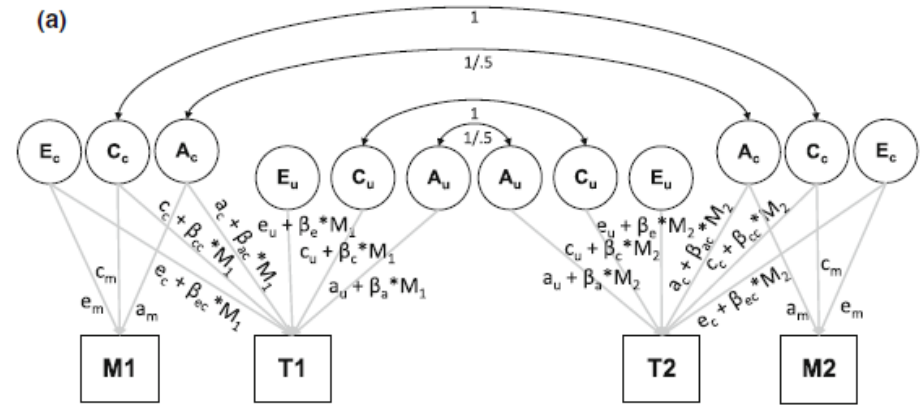
# Unless...



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

1. **Always** 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 extended univariate parameterization (more powerful)