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Master's Thesis

Intergenerational Transmission of Depression and Anxiety: Offspring's Temperament as a Mediator in the Association between Gender and Severity of Symptoms

Armin Shiasy

2695251

Supervisor: Dr. Lynn Boschloo

Master of Science Program in Clinical Psychology

Faculty of Social and Behavioral Sciences

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Abstract

Introduction: A parental history of depression and/or anxiety puts offspring at an ultra-high emergence risk of the same themselves, with girls showing a more severe symptomatology. With temperament being implicated as one of the factors influencing these disorders, the present study – the first of its kind – examined whether different temperamental traits mediated the association between female gender and severity of symptoms in an offspring sample.

Methods: A sample of 524 (57.1% female) offspring was analyzed. Parental disorders were assessed by the means of the Composite International Diagnostic Interview, temperament by the Adult Temperament Questionnaire, depression and anxiety by a DSM-IV self-report questionnaire. *T*-statistics and regression analyses were deployed.

Results: Female gender was related to a higher severity of depressive and anxious symptoms. Negative affect, affiliativeness and orienting sensitivity were higher among girls and correlated positively with depression/anxiety severity. Though showing no relations to gender, extraversion and effortful control were negatively associated with depression/anxiety severity.

Conclusion: A mediating role of the risk factors negative affect, affiliativeness and orienting sensitivity in the association between female gender and severity of symptoms could be substantiated. Extraversion and effortful control were shown to play a protective role towards depression/anxiety severity. An anamnestic assessment of pathological deviations of temperamental traits in offspring could help identify susceptibilities to these disorders. Psycho-education and systemic targeted interventions could be beneficial measures, though prospective longitudinal research is required towards identifying optimal interventions.

Keywords: ARIADNE, gender, temperament, depression, anxiety, offspring, mediation

Introduction

Depression and anxiety are among the most common psychiatric disorders, with a lifetime prevalence of 20.6% (Hasin et al., 2018), and 33.7% (Bandelow & Michaelis, 2022), respectively. Depression is categorized as a mood disorder (World Health Organization, 2022), characterized by, for example, feelings of sadness, loss of pleasure, lack of energy and insomnia (Cui, 2015), thus affecting cognitive, affective, social and somatic processes (Hauenstein, 2003). Anxiety disorders are a cluster of mental disorders distinguished by an excess in feelings of fear and anxiousness, as well as disturbances in an individual's behavior, which also often lead to notable distress and impairments of daily life (World Health Organization, 2022). Depression and anxiety often have an early onset in adolescence and young adulthood, typically at around 30 (Solmi et al., 2022) and 21.3 years old (Lijster et al., 2017), respectively. They also frequently exhibit a chronic course, which may result in aggravated morbidity (Young et al., 2008). On account of the relatively high and increasing (Osorio & Hyde, 2021) prevalence rates of these disorders, as well as the risk they pose to vulnerable, mostly younger individuals, a more profound exploration of potential risk factors contributing towards their exacerbation is essential.

Intergenerational transmission of depression and anxiety

Empirical evidence implicates parental depressive and/or anxiety disorder in putting offspring at a higher exacerbation risk of the same themselves (e.g. Lawrence et al., 2019; Adolph et al., 2020; Paananen et al., 2021), with studies reporting the odds to be three- to fourfold (Loechner et al., 2020) compared to the general population *without* affected parents. A 30-year longitudinal study by Weissman and colleagues (2016) in the United States with 147 offspring of depressed parents revealed prevalence rates of 73.8% for major depressive disorder and 71.8% for anxiety disorders in offspring, as well as higher mortality rates from unnatural causes, and an almost 8-year difference in age at death compared to those without affected parents. These results are in line with findings from the largest longitudinal study thus far comprising 524 Dutch offspring, revealing a cumulative prevalence of mood and/or anxiety disorders at 65% by the age of 35 (Havinga et al., 2017). These results reaffirm the remarkable transnational prevalence of these disorders in offspring when compared to individuals without affected parents, hence stressing the importance of conducting further research in this ultra-high-risk group, e.g. towards

identifying further pathological mechanisms, possible unmet needs and devising tailored treatment plans.

Gender differences in the intergenerational transmission of depression and anxiety

The diagnosis of depression and or anxiety among female and male offspring of affected parents exhibits a considerable disproportionality, with female gender predicting a 2.34 times higher risk of developing these disorders (Havinga, 2020). These findings coincide with insights from epidemiological studies among individuals *without* affected parents, showing a twice higher prevalence of depression (Neitzke, 2016), and a 1.7 times higher prevalence of anxiety disorders (McLean et al., 2011) among women than men. These observations suggest that a parental history of depression and/or anxiety augments the risk of the same for females more than it does for males, thus emphasizing the need for in-depth clinical research towards establishing gender-specific interventions and customized courses of action.

Temperament and the exacerbation of depression and anxiety

The etiology of depression and anxiety is believed to be multi-causal (Lang & Borgwardt, 2013; Geiser et al., 2012), with studies suggesting temperament to play a role in these disorders in offspring of parents affected by depression and anxiety. The term temperament typically refers to the fundamental, biologically-rooted underpinning of one's personality, often manifesting in early stages of life (American Psychological Association, 2023). The definition and measurement of temperament exhibit significant variations across publications. Evans and Rothbart (2007) postulate five different temperament dimensions in their Two-Factor Model, which are depicted in Table 1.

Table 1

Temperament dimensions and definitions by Evans and Rothbart (2007)

Temperament dimension	Definition
Negative affect	Both aggressive and non-aggressive emotions such as anger or sadness
Affiliativeness	Emotional empathy and social closeness
Orienting sensitivity	Affective and general perceptual sensitivity
Extraversion	Sociability and high intensity pleasure
Effortful control	Activation and inhibition control

In a longitudinal study with 203 offspring of parents with or without depression, difficult temperament (defined as the tendency for intense emotional and physiological reactivity, coupled with ineffective self-regulation) was found to predict a higher life-time prevalence of major depression in offspring of affected compared to unaffected parents (Sherman at al., 2016). More specifically, some temperament dimensions such as negative affect (Landman-Peeters, 2007) and affiliativeness (Zilber, 2015) have shown to be risk factors for depression and anxiety, since offspring with higher scores on these dimensions typically exhibit more severe depressive/anxious symptoms. Conversely, empirical data implies a negative association between extraversion, effortful control (Klein et al., 2011) and depressive and anxious severity, thus suggesting a rather protective role of these dimensions. To our understanding, it remains uncertain whether there are associations between orienting sensitivity and depression/anxiety severity. These findings collectively underscore the clinical significance of recognizing and addressing temperament as a potential precursor to mental health vulnerabilities, especially in ultra-high-risk offspring.

Temperament and differences in gender

The relationship between temperament and gender in offspring of parents affected by depression and/or anxiety remains unknown as of yet. However, data from general population studies imply positive associations between female gender and negative affect (Malesza, 2021), orienting sensitivity and extraversion (Ahola et al., 2023; Weisberg et al., 2011), as well as effortful control (Kornienko et al., 2018) - with no evidence to provide support for a link between gender and affiliativeness. It is striking that an in-depth understanding of the interplay between gender and temperament in the context of parental mental health has long been neglected. Nevertheless, clarifying this relationship remains

crucial towards customizing effective interventions and support strategies based on gender-specific temperament patterns in individuals with a high familial risk.

Temperament as a possible mediator of the association between female gender and the severity of depression and anxiety in an offspring sample

In spite of temperament being identified as a contributing factor to depressive/anxious symptoms (e.g. Zilber, 2015; Marchetti et al., 2018), and despite evidence establishing links between gender and temperament (e.g. Ahola et al., 2023), it appears that a possible mediating role of temperament in the interplay between female gender and the severity of depression and anxiety has remained unexplored as of yet, both within general population and vulnerable offspring samples. Exploring this mediating role among at-risk offspring could enhance our understanding of the intricate dynamics at play. Therefore, there is a need for more profound examinations in order to identify possible pathogenic mediators and close this notable research gap.

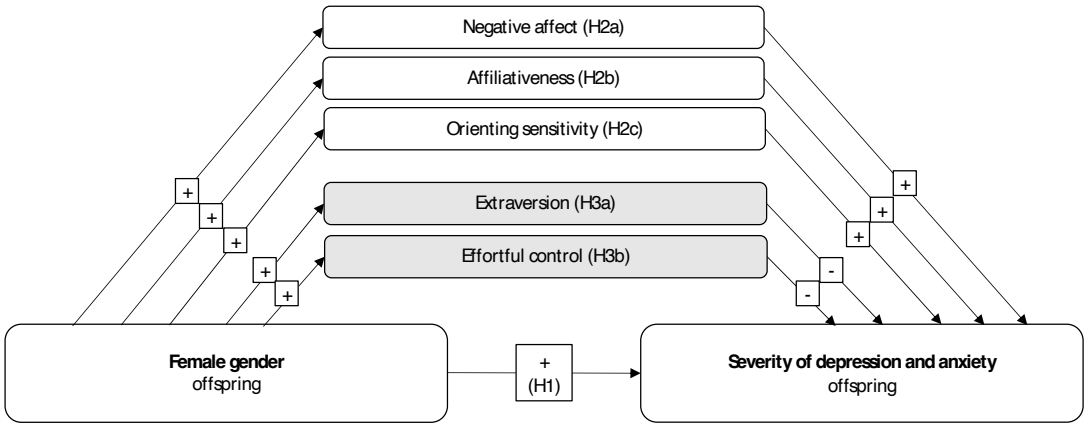
Objectives of the present study

Given the scarcity of prior findings, the current study aimed at investigating the mediating role of the five temperamental dimensions suggested by Evans and Rothbart (2007) in the association between (female) gender and depression/anxiety severity in an integrative model. This study utilized data collected within the framework of the ARIADNE project (Adolescents at Risk of Anxiety and Depression: A Neurobiological and Epidemiological approach), which included 524 adolescent and young adult offspring of parents with a history of clinical depression and/or anxiety, who had received specialized treatment for these disorders. The choice to use these data was due to ARIADNE representing an ultra-high-risk group of individuals, granting insights into the pathological mechanisms contributing towards the development of depression, anxiety or both. The clinical relevance of using this sample in the present study lies upon enhancing our understanding of the intricate gender- and temperament-related dynamics, which holds promise for developing interventions for individuals with a familial vulnerability to mental health disorders. Based on literature findings portrayed earlier, we hypothesized that the severity of depression and anxiety will be higher in girls than in boys (*hypothesis 1*). In addition, we expected that negative affect (*hypothesis 2a*), affiliativeness (*hypothesis 2b*) and orienting

sensitivity (*hypothesis 2c*), will act as mediators in this association between gender and overall depression/anxiety severity, as girls typically score higher on these traits, which are considered risk factors for depression and anxiety. Even though girls are shown to generally exhibit more severe symptoms of depression and anxiety, it is noteworthy that boys also manifest such symptoms and that, thus, some temperamental traits protect girls from depression and anxiety. Therefore, we further hypothesized that extraversion (*hypothesis 3a*) and effortful control (*hypothesis 3b*) are mediators in the association between gender and overall depression/anxiety severity, as girls typically score higher on these traits, which are considered to be protective factors for depression and anxiety. Figure 1 provides a schematic depiction of the hypotheses in the mediation model.

Figure 1

Schematic depiction of the mediation model and hypotheses



Methods

Participants

Baseline data from 524 Dutch offspring of parents with a history of clinical depression and/or anxiety was used within ARIADNE (Adolescents at Risk of Anxiety and Depression: A Neurobiological and Epidemiological approach). ARIADNE represents a cohort study and comprises offspring of patients who have received specialized treatment for depression and/or anxiety disorders in psychiatric services in the north of the Netherlands. Participants' recruitment took place between June 2000 and September 2002, when approximately 65000 medical files from 16 mental health facilities were viewed for the purpose of identifying eligible patients with children between the ages of 13 to 25

(Landman-Peeters, 2007; Havinga et al., 2017). Subsequently, 4470 individuals were identified and sent an information letter explaining the objectives of the planned study, as well as a demographic questionnaire. In the end, 366 parents volunteered to participate in the study with one or more of their children. A sample of 524 offspring (299 [57.1%] females and 225 [42.9%] males) with a mean age of 18.1 (*SD*= 3.2, range= 13 to 25) years was gathered. Almost all (> 95%) parents and their offspring were of Dutch origin. The prevalence of parental major depressive disorder, dysthymia, panic disorder, agoraphobia and obsessive-compulsive disorder were assessed by highly-trained diagnosticians by the means of CIDI classification (World Health Organization Composite International Diagnostic Interview, Kessler & Üstün, 2004). Of the 366 participating index parents, 138 (37.7%) exhibited a life-time diagnosis of depression and 25 (12.1%) of anxiety disorders. A comorbid presence of depression and anxiety was detected among 183 (50%) of the parents, thus leaving 20 (5.5%) parents who did not exhibit any formal CIDI-diagnosis at baseline collection — though 19 (5.2%) of them had had a history of subclinical depressive and/or anxious symptoms. The prevalence of the aforementioned disorders was also assessed in offspring via diagnostic interviews and self-report questionnaires. The recruitment process began after a successful application for the project's ethical approval by the Medical Ethics Committee of University Medical Center Groningen. Both index parents and their offspring provided written informed consent prior to the study. The present study was registered with Student Ethics Review and Registration of Utrecht University (UU-SER). Furthermore, a positive ethics vote by the Ethics Review Board of the Faculty of Social and Behavioral Sciences (FERB) at Utrecht University was obtained (reference number: 23-1810).

Measures and instruments

Gender and other baseline information were gathered via demographic questionnaires. The *severity of depression and anxiety* was assessed by a self-report questionnaire (DSM-IV, Hartman et al., 2001; Hartman, 2002), which shows a high statistical reliability (internal consistency of α= 0.92 for the depression scale and α= 0.88 for the anxiety scale; Landman-Peeters, 2007). The depression scale included 16 items covering two subdomains, whereas the anxiety scale included 36 items covering five subdomains (see Table 2 for an overview). The offspring were instructed to assess the extent to which each of the 52 items reflected their behavior in the past 12 months using a four-point Likert

scale, ranging from 1, indicating ‘not at all’, to 4, indicating ‘to a very strong degree’. The depression subdomain ‘positive affect’ was recoded prior to the analysis, because its items were reversed to control for aberrant response behavior. The subjects’ responses in both depression and anxiety scales were aggregated in order to build one sum score for overall severity of depression and anxiety (internal consistency α= .940).

Table 2

Depression and anxiety subdomains, the number of items, and example item for each subdomain

Subdomain	Number of items	Example item
Positive affect	5	I am regularly happy
Negative affect	11	I often feel sad
Generalized Anxiety Disorder	5	I fret a lot
Separation Anxiety Disorder	3	I find it difficult to go anywhere without my parent/guardian
Social Anxiety	4	I feel very nervous when I have to do something while others are watching
Obsessive Compulsive Disorder	10	I repeat seemingly pointless actions, I do the same thing over and over again
Panic Disorder	14	I sometimes panic when I am alone outside the house

Temperament was assessed using the Adult Temperament Questionnaire (ATQ; Evans & Rothbart, 2007). A total of 164 items loading to five temperament dimensions were presented to the offspring, who were again requested to rate them on a four-point Likert scale based on how well each item described them (ranging from 1: ‘It does not describe me at all’, to 4: ‘It describes me very well’). See Table 3 for an overview.

Table 3

Temperament dimensions, the number of items, example item for each dimension and their internal consistency by the means of Cronbach's α

Temperament dimension	Number of items	Example item	Cronbach's *α*
Negative affect	45	I get frightened easily.	.866
Affiliativeness	26	When I see a happy animal such as a playful dog or a purring cat, it makes me feel happy.	.807
Orienting sensitivity	32	When I am listening to music, I am usually aware of subtle emotional tones.	.840
Extraversion	37	I usually like to spend my free time with people.	.838
Effortful control	24	It is very hard for me to focus my attention when I am distressed.	.838

Analyses

The data analysis process was facilitated by the use of the statistics software SPSS (IBM SPSS Statistics for Macintosh, Version 29). Descriptive-statistical analyses of gender, temperament dimensions and severity of depression and anxiety were conducted for the purpose of gaining insights into sample properties. Further tests were run to identify possible interrelations between the five temperament dimensions, as well as correlations between these dimensions and depression/anxiety severity. To test whether depression/ anxiety was more severe in girls than boys (*hypothesis 1*), an independent-samples *t*-test was performed. To test whether the five temperament dimensions mediated the association of gender with the severity of depression and anxiety (*hypotheses 2a-2c* and *hypotheses 3a-3b)*, the statistical mediation model number 4 in PROCESS Macro (https://www.processmacro.org; Hayes, 2022) was used.

Testing the assumptions of the analyses

A Kolmogorov-Smirnov's test of normality prior to the *t*-test indicated a significant deviation from a normal distribution in the variable 'severity of depression and anxiety' ($D(518)= .135$, $p < .001$). However, since the distribution of the sample mean was believed to approach normality in larger samples in accordance with the Central Limit Theorem (CLT, Ernst & Albers, 2017), these findings were deemed to be negligible. A Levene's test for equality of variances indicated variance heterogeneity ($p < .001$), therefore the degrees of

freedom were adjusted to 514 from 516 and a *t*-statistic not assuming variance homogeneity was adduced. Supplementary tests were run prior to the initiation of the regression model. The assumption of linearity between the independent variables (i.e., gender and the five temperament dimensions) and the dependent variable (i.e., severity of depression and anxiety) was examined via visual inspection of a scatterplot with a locally estimated scatterplot smoothing (LOESS) line, revealing some deviation from a linear relationship. However, no further action was taken since this deviation was deemed to be minimal in magnitude. A histogram and a normal probability plot (P-P plot) of the regression standardized residuals showed a minor departure from a normal distribution, which was deemed inconsequential due to the anticipated skewness of the dependent variable and the compensating effect of the relatively large sample size in accordance with CLT. The standardized residuals were plotted against predicted values to check for homoscedasticity, yielding an approximately equal variability of the standardized residuals for all predicted values of the dependent variable (i.e., severity of depression and anxiety). Collinearity diagnostics revealed no significant correlations between the predictors (i.e. gender and temperament dimensions; all variance inflation factors < 2.288). A Mahalanobis distance test implicated five potential outliers in the independent variables (i.e., gender and temperament dimensions), with values larger than the critical chi-square value for six predictors in the model (22.46). The calculation of standardized residuals implicated two potential outliers in the dependent variable (i.e., severity of depression and anxiety), with values larger than the critical cut-off (±3). Nonetheless, the choice was made to retain any outliers within the model after a thorough examination of the data.

Results

Descriptives

The sample of 524 offsprings consisted of 299 (57.1%) girls and 225 (42.9%) boys. The mean age was 18.1 (*SD*= 3.2, range= 13 to 25) years. Pearson correlation analyses revealed positive associations between the hypothesized risk factors of negative affect, affiliativeness and orienting sensitivity; as well as between the assumed protective factors of extraversion and effortful control. Congruent to our expectations, the risk and protective factors were negatively related to each other – with the exception of affiliativeness, which showed positive relations to extraversion and effortful control. The risk factors showed positive, the protective factors negative correlations with the severity of depression and

anxiety. Descriptive statistics and intercorrelations of the key variables in this thesis are presented in Table 4.

Table 4

Descriptive statistics and intercorrelations across temperament dimensions and with the cumulative depression/anxiety scale.

	Descriptives					Intercorrelations (Pearson's *r*)					
Variable	*N*	*M*	*SD*	*Min*	*Max*	1	2	3	4	5	6
1. Negative affect	502	106.62	11.92	54	149	1.00	.227**	.398**	-.513**	-.339**	.708**
2. Affiliativeness	502	75.88	6.99	57	97	.227**	1.00	.396**	.217**	.109*	.251**
3. Orienting sensitivity	502	85.48	8.94	58	124	.398**	.396**	1.00	-.009	-.057	.391**
4. Extraversion	502	102.53	10.38	67	133	-.513**	.217**	-.009	1.00	.162**	-.478**
5. Effortful control	502	60.56	7.61	35	84	-.339**	.109*	-.057	.162**	1.00	-.288**
6. Depression/anxiety score	518	79.07	19.11	52	158	.708**	.251**	.391**	-.478**	-.288**	1.00

N= Number of individuals with complete data ; M= Mean; SD= Standard deviation; Min= Minimum score; Max= Maximum score

** p < .05; ** p < .001*

Gender differences in depression and anxiety severity

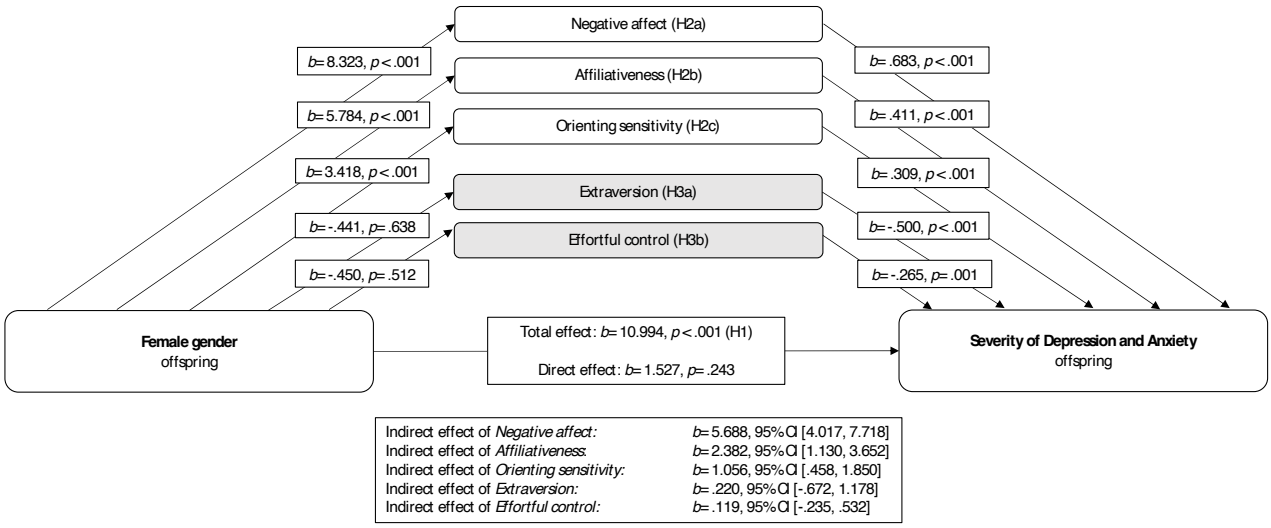
An independent samples *t*-test was run to test gender differences in overall depression/ anxiety severity. In line with *hypothesis 1*, we found that girls did indeed exhibit a more severe depressive and anxious symptomatology than boys (M= 83.85, SD= 20.70 versus M= 72.60, SD= 14.42; $t(514)$= 7.283, $p < .001$, d= .614).

Temperament dimensions as mediators in the association between gender and the severity of depression and anxiety

Next, we tested whether the five temperament dimensions acted as mediators in the association between female gender and the severity of depression and anxiety. See Figure 2 for a detailed overview of the mediation model.

Figure 2

Mediation model with total, direct and indirect effects



Consistent with *hypotheses 2a*, *2b* and *2c*, the mediation analysis revealed significant indirect effects of negative affect, affiliativeness and orienting sensitivity – providing support for a mediating role of these risk factors in the association between gender and the severity of depression and anxiety. The positive regression coefficients between female gender and negative affect, affiliativeness and orienting sensitivity, as well as between these three temperament dimensions and the severity of depression and anxiety show that girls – in line with our hypotheses – did indeed score higher on these three dimensions, and that these dimensions were indeed associated with a higher severity of depression and anxiety. Notwithstanding, the model failed to provide adequate support for a mediating role of the assumed protective factors of extraversion and effortful control in the association between female gender and the severity of depression and anxiety, since these indirect effects remained non-significant, leading to the dismissal of *hypotheses 3a* and *3b*. In contrast with our expectations, extraversion and effortful control did not seem to be related to gender in our sample. However, the significant negative regression coefficients between these two dimensions and the severity of depression and anxiety indicated a protective role of these two towards the latter, which is congruent to our expectations. With the direct effect of gender on the severity of depression/anxiety being non-significant, the findings imply that this effect most likely does not operate independently of the mediating variables, thus suggesting a *full mediation model*. The overall model was able to explain a considerable amount of the variance observed in the

outcome variable of depression/anxiety severity (R^2 = 56.85 %) by the means of gender and temperament.

Discussion

Key findings

Female gender was shown to be associated with a more severe depressive and anxious symptomatology in our large sample of offspring with depressed/anxious parents. As hypothesized, the temperament dimensions of negative affect, affiliativeness and orienting sensitivity showed positive associations with both female gender and depression/anxiety severity. Contrasting our expectations, however, the dimensions of extraversion and effortful control were not related to gender. Nevertheless, they showed negative associations with depression/anxiety severity as expected. These findings implicate negative affect, affiliativeness and orienting sensitivity as mediating risk factors in the association between female gender and the severity of depression and anxiety. Though unrelated to gender, extraversion and effortful control were shown to play a protective role towards depression/anxiety severity.

Female gender and the higher severity of depression and anxiety and the mediating role of negative affect, affiliativeness and orienting sensitivity in this association

Concordant with numerous previous studies in both offspring (e.g. Havinga, 2020) and general population studies (e.g. Neitzke, 2016; McLean et al., 2011), female gender was related to a more severe depressive and anxious symptomatology in our sample as well. To the best of our knowledge, the present study was the first to examine temperamental traits as mediators in the association between gender and depression/anxiety severity in an offspring sample in an integrative model. Therefore, a juxtaposition of our findings with other related research is unfeasible. Nonetheless, in accordance with insights from general population studies showing positive associations between female gender and negative affect (Malesza, 2021) as well as orienting sensitivity (Ahola et al., 2023), we had hypothesized to find higher scores on these two dimensions among girls in our sample as well. In spite of the sparsity of data with regard to affiliativeness (defined as emotional empathy and social closeness), we had again predicted girls to score higher on this dimension, since adjacent findings show women to exhibit higher levels of empathy

(Baron-Cohen & Wheelwright, 2004). Our findings do indeed fall in line with the outcomes of the aforementioned studies. A number of possible mechanisms towards the formation of gender differences in temperament are discussed in scientific literature, including biological and developmental influences. For instance, it is argued that the development of divergent traits such as higher levels of negative affect in women is attributable to evolutionary advantages, since environmental threats impose greater risks on them compared to men (cf. Rakison, 2009). Others state that gender-related temperamental differences arise from the impact of gender roles and societal conditioning (Leaper, 2000). These differences are for instance imparted on offspring, as parents try to guide them label and interpret their emotions (Else-Quest, 2012). Furthermore, stereotypical expectations with regard to one's gender may also influence the emergence of differing traits in girls and boys, for example since girls are rather expected to be emotionally expressive (Barrett & Bliss-Moreau, 2009; Else-Quest, 2012). Pertaining to the impact of these traits on the severity of depression and anxiety among offspring, we hypothesized positive associations between negative affect, affiliativeness and depression/anxiety severity based on previous studies (e.g. Landman-Peeters, 2007; Zilber, 2015). Although a possible positive relationship between orienting sensitivity (defined as affective and general perceptual sensitivity) and the severity of depression and anxiety remains uncertain, such a relationship was assumed due to fact that depression and anxiety are generally positively related to (pathological) vigilance (Richards et al., 2014). Similarly here, our results seem to align with prior research findings. One of the mechanisms through which temperament is believed to contribute towards psychopathology is by influencing an individual's response to environmental stressors. For instance, elevated levels of negative affect are argued to evoke dysfunctional cognitive responses such as rumination in reaction to a stressful event, which – in due course – may lead to an exacerbation/aggravation of depressive symptoms (Harding, 2016). Moreover, temperament is also believed to biologically alter brain areas controlling emotional regulation, such as the ventromedial prefrontal cortex and amygdala connectivity, which is adversely impacted by high negative affect (Makovac et al., 2016). These findings coincide with impairments in cognitive function (Zainal & Newman, 2021), which potentially lead to more anxiety.

Extraversion and effortful control as protective factors towards depression and anxiety severity

The negative associations between extraversion, effortful control and depression/anxiety severity insinuate a protective role of these dimensions in face of the latter – congruent to empirical insights from general population studies (e.g. Klein et al., 2011). Contrasting our expectations, however, no positive significant associations between female gender, extraversion and effortful control could be found in our sample, even though general population studies (e.g. Weisberg et al., 2011; Kornienko et al., 2018) were able to establish such relations. These discrepant findings could be attributed to methodological differences, as we deployed the Adult Temperament Questionnaire (ATQ; Evans & Rothbart, 2007) to assess temperament, which structurally differs from questionnaires used by Weisberg and colleagues (Big Five Aspect Scales, DeYoung et al., 2007) and Kornienko and colleagues (Effortful Control Scale, Simonds et al., 2007; Simonds & Rothbart, 2004) in the operationalization of this construct. Furthermore, it is noteworthy that these studies accrued data from Canadian and Russian participants, who exhibit a socio-cultural divergence from the Dutch participants in our study. Last but foremost, the discordant findings could be ascribed to the fact that our study focused on an offspring sample. With both boys and girls exhibiting an elevated vulnerability via having parents affected by depression/anxiety, gender does not seem to further contribute towards a statistically significant difference regarding extraversion and effortful control. The adverse effects of parental psychopathology on offspring's temperament seem to be greater on enhancing the three risk factors of negative affect, affiliativeness and orienting sensitivity, and that to a higher extent for girls.

Clinical implications

A parental history of depression and anxiety imposes various adverse effects on offspring. For instance, depressed parents have consistently been shown to exhibit a more hostile and disengaged parenting style, with consequences being more severe for girls (England et al., 2009). Similarly, anxious parents have shown to exhibit less warmth towards their children, paired with an increased inclination to express criticism about their children's competence (Crosby Budinger et al., 2013). With the elevated risk for offspring of depressed/anxious parents to develop these pathologies having been established, psycho-social interventions targeting offspring should incorporate a systemic approach to

also include the parental microsystem. Interventions such as the 'Triple P Positive Parenting Program' (Sanders, 1999), aiming at enhancing parental competence and altering dysfunctional parenting practices could be a helpful supplement to psychotherapy in order to educate parents and to help reduce child maltreatment, thus relieving some parental stress imposed on (female) offspring. Pertaining to offspring's temperament, higher scores on negative affect, affiliativeness and orienting sensitivity, as well as lower scores on extraversion and effortful control can be seen as indicators of susceptibility towards depression and anxiety. Therefore, it is recommendable to assess temperamental traits during initial anamnestic interviews. Clinicians could then address possible conspicuous findings by educating young offspring about the legitimacy of their negative emotions, as well as introducing effective coping strategies. This could be achieved via a concise training in mindfulness meditation or somatic relaxation, which can successfully alleviate distress and rumination (Jain et al., 2007). Furthermore, economical, self-guided interventions such as 'Project Personality' could be deployed to educate at-risk youth on the malleability of their personality and help them enhance their perception of control over their behavior and emotions (Schleider & Weisz, 2019). The specifically higher vulnerability of girls for temperamental risk factors can be attributed to higher levels of emotional parentification experienced by them (Lewandowska-Walter et al., 2017). Being expected to assume the emotional responsibilities typically associated with a caregiver could be overwhelming, thus leading to adverse emotional outcomes. Hence, a possible psychological intervention could focus on educating caregivers on the importance of clear boundaries between adult-child responsibilities, as well as establishing a supportive environment for children – especially girls – to express their concerns without fear of reprisal.

Strengths, weaknesses and recommendations for future projects

The present study was the first to examine temperamental traits as mediators in the association between gender and depression/anxiety severity in a large offspring sample. Both parents and offspring had undergone thorough psychiatric evaluations, thus contributing towards the methodological qualities of this study. The large and robust sample collected within ARIADNE enabled a profound statistical examination of gender-related susceptibilities to depression and anxiety in an ultra-high-risk cohort. In spite of the large sample and the quality of the data, ARIADNE's focus laid on a WEIRD (Western,

Educated, Industrialized, Rich and Democratic) sample, with almost all (> 95%) index parents and their offspring being of Dutch origin. This homogeneity limits the generalizability of findings on larger populations (Henrich et al., 2010). Furthermore, with 27% of the inhabitants in the Netherlands being born in a foreign country or having at least one foreign-born parent (Centraal Bureau voor de Statistiek, 2023), the sample also fails to accurately represent the socio-cultural variance of the host country, thus limiting the external validity of the findings. This study used baseline data deriving from a larger project, effectively rendering it cross-sectional in practice. Prospective longitudinal projects could enhance our understanding of how different interventions influence the interplay of gender, temperamental traits and the severity of depressive/anxious symptoms across different countries. For instance, future inter-cultural studies could focus on recruiting at-risk participants in countries with varying socio-economical circumstances and different understandings of gender expectations, while monitoring how they respond to our proposed interventions over a longer period of time.

Conclusion

Female gender is associated with more severe depressive and anxious symptoms. The present study provides an addition to existent research by implicating negative affect, affiliativeness and orienting sensitivity as mediating risk factors in this association among offspring of depressed/anxious parents, while reaffirming extraversion and effortful control to play a protective role towards these disorders. Psychological interventions targeting young offspring should also include strategies to address dysfunctional parenting cognitions and practices. Providing psycho-education to both caregivers and offspring – especially girls –, as well as introducing strategies to cope with stressors are necessary measures towards alleviating vulnerabilities for psychopathologies. Future longitudinal research is required towards the identification of optimal interventions.

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Appendix A: Description of the Data Collection Process

This thesis made use of data collected within the framework of ARIADNE (Adolescents at Risk of Anxiety and Depression: A Neurobiological and Epidemiological approach). Between June 2000 and September 2002, approximately 65000 medical files stemming from 16 mental health providers in northern Netherlands were sighted in order to identify parents with a history of depression and/or anxiety with at least one child between the ages of 13 to 25. This search yielded 6874 index parents who fulfilled these criteria. After a secondary round of screening, 4470 individuals with correct contact information were selected and sent an invitation to participate in the study, alongside information explaining the objectives of the planned study, as well as a demographic questionnaire via post. In the end, 355 parents volunteered to participate in the study with one or more of their children, amounting to a sample of 524 offspring.