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Intergenerational transmission of depressive and anxiety disorders: Mediation via youth personality

Daniel M. Mackin[1], **Megan C. Finsaas**[2], **Brady D. Nelson**[1], **Greg Perlman**[3], **Roman Kotov**[1,3], **Daniel N. Klein**[1,3]

[1]Stony Brook University, Department of Psychology

[2]Columbia University, Department of Epidemiology

[3]Stony Brook University, Department of Psychiatry

Abstract

Background.—Youth personality is hypothesized to mediate the intergenerational transmission of internalizing disorders. However, this has rarely been examined. We tested whether the intergenerational transmission of depressive and anxiety disorders is mediated by youth neuroticism and extraversion, and how parent personality influenced these relationships.

Method.—Participants included 550 adolescent girls, aged 13-15 years at baseline (T1), and a co-participating biological parent. Depressive and anxiety disorders were assessed by interview at T1, and adolescents were re-interviewed every nine months for three years (T2-T5). Parent and youth personality was assessed at T1. Four path models examined direct and indirect effects of parent psychopathology and personality (neuroticism and extraversion) on youth outcomes, with youth neuroticism and extraversion as mediators in separate models.

Results.—In the model examining the effects of parent psychopathology via T1 youth neuroticism, there were direct effects of parent depression on T2-T5 youth depressive disorders and indirect effects of parent anxiety disorders on T2-T5 youth depressive and anxiety disorders. When parent neuroticism was added, indirect effects of T1 parent anxiety disorders and neuroticism on T2-T5 youth depressive and anxiety disorders via T1 youth neuroticism were significant. In the model examining T1 youth extraversion as a mediator, there were significant direct effects of parent depressive and anxiety disorders on T2-T5 youth depressive and anxiety disorders, respectively. Finally, when adding parent extraversion, indirect effects of parent extraversion on T2-T5 youth depressive and anxiety disorders via youth extraversion were significant.

Correspondence concerning this article should be addressed to Daniel M Mackin, Department of Psychology, Stony Brook University, Stony Brook, NY, 11794. daniel.mackin@stonybrook.edu.

All data and code required to replicate the present analyses has been made publicly available: https://osf.io/baur5/. This study was not preregistered.

Conflict of Interest

The authors have no conflicts of interest to report.

Ethical Standards

All procedures comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Conclusions.—Parent and youth personality play important roles in the intergenerational transmission of depressive and anxiety disorders.

General Scientific Summary

The intergenerational transmission of depressive and anxiety disorders is hypothesized to operate via youth personality; however, this has rarely been examined. The current study tested whether the intergenerational transmission of depressive and anxiety disorders operates through youth neuroticism and extraversion, as well as how parent neuroticism and extraversion influence these relationships. Findings show that the intergenerational transmission of depressive and anxiety disorders operates partially through youth neuroticism, and that parent neuroticism further influences these relationships, while youth extraversion mediates the influence of parental extraversion on youth depressive and anxiety disorders.

Keywords

Depression; anxiety; neuroticism; extraversion; intergenerational transmission

Depressive and anxiety disorders are common during youth. Anxiety disorders are the most prevalent mental disorder among children and teens, while the incidence of depressive disorders increases sharply during adolescence, with prevalence rates reaching those seen in adults by the end of this period (Avenevoli, Swendsen, He, Burstein, & Merikangas, 2015; Merikangas et al., 2010). The prevalence rates of depressive and anxiety disorders are both roughly twice as high for females as males, and these sex differences emerge by middle adolescence (Kessler et al., 2013).

Intergenerational Transmission of Depressive and Anxiety Disorders

Parental history of internalizing psychopathology is one of the best-established risk factors for youth depressive and anxiety disorders. A family history of depression doubles the risk for depressive disorder onset (Hammen, 2009; Weissman et al., 1999) and offspring of parents with anxiety disorders are at increased risk for developing anxiety disorders (Lawrence, Murayama, & Creswell, 2019; Micco et al., 2009). The homotypic associations between parent and offspring depressive and anxiety disorders are well established, but intergenerational transmission of internalizing disorders may be non-specific (Lawrence et al., 2019; Micco et al., 2009; Starr, Conway, Hammen, & Brennan, 2014). However, risk for developing depressive and anxiety disorders have rarely been examined simultaneously (Lawrence et al., 2019). Additionally, the processes by which internalizing disorders are transmitted intergenerationally are not well understood (Goodman, 2020). One potential process of transmission is through the influence of parent psychopathology on offspring personality (Barlow, Ellard, Sauer-Zavala, Bullis, & Carl, 2014; Klein, Dougherty, Laptook, & Olino, 2008; Silberg & Rutter, 2002), which may reflect critical underlying genetic and psychosocial mechanisms.

Personality and Psychopathology

Personality, especially the traits of neuroticism (or negative emotionality) and extraversion (or positive emotionality), is another well-established risk factor for depressive and anxiety disorders (Klein, Kotov, & Bufferd, 2011). Neuroticism and extraversion are concurrently and prospectively associated with depressive and anxiety disorders in adolescents and adults, with moderate-to-large effect sizes (Bould et al., 2014; Hakulinen et al., 2015; Jeronimus, Kotov, Riese, & Ormel, 2016; Kotov, Gamez, Schmidt, & Watson, 2010). Critically, higher neuroticism and lower extraversion are present prior to the onset of psychopathology and have been conceptualized as precursors or predispositions of internalizing disorders (Klein et al., 2011). Maladaptive levels of neuroticism and extraversion may be key factors that predispose individuals towards the development of depressive or anxiety disorders, whereas other individuals do not develop symptoms despite experiencing similar levels of stress or adversity (Barlow, Curreri, & Woodard, 2021).

The literatures on parental internalizing disorders and personality in the development of depressive and anxiety disorders have generally remained separate, and few models have been proposed to incorporate both sets of risk factors. However, several investigators have conjectured that the intergenerational transmission of internalizing disorders occurs through the influence of parent depressive and anxiety disorders on youth personality (Klein et al., 2008; Silberg & Rutter, 2002). A handful of studies have investigated personality in the offspring of depressed parents, the first leg of the hypothesized mediational pathway. This work has produced evidence that offspring of depressed parents exhibit higher levels of neuroticism/negative emotionality (Jessee, Mangelsdorf, Shigeto, & Wong, 2012; Olino, Klein, Dyson, Rose, & Durbin, 2010), and lower levels of extraversion/positive emotionality (Durbin, Klein, Hayden, Buckley, & Moerk, 2005), than offspring of non-depressed parents. However, only one study has examined whether youth personality mediated the intergenerational transmission of internalizing psychopathology. This investigation found that maternal history of depression was associated with increased neuroticism at age 5, and that neuroticism, but not extraversion, mediated the effect of maternal history of depression on children's symptoms at age 9 (Allen, Oshri, Rogosch, Toth, & Cicchetti, 2019). However, this study had several notable limitations. It did not adjust for baseline symptom levels or examine disorder onset, nor did it distinguish offspring depression and anxiety symptoms, prohibiting examination of disorder-specific relationships. Moreover, it ended when children were 9 years of age, prior to the period of greatest risk for depressive disorders. Finally, this study relied upon parent reports of both parent and youth symptoms, a critical limitation in testing mediational hypotheses (Burt et al., 2005); the findings did not replicate with teacher-reported symptoms, suggesting that these results may be due to method biases. Therefore, it is currently unclear whether youth personality mediates the intergenerational transmission of internalizing disorders.

The role of parental neuroticism and extraversion in the intergenerational transmission of internalizing disorders is also unknown. If youth personality mediates the intergenerational transmission of depressive and anxiety disorders, it is critical to determine whether these effects can be explained by parental personality, especially via its effect on youth personality. The transmission of personality traits from parents to offspring is well-

established (Eley et al., 2015; Kitamura et al., 2009). Additionally, parent personality has been hypothesized to influence the development of affective disorders in offspring, and higher levels of neuroticism in parents are associated with greater levels of internalizing problems in youth (Ellenbogen & Hodgins, 2004). However, no studies have examined whether the influence of parent personality on youth psychopathology operates directly or via its effects on youth personality.

Parent neuroticism and extraversion could contribute to the development of psychopathology in offspring in several ways. Neuroticism and extraversion are each moderately heritable (~0.4 – 0.6; Bouchard & Loehlin, 2001; Jang, Livesley, & Vemon, 1996; Kendler, Prescott, Myers, & Neale, 2003; Viken, Rose, Kaprio, & Koskenvuo, 1994; Vink et al., 2012), and there is substantial genetic covariation between internalizing psychopathology and personality, particularly neuroticism (Lo et al., 2017; Tackett et al., 2013). Additionally, parental depressive and anxiety disorders, as well as elevated neuroticism and reduced extraversion, are associated with negative parenting behaviors (e.g., low warmth and support, overcontrol, overprotection), which may contribute to the development of both personality trait vulnerabilities and psychopathology in offspring (Atherton & Schofield, 2021; Barlow et al., 2014; Kochanska, Clark, & Goldman, 1997; Prinzie, Stams, Deković, Reijntjes, & Belsky, 2009). Therefore, genes and parenting are likely mechanisms that contribute to the intergenerational transmission of internalizing disorders via their influence on offspring personality.

The Current Study

There are almost no data on whether the transmission of internalizing disorders is mediated by offspring personality or the role of parental personality in this process. Additionally, it is important to examine the transmission of depressive and anxiety disorders simultaneously to determine whether the processes are relatively specific or transdiagnostic. The current study extends the very limited empirical literature in this area by utilizing a community sample of 550 adolescent girls to examine the influence of parental depressive and anxiety disorders on subsequent youth depressive and anxiety disorders via youth neuroticism and extraversion. We also examine whether parental neuroticism and extraversion account for the intergenerational transmission of depression and anxiety via youth neuroticism and extraversion, respectively.

Method

Participants

The sample consisted of 550 adolescent girls and a biological parent recruited from the community to participate in a longitudinal study of predictors of first-onset depression (Mackin et al., 2019; Michelini et al., 2021; Nelson, Perlman, Klein, Kotov, & Hajcak, 2016). Eligibility requirements included being female, between 13 and 15 years of age, fluent in English, and having a co-participating biological parent. Exclusion criteria were a lifetime history of MDD or dysthymia or a developmental disability.

Data were obtained at the baseline (T1) visit for adolescents and parents, and adolescents were re-assessed four times at 9-month intervals over the next three years (T2-T5). The T1, T3, and T5 assessments were generally in person; T2 and T4 were over the telephone. Youth racial/ethnic background was 80.5% non-Hispanic Caucasian and 64.7% of participants had at least one parent who completed a bachelor's degree or greater.

Parents and adolescents provided informed consent and assent, respectively, and all procedures were approved by the Stony Brook University Institutional Review Board (protocol #328420). All families were compensated for their participation.

Measures

Parent Psychopathology.—At T1, the participating biological parent was interviewed about their history of psychopathology with the Structured Clinical Interview for the DSM-IV (SCID; First, 1996). The present study focused on lifetime history of depressive disorders (MDD or dysthymia), Generalized Anxiety Disorder (GAD), Post-Traumatic Stress Disorder (PTSD), Panic Disorder (PD), Social Phobia (SAD), Specific Phobia (SP), and Agoraphobia. In addition, the parent provided information on the history of psychopathology in the child's other biological parent using the Family History Screen (FHS; Weissman et al., 2000). The FHS demonstrates adequate sensitivity, specificity, and test-retest reliability for informant-reported psychiatric histories (Weissman et al., 2000). Information for both parents was combined into a dichotomous variable to reflect the absence vs. presence of parental histories of depressive and anxiety disorder in either parent.

The SCID and FHS were administered by extensively trained research staff who were closely supervised by clinical psychologists (D.K., G.P., and R.K.). Of the parents interviewed, 92.9% were mothers. Inter-rater reliability estimates of 25 SCID recordings were found to be adequate (kappa range: 0.69 [SP] to 1.00 [PD]).

Adolescent Psychopathology.—Lifetime history of psychopathology was assessed via interview with the adolescent at T1 using the Schedule for Affective Disorders and Schizophrenia for School-Aged Children: Present and Lifetime version (K-SADS; Kaufman et al., 1997). The K-SADS was also administered at each of the four follow-ups (T2-T5) for the interval since the previous interview. In-person interviews were conducted on average 17.71 (SD = 1.35) and 37.47 (SD = 2.98) months after baseline, and phone follow-ups were conducted on average 9.07 (SD = 0.95) and 26.76 (SD = 1.20) months after T1. Due to their episodic nature, depressive disorders were assessed at all waves, while anxiety disorders were assessed at T1, T3, and T5. Although depressive disorders were assessed more frequently, both depressive and anxiety disorders were assessed throughout the entire 36-month period.

The study from which the current sample was drawn aimed to investigate the first onset of depressive disorders, therefore adolescents were excluded from the study if they had ever met criteria for MDD or dysthymia by the baseline assessment. However, participants with a history of Depression Not Otherwise Specified (NOS; i.e., demonstrating clinically significant symptoms and impairment, but not meeting diagnostic criteria for MDD or dysthymia) were included. Therefore, T1 youth depressive disorders were defined

as the presence of depression NOS at T1 and T2-T5 youth depressive disorders were operationalized as the presence of either MDD or dysthymia at any time after T1 (i.e., T2-T5). T1 anxiety was operationalized as the current or past diagnosis of a DSM-IV anxiety disorder (GAD, PTSD, PD, SAD, SP, or agoraphobia) at the baseline visit. Similarly, T2-T5 youth anxiety was defined as the presence of an anxiety disorder at any time after T1.

The K-SADS was administered by extensively trained research staff closely supervised by clinical psychologists (D.K., G.P., and R.K.). Inter-rater reliability estimates of 25 K-SADS recordings were found to be adequate (kappa range: 0.65 [MDD] to 1.00 [PD]).

Parent and Adolescent Personality.—Parent and youth neuroticism and extraversion were assessed via self-report at T1 using the Big Five Inventory (BFI; John, Donahue, E. M., & Kentle, R. L., 1991; John, Naumann, & Soto, 2008). The BFI is a 44-item factor-analytically derived measure of the Big Five personality trait model. The neuroticism and extraversion scales are each comprised of 8 items. Items consist of short descriptive phrases rated on a five-point Likert scale ranging from 1 (disagree strongly) to 5 (agree strongly). The BFI has good internal consistency, test-retest reliability, and convergent and discriminant validity (John et al., 2008). All personality scales were z-scored to allow for direct comparisons. Internal consistency was good for both youth ($\alpha_{neuroticism}$ = .83; $\alpha_{extraversion}$ = .80) and parents ($\alpha_{neuroticism}$ = .84; $\alpha_{extraversion}$ = .84).

Data Analysis

Pearson's, point-biserial, and tetrachoric correlations were estimated between continuous-continuous, continuous-binary, and binary-binary variable pairs, respectively. Attrition analyses indicated that the 515 participants with complete data did not differ from those missing one or more data points on any demographic or T1 variable (all *p*-values >.18).

A series of path models were created to examine the intergenerational transmission of depressive and anxiety disorders via offspring personality. The first model examined the direct effects of T1 parent depressive and anxiety disorders on T2-T5 youth depressive and anxiety disorders, and indirect effects via T1 youth neuroticism. T2-T5 youth depressive disorders and T2-T5 youth anxiety disorders were each regressed on T1 youth depressive disorders and T1 youth anxiety disorders to adjust for the impact of pre-existing psychopathology. Next, this model was replicated replacing T1 youth neuroticism with T1 youth extraversion. To investigate the effects of parent neuroticism on the intergenerational transmission of internalizing disorders via youth neuroticism, the third model added T1 parent neuroticism as a predictor of T2-T5 youth depressive and anxiety disorders, both directly and via T1 youth neuroticism. Finally, the third model was replicated replacing T1 parent neuroticism and T1 youth neuroticism with T1 parent extraversion and T1 youth extraversion, respectively. Neuroticism and extraversion were examined in separate models due to sample size limitations and to allow for more interpretable results.

Sensitivity analyses were conducted for the two models that included T1 parent personality as predictors. These models were modified by switching T1 parent neuroticism/extraversion and T1 youth neuroticism/extraversion such that T1 parent personality was the mediator and T1 youth personality was the predictor. This can provide greater confidence in determining

the direction of the effect when the predictor and mediator variables are assessed cross-sectionally.

All analyses were conducted in Mplus 8.3 (Muthen & Muthen, 2012-2018) using a probit link, theta parameterization, and the robust weighted least squares estimator (WLSMV), which is suitable for ordinal data (Flora & Curran, 2004). Pairwise deletion was used as required by the WLSMV estimator. This allows all individuals with data on the relevant variables to be included when estimating different portions of the model. Because models were just-identified, model fit statistics were not available. Cutoffs of $\beta < 0.2$, $0.2 < \beta < 0.5$, and $\beta > 0.5$ were used to describe small, moderate, and large effect sizes, respectively (Acock, 2008).

All data and code required to replicate the present analyses has been made publicly available: https://osf.io/baur5/. This study was not preregistered.

Results

Descriptive Statistics and Bivariate Associations

Descriptive statistics are presented in Table 1. The prevalences of parental and youth anxiety disorders were approximately twice that of parental and youth depressive disorders. Youth depressive and anxiety disorder incidence increased substantially from T1 to the T2-T5 assessments. Parent depressive and anxiety disorders were moderately correlated, as were T2-T5 youth depressive and anxiety disorders. Similarly, parent and youth personality were moderately and significantly correlated at T1.

Intergenerational Effects of Parent Disorders on Youth Disorders Via Youth Neuroticism[1]

Table 2 (top) and Figure 1 (top) present results from the model examining the intergenerational influence of parent depressive and anxiety disorders on T2-T5 youth depressive and anxiety disorders via T1 youth neuroticism. Analyses controlled for T1 depression NOS and anxiety disorders. There was a small but significant main effect of T1 parent depressive disorders on T2-T5 youth depressive, but not T2-T5 anxiety, disorders; the direct effect of parent anxiety disorders on T2-T5 youth psychopathology was trending toward significance ($p = .06$). Additionally, parent anxiety disorders, but not parent depressive disorders, had small effects on T1 neuroticism in youth. In turn, T1 youth neuroticism predicted T2-T5 youth anxiety and depressive disorders with moderate effect sizes.

The indirect effects of parent depressive disorders on T2-T5 youth anxiety and T2-T5 youth depressive disorders via T1 youth neuroticism were non-significant. In contrast, the presence of parent anxiety disorders had small, but significant, indirect effects on both T2-T5 youth anxiety and depressive disorders via T1 youth neuroticism.

[1]The pattern of findings was identical across models when reanalyzing the data excluding cases with a current T1 parent depressive or anxiety disorder, with one exception. In the first neuroticism model that did not include parent neuroticism, the direct effect of parent depressive disorders on youth depressive disorders was non-significant (β=.08, $SE\ \beta$=0.06, p=.23).

Intergenerational Effects of Parent Disorders on Youth Disorders Via Youth Extraversion

Table 2 (bottom) and Figure 1 (bottom) present results from the model examining the intergenerational transmission of parent depressive and anxiety disorders on T2-T5 youth depressive and anxiety disorders via T1 youth extraversion. Analyses controlled for T1 depression NOS and anxiety disorders. There was a small but significant main effect of T1 parent depressive disorders on T2-T5 youth depressive, but not T2-T5 anxiety, disorders. Similarly, there was a small but statistically significant direct effect of T1 parent anxiety disorders on T2-T5 youth anxiety, but not T2-T5 youth depressive, disorders. Neither T1 parent depressive nor anxiety disorders were associated with T1 youth extraversion. However, lower T1 youth extraversion predicted an increased likelihood of T2-T5 youth anxiety and depressive disorders with small effect sizes. All indirect effects of T1 parent depressive and anxiety disorders on T2-T5 youth depressive and anxiety disorders via T1 youth extraversion were non-significant.

Role of Parental Neuroticism in Intergenerational Effects

The next model added predictive effects of T1 parent neuroticism while examining T1 youth neuroticism as a mediator. Results are presented in Table 3 (top) and Figure 2 (top). Analyses again controlled for T1 youth depression NOS and anxiety disorders. Once parental neuroticism was added to the model, the main effect of parent depressive disorders on T2-T5 youth depression was reduced to a trend ($p = .06$). Similarly, all other main effects of parent personality and psychopathology on T2-T5 youth outcomes were non-significant, although the main effect of T1 parent anxiety disorders on T2-T5 youth anxiety disorders was trending ($p = .06$). However, the presence of parent anxiety disorders and parent neuroticism had small and moderate effects on T1 youth neuroticism, respectively. Parental depressive disorders were not significantly associated with youth neuroticism.

The indirect effects of parent depressive disorders on T2-T5 youth depressive and anxiety disorders via T1 youth neuroticism were non-significant. However, T1 parent anxiety disorders had small but significant effects on T2-T5 youth depressive and anxiety disorders via T1 youth neuroticism. Similarly, parent neuroticism had small effects on both T2-T5 youth depressive and anxiety disorders via T1 youth neuroticism.

Role of Parental Extraversion in Intergenerational Effects

The final model included the effects of T1 parent extraversion while T1 youth extraversion was included as a mediator. Results are presented in Table 3 (bottom) and Figure 2 (bottom). Analyses again controlled for T1 youth depression NOS and anxiety disorders. The main effects of T1 parent depressive disorders on T2-T5 youth depression, and of T1 parent anxiety disorders on T2-T5 youth anxiety disorders, were small but statistically significant. All other main effects of T1 parent extraversion and psychopathology on T2-T5 youth outcomes were non-significant. However, T1 parent extraversion was moderately and significantly associated with T1 youth extraversion.

All indirect effects of T1 parent psychopathology on T2-T5 youth depressive and anxiety disorders via T1 youth extraversion were non-significant. However, T1 parent extraversion

had small but significant indirect effects on T2-T5 youth depressive and anxiety disorders via T1 youth extraversion.

Sensitivity Analyses

Results from the sensitivity analyses are presented in Supplemental Table 5. In both models, the significant indirect effects from T1 parent neuroticism or extraversion to T2-T5 depressive and anxiety disorders via T1 youth neuroticism or extraversion did not replicate when switching the mediator and predictor variables. The indirect effects of T1 youth neuroticism on T2-T5 youth depressive disorders ($\beta = 0.01$, $p = .60$) and on T2-T5 youth anxiety disorders ($\beta = 0.004$, $p = .74$) via parent neuroticism were non-significant. Similarly, the indirect effects of T1 youth extraversion on T2-T5 youth depressive disorders ($\beta = 0.02$, $p = .14$) and T2-T5 youth anxiety disorders ($\beta = 0.01$, $p = .53$) via parent extraversion were non-significant.

Discussion

Although parental internalizing disorders and youth personality are well-established risk factors for the development of depressive and anxiety disorders, they each have separate literatures and few studies have attempted to link them together. One way in which these two domains may be interrelated is that youth personality could mediate the intergenerational transmission of depressive and anxiety disorders (Klein et al., 2008; Silberg & Rutter, 2002) However, this hypothesis has received little empirical attention, and has never been tested on depressive and anxiety disorders concurrently or at the level of full diagnoses. The current study is the first to examine youth neuroticism and extraversion as mediators of the intergenerational transmission of depressive and anxiety disorders. Results of our initial two models examining parental psychopathology, without considering parental personality, showed significant but small main effects of parental psychopathology on subsequent youth homotypic outcomes, and significant transdiagnostic indirect effects of parental anxiety disorders on later youth depressive and anxiety disorders via youth neuroticism, but not extraversion. Moreover, the effects of youth neuroticism on subsequent outcomes were consistently stronger than the influence of youth extraversion.

In models considering parent personality, we observed transdiagnostic effects of parent neuroticism and extraversion on youth depressive and anxiety disorders via youth personality, with only slight changes in the magnitude of the direct effect estimates of parental psychopathology on youth psychopathology once parental personality was considered. Parent and youth personality may help to explain the non-specific portion of the relationship between parental and youth depressive and anxiety disorders. The effects of parent neuroticism on depressive and anxiety disorders were again larger than the effects of parent extraversion, and at least comparable in magnitude to the within-disorder effects of parental psychopathology.

Direct Effects of Parent Depressive Disorders on Youth Depressive Disorders

Results from the models examining parental psychopathology, but not including parental personality, are consistent with much prior literature showing that the offspring of

parents with depressive disorders are at increased risk for developing depression (Klein, Lewinsohn, Rohde, Seeley, & Olino, 2005). Current results are also consistent with prior investigations demonstrating that the association between neuroticism and anxiety disorders is generally stronger than the connection between neuroticism and depression (Kotov et al., 2010). Additionally, parental anxiety disorders, which frequently co-occur with depressive disorders, may be responsible for the increased rate of anxiety disorders in offspring of depressed parents in previous studies. Simultaneously examining depressive and anxiety disorders appears critical to understanding the intergenerational transmission of internalizing disorders.

Indirect Effects of Parent Anxiety Disorders Via Youth Neuroticism

The current findings are also consistent with previous literature demonstrating that offspring of parents with anxiety disorders are at increased risk for both depressive and anxiety disorders (Lawrence et al., 2019; Micco et al., 2009). However, our results extend this literature by indicating that the intergenerational influence of parental anxiety disorders is mediated by youth neuroticism, but not extraversion. The magnitude of the indirect effects is comparable for subsequent youth depressive and anxiety disorders, which may partially explain the relatively non-specific effect of parental anxiety disorders on youth.

Indirect Effects of Parent Personality on Youth Disorders Via Youth Personality

This study is the first to examine parental personality in combination with depressive and anxiety disorders in the intergenerational transmission of internalizing psychopathology. This is a particularly glaring gap in the current literature; as offspring personality has been hypothesized to mediate the association between parent and youth internalizing disorders (Barlow et al., 2014; Klein et al., 2008; Silberg & Rutter, 2002), it follows that these intergenerational effects may be at least partially due to the influence of parent personality. We found that parental neuroticism and extraversion contributed to the development of offspring depressive and anxiety disorders via youth neuroticism and extraversion, beyond the effects of parental psychopathology, and these effects are comparable in magnitude to those of parental depressive or anxiety disorder. These findings are consistent with the view that these traits constitute broad liabilities for internalizing psychopathology (Barlow, Sauer-Zavala et al., 2014; Klein et al., 2011).

The Role of Youth Personality in the Intergenerational Transmission of Psychopathology

New taxonomic classification systems of psychopathology, such as the Hierarchical Taxonomy of Psychopathology (HiTOP), incorporate both personality traits and psychopathology symptoms (Kotov et al., 2017). Currently, there is debate regarding whether personality traits and psychopathology symptoms are distinct constructs, although there is agreement that traits and symptoms differ in stability and the time frame of assessment (DeYoung et al., 2020; Goldstein et al., under review; Wright & Hopwood, 2021). However, our findings are relevant in either instance. The continuum/spectrum model of personality-psychopathology relationships hypothesizes that traits and symptoms are both reflections of a single dimensional construct, with traits reflecting more typical levels and symptoms indicating elevated levels of the underlying construct (Klein et al., 2011). Consistent with this framework, high neuroticism and low extraversion may be

less severe indicators of underlying pathology which, when exacerbated, are considered depression and/or anxiety disorders. However, the results are also supportive of the precursor and predisposition personality-psychopathology models, which posit that these traits are antecedents or risk factors, respectively, for subsequent psychopathology (Klein et al., 2011). In either case, youth neuroticism and extraversion may reflect broad vulnerabilities present prior to the onset of clinical symptoms, and may therefore index important processes, such as genes and parenting, that contribute to the intergenerational transmission of internalizing psychopathology.

Genes and environmental factors, such as parenting, have both been implicated in the development of youth personality and the intergenerational transmission of depressive and anxiety disorders (Barlow et al., 2014; Goodman, 2020). Neuroticism and extraversion are both moderately heritable (Jang et al., 1996), and behavior genetic studies suggest that there is substantial pleiotropy in the genetic influences underlying neuroticism and internalizing psychopathology in youth (Tackett et al., 2013). In addition, molecular genetic studies have identified gene variants that are associated with neuroticism, anxiety, and depression (Levey et al., 2020; Nagel et al., 2018). Parents with elevated neuroticism, reduced extraversion, or a history of internalizing psychopathology may transmit psychopathology intergenerationally by passing on a genetic predisposition to develop high levels of neuroticism or low levels of extraversion.

Parenting behaviors are also likely to play a role in the intergenerational transmission of internalizing disorders via youth personality. Internalizing psychopathology, neuroticism, and extraversion are associated with parenting behaviors such as lack of warmth, overprotection and control, and prevention- rather than promotion-focused parenting styles that can contribute to the development of greater neuroticism and lower extraversion in offspring (Barlow et al., 2014; Belsky & Barends, 2002; Yap, Pilkington, Ryan, & Jorm, 2014), increasing risk for subsequent depression and anxiety disorders.

Treatment Implications: Targeting Neuroticism

Among offspring with parental histories of internalizing psychopathology, youth with elevated levels of neuroticism appear to be particularly vulnerable. High neuroticism may be an indicator of youth at especially marked risk for developing internalizing disorders, and an important intervention target. Psychosocial and pharmacological interventions have been shown to reduce neuroticism (Carl, Gallagher, Sauer-Zavala, Bentley, & Barlow, 2014; Sauer-Zavala et al., 2021; Spinhoven, Huijbers, Ormel, & Speckens, 2017; Tang et al., 2009; Zinbarg, Uliaszek, & Adler, 2008), and treating or preventing the development of trait neuroticism may have substantial public health benefits (Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014; Lahey, 2009; Ormel et al., 2013; ten Have, Oldehinkel, Vollebergh, & Ormel, 2005; Widiger & Oltmanns, 2017). Furthermore, parenting interventions that target overprotective and controlling parenting are effective in modifying aspects of neuroticism and preventing the onset of anxiety disorders in youth (Kennedy, Rapee, & Edwards, 2009). The transdiagnostic effects of parent neuroticism operating via youth neuroticism suggests that targeting youth neuroticism, and parenting behaviors that contribute its development, may be more effective for treatment and prevention of internalizing disorders in youth than

interventions designed to treat specific disorders. Indeed, personality change is possible (d ~ .60 during brief treatment; Roberts et al., 2017), so personality traits may serve either as targets of intervention or to identify high risk groups for prevention, potentially breaking the cycle of intergenerational transmission of psychopathology.

Much of the intervention literature has focused on neuroticism. However, youth and parent extraversion may also be modifiable risk factors, and interventions increasing extraversion may also prevent the onset of, or treat existing, depressive and anxiety disorders (Craske et al., 2019; Roberts et al., 2017).

Strengths and Limitations

The current study is the first to examine parental personality and only the second to examine youth personality in the intergenerational transmission of internalizing disorders. Results showed that traits statistically mediate the intergenerational transmission of internalizing psychopathology, which should help guide future research in identifying underlying genetic and psychosocial mechanisms.

However, the current study had several limitations. First, parental psychopathology and personality, and youth personality were assessed at the same time, meaning that we cannot rule out bidirectional effects of youth personality on parent psychopathology and personality. To partially address this, we conducted sensitivity analyses which showed that, when switching parent and youth personality so that parent personality was the mediator, none of the indirect effects via parent personality were significant. While this does not eliminate the possibility of bidirectional effects of youth personality on baseline parent personality, it does suggest that the indirect effects function only from parent personality to youth outcomes via youth personality. Additionally, we ran another set of analyses excluding parents with current depressive or anxiety disorders. Importantly, the pattern of findings remained the same, arguing against the possibility that parental psychopathology was a consequence of youth personality.

Second, only data on youth and parent personality from the baseline visit were examined, prohibiting examination of dynamic changes in personality and psychopathology across time. Third, while data on lifetime history psychopathology was collected on both parents, only one parent provided this information. Although not optimal, it is preferable to not including information on psychopathology in non-participating parents. Fourth, we do not have data on personality from the non-participating parent, potentially resulting in an underestimate the influence of parent personality. Fifth, history of MDD or dysthymia in youth was an exclusion criterion at baseline, although very few potential participants were screened out for diagnoses. Finally, the sample was comprised of entirely of adolescent girls, most of whom were white and non-Hispanic, potentially reducing generalizability of the findings.

Conclusion

In conclusion, this study is the first to provide evidence that youth personality mediates the intergenerational transmission of depressive and anxiety disorders, and the first to include parent personality in examining the intergenerational transmission of internalizing

psychopathology. These findings implicate elevated youth neuroticism and low youth extraversion as mediators of the intergenerational transmission of depressive and anxiety disorders and indicate that parental personality also needs to be considered. Our results highlight the transdiagnostic nature of the intergenerational transmission of psychopathology and indicate that it is necessary to go beyond direct intergenerational disorder-to-disorder effects and incorporate the role of traits as transdiagnostic mediators.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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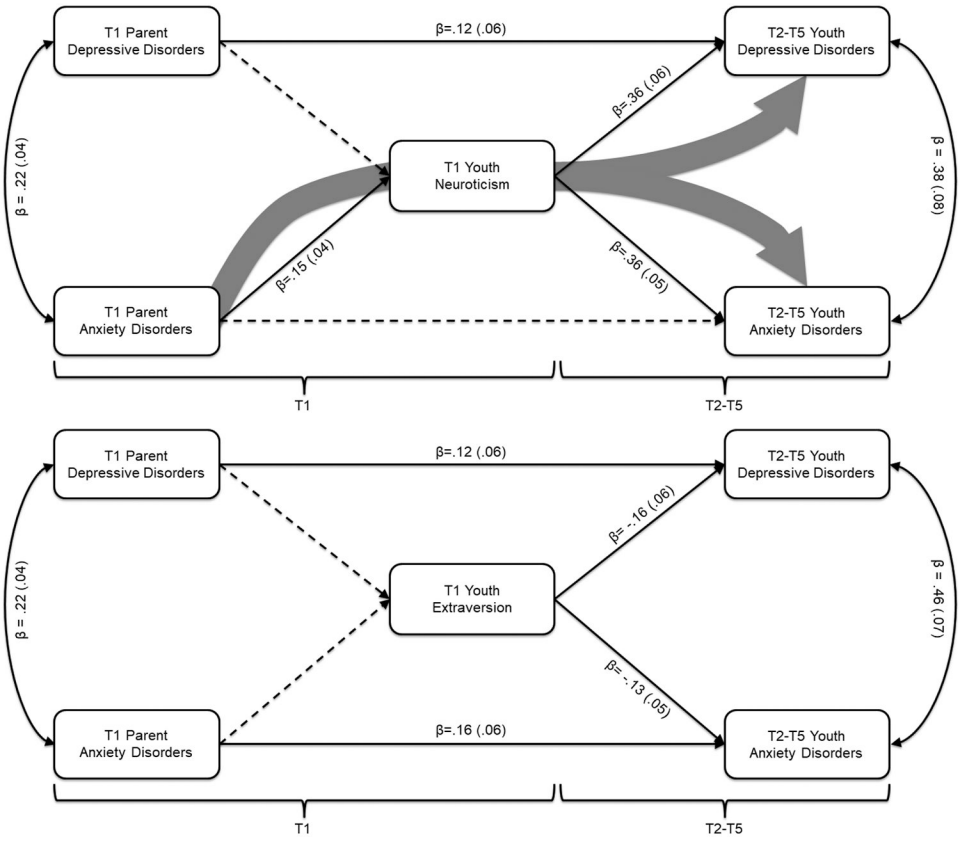

Figure 1. Intergenerational Effects of Parent Disorders on Youth Disorders Via Youth Neuroticism (Top) and Extraversion (Bottom)

Note. Solid black arrows indicate significant direct effects at the $p < .05$ level. Dashed black arrows indicate non-significant direct effects. Thick curved gray lines indicate significant indirect effects. T1 = baseline visit. T2-T5 = four follow-up visits. Estimates for the direct effects of T1 parent depressive disorders on T2-T5 youth anxiety disorders and direct effects of T1 parent anxiety disorders on T2-T5 youth depressive disorders are in Table 2 but were omitted from the figure for simplicity. Covariance parameter estimates were omitted for simplicity but are included in Supplemental Tables 1 and 2.

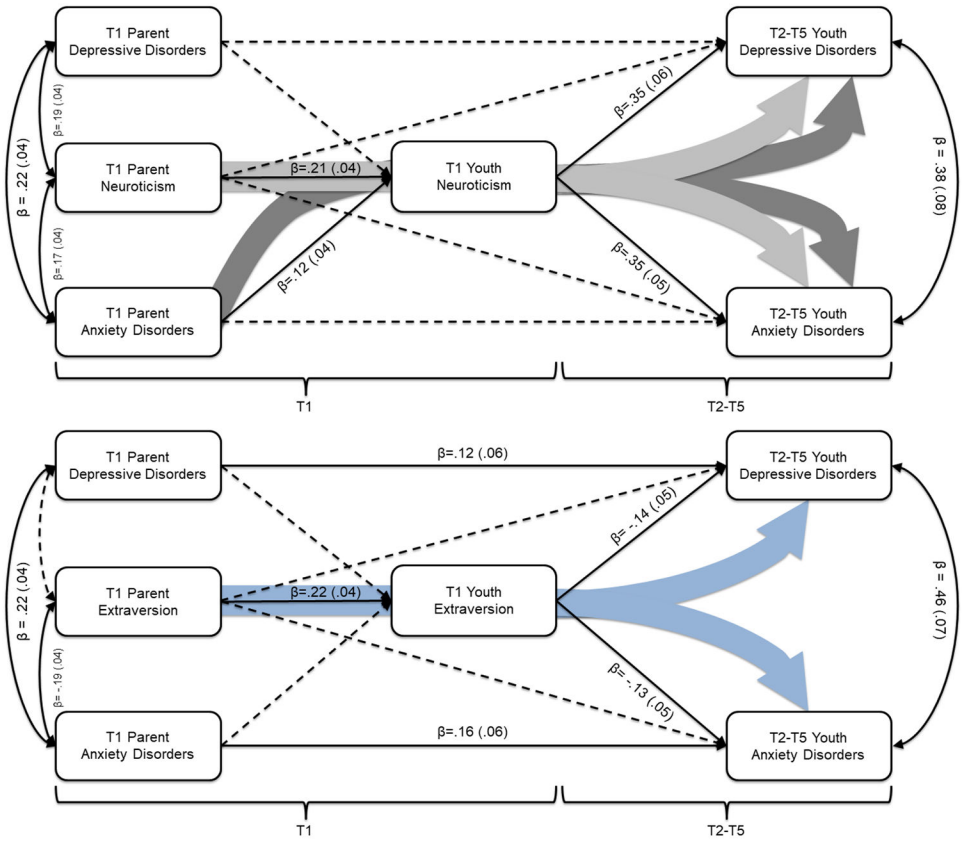

Figure 2. Intergenerational Effects of Parent Disorders and Personality on Youth Disorders Via Youth Neuroticism (Top) and Extraversion (Bottom)

Note. Solid black arrows indicate significant direct effects at the $p < .05$ level. Dashed black arrows indicate non-significant direct effects. Thick curved gray and blue lines indicate significant indirect effects. T1 = baseline visit. T2-T5 = time 2 to time 5 visits. Estimates for the direct effects of T1 parent depressive disorders on T2-T5 youth anxiety disorders and direct effects of T1 parent anxiety disorders on T2-T5 youth depressive disorders are presented in Table 3 but were omitted from the figure for simplicity. Covariance parameter estimates were omitted for simplicity but are included in Supplemental Tables 3 and 4.

Table 1

Descriptive statistics and correlation coefficients for parent and youth personality and psychopathology

	Variable	*N*	*M/%*	*SD*	1	2	3	4	5	6	7	8	9
1.	Parent Depressive Disorders	541	23.67	--	--								
2.	Parent Anxiety Disorders	550	44.73	--	.37***	--							
3.	T1 Parent Neuroticism	548	0.00	1.00	.26***	.22***	--						
4.	T1 Parent Extraversion	548	0.00	1.00	−.11	−.24***	−.27***	--					
5.	T1 Youth Neuroticism	548	0.00	1.00	.10	.20***	.23***	−.09	--				
6.	T1 Youth Extraversion	550	0.00	1.00	−.07	−.03	−.12**	.22***	−.27***	--			
7.	T1 Youth Depressive Disorders	550	6.18	--	.18	.14	.07	−.04	.37***	−.04	--		
8.	T1 Youth Anxiety Disorders	550	22.55	--	.18*	.16*	.16**	−.03	.43***	−.24***	.19	--	
9.	T2-T5 Youth Depressive Disorders	540	21.30	--	.19*	.09	.13*	−.14*	.37***	−.17**	.56***	.23**	--
10.	T2-T5 Youth Anxiety Disorders	525	43.81	--	.04	.20**	.11*	−.02	.37***	−.13*	.25*	.55***	.46***

Note.

*** = $p<.001$.

** = $p<.01$.

* = $p<.05$. T1 = baseline visit. T2-T5 = 4 follow-up assessments. M = mean. % = percent of parent pairs who received a diagnosis.

Table 2

Intergenerational transmission of depressive and anxiety disorders via youth neuroticism (top) and youth extraversion (bottom)

Predictor Variables	Outcome Variables													
	T1 Youth Neuroticism				*T2-T5 Youth Depressive Disorders*					*T2-T5 Youth Anxiety Disorders*				
	R^2	*β*	*SE β*	*p*	R^2	*β*	*SE β*	*p*	*%*	R^2	*β*	*SE β*	*p*	*%*
Youth T1 Neuroticism as Mediator														
Model R^2	**.03**	--	--	**<.05**	**.15**	--	--	**<.001**	--	**.15**	--	--	**<.001**	--
Parent Depressive Disorders		0.04	0.04	.32		**0.12**	**0.06**	**<.05**	**85.7**		−0.02	0.05	.68	50.0
Indirect via Youth Neuroticism		--	--	--		0.02	0.02	.32	14.3		0.02	0.02	.32	50.0
Parent Anxiety Disorders		**0.15**	**0.04**	**<.001**		−0.01	0.06	.83	16.7		0.10	0.05	.06	66.7
Indirect via Youth Neuroticism		--	--	--		**0.05**	**0.02**	**<.01**	**83.3**		**0.05**	**0.02**	**<.01**	**33.3**
T1 Youth Neuroticism		--	--	--		**0.36**	**0.05**	**<.001**	--		**0.36**	**0.05**	**<.001**	--
T1 Youth Depressive Disorders		--	--	--		**0.45**	**0.09**	**<.001**	--		0.12	0.11	.27	--
T1 Youth Anxiety Disorders		--	--	--		0.07	0.08	.37	--		**0.42**	**0.06**	**<.001**	--
	T1 Youth Extraversion				*T2-T5 Youth Depressive Disorders*					*T2-T5 Youth Anxiety Disorders*				
	R^2	*β*	*SE β*	*p*	R^2	*β*	*SE β*	*p*	*%*	R^2	*β*	*SE β*	*p*	*%*
Youth T1 Extraversion as Mediator														
Model R^2	.00	--	--	.54	.05	--	--	.08	--	.04	--	--	.61	--
Parent Depressive Disorders		−0.05	0.04	.27		**0.12**	**0.06**	**.04**	**92.3**		−0.02	0.06	.81	66.7
Indirect via Youth Extraversion		--	--	--		0.01	0.01	.30	7.7		0.01	0.01	.32	33.3
Parent Anxiety Disorders		−0.02	0.04	.70		0.04	0.06	.53	100		**0.16**	**0.06**	**.01**	**100**
Indirect via Youth Extraversion		--	--	--		0.00	0.01	.70	0		0.00	0.01	.70	0
T1 Youth Extraversion		--	--	--		**−0.16**	**0.06**	**.01**	--		**−0.13**	**0.05**	**.02**	--
T1 Youth Depressive Disorders		--	--	--		**0.54**	**0.09**	**<.001**	--		**0.24**	**0.11**	**.03**	--
T1 Youth Anxiety Disorders		--	--	--		**0.17**	**0.08**	**.03**	--		**0.51**	**0.06**	**<.001**	--

Note. T1 = baseline visit. T2-T5 = four follow-up assessments. % = percentage of total effect accounted for by the direct and indirect effect estimates for each predictor variable (e.g., direct effect of parent depressive disorders on T2-T5 youth depressive disorders accounts for 85.7% of the total effect of parent depressive disorders on T2-T5 youth depressive disorders; indirect effect of parent depressive disorders on T2-T5 youth depressive disorders via T1 youth neuroticism accounts for 14.3% of the total effect of parent depressive disorders on T2-T5 youth depressive disorders). Covariance parameter estimates for the neuroticism and extraversion models are in Supplemental Table 1 and Supplemental Table 2, respectively.

Table 3

Influence of parental depressive and anxiety disorders and personality on youth depressive and anxiety disorders via youth neuroticism (top) and extraversion (bottom)

Predictor Variables	Outcome Variables													
	T1 Youth Neuroticism				*T2-T5 Youth Depressive Disorders*					*T2-T5 Youth Anxiety Disorders*				
	R^2	*β*	*SE β*	*p*	R^2	*β*	*SE β*	*p*	*%*	R^2	*β*	*SE β*	*p*	*%*
Youth T1 Neuroticism as Mediator														
Model R^2	**.07**	--	--	**.01**	**.15**	--	--	**<.001**	--	**.15**	--	--	**<.001**	--
Parent Depressive Disorders		0.01	0.04	.84		0.11	0.06	.06	91.7		−0.03	0.06	.65	75.0
Indirect via Youth Neuroticism		--	--	--		0.01	0.04	.84	8.3		0.01	0.04	.84	25.0
Parent Anxiety Disorders		**0.12**	**0.04**	**<.01**		−0.02	0.06	.78	33.3		0.10	0.05	.06	71.4
Indirect via Youth Neuroticism		--	--	--		**0.04**	**0.09**	**.01**	**66.7**		**0.04**	**0.04**	**<.01**	**28.6**
T1 Parent Neuroticism		**0.21**	**0.04**	**<.001**		0.03	0.06	.59	27.3		0.02	0.06	.74	20.0
Indirect via Youth Neuroticism		--	--	--		**0.08**	**0.02**	**<.001**	**72.7**		**0.08**	**0.02**	**<.001**	**80.0**
T1 Youth Neuroticism		--	--	--		**0.35**	**0.06**	**<.001**	--		**0.35**	**0.05**	**<.001**	--
T1 Youth Depressive Disorders		--	--	--		**0.45**	**0.09**	**<.001**	--		0.12	0.11	.27	--
T1 Youth Anxiety Disorders		--	--	--		0.07	0.08	.88	--		**0.42**	**0.06**	**<.001**	--
	T1 Youth Extraversion				*T2-T5 Youth Depressive Disorders*					*T2-T5 Youth Anxiety Disorders*				
	R^2	*β*	*SE β*	*p*	R^2	*β*	*SE β*	*p*	*%*	R^2	*β*	*SE β*	*p*	*%*
Youth T1 Extraversion as Mediator														
Model R^2	**.05**	--	--	**<.01**	**.05**	--	--	**<.05**	--	**.04**	--	--	**.05**	--
Parent Depressive Disorders		−0.04	0.04	.37		**0.12**	**0.06**	**.04**	**92.3**		−0.01	0.06	.83	50.0
Indirect via Youth Extraversion		--	--	--		0.01	0.01	.40	7.7		0.01	0.01	.40	50.0
Parent Anxiety Disorders		0.02	0.04	.59		0.02	0.06	.73	100		**0.16**	**0.06**	**<.01**	**100**
Indirect via Youth Extraversion		--	--	--		−0.00	0.01	.60	0		−0.00	0.01	.58	0
T1 Parent Extraversion		**0.22**	**0.04**	**<.001**		−0.10	0.06	.12	76.9		0.04	0.06	.53	57.1
Indirect via Youth Extraversion		--	--	--		**−0.03**	**0.02**	**<.05**	**23.1**		**−0.03**	**0.01**	**.03**	**42.9**
T1 Youth Extraversion		--	--	--		**−0.14**	**0.06**	**.03**	--		**−0.13**	**0.05**	**.01**	--
T1 Youth Depressive Disorders		--	--	--		**0.55**	**0.09**	**<.001**	--		**0.24**	**0.11**	**.03**	--
T1 Youth Anxiety Disorders		--	--	--		**0.18**	**0.08**	**.02**	--		**0.51**	**0.06**	**<.001**	--

Note. T1 = baseline visit. T2-T5 = four follow-up assessments. % = percentage of total effect accounted for by the direct and indirect effect estimates for each predictor variable (e.g., direct effect of parent depressive disorders on T2-T5 youth depressive disorders accounts for 91.7% of the total effect of parent depressive disorders on T2-T5 youth depressive disorders; indirect effect of parent depressive disorders on T2-T5 youth depressive disorders via T1 youth neuroticism accounts for 8.3% of the total effect of parent depressive disorders on T2-T5 youth depressive disorders). Covariance parameter estimates for the neuroticism and extraversion models are available in Supplemental Table 3 and Supplemental Table 4, respectively.