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TITLE: Genetic and environmental influences on sexual orientation: Moderation by childhood gender nonconformity and early-life adversity

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KEYWORDS: Sexual orientation, childhood gender nonconformity, early-life adversity, moderation

**ABSTRACT:**

Existing evidence indicates genetic and non-genetic influences on sexual orientation; however (Bailey et al., 2016), the possibility of gene-environment interplay has not been previously formally tested despite theories indicating this (Rind, 2013; Bem, 1996). This study investigated whether childhood gender nonconformity and early-life adversities independently moderated individual differences in sexual orientation and the relationship between sexual orientation and childhood gender nonconformity in a Finnish twin cohort. It also investigated the etiological bases of the proposed moderation effects. Sexual orientation, childhood gender nonconformity and early-life adversities were assessed using standardized questionnaires. Twin modelling was carried out using Structural Equation Modelling in OpenMx (Boker et al., 2011). The present study showed that childhood gender nonconformity and early-life adversities

were significantly associated with increased individual differences in sexual orientation ( $\beta = 0.14$  and  $0.18$  respectively, 95% CIs:  $0.13-0.21$ ) and covariance between sexual orientation-childhood gender nonconformity ( $\beta = 0.06$  and  $0.08$  respectively, 95% CIs:  $0.04-0.11$ ). Moderation of individual differences in sexual orientation was explained by genetic ( $\beta_A = 0.50$  for childhood gender nonconformity, 95% CI:  $0.45-0.56$ ) and individual-specific environmental influences ( $\beta_E = 0.07$  and  $0.10$  for childhood gender nonconformity and early-life adversities respectively, 95% CIs:  $0.02-0.17$ ) while moderation of the relationship between sexual orientation and childhood gender nonconformity was driven by individual-specific environmental influences ( $\beta_E = 0.15$  and  $0.10$  for childhood gender nonconformity and early-life adversities respectively, 95% CIs:  $0.04-0.21$ ). These findings suggest that etiological (genetic and environmental) influences on sexual orientation are dynamic and are in turn influenced by developmental factors.

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