Childhood Anxiety and Depressive Symptoms: Longitudinal Association and Genetic Etiology

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ABSTRACT

Introduction: Between 9 and 12 years of age, prevalence rates for anxiety and depressive disorders lie between 9% and 4.6% for the former and between 5% and 1.9% for the latter (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003). Although prevalence rates are quite low, the presence of sub-clinical symptoms may be more common. Indeed, some studies have observed that around 25% of children experience high levels of anxious (AS) or depressive symptoms (DS) at age 10 (Costello et al., 2003; Riberdy, Télémant, & Desrosiers, 2013). However, few studies have looked at the phenotypic and genotypic association between anxiety and depression in children from the perspective of symptoms. This study examines the association between AS and DS in children from kindergarten to grade 6 to document: 1) their longitudinal relations and 2) the contribution of genetic and environmental factors to their association. Methodology: Data were collected from a prospective longitudinal twin cohort study of child development, the Quebec Newborn Twin Study (QNTS; Boivin et al., 2013), which conducts annual assessments in a population-based sample of 1234 twins (652 families) born between April 1st 1995 and December 31st 1998 in the greater Montreal area. The sample used in this study included 838 children who were assessed for AS and DS by their teachers from kindergarten to grade 6 and items embedded in a larger questionnaire on child adjustment in school, the Social Behavior Questionnaire (SBQ; Tremblay et al., 1991). Time-specific relations between AS and DS were examined using a cross-lagged structural model. Bivariate genetic analyses were conducted to assess the contribution of genetic and environmental factors to AS and DS and their association at each time point. Analyses were carried out using Mplus (Muthén & Muthén, 2007) using maximum likelihood estimation with robust standard errors (MLR). Results: As shown in Figure 1, DS show temporal stability from kindergarten to grade 6 and AS from grade 1 to grade 6. Temporal stability appears greater for DS than for AS, although it increases for AS throughout childhood. AS and DS measured at the same time-point show a moderate association from kindergarten to grade 6. Cross-lagged paths indicate that DS assessed at one time point tends to predict the AS assessed at the following time point from kindergarten to grade 3 whereas the reverse association was not found. Results from the genetic analyses reveal that additive genetic factors and unique environmental factors contributed to the variation in both AS and DS. Path coefficients indicate that genetic influences tend to increase with age for both phenotypes. The association between the genetic factor of AS and DS at each time point ranged from .44 to .74 while it ranged from .39 to .70 for the unique environmental factors (see Table 1) indicating that while both share a common genetic etiology, they are also influenced by specific genetic factors during this period. Conclusion: The present findings show that DS tend to predict subsequent AS during elementary school and that their association is explained by common genetic and environmental factors.

INTRODUCTION

Between 9 and 12 years of age, prevalence rates for anxiety and depressive disorders lie between 9% and 4.6% for the former and between 5% and 1.9% for the latter (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003).

Around 25% of children experience high levels of anxious (AS) or depressive symptoms (DS) at age 10 (Costello et al., 2003; Riberdy, Télémant, & Desrosiers, 2013).

Few studies have looked at the phenotypic and genotypic association between anxiety and depression in children from the perspective of symptoms.

Objective: To examine the association between AS and DS in children from kindergarten to grade 6 to document:

1) their longitudinal relations;
2) the contribution of genetic and environmental factors to their association.

METHODOLOGY

Participants

Data come from the Quebec Newborn Twin Study (QNTS) whose twins were born between April 1st 1995 and December 31st 1998 surrounding the Greater Montreal Area. The data collected from 838 children were used in analysis.

Measures

Table 1

<table>
<thead>
<tr>
<th></th>
<th>AS</th>
<th>DS</th>
<th>r_MPLUS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kindergarten</strong></td>
<td>.39</td>
<td>.62</td>
<td>.31</td>
</tr>
<tr>
<td><strong>Grade 1</strong></td>
<td>.39</td>
<td>.70</td>
<td>.54</td>
</tr>
<tr>
<td><strong>Grade 3</strong></td>
<td>.35</td>
<td>.65</td>
<td>.45</td>
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<tr>
<td><strong>Grade 4</strong></td>
<td>.32</td>
<td>.68</td>
<td>.58</td>
</tr>
<tr>
<td><strong>Grade 6</strong></td>
<td>.50</td>
<td>.50</td>
<td>.53</td>
</tr>
</tbody>
</table>

Statistical Analyses

1) Cross-lagged structural model: time-specific relations between AS and DS
2) Bivariate genetic analyses: contribution of genetic and environmental factors to AS and DS and to their association

RESULTS

Cross-lagged Model of the Longitudinal Relationship Between Teacher-reported AS and DS

Proportions of Variance Explained by Additive Genetic (a²), Shared Environment (c²), and Unique Environment (e²) Factors and Genetic (r_A), Shared Environment (r_C), and Unique Environment (r_E) Correlations from the Best-fitting Bivariate Model of AS and DS

CONCLUSIONS

DS assessed at one time point tends to predict the AS assessed at the following time point.

Additive genetic factors and unique environmental factors contributed to the variation in AS and DS at all time points and genetic influences tend to increase with age for both phenotypes.

The association between AS and DS is explained by common genetic and unique environmental factors. While both AS and DS share a common genetic etiology, they are also influenced by specific genetic factors during elementary school.

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