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TITLE: Incorporating Polygenic Scores in the Nuclear Twin Family Design: Detecting Cultural Transmission. [Word count: 13]

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ABSTRACT: [Word count: 141 + 93 = 234]

Cultural transmission occurs when parental genotypes influence offspring phenotypes independent from genotypic transmission, thereby inducing a genotype-environment covariance. Its detection is important for determining the genetic architecture of a trait as well as for ensuring model validity.

Methods to detect cultural transmission include modeling phenotypic covariance between twins and their parents¹ and modeling effects of parental transmitted and nontransmitted polygenic scores². It is unknown how these approaches compare in terms of power and resolution. Additionally, a combination of latent and observed genotypic information might benefit the power to detect cultural transmission³.

In the present study we extend the Nuclear Twin Family Design by incorporating polygenic scores. We use data simulation to compare the power to detect cultural transmission of the three designs under different scenarios, including variation in the effective sample size and in the magnitude of cultural transmission.

¹Keller, M.C., Medland, S.E., Duncan, L.E., Hatemi, P.K., Neale, M.C., Maes, H. H., & Eaves, L.J. (2009). Modeling extended twin family data I: description of the Cascade model. *Twin research and human genetics*, 12(1), 8-18.

²Kong, A., Thorleifsson, G., Frigge, M.L., Vilhjalmsón, B J., Young, A.I., Thorgeirsson, T.E., ... & Gudbjartsson, D.F. (2018). The nature of nurture: Effects of parental genotypes. *Science*, 359(6374), 424-428.

³Dolan, C.V., Huijskens, R.C., Minica, C.C., Neale, M.C., & Boomsma, D.I. (preprint). Incorporating polygenic scores in the twin model to estimate genotype-environment covariance: exploration of statistical power. *bioRxiv*, 702738.

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