The Intergenerational Transmission of Depression and Anxiety:

Differences across Boys *vs* Girls as well as Paternal *vs* Maternal Depression and Anxiety

Oskaras Brežinskas

Student ID - 4564200

Department of Clinical Psychology, Utrecht University

MSc Thesis, Clinical Psychology Master’s program

Dr Lynn Boschloo

2022-02-27

**Abstract**

Parental depression and anxiety can affect offspring and increase their chances of having depression and anxiety disorders. Girls have a higher chance of developing depression and anxiety, and the transmission from parents is also higher than for males. The current study addresses the hypothesis that (a) girls show more depression and anxiety symptoms than boys; (b) the offspring of mothers with depression and anxiety display more depression and anxiety symptoms than the offspring of fathers with depression and anxiety; and (c) the association between offspring gender and the depression and anxiety symptoms is dependent on the gender of the affected parent. For the hypotheses testing, results were taken from the ARIADNE (“Adolescents at Risk of Anxiety and Depression; A combined Neurobiological and Epidemiological approach”) study. A total of 412 offspring and their parents’ information was eligible for analysis within this research. For hypothesis (a), the results demonstrate that female offspring had a higher mean and prevalence of depression and anxiety symptoms. For hypothesis (b), the children of mothers with depression or anxiety do not show more depression or anxiety symptoms than the children of fathers with depression or anxiety. For hypothesis (c), the affected parents’ sex is not significant in offspring association with depression and anxiety symptoms.

The current study showed that female offspring show a higher mean across all the symptoms that were in this study. Female offspring had a higher prevalence of almost all the symptoms, and the highest prevalence for girls was a 3-fold increase for feeling worthless. This could be because the symptoms of depression and anxiety examined in this study are more in line with female symptoms than male symptoms, showing a higher mean and prevalence for girls. Also, parental sex does not differ in the influence on the offspring's depression and anxiety symptoms, and it could be because previous studies show that paternal influence is stronger in the postnatal stage which could equalize the influence of parental sex. Lastly, parental sex interaction with offspring is not enough of interaction to influence the offspring's depression and anxiety symptoms and there must be other factors.

Keywords: depression and anxiety, parental influence, offspring, male and female

# Introduction

Depression and anxiety disorders can have a substantial functional impairment for both the affected individual and the wider economy. For the individual, depression can affect psychological and physical health, view on self, quality of life, and the relationship with others (Nechita et al., 2018; Zisook et al., 2007). In addition, both disorders can develop from an early age and can affect a person throughout their whole life; moreover, an early age onset of depression increases the chances of the individual having more severe and recurrent forms of depression (Beesdo et al., 2009; Breslau et al., 2017; Stein & Lang, 2002; Zisook et al., 2007). An examination of the wider perspective of depression and anxiety, as revealed in statistics from Dattani et al. (2021), indicates that in 2017, 3.44% and 3.76% of the population worldwide suffered from depression and anxiety, respectively. This equates to approximately 264 million people with depression and 284 million people with anxiety disorders. The human capital value of losses due to days out of role because of depression ranges from 30.1 to 51.5 billion USD every year, and the annual medical cost of anxiety disorders in the USA was approximately USD 33.71 billion in 2010 (Kessler, 2012; Shirneshan, 2013). Given this high prevalence of depression and anxiety, especially at an early age, it would be essential to identify those children and adolescents with an increased risk of developing depression/anxiety and offer them appropriate prevention strategies.

## Intergenerational Transmission of Depression and Anxiety

The offspring of parents who have depression and/or anxiety disorders have an increased chance of developing the same disorders as the parents (Lannes et al., 2021; Havinga et al., 2016). The risk for offspring of anxious parents in developing anxiety is much higher than for offspring of non-anxious parents (relative risks of 1.8 and 1.3, respectively; Lawrence et al., 2019). For depression, the offspring of a parent with a major depressive disorder are found to have a 64.8% chance of also having a major depressive disorder, while the offspring of non-depressed parents have a 32.5% chance of having a major depressive disorder (Weissman et al., 2021). Moreover, the children of depressed parents have from two to six times more chance of developing an anxiety disorder compared to the children of parents who have never had depression (Colletti et al., 2009). Parental depression can even increase the chances of other psychiatric disorders for offspring by 21.4% compared to 14.3% for a child with no parental depression (Mars et al., 2012). Parental anxiety may also place offspring at an increased risk of developing a depression or anxiety disorder through exposure to negative life events, which may either increase a child’s risk of developing anxiety directly or indirectly through diminishing the child’s sense of control (Murray et al., 2009). Finally, it has been found that the range of parental everyday-life anxieties demonstrates a positive relationship to their offspring’s anxiety symptom load (Adolph et al., 2020). Given the frequent intergenerational transmission of depression and anxiety, offspring of depressed/anxious patients would be an important target group for prevention.

## Sex differences in Depression and Anxiety

Notably, depression and anxiety disorders differ between men and women. In the general population, paediatric depression and anxiety are twice as common in girls than in boys (Axelson & Birmaher, 2001; Derdikman-Eiron et al., 2012), and the higher prevalence of the disorders for women spans all age groups (Angst et al., 2002; Asher & Aderka, 2018). These sex differences are also present in offspring of depressed and/or anxious patients (Low et al., 2012; Havinga et al., 2016; Vismara et al., 2019); for example, Havinga et al. (2016) found that daughters of parents in specialized treatment for depression and anxiety had a two-fold increased risk of developing mood and anxiety disorders themselves compared to. Extant parental depression and anxiety studies have also found that parental disorders increase the chances of depression and anxiety more for female offspring than for male offspring across all ages (Bouma et al., 2008; Morris et al., 2013; Ranney et al., 2021).

## The Different Effects of Mothers’ and Fathers’ Depression and Anxiety Disorders on Their Children

Research indicates that the mental health conditions of mothers and fathers can transmit to offspring. Both mother’s and father’s depression and anxiety can increase the chances of offspring’s having depression and/or anxiety disorders (Spry et al., 2020; Burstein et al., 2010). Although maternal and paternal depression and anxiety have different influences on offspring. Approximately 14% of children of mothers with depression are diagnosed with either a mood or anxiety disorder, compared to 6% of children of depressed fathers (REF). Further studies confirm this, stating that a mother’s psychological problems have a stronger effect on the disorder development of her children than a father’s psychological problems, even in a later age of the offspring (Ayano, 2021; Kwok & Gu, 2019). Maternal depression and anxiety can also affect a child when in utero, thereby increasing their risk of anxiety in childhood and adolescence (Capron et al., 2015).

**The importance of considering individual symptoms**

A symptom-specific approach is important because a detailed view of symptoms of depression helps to find the casual associations, and this will help to find individualized treatment for every affected person. Also, different risk factors influence different depression symptoms and analysis of individual symptoms will help to reveal patterns that were neglected before. The problem with diagnosing with sum scores is that individuals with similar sum-score can have very different syndromes and individual depression described by a sum-score can conceal important clinical insights (Fried et al., 2013; Fried and Nesse 2015). Using a symptom-specific approach in this study it will help to find out is there a difference in symptom sum between male and female offspring’s. Also, it will help to find out which offspring symptoms are influenced by parental depression and anxiety and if there is a different influence on offspring depression and anxiety between male and female affected parents.

**The current study**

The present study uses data from ARIADNE (Adolescents at Risk of Anxiety and Depression: A Neurobiological and Epidemiologic approach). The ARIADNE study includes 522 offspring (299 daughters and 223 sons) of 366 patients in treatment for depression and anxiety. This study will examine whether offspring gender and gender of the depressed/anxious parent are related to the number of depression and anxiety symptoms experienced in offspring. We expected that (a) girls show more depression and anxiety symptoms than boys; (b) the offspring of mothers with depression and anxiety display more depression and anxiety symptoms than the offspring of fathers with depression and anxiety; and (c) the association between offspring gender and the depression and anxiety symptoms is dependent on the gender of the affected parent. Through exploratory analyses, this study also considers potential differences in the associations with individual symptoms of depression and anxiety. This detailed view on every individual symptom of depression and anxiety will help to get a better view of the disorders and maybe find substantial differences between the symptoms.

# Method

## Study design and sample

Data were derived from ARIADNE (“Adolescents at Risk of Anxiety and Depression; A combined Neurobiological and Epidemiological approach”), which is an observational cohort study that included 522 offspring of 366 patients who had received treatment for depressive (i.e., major depressive disorder, dysthymia) and/or anxiety disorders (i.e., panic disorder with or without agoraphobia, obsessive-compulsive disorder) at one of 16 psychiatric services in the north of the Netherlands (Havinga et al., 2016; Landman-Peeters, 2007). The current project focuses on the baseline assessment and includes 412 offspring who have one parent with a depressive and/or anxiety disorder.

Approximately 65,000 medical files were gathered from the 16 psychiatric services that contributed to ARIADNE. After the two selection and exclusion sections, which are illustrated in Figure 1, 4,470 medical files were chosen to participate in the study. Invitations were sent by post, and 366 patients and their 522 offspring consented and were eligible to participate in the study. Of the 522 offspring, 207 had an anxiety disorder (56.6%; of which 12.1% had a pure anxiety disorder and 87.9% had a comorbid depressive disorder), and 320 had a depressive disorder (87.4%; of which 43.1% had a pure depressive disorder and 56.9% had a comorbid anxiety disorder) as was established by the Composite International Diagnostic Interview (CIDI). Offspring that were included in the study were aged between 13 and 25 years old (M = 18.1; SD = 3.2). Most parents and offspring (> 95%) were of Dutch origin. Patients and their children were not eligible to participate in the study if the patient had a history of schizophrenia or post-traumatic stress disorder.

For the current study only 412 offspring and their parent information was eligible to be analysed in this study.

A detailed description of the recruitment of the study’s participants is presented in Figure 1 below.

**Figure 1**

*Flowchart of the Study Design*



## Procedure

The participants in both previous studies were interviewed by professional interviewers using questionnaires that were required to gather information about depression and anxiety disorders. Both the index parents and their offspring at home or at the clinical research site. The interviews were conducted by highly trained interviewers. To ensure blindness for parental diagnosis, parents and offspring were interviewed separately by different interviewers. For more details on the procedure, see Landman-Peeters (2007) and Havinga et al. (2016).

## Measures

### Number of Depression and Anxiety Symptoms

To gather information about individual symptoms of depression and anxiety in the past 12 months, 15 individual items of the DSM-IV questionnaire were used (Havinga et al., 2016). The offspring were asked to report on a 4-point Likert scale to what extent the descriptions of symptomatic behavior accurately described their behavior at the time of measurement and in the preceding 12 months. The answers on the 4-point Likert scale were dichotomized into either present or absent of the symptom and the symptoms were counted for a measure on the number of symptoms.

 The internal consistency reliability of the questionnaire was 0.92 for the depression scale and 0.88 for the anxiety scale, and Cronbach’s alpha was 0.853 which means that the depression and anxiety symptoms have a high internal consistency.

### Gender of the Affected Parent and Offspring

The gender of the affected index parent and their offspring were considered during the study to test the effect of the parents’ gender on the offspring's depression and anxiety disorder symptoms. Also, the offspring that were selected were the ones with only the index parent with depression and/or anxiety and not the other parent.

Similarly, at a baseline, CIDI (version 3.0) was used to assess the presence of DSM-IV depression and/or anxiety in index parents. The CIDI coefficients for interrater reliability were 0.94 and 0.95 for the CIDI sections that were used for index parents.

To gather information about the psychiatric history of the offspring’s other biological parent, the Family History-Research Diagnostic Criteria method was employed. Index parents were asked about the history of anxiety or depressive disorders of their children’s other biological parent by using a case vignette describing the main DSM-IV characteristics of the disorder under investigation; this was followed by a series of questions assessing lifetime occurrence, professional treatment, and medication use. The other biological parent was classified as affected if they had received treatment for anxiety or depressive disorders. This criterion served as a proxy measure of equal “illness severity” for the two affected parents. This information was used only on the index parent for selecting the sample for this study.

## Statistical Analyses

All the statistical analysis was performed using SPSS version 28. First, descriptive statistics were used to provide an overview on the characteristics of the sample. Then, an independent sample T-test was used to examine whether girls show more depression and anxiety symptoms than boys (hypothesis 1). To compare the mean of symptoms between male and female offspring, the T-test was used. The T-test was also used for the testing of the hypothesis that offspring of mothers with depression and anxiety display more depression and anxiety symptoms than the offspring of fathers with depression and anxiety (hypothesis 2). The logistic regression analysis was undertaken to check the association between offspring gender and the depression and anxiety symptoms dependence on the gender of the affected parent (hypothesis 3). The p-value for the analysis was .05, although when all the 15 symptoms were analysed using logistic regression there was a risk for the type 1 error because of the 15 analyses, so the Bonferroni correction was used by dividing the p-value by the number of analyses and making the p-value .003.

**Assumptions**

Before the analysis of the information, some assumptions had to be met. For the independent sample t-test, the samples had to be independent. This was checked by looking if the values of one sample did not affect the other sample and if the values in one sample did not reveal any information about the other sample. There had to be no outlines in the samples, which was checked using box plots, and the outlines were removed. The data had to be normally distributed, which was checked by using the Kolmogorov-Smirnov test. Lastly, there had to be a homogeneity of variances, which was checked using Levene’s test. For the logistic regression analysis, the dependent variable had to be binary, and the dependent variable in this study was recoded from a 4-point Likert scale were dichotomized into either present or absent of the symptom and the symptoms were counted for a measure on the number of symptoms. There had to be linearity between the independent and dependent variables, which was checked by looking at the scatter plots. Finally, there had to be no multicollinearity among the independent variables, which was examined using the variance inflation factor. As for the logistic regression, the samples had to be also independent of each other. All of these assumptions had to be met in order to conduct the analysis of the sample.

# Results

## Descriptive Statistics

Of the study’s 524 offspring participants, only 412 offspring were eligible for analysis, because only offspring with one parent with depression and or anxiety information was used. Out of 412 offspring parents, there were 124 male parents, 288 female parents and 372 with a depressive disorder and 294 with an anxiety disorder. For offspring, there were 239 female offspring, the mean age was 18.1 for all the offspring, and the mean number of symptoms was 5.5, the range in prevalence was from 63 offspring with suicidal thoughts to 305 with excessive worry.  A detailed breakdown of the distribution of symptoms across offspring is indicated in Table 2.

**Table 2**

*Description of Offspring and the Number of Symptoms*

|  |  |
| --- | --- |
|  | Mean (SD) / N (%) |
| *Sociodemographics* |  |
| Female sex  | 239 (58.0%) |
| Age in years | 18.1 (3.1) |
|  |  |
| *Depression and anxiety symptoms* |  |
| Number of symptoms | 5.5 (3.9) |
| Presence of individual symptom |  |
| * Feeling sad
 | 188 (45.6%) |
| * Feeling hopeless
 | 115 (27.9%) |
| * Feeling worthless
 | 135 (32.9%) |
| * Feeling guilty
 | 236 (57.3%) |
| * Tiredness or lack of energy
 | 187 (45.4%) |
| * Anhedonia
 | 103 (25.0%) |
| * Retardation
 | 140 (34.0%) |
| * Suicidal thoughts
 | 63 (15.3%) |
| * Early night insomnia
 | 151 (36.7%) |
| * Middle night insomnia
 | 79 (19.2%) |
| * Sleep disturbance
 | 121 (29.4%) |
| * Excessive worry
 | 305 (74.0%) |
| * Feeling tense/nervous
 | 140 (34.0%) |
| * Panic
 | 103 (25.0%) |
| * Indecisiveness
 | 207 (50.2%) |

## Associations with the Number of Depression and Anxiety Symptoms

In line with hypothesis that girls show more depression and anxiety symptoms than boys, the independent sample t-test showed that girls reported more depression and anxiety symptoms than boys (mean = 6.2, SD = 4.0 versus mean = 4.5, SD = 3.6; p < 0.001). In contrast, parental sex was not related to the number of depression and anxiety symptoms, as the offspring of depressed/anxious mothers did not differ from offspring of depressed/anxious fathers in the number of reported symptoms (mean = 5.6, SD = 4.1 versus mean = 5.5, SD = 3.9; p = 0.89). The interaction term of offspring sex with parental sex was not significant (p = .32), indicating that the association of offspring sex with the number of depression and anxiety symptoms was not dependent on the sex of the affected parent.

## Associations with the Presence of Individual Depression and Anxiety Symptoms

As demonstrated in Figure 2, this study found that the female sex is differentially related to individual symptoms of depression and anxiety. Odds ratios range from 0.87 for anhedonia to 3.34 for feeling worthless. The results indicate that female sex is associated with an increased risk of all individual symptoms, except for anhedonia; however, only the associations with feeling hopeless, feeling worthless, and sleep disturbances were significant (Bonferroni-corrected p < .003). The associations with two symptoms (i.e., anhedonia and retardation) were not at all significant, and the associations with the remaining ten symptoms were borderline significant (p < .05).

**Figure 2**

*The Associations of Offspring Sex with Individual Symptoms of Depression and Anxiety*

Figure 3 illustrates the associations of parental sex with individual symptoms of depression and anxiety. Although odds ratios range from 0.67 for feeling tense/nervous to 1.34 for middle night insomnia, the results showed that depressed/anxious mothers do not have an increased risk of having any of the symptoms in offspring relative to depressed/anxious fathers (p > .08).

**Figure 3**

*The Associations of Index Parent’s Sex with Individual Symptoms of Depression and Anxiety*

In the last step, it was examined is the interaction between offspring and parental sex influential on the offspring individual symptoms. The interaction term was not significant for any of the symptoms (p > .05; results not tabulated).

# Discussion

Previous studies have found that offspring of patients with major depression and/or an anxiety disorder have an increased risk of developing depression and anxiety disorders themselves (Micco et al., 2009; Rusengamihigo et al., 2021). This offspring study further investigated the intergenerational transmission of depression and anxiety by exploring the associations of offspring sex and sex of the depressed/anxious parent with different symptoms of depression and anxiety. In line with our expectations, we found that girls had more depression and anxiety symptoms than boys. There is a large difference across the prevalence of symptoms in offspring. Female offspring had a higher prevalence on almost all of the symptoms and the ratio for the prevalence ranged from 0.87 to 3.34. Female offspring had a higher prevalence for the following individual symptoms of depression and anxiety: feeling sad, feeling hopeless, feeling worthless, feeling guilty, tiredness or lack of energy, suicidal thoughts, and early night insomnia. The highest 3-fold increase in symptoms for female offspring of prevalence was for feeling worthless. There was no prevalence difference in the retardation and anhedonia symptoms between male and female symptoms. On the third hypothesis, results showed that the parents’ sex is not associated with individual symptoms and had no associations with the offspring’s sex or their individual symptoms of depression and anxiety. This means that affected parent’s gender is not influential on the offspring symptoms of depression and anxiety.

**Sex differences in depression and anxiety symptoms**

Our study provides important additional information by showing large sex differences across individual symptoms. The highest symptom prevalence difference between male and female offspring was for feelings of worthlessness and hopelessness; females showed a much higher prevalence for both these symptoms. The high prevalence for the symptoms can be explained by women being more likely to suffer from self-disappointment and self-blame (REFS); similarly, research has indicated that women are socialised at an early age to be caring and sensitive, to express emotions, to minimise disagreements, and to be concerned about what others think of them (Bennett et al., 2005). This type of socialisation has arguably led to the higher prevalence of feeling worthless and hopeless as symptoms in women than men. In contrast, no difference in prevalence was found between genders in the anhedonia and retardation symptoms. This can be understandable, as anhedonia is a stable symptom in depression across both genders and retardation correlates with the severity of depression and does not also differ across genders (Bennik et al., 2013; Buyukdura et al., 2011). No prevalence difference was therefore seen for retardation and anhedonia because they are symptoms that correspond with depression in general and do not vary for different genders.

It is important to here acknowledge that men’s expression of depression and anxiety is generally different to that of women. Men are more likely than women to express depression through anger attacks, aggression, irritability, substance abuse, risk-taking, and withdrawal symptoms (Martin et al., 2013); this bad behavior is often aimed to suppress the internal turmoil that the man is experiencing. Socially, men are more likely to be expected to display independence, competitiveness, emotional stoicism, and self-control, which can restrict the expression of their emotional, sensitive side and prevents them from expressing depression and anxiety in the same way that women do (Ogrodniczuk & Oliffe, 2011). Similarly, male anxiety symptoms are likely to manifest as co-morbid alcohol and substance abuse, while women tend to have higher rates of co-morbid mood and anxiety disorders (Altemus et al., 2014). It is therefore evident that men experience different depression and anxiety symptoms to women, and it must be considered that the anxiety and depression symptoms under study in this research may more resemble the female expression, thereby accounting for the higher overall symptom prevalence in the female offspring participants.

## Differences between offspring of depressed/anxious mothers versus fathers

Previous studies indicate that paternal and maternal depression both independently increase the chances of offspring depression, but maternal depression and anxiety have a higher association with offspring depression and anxiety (Brennan et al., 2002; Low et al., 2012; Pietikäinen et al., 2019). However, this study specifically explored how parental gender influences the different symptoms of depression and anxiety, and it was found that there is no effect for different symptoms, thus disproving Hypothesis 2. These results demonstrate that although previous research states a parent’s gender does affect their child’s depressive and anxiety disorder, the intensity does not differ between male and female affected index parents. This could be explained that the influence of maternal and paternal disorders on offspring equalizes after the birth of the offspring. In the previous studies, it is stated that the influence of maternal depression was higher when the maternal depression was at the antenatal stage (Capron et al., 2015). The paternal depression influence on offspring is higher at the postnatal period of the offspring (Spry et al., 2020). The paternal associations of symptoms for offspring were higher in the postnatal period of offspring. In another study where the participant offspring's age was from 6 years to 23 years maternal and paternal depression had the same influence on offspring depression (Jacobs et al., 2014). In this study confirms the fact that both parents have the same influence when the offspring is in the postnatal period or older.

## There Is An Interaction Between Parental Sex and Offspring Sex and Depression and Anxiety Symptoms

This study found that maternal and paternal gender interaction with offspring gender is not significant in increasing or decreasing depression and anxiety symptoms. The study results confirm this for every symptom of depression and anxiety under study, thereby refuting Hypothesis C. This non-significance could be because there should be also other factors to influence offspring depression and anxiety symptoms. Previous studies show that maternal depression has a significant influence on the increase of female offspring depression through environmental factors (Lewis et al., 2011). Moreover, parental symptoms of weight loss and appetite loss are proven to increase the chances of depression symptoms in offspring (Mars et al., 2013), while Gibler et al. (2017) find that maternal encouragement of independence for offspring was an indirect prompt for paternal anxiety-related transmission to offspring. Furthermore, for anxiety, parental overprotection and negative life events predicted anxiety in preschool children (Edwards et al., 2010). This study is in line with previous studies it could be that parental sex is not enough of an influential factor in the interaction with offspring depression and anxiety symptoms and there must be also other factors to make the interaction influential.

**Suggestions for further research**

## Clinical Implications

This study’s findings have important clinical implications on the understanding of depression and anxiety disorder symptoms for the children of those who also suffer from anxiety and depression. As it has been asserted that male expressions of depression and anxiety differ from female expressions, it is likely that this study unintentionally focused on how women express their depression and anxiety symptoms. Therefore, when researching female depression and anxiety, this study can act as a starting point for researchers compiling symptoms to study. Correspondingly, symptoms other than these should be explored when examining predominantly male expressions of depression and anxiety.

A further important implication of the results of this study is due to the highest difference in symptom prevalence between genders being for the symptoms of feeling worthless and feeling hopeless. The female offspring participants exhibited a much higher prevalence for these two symptoms, suggesting that women will show these symptoms at the start of their depression or anxiety disorders. In contrast, the symptoms of retardation and anhedonia did not differ in prevalence for male and female offspring. It is therefore suggested that mental health specialists focus on these symptoms when diagnosing depression and anxiety in both men and women.

Furthermore, mental health specialists should investigate not only the gender of affected parents but also other external factors that could increase the associations between parental and offspring sex and depression and anxiety symptoms when treating offspring of parents with depression and/or anxiety disorder.

## Strengths and Limitations of the Study

The major strength of this study is its detailed examination of different depression and anxiety symptoms. This thorough exploration demonstrated the difference between male and female offspring regarding the number of symptoms suffered and how the genders differ in the prevalence of these symptoms. The study also conducted an in-depth investigation into the correlation of a parent’s sex on their offspring's different depression and anxiety symptoms, which is a further strength of this research.

However, it must be acknowledged that this study analyzed only the sex of one affected parent, omitting the other parent’s sex and its influence on the offspring depression and anxiety symptoms. Moreover, this study investigated the symptoms of depression and anxiety based on their presence or absence, overlooking differences in severity. Also, the symptoms in the study were much more in line with the female expression of depression and anxiety omitting the expression of disorders of offspring males. These limitations could be addressed in future research, thereby offering a more rounded commentary on the severity and cause of each symptom.

## Suggestions for Future Studies

## This study investigated the different symptoms of depression and anxiety for the offspring of parents with depression and anxiety. The study explored the correlations between parental sex and the different symptoms of offspring depression and anxiety. Future research should broaden the depression and anxiety symptoms under study by adding more typically male expressions and analyzing the mean and prevalence of these. It would be essential to focus on the individual symptoms of depression and anxiety disorder of the affected parent. Future studies could examine the symptom-specific mechanisms, the feelings of hopelessness and others, through which girls are more likely to have depression and anxiety disorders than boys. Also, it would be interesting to examine the interrelatedness of individual symptoms by using network analyses. It would be also interesting to investigate other factors that increase the affected parent to offspring transmission of depression and anxiety symptoms and explore which factors have the highest transition association. Also, as stated above, the cause and severity of symptoms would make a compelling subject for further research.

## Conclusion

The study brings a new insight into the transmission of depression and anxiety from affected parents to their offspring. The study demonstrates that female offspring have a higher number and a higher prevalence of symptoms, both parents’ sex are found to be influential on the transmission of different symptoms of depression and anxiety. Despite male expressions and symptoms of depression and anxiety being potentially overlooked, the study crucially asserts that the gender of the parent is not a significant factor in the transmission of depression and anxiety symptoms.  Therefore, this study has investigated many of the symptoms of depression and anxiety and has obtained detailed information on the influence of the affected parents’ sex on the offspring’s sex and their depression and anxiety symptoms.

# References

Adolph, D., Margraf, J., & Schneider, S. (2020). Your fear is my fear: The relationship between parental and offspring anxieties. *Child Psychiatry & Human Development, 52*(5), 772–781. https://doi.org/10.1007/s10578-020-01060-y

Altemus, M., Sarvaiya, N., & Neill Epperson, C. (2014). Sex differences in anxiety and depression clinical perspectives. *Frontiers in Neuroendocrinology, 35*(3), 320–330. https://doi.org/10.1016/j.yfrne.2014.05.004

Angst, J., Gamma, A., Gastpar, M., Lépine, J. P., Mendlewicz, J., & Tylee, A. (2002). Gender differences in depression: Epidemiological findings from the European DEPRES I and II studies. *European Archives of Psychiatry and Clinical Neuroscience*, *252*(5), 201–209. https://doi.org/10.1007/s00406-002-0381-6

Armstrong, K. A., & Khawaja, N. G. (2002). Gender differences in anxiety: An investigation of the symptoms, cognitions, and sensitivity towards anxiety in a nonclinical population. *Behavioural and Cognitive Psychotherapy, 30*(2), 227–231. https://doi.org/10.1017/s1352465802002114

Asher, M., & Aderka, I. M. (2018). Gender differences in social anxiety disorder. *Journal of Clinical Psychology*, *74*(10), 1730–1741. https://doi.org/10.1002/jclp.22624

Axelson, D. A., & Birmaher, B. (2001). Relation between anxiety and depressive disorders in childhood and adolescence. *Depression and Anxiety, 14*(2), 67–78. https://doi.org/10.1002/da.1048

Ayano, G., Betts, K., Lin, A., Tait, R., & Alati, R. (2021). Maternal and paternal mental health problems and the risk of offspring depression in late adolescence: Findings from the Raine study. *Journal of Mental Health, 30*(3), 349–357. https://doi.org/10.1080/09638237.2021.1875423

Beesdo, K., Knappe, S., & Pine, D. S. (2009). Anxiety and anxiety disorders in children and adolescents: Developmental issues and implications for DSM-V. *Psychiatric Clinics of North America, 32*(3), 483–524. https://doi.org/10.1016/j.psc.2009.06.002

Bennett, D. S., Ambrosini, P. J., Kudes, D., Metz, C., & Rabinovich, H. (2005). Gender differences in adolescent depression: Do symptoms differ for boys and girls*? Journal of Affective Disorders, 89*(1–3), 35–44. https://doi.org/10.1016/j.jad.2005.05.020

Bennik, E. C., Nederhof, E., Ormel, J., & Oldehinkel, A. J. (2013). Anhedonia and depressed mood in adolescence: course, stability, and reciprocal relation in the TRAILS study. *European Child & Adolescent Psychiatry, 23*(7), 579–586. https://doi.org/10.1007/s00787-013-0481-z

Bouma, E. M., Ormel, J., Verhulst, F. C., & Oldehinkel, A. J. (2008). Stressful life events and depressive problems in early adolescent boys and girls: The influence of parental depression, temperament and family environment. *Journal of Affective Disorders*, *105*(1–3), 185–193. https://doi.org/10.1016/j.jad.2007.05.007

Brennan, P. A., Hammen, C., Katz, A. R., & le Brocque, R. M. (2002). Maternal depression, paternal psychopathology, and adolescent diagnostic outcomes. *Journal of Consulting and Clinical Psychology, 70*(5), 1075–1085. https://doi.org/10.1037/0022-006x.70.5.1075

Breslau, J., Gilman, S. E., Stein, B. D., Ruder, T., Gmelin, T., & Miller, E. (2017). Sex differences in recent first-onset depression in an epidemiological sample of adolescents. *Translational Psychiatry, 7*(5), Art. e1139. https://doi.org/10.1038/tp.2017.105

Burstein, M., Ginsburg, G. S., & Tein, J. Y. (2010). Parental Anxiety and Child Symptomatology: An Examinzation of Additive and Interactive Effects of Parent Psychopathology. *Journal of Abnormal Child Psychology*, *38*(7), 897–909. <https://doi.org/10.1007/s10802-010-9415-0>

Buyukdura, J. S., McClintock, S. M., & Croarkin, P. E. (2011). Psychomotor retardation in depression: Biological underpinnings, measurement, and treatment*. Progress in Neuro-Psychopharmacology and Biological Psychiatry, 35*(2), 395–409. https://doi.org/10.1016/j.pnpbp.2010.10.019

Capron, L. E., Glover, V., Pearson, R. M., Evans, J., O’Connor, T. G., Stein, A., Murphy, S. E., & Ramchandani, P. G. (2015). Associations of maternal and paternal antenatal mood with offspring anxiety disorder at age 18 years. *Journal of Affective Disorders, 187*, 20–26. https://doi.org/10.1016/j.jad.2015.08.012

Christiansen, D. M. (2015). Examining sex and gender differences in anxiety disorders. In F. Durbano (Ed.), *A fresh look at anxiety disorders* (pp. 17–49). Intech Open. https://doi.org/10.5772/60662

Colletti, C. J. M., Forehand, R., Garai, E., Rakow, A., McKee, L., Fear, J. M., & Compas, B. E. (2009). Parent depression and child anxiety: An overview of the literature with clinical implications. *Child & Youth Care Forum, 38*(3), 151–160. https://doi.org/10.1007/s10566-009-9074-x

Dattani, S., Ritchie, H., & Roser, M. (2021). *Mental health*. Our World in Data. https://ourworldindata.org/mental-health

Derdikman-Eiron, R., Indredavik, M. S., Bakken, I. J., Bratberg, G. H., Hjemdal, O., & Colton, M. (2012). Gender differences in psychosocial functioning of adolescents with symptoms of anxiety and depression: Longitudinal findings from the Nord-Trøndelag Health Study. *Social Psychiatry and Psychiatric Epidemiology, 47*(11), 1855–1863. https://doi.org/10.1007/s00127-012-0492-y

Edwards, S. L., Rapee, R. M., & Kennedy, S. (2010). Prediction of anxiety symptoms in preschool-aged children: examination of maternal and paternal perspectives. *Journal of Child Psychology and Psychiatry, 51*(3), 313–321. https://doi.org/10.1111/j.1469-7610.2009.02160.x

Fried, E. I., & Nesse, R. M. (2015). Depression sum-scores don’t add up: why analyzing specific depression symptoms is essential. *BMC Medicine*, *13*(1). <https://doi.org/10.1186/s12916-015-0325-4>

Fried, E. I., Nesse, R. M., Zivin, K., Guille, C., & Sen, S. (2013). Depression is more than the sum score of its parts: individual DSM symptoms have different risk factors. *Psychological Medicine*, *44*(10), 2067–2076. <https://doi.org/10.1017/s0033291713002900>

Gibler, R. C., Kalomiris, A. E., & Kiel, E. J. (2017). Paternal anxiety in relation to toddler anxiety: The mediating role of maternal behavior. *Child Psychiatry & Human Development*, 49(4), 512–522. https://doi.org/10.1007/s10578-017-0771-7

Havinga, P. J., Boschloo, L., Bloemen, A. J. P., Nauta, M. H., de Vries, S. O., Penninx, B. W. J. H., Schoevers, R. A., & Hartman, C. A. (2016). Doomed for disorder? High incidence of mood and anxiety disorders in offspring of depressed and anxious patients. *The Journal of Clinical Psychiatry*, *78*(1), e8–e17. https://doi.org/10.4088/jcp.15m09936

Jacobs, R. H., Talati, A., Wickramaratne, P., & Warner, V. (2014). The Influence of Paternal and Maternal Major Depressive Disorder on Offspring Psychiatric Disorders. *Journal of Child and Family Studies*, *24*(8), 2345–2351. <https://doi.org/10.1007/s10826-014-0037-y>

Kessler, R. C. (2012). The costs of depression. *Psychiatric Clinics of North America, 35*(1), 1–14. https://doi.org/10.1016/j.psc.2011.11.005

Kwok, S. Y. C. L., & Gu, M. (2019). Parental suicidal ideation and child depressive symptoms: The roles of optimism and gratitude. *Journal of Social Service Research, 46*(4), 586–595. https://doi.org/10.1080/01488376.2019.1612819

Landman-Peeters, K. M. C. (2007). *At risk of depression and anxiety: Studies into the interplay of personal and environmental risk factors* [Doctoral dissertation, University of Groningen]. University of Groningen research database.

Landman-Peeters, K. M., Ormel, J., van Sonderen, E. L., den Boer, J. A., Minderaa, R. B., & Hartman, C. A. (2008). Risk of emotional disorder in offspring of depressed parents: Gender differences in the effect of a second emotionally affected parent. *Depression and Anxiety, 25*(8), 653–660. https://doi.org/10.1002/da.20350

Lannes, A., Bui, E., Arnaud, C., Raynaud, J. P., & Revet, A. (2021). Preventive interventions in offspring of parents with mental illness: a systematic review and meta-analysis of randomized controlled trials. *Psychological Medicine*, *51*(14), 2321–2336. <https://doi.org/10.1017/s0033291721003366>

Lawrence, P. J., Murayama, K., & Creswell, C. (2019). Systematic review and meta-analysis: Anxiety and depressive disorders in offspring of parents with anxiety disorders. *Journal of the American Academy of Child & Adolescent Psychiatry, 58*(1), 46–60. https://doi.org/10.1016/j.jaac.2018.07.898

Lewis, G., Rice, F., Harold, G. T., Collishaw, S., & Thapar, A. (2011). Investigating environmental links between parent depression and child depressive/anxiety symptoms using an assisted conception design. *Journal of the American Academy of Child & Adolescent Psychiatry, 50*(5), 451–459.e1. https://doi.org/10.1016/j.jaac.2011.01.015

Low, N. C., Dugas, E., Constantin, E., Karp, I., Rodriguez, D., & O’Loughlin, J. (2012). The association between parental history of diagnosed mood/anxiety disorders and psychiatric symptoms and disorders in young adult offspring. *BMC Psychiatry, 12*(1), Art. 188. https://doi.org/10.1186/1471-244x-12-188

Marcus, S. M., Young, E. A., Kerber, K. B., Kornstein, S., Farabaugh, A. H., Mitchell, J., Wisniewski, S. R., Balasubramani, G., Trivedi, M. H., & Rush, A. J. (2005). Gender differences in depression: Findings from the STAR\*D study. *Journal of Affective Disorders, 87*(2–3), 141–150. https://doi.org/10.1016/j.jad.2004.09.008

Mars, B., Collishaw, S., Smith, D., Thapar, A., Potter, R., Sellers, R., Harold, G. T., Craddock, N., Rice, F., & Thapar, A. (2012). Offspring of parents with recurrent depression: Which features of parent depression index risk for offspring psychopathology? *Journal of Affective Disorders, 136*(1–2), 44–53. https://doi.org/10.1016/j.jad.2011.09.002

Mars, B., Harold, G. T., Elam, K. K., Sellers, R., Owen, M. J., Craddock, N., Thapar, A. K., Rice, F., Collishaw, S., & Thapar, A. (2013). Specific parental depression symptoms as risk markers for new-onset depression in high-risk offspring. *The Journal of Clinical Psychiatry, 74*(9), 925–931. https://doi.org/10.4088/jcp.12m08152

Martin, L. A., Neighbors, H. W., & Griffith, D. M. (2013). The experience of symptoms of depression in men vs women. *JAMA Psychiatry, 70*(10), 1100–1106. https://doi.org/10.1001/jamapsychiatry.2013.1985

McLean, C. P., Asnaani, A., Litz, B. T., & Hofmann, S. G. (2011). Gender differences in anxiety disorders: Prevalence, course of illness, comorbidity, and burden of illness. *Journal of Psychiatric Research, 45*(8), 1027–1035. https://doi.org/10.1016/j.jpsychires.2011.03.006

Micco, J. A., Henin, A., Mick, E., Kim, S., Hopkins, C. A., Biederman, J., & Hirshfeld-Becker, D. R. (2009). Anxiety and depressive disorders in offspring at high risk for anxiety: A meta-analysis. *Journal of Anxiety Disorders, 23*(8), 1158–1164. https://doi.org/10.1016/j.janxdis.2009.07.021

Morris, B. H., McGrath, A. C., Goldman, M. S., & Rottenberg, J. (2013). Parental depression confers greater prospective depression risk to females than males in emerging adulthood. *Child Psychiatry & Human Development, 45*(1), 78–89. https://doi.org/10.1007/s10578-013-0379-5

Murray, L., Creswell, C., & Cooper, P. J. (2009). The development of anxiety disorders in childhood: an integrative review. *Psychological Medicine, 39*(9), 1413–1423. https://doi.org/10.1017/s0033291709005157

Nechita, D., Nechita, F., & Motorga, R. (2018). A review of the influence the anxiety exerts on human life. *Romanian Journal of Morphology and Embryology*, *59*(4), 1045–1051.

Ogrodniczuk, J. S., & Oliffe, J. L. (2011). Men and depression. *Canadian Family Physician Médecin de Famille Canadien, 57*(2), 153–155.

Pietikäinen, J. T., Kiviruusu, O., Kylliäinen, A., Pölkki, P., Saarenpää‐Heikkilä, O., Paunio, T., & Paavonen, E. J. (2019). Maternal and paternal depressive symptoms and children’s emotional problems at the age of 2 and 5 years: a longitudinal study*. Journal of Child Psychology and Psychiatry, 61*(2), 195–204. https://doi.org/10.1111/jcpp.13126

Ranney, R. M., Behar, E., & Zinsser, K. M. (2021). Gender as a moderator of the relationship between parental anxiety and adolescent anxiety and depression. *Journal of Child and Family Studies, 30*(5), 1247–1260. https://doi.org/10.1007/s10826-021-01931-5

Rusengamihigo, D., Mutabaruka, J., Biracyaza, E., Magalakaki, O., & El’Husseini, M. (2021). Parental mental illness and their offspring’s mental health in Rwanda: Neuropsychiatric hospital of Rwanda. *BMC Psychology, 9*(1), Art 135. https://doi.org/10.1186/s40359-021-00633-3

Shirneshan, E. (2013). *Cost of illness study of anxiety disorders for the ambulatory adult population of the United States* [Doctoral dissertation, University of Tennessee]. University of Tennessee, Health Science Center database.

Spry, E. A., Aarsman, S. R., Youssef, G. J., Patton, G. C., Macdonald, J. A., Sanson, A., Thomson, K., Hutchinson, D. M., Letcher, P., & Olsson, C. A. (2020). Maternal and paternal depression and anxiety and offspring infant negative affectivity: A systematic review and meta-analysis. *Developmental Review*, *58*, 100934. <https://doi.org/10.1016/j.dr.2020.100934>

Stein B. M., & Lang J. A., (2002) Anxiety and stress disorders: Course over the lifetime. In K. L. Davis, D. Charney, J. T. Coyle, & C. Nemeroff (Eds.), *Neuropsychopharmacology: The fifth generation of progress* (pp. 859–866). American College of Neuropsychopharmacology.

Vismara, L., Sechi, C., & Lucarelli, L. (2019). Fathers’ and mothers’ depressive symptoms: Internalizing/externalizing problems and dissociative experiences in their adolescent offspring. *Current Psychology*, *41*(1), 247–257. https://doi.org/10.1007/s12144-019-00566-6

Weissman, M. M., Talati, A., Gameroff, M. J., Pan, L., Skipper, J., Posner, J. E., & Wickramaratne, P. J. (2021). Enduring problems in the offspring of depressed parents followed up to 38 years. *eClinicalMedicine, 38*, Art. 101000. https://doi.org/10.1016/j.eclinm.2021.101000

Zisook, S., Lesser, I., Stewart, J. W., Wisniewski, S. R., Balasubramani, G., Fava, M., Gilmer, W. S., Dresselhaus, T. R., Thase, M. E., Nierenberg, A. A., Trivedi, M. H., & Rush, A. J. (2007). Effect of age at onset on the course of major depressive disorder. *American Journal of Psychiatry, 164*(10), 1539–1546. <https://doi.org/10.1176/appi.ajp.2007.06101757>

# Appendix A

**Table A1**

*The Associations of Offspring Sex with Individual Symptoms of Depression and Anxiety*

|  |  |  |  |
| --- | --- | --- | --- |
| Symptom | OR | 95% C.I for OR | p |
| Lower | Upper |
| Feeling sad | 1.76 | 1.18 | 2.63 | .005 |
| Feeling hopeless | 2.48 | 1.55 | 3.97 | <.001 |
| Feeling worthless | 3.34 | 2.10 | 5.29 | <.001 |
| Feeling guilty | 1.78 | 1.19 | 2.64 | .005 |
| Lack of energy or tired | 1.66 | 1.12 | 2.48 | .012 |
| Anhedonia | 0.87 | 0.55 | 1.36 | .526 |
| Retardation | 1.13 | 0.75 | 1.71 | .557 |
| Suicidal thoughts | 1.83 | 1.07 | 3.26 | .041 |
| Early night insomnia | 1.57 | 1.04 | 2.38 | .032 |
| Middle night insomnia | 2.00 | 1.17 | 3.40 | .011 |
| Sleep disturbance | 2.47 | 1.56 | 3.92 | <.001 |
| Excessive worry | 1.19 | 1.20 | 2.90 | .006 |
| Feeling tense/nervous | 1.56 | 1.02 | 2.37 | .040 |
| Panic | 1.98 | 1.23 | 3.18 | .005 |
| Indecisiveness | 1.49 | 1.00 | 2.20 | .048 |

# Appendix B

**Table B1**

*The Associations of Index Parent Sex with Individual Symptoms of Depression and Anxiety*

|  |  |  |  |
| --- | --- | --- | --- |
| Symptom | OR | 95% C.I for OR | p |
| Lower | Upper |
| Feeling sad | 1.13 | 0.74 | 1.72 | .578 |
| Feeling hopeless | 0.92 | 0.58 | 1.47 | .740 |
| Feeling worthless | 1.21 | 0.77 | 1.91 | .406 |
| Feeling guilty | 0.91 | 0.59 | 1.40 | .669 |
| Lack of energy or tired | 1.34 | 0.88 | 2.06 | .176 |
| Anhedonia | 0.83 | 0.51 | 1.35 | .457 |
| Retardation | 0.96 | 0.61 | 1.49 | .845 |
| Suicidal thoughts | 0.84 | 0.47 | 1.48 | .543 |
| Early night insomnia | 1.19 | 0.76 | 1.85 | .443 |
| Middle night insomnia | 1.34 | 0.77 | 2.34 | .304 |
| Sleep disturbance | 0.82 | 0.52 | 1.30 | .399 |
| Excessive worry | 1.32 | 0.83 | 2.11 | .241 |
| Feeling tense/nervous | 0.67 | 0.44 | 1.04 | .075 |
| Panic | 0.94 | 0.58 | 1.52 | .804 |
| Indecisiveness | 0.70 | 0.46 | 1.07 | .099 |

# Appendix C

**Table C1**

*The Associations of Offspring Sex Interaction with Index Parent Sex with Individual Symptoms of Depression and Anxiety*

|  |  |  |  |
| --- | --- | --- | --- |
| Symptom | OR | 95% C.I for OR | p |
| Lower | Upper |
| Feeling sad | 0.84 | 0.35 | 2.00 | .693 |
| Feeling hopeless | 0.83 | 0.30 | 2.26 | .713 |
| Feeling worthless | 0.87 | 0.32 | 2.38 | .787 |
| Feeling guilty | 0.56 | 0.23 | 1.34 | .193 |
| Lack of energy or tired | 0.89 | 0.37 | 2.13 | .801 |
| Anhedonia | 0.58 | 0.22 | 1.51 | .267 |
| Retardation | 0.67 | 0.27 | 1.65 | .384 |
| Suicidal thoughts | 0.56 | 0.16 | 1.92 | .352 |
| Early night insomnia | 1.44 | 0.59 | 3.54 | .427 |
| Middle night insomnia | 1.02 | 0.32 | 3.33 | .969 |
| Sleep disturbance | 1.20 | 0.46 | 3.19 | .704 |
| Excessive worry | 0.95 | 0.37 | 2.46 | .914 |
| Feeling tense/nervous | 0.71 | 0.29 | 1.75 | .459 |
| Panic | 0.38 | 0.13 | 1.10 | .074 |
| Indecisiveness | 0.61 | 0.26 | 1.44 | .256 |