Published in final edited form as:

Int J Eat Disord. 2014 November ; 47(7): 784–792. doi:10.1002/eat.22318.

Childhood Anxiety Trajectories and Adolescent Disordered Eating: Findings from the NICHD Study of Early Child Care and Youth Development

Stephanie Zerwas, PhD^a, Ann Von Holle, MS^a, Hunna Watson, PhD^{a,b,c,d}, Nisha Gottfredson, PhD^e, and Cynthia M. Bulik, PhD^{a,f}

^aDepartment of Psychiatry, University of North Carolina at Chapel Hill, Chapel Hill, NC

^bCenter for Clinical Interventions, Department of Health in Western Australia, Perth, Australia

^cThe Department of Health, Eating Disorders Program, Princess Margaret Hospital for Children, Perth, Australia

^dThe Faculty of Medicine, Dentistry and Health Sciences, School of Pediatrics and Child Health, The University of Western Australia, Australia

^eCenter for Developmental Science, University of North Carolina at Chapel Hill, Chapel Hill, NC

^fDepartment of Nutrition, University of North Carolina at Chapel Hill, Chapel Hill, NC

Abstract

Objective—The goal of the present paper was to examine whether childhood anxiety *trajectories* predict eating psychopathology. We predicted that girls with trajectories of increasing anxiety across childhood would have significantly greater risk of disordered eating in adolescence in comparison to girls with stable or decreasing trajectories of anxiety over childhood.

Method—Data were collected as part of the prospective longitudinal NICHD Study of Early Child Care and Youth Development (N=450 girls). Childhood anxiety was assessed yearly (54 months through 6th grade) via maternal report on the Child Behavior Checklist. Disordered eating behaviors were assessed at age 15 via adolescent self-report on the Eating Attitudes Test (EAT-26). We conducted latent growth mixture modeling to define girls' childhood anxiety trajectories. Maternal sensitivity, maternal postpartum depression, maternal anxiety, and child temperament were included as predictors of trajectory membership.

Results—The best fitting model included three trajectories of childhood anxiety, the low-decreasing class (22.9% of girls), the high-increasing class (35.4%), and the high-decreasing class (41.6%). Mothers with more symptoms of depression and separation anxiety had girls who were significantly more likely to belong to the high-increasing anxiety trajectory. There were no significant differences in adolescent disordered eating for girls across the three childhood anxiety trajectories.

Conclusions—Childhood anxiety, as captured by maternal report, may not be the most robust predictor of adolescent disordered eating and may be of limited utility for prevention programs that aim to identify children in the community at greatest risk for disordered eating.

Despite major shifts in the conceptualization of the etiology of eating psychopathology over time, there has been a remarkably stable interest in the role of anxiety in the development of eating disorders. Anxiety problems are highly comorbid in women with an eating disorder or disordered eating.(1–5) The majority of patients with an eating disorder report that an anxiety disorder preceded the onset of their eating disorder symptoms.(6–11) Moreover, adolescents and adults with anorexia nervosa and bulimia nervosa frequently report a childhood-onset of anxiety disorders with a mean age of anxiety onset at 8–10 years including separation anxiety, overanxious disorder, simple phobia, and social phobia.(6, 10–14)

However, studies on childhood anxiety and the development of eating disorders have traditionally relied on retrospective reports (self-report or parent-report) of childhood anxiety symptoms and are complicated by the relatively low lifetime prevalence of eating disorders (5–6%).(15) In the few prospective longitudinal studies examining eating disorder risk factors, anxiety symptoms have typically been measured in *early adolescence* and are generally included under a broader category of negative emotionality or internalizing behavior.(16–19) In some, internalizing behavior in early adolescence was an independent predictor of eating disorder onset in late adolescence and young adulthood.(18–20) But in others, internalizing behavior, although concurrently associated with eating disorder symptoms, was not an independent predictor of disordered eating.(16, 17) Similarly, a large-scale meta-analysis of risk and maintenance factors for adolescent eating pathology also found that negative affect but not anxiety was a significant predictor of disordered eating.(21)

To our knowledge, only three studies have examined a prospective association between *childhood* anxiety (at approximately age 10) and later eating psychopathology. Allen et al., (2009) found that higher maternal ratings on the CBCL withdrawn problems (social withdrawal) scale predicted a higher likelihood of eating disorder symptoms by age 15.(22) However once other 10-year-old risk factors (female sex, child self-efficacy, and parental perception of child overweight) were included in a multivariable model, this association was no longer significant. Nicholls et al. (2009) found that maternal ratings of child emotional problems were not related to later adult diagnoses of AN.(23) Tanofsky-Kraff et al. (2011) found that anxiety was not a significant predictor of adolescent loss of control over eating.(24) Thus, despite the replicated retrospective findings associating childhood anxiety and later eating psychopathology, prospective findings are more equivocal about the putative association.

These studies all assessed childhood anxiety at the same time point, approximately age 10. By assessing child anxiety only at one time-point, there is a greater chance that anxiety measured at that point is transient and reflects situational stressors rather than anxieties that are pervasive and life disrupting. Anxiety symptoms and fears in childhood and adolescence are common and not just experienced by children with clinical diagnoses.(25) This

variability, with children displaying anxiety symptoms due to transient situational stress scoring similarly to children with chronic anxiety may cloud the detection of any prospective association between childhood anxiety and later eating psychopathology.

Thus, the goal of the present paper was to examine whether childhood anxiety *trajectories* prospectively predict eating psychopathology. By examining trajectories of child emotional symptoms over time, we can distinguish anxiety that may be transient from chronic anxiety symptoms. Moreover, there appear to be distinct trajectories of anxiety experienced across early childhood. Using person-oriented statistical approaches such as trajectory analyses, researchers have found four distinct subgroups of low, low increasing, high-decreasing, and high-increasing anxiety trajectories in boys and four subgroups of internalizing behavior in girls from 2–12 years of age.(26, 27) Although childhood anxiety measured at one time point may not predict adolescent eating psychopathology in prospective studies, a trajectory of high and chronic anxiety may signal greater risk for later disordered eating behaviors.

In addition, there is replicated research that maternal sensitivity, maternal postpartum depression, maternal anxiety, and child temperament are all significant predictors of trajectories of childhood anxiety.(26, 28–30) From a developmental psychopathology framework, both proximal and distal risk factors play an important role in the development of adolescent psychopathology. Moreover, an effort was made to understand how these factors interacted with functioning over the course of development. Maternal insensitivity, maternal mental health problems and difficult child temperament difficulties may signal reciprocal biological and social risk for the development of childhood anxiety.(31)

Hypotheses

We hypothesized the following: First, based on the extant literature of anxiety trajectories in boys and internalizing trajectories in girls, we predicted four distinct anxiety trajectory subclasses over childhood of low, low increasing, high-decreasing, and high-increasing trajectories.(26, 32) Second, we anticipated that greater maternal and anxiety symptoms, low maternal sensitivity and greater fussy and difficult temperament would predict membership in the low-increasing and high-increasing trajectories. Finally, we predicted that girls in the high-increasing and low-increasing trajectories would have significantly greater risk of disordered eating in adolescence in comparison to the low-and high-decreasing trajectories.

METHODS

Study Overview

Relatively few prospective longitudinal studies contain repeated measures of anxiety across early and middle childhood and also include measures of adolescent eating psychopathology. However, one exception is the NICHD Study of Childcare and Youth Development (SECCYD), a prospective longitudinal study of approximately 1200 children raised in the United States and followed until age 15. Even in a dataset this large, with children who have been followed until adolescence, the likelihood of capturing full eating disorder diagnoses is extremely low. Although some adolescents develop an eating disorder by 15 years, they have not yet traversed the age of greatest risk for developing threshold

eating disorders; the median age of onset for anorexia nervosa, bulimia nervosa, and binge eating disorder ranges between 18–21 years of age.(15) Thus, instead we chose to examine *disordered eating* instead of *eating disorders* in 15 year olds so that we could capture a wider range of eating psychopathology at this stage of development.

We focused our analyses on girls. Adolescent girls struggle with disordered eating disproportionately more than boys and have higher and more stable levels of anxiety across childhood and adolescence than boys.(33, 34) Girls are also more likely to demonstrate heterotypic comorbidity (i.e., syndrome changes form over development) than boys, with specific anxiety problems in childhood associated with subsequent depression, substance abuse, or different anxiety problems in adolescence.(35) Moreover, although there is some evidence that more girls than boys follow an elevated-stable trajectory of *internalizing* problems, no studies to our knowledge have examined parent-reported girls' *anxiety* trajectories specifically in this age group.(32)

Participants

Participants were drawn from the SECCYD. Inclusion criteria for SECCYD were maternal age of at least 18 and fluency in English. Exclusion criteria were multiple births, children released for adoption, or congenital abnormalities. Recruitment has been described previously and included the use of conditional random sampling to ensure the participation of ethnic minority mothers, single mothers, and mothers with a high school degree. At 1-month postpartum, 1,364 mothers completed an interview and became study participants. (36)

The present study included 445 girls from the larger sample of 659 girls in the SECCYD who completed the Eating Attitudes Test at 15 years of age. Data analytic exclusion criteria included missing data on measures of the primary outcome disordered eating in adolescence and missing data on observed covariates. Because, Mplus 6.11 software does not have a direct way to model missing covariate data (as predictors of the latent classes) in a latent growth mixture model framework, missing data on observed covariates or distal outcomes, 69 cases with missing covariate data and 5 cases with missing longitudinal data were listwise deleted.(37)

Measures

Proximal Outcome

Child Anxiety: We selected items from the Child Behavior Check List (CBCL/age 4–18 years) that measure anxious feelings and anxiety-related somatic symptoms.(38) On the CBCL, mothers rated their children's behavior on a 3-point Likert scale on a range of behaviors at multiple time points across their child's development—at Pre-Kindergarten (54 months) and at each school grade, Kindergarten (5–6 years), 1st (6–7 years), 2nd (7–8 years), 3rd (8–9 years), 4th (9–10 years), 5th (10–11 years), and 6th grade (11–12 years).

The anxiety scale used in the present study was based on procedures used by Feng et al.(26) First, items were selected from Achenbach's DSM-oriented Anxiety Problems scale for the CBCL. These included 6 items: dependent, fears, fears school, nervous, high strung or tense,

too fearful or anxious, worries.(39) We added the additional CBCL items used by Feng et al. (2008) to index anxiety including: fears he or she might think or do something bad, feels he or she has to be perfect, feels others are out to get him or her, self-conscious or easily embarrassed, too shy or timid.(26) These items have also been used in self-report anxiety questionnaires and in previous studies to assess anxiety in children.(40, 41) Internal consistency (Cronbach alpha) for anxiety was high at Pre-Kindergarten (54 months; .90) and at each school grade, Kindergarten (5–6 years; .90), 1st (6–7 years; .89), 2nd (7–8 years; .88), 3rd (8–9 years; .88), 4th (9–10 years; .88), 5th (10–11 years; .88), and 6th grade (11–12 years; .89).

Time-Invariant Covariates

Maternal separation anxiety—There were no direct measures of maternal state or trait maternal anxiety in the sample. In order to capture a proxy of maternal anxiety during children's early development, we included a measure of maternal separation anxiety; this was not a measure of children's anxiety but a measure of mothers' own anxiety about being separated from their children. At 24 months, mothers rated 21-items on a 5-point Likert scale that reflect maternal separation anxiety from the Maternal Separation Anxiety Scale. (42) Internal consistency was 0.71 (Cronbach alpha).

Maternal depression—At 36 months, mothers completed the CES-D: Center for Epidemiological Studies Depression Scale on which they reported the frequency of their depression symptoms over the past week using a 4-point Likert scale (1=rarely or none of the time; 4=most or all of the time).(43) Scores theoretically could range from 0 to 60. Internal consistency was 0.85 (Cronbach alpha).

Maternal sensitivity—Qualities of mother-child interaction were rated from videotaped semi-structured play in the lab at 36 months. Independent coders rated mother-child interaction on 7-point Likert qualitative rating scales. The maternal sensitivity composite at 36 months was formed from the sum of supportive presence, hostility (reverse scored), and respect for autonomy (NICHD Study of Early Child Care Network, 1999). Internal consistency was .78 (Cronbach alpha) and inter-rater reliability was .84 (intraclass correlation).

Child temperament—At the 6 months, mothers reported on their infant's temperament using the Revised Infant Temperament Questionnaire.(44) Items were designed to capture children's approach, activity, intensity, mood, and adaptability and were rated on 6-point scale from "almost never" to almost always". Internal consistency was .81 (Cronbach alpha).

Child income-to-needs—The income-to-needs ratio was calculated based on maternal report: the total family income including government payments was divided by the appropriate poverty threshold for each household size for that year. Higher scores indicate greater financial resources per person in the household.

Distal Outcomes

Disordered Eating: Girls in the sample self-reported disordered eating behaviors and attitudes on the Eating Attitudes Test-26 (EAT-26) at 15 years of age.(45) The EAT-26 is one of the most widely used measures to screen for disordered eating behaviors among adolescents and has been validated in clinical and non-clinical samples across cultural backgrounds (Eastern/Western Europe, South America, Middle East, Asia).(46) Greater scores indicate more disordered eating behaviors. Although, the EAT-26 was subdivided into three subscales including bulimia, dieting, and oral control, there have been inconsistent findings validating these subscales in nonclinical samples.(47) Because our sample comprised girls in the community, we chose to examine the total EAT-26 score as a distal outcome instead of examining each of the three subscales.

The EAT-26 was originally designed to identify individuals with anorexia nervosa-like symptoms and has a clinical cutoff score of 20. In the present analyses, we used the cutoff of 11 for two reasons. First, in a visual inspection of the EAT-26 histogram, the frequency of EAT-26 scores fell off sharply at 11. Second, in a community sample of adolescents, a cutoff score of 11 was found to have high specificity (0.95), positive predictive value of (0.53) and negative predictive value of (0.89) psychopathology.(48) Therefore, the EAT-26 was dichotomized at a score of 11. Scores ≥ 11 reflected disordered eating behavior.

Statistical Analyses

The statistical analysis estimates the association between anxiety symptoms over time from 54 months to 6th grade and a distal outcome representing disordered eating at 15 years of age. We used latent growth mixture modeling (LGMM) to capture information relating different anxiety trajectories (latent classes) to a disordered eating outcome because this model allows us to model intercepts/baseline levels and slopes/development.(49) For more detail on modeling procedures see Appendix 1. Data preparation was in SAS v9.2 and data analyses were done in Mplus v6.11 and R.(50, 2012 #14228 2012 #14228, 51, 52) P-values less than 0.05 were considered significant.

RESULTS

Participants

Participants included in the analysis sample were significantly more likely to be white ($X^2=9.4$, $p<.05$) and have mothers with a college education or higher ($X^2=20.9$, $p<.001$; data not shown). In the analysis sample, 24% of mothers in the present study had only a high school education with the rest completing some college education (34%), a college degree (26%) or some graduate work (17%). Girls in the study were primarily white (83.0%) but with some representation of ethnic minorities; 10% were African-American, 7% were Native-American, Asian or Pacific Islander, and 4% identified as Latino. Families primarily had a father living in the home (64%) and 34% reported that there was no father in the home. The average income to needs ratio was 5 ($SD=5.5$) indicating that families on average had a family income 5 times the appropriate poverty threshold for their household size.

Descriptive statistics

Descriptive statistics for all anxiety, disordered eating and covariates variables are shown in Table 1.

Trajectory Analysis

The final model included a 3-class Poisson distribution and contained the smallest adjusted Bayesian information criterion (aBIC). Moreover, the likelihood replicated with a random intercept. Thus, we selected this model for interpretation (for detailed trajectory modeling procedures, see Appendix 1, Figure 1). Figure 1 depicts the trajectories of the three-class model. The trajectory classes are labeled as the low-decreasing class (class 1), the high-decreasing class (class 2) and the high-increasing class (class 3). Girls in smallest group, the low-decreasing trajectory class (N=86, 22.9%), exhibited stable low levels of anxiety, with just over half of a standard deviation (SD) below the mean at 54 months (Intercept=1.29) and an anxiety score just above one SD below the mean by 6th grade (11–12 years of age; M=0.3; linear slope = -0.19). Girls in the high-decreasing trajectory class (N=133, 35.4%) had relatively high levels of anxiety that decreased over childhood. At Pre-Kindergarten (54 months), their anxiety symptoms were high (intercept=4.23) and just under half a SD above the mean but by 6th grade (11–12 years), these children's anxiety symptoms approximated the mean (M = 2.7; linear slope=-0.08). Unlike the other two trajectory classes, girls in the high-increasing trajectory class had anxiety symptoms, which increased over childhood (N=156, 41.6%). At Pre-Kindergarten (54 months), their anxiety symptoms were approximately at the mean (intercept=2.39) but their anxiety increased across childhood (linear slope = 0.06). By 6th grade (11–12 years), their anxiety symptoms exceeded those of the girls in the high-decreasing group and were just under a full SD above the mean (M=4.0).

Predicting Disordered Eating with Trajectory Group Membership

Girls in the high-increasing and high-decreasing childhood anxiety trajectory classes were 1.57 (SE=0.49) and 1.68 times (SE=0.50) more likely to demonstrate disordered eating at 15 years of age than girls in the low-decreasing class. Girls in the high-increasing class were no more likely to demonstrate disordered eating than girls in the high-decreasing class (OR=0.93, SE=0.46). The percentages of girls exceeding the EAT disordered eating behavior threshold were 12.8%, 19.8%, 18.8%, for low-decreasing, high-decreasing, and high-increasing classes. However, the percentages of adolescents with disordered eating were not significantly different across the three childhood anxiety trajectory classes. In comparison, overall in the sample, 18.0% of girls had scores on the EAT that exceeded this threshold.

Class Membership: Predictors

We included time-invariant covariates, risk factors, to examine whether these maternal and child factors predicted trajectory class membership. All risk factors were measured at a time point in development before the anxiety trajectories. Table 2 contains the parameter estimates for the predictive power of risk factors for trajectory class membership comparisons accounting for all other predictors. The parameter estimates indicate the

direction and the strength of the risk factor for the likelihood of group membership. All significant predictors are in bold.

Greater maternal depression predicted a greater likelihood of girls' membership in the high-increasing trajectory class and high-decreasing trajectory class in comparison to the low-decreasing trajectory class. Greater maternal separation anxiety also predicted a greater likelihood of girls' membership in the high-increasing trajectory class in comparison to the low-decreasing trajectory class. More difficult and fussy infant temperament predicted a greater likelihood of membership in the high-decreasing trajectory class than the high-decreasing class.

CONCLUSIONS

In sum, the best fitting model of girls' childhood anxiety symptoms over time included three trajectories high-increasing (41.6%), high-decreasing (35.4%), and low-decreasing (22.9%). However, we did not find support for our hypothesis that girls in the high-increasing and low-increasing anxiety trajectories had significantly higher risk of disordered eating in adolescence in comparison to the low and high-decreasing anxiety trajectories. Moreover, the percentage of girls displaying disordered eating in the high-increasing and high-decreasing trajectory classes was close to the mean for the sample as a whole (19.8% and 18.8% demonstrated disordered eating in adolescence, respectively vs. 18.0% on average). These findings are in line with previous prospective research studies, and a large-scale meta-analytic study of risk factors which did not find that childhood anxiety was a significant predictor for the initiation of disordered eating.(21–24)

One possible implication of the present findings is that anxiety during childhood has relatively low specificity as a predictor for later eating psychopathology. For community-based prevention programs designed to identify those at greatest risk for later disordered eating, obtaining parental-report of girls' anxiety symptoms over time may be an ineffective way to determine which girls are at elevated risk. Girls in the high-increasing and high-decreasing anxiety trajectories had no greater risk of adolescent disordered eating than girls overall in the sample (19.8% and 18.8% vs. 18.0% respectively). Thus, these findings may mean that categorizing girls' anxiety trajectories is of limited clinical utility for predicting later disordered eating in community samples. However, support for this conclusion would require replication in a larger longitudinal sample of children and adolescents.

Another implication could be that *maternal report* of girls' childhood anxiety is of limited utility especially for mothers with greater depressive and anxiety symptoms. Girls with high but increasing levels of anxiety throughout childhood were more likely to have mothers with greater depressive and anxiety symptoms. Mothers who have struggled with their own depression and anxiety may be more likely to detect and report the same symptoms in their daughters. Although, maternal depression and anxiety symptoms were measured at 24 and 36 months, prior to when childhood anxiety trajectories were included as time-invariant covariates, the present model did not directly include concurrent maternal depression and anxiety as a covariate at each time point child anxiety was measured. Future research could

examine whether teacher-report or the child's own report of their anxiety symptoms would be a better predictor of later disordered eating behavior.

It is important to note that although childhood anxiety symptoms may not be a robust predictor of later disordered eating symptoms, full-threshold childhood anxiety disorders may still be a risk factor for a later full-threshold eating disorder.(10, 53, 54) Like many prospective studies, the present sample cannot capture a sample of adolescent eating disorders at this time point due to the low prevalence of eating disorders and the fact that these data captured girls only until 15 years of age before they had traversed the age of greatest risk for eating disorder onset (18–21 years).(15) It remains an open question whether disordered eating exists on the same continuum as eating disorders or whether it is a qualitatively distinct cluster of symptoms that are distinct from eating disorders.

Moreover, capturing anxiety symptoms in childhood before the pubertal transition may be ultimately less informative for prediction of adolescent disordered eating. Early puberty is associated with disordered eating and anxiety, and this association may be due to an organizational effect of pubertal hormones on both mood and eating behavior.(55) Puberty may contribute directly to symptoms of both anxiety and disordered eating through biological and psychosocial mechanisms. Trajectories of anxiety during adolescence may still be a predictor of disordered eating and eating disorders in young adulthood although pre-pubertal anxiety may not predict adolescent disordered eating.

Strengths

The strengths of the current study include a multiple-informant methodology to capture childhood anxiety and disordered eating which reduces reporting bias. In addition, maternal sensitivity was measured through observational coding of mother-child interaction videotapes which improves the external validity of these assessment. This study is the first to describe girls' childhood anxiety trajectories using maternal report and among the first in the eating disorders literature to use latent growth mixture modeling.(56–58) Moreover, the SECCYD is one of only a few large prospective longitudinal studies to include detailed multi-method measurements of child behavior from infancy to adolescence and a measure of disordered eating behaviors and attitudes in adolescence.

Limitations

The limitations of the present study include a selection bias due to the reliance on non-missing data. Although there were 659 girls in the larger SECCYD sample, only 450 of those girls had non-missing data on the Eating Attitudes Test at age 15. When we compared the girls in our study to the larger sample of girls in the SECCYD, we found that participants were significantly more likely to be white and to come from families with higher maternal education. Thus, although the larger sample was broadly representative of US demographics, the present sample was biased towards a Caucasian and a comparatively more educated sample

The present findings suggest that trajectories of pre-pubertal childhood anxiety symptoms based on maternal report may not be a robust predictor of adolescent disordered eating and may be of limited utility for community-based prevention programs. However, replication of

these findings in another large, longitudinal sample of children's growth and development is essential.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

REFERENCES

1. Kaye WH, Bulik C, Thornton L, Barbarich BS, Masters K. Group PFC. Comorbidity of anxiety disorders with anorexia and bulimia nervosa. *American Journal of Psychiatry*. 2004; 161:2215–2221.
2. Touchette E, Henegar A, Godart NT, Pryor L, Falissard B, Tremblay RE, et al. Subclinical eating disorders and their comorbidity with mood and anxiety disorders in adolescent girls. *Psychiatry research*. 2011 Jan 30; 185(1–2):185–192. [PubMed: 20546924]
3. von Ranson KM, Kaye WH, Weltzin TE, Rao R, Matsunaga H. Obsessive-compulsive disorder symptoms before and after recovery from bulimia nervosa. *The American journal of psychiatry*. 1999 Nov; 156(11):1703–1708. [PubMed: 10553732]
4. Bulik C. Eating disorders in adolescents and young adults. *Child and adolescent psychiatric clinics of North America*. 2002; 11(2):201–218. [PubMed: 12109318]
5. Godart N, Flament M, Perdereau F, Jeammet P. Comorbidity between eating disorders and anxiety disorders: a review. *The International journal of eating disorders*. 2002; 32:253–270. [PubMed: 12210640]
6. Adambegan M, Wagner G, Nader IW, Fernandez-Aranda F, Treasure J, Karwautz A. Internalizing and externalizing behaviour problems in childhood contribute to the development of anorexia and bulimia nervosa-a study comparing sister pairs. *Eur Eat Disord Rev*. 2012 Mar; 20(2):116–120. [PubMed: 21826764]
7. Bulik C, Sullivan P, Fear J, Joyce P. Eating disorders and antecedent anxiety disorders: A controlled study. *Acta Psychiatrica Scandinavica*. 1997; 96:101–107. [PubMed: 9272193]
8. Godart N, Flament M, Perdereau F, Jeammet P. [Predictive factors in social adaptation disorders in anorexic and bulimic patients]. *L'Encephale*. 2003 Mar-Apr; 29(2):149–156.
9. Kaye WH, Bulik CM, Thornton L, Barbarich N, Masters K. Comorbidity of anxiety disorders with anorexia and bulimia nervosa. *The American journal of psychiatry*. 2004 Dec; 161(12):2215–2221. [PubMed: 15569892]
10. Raney TJ, Thornton LM, Berrettini W, Brandt H, Crawford S, Fichter MM, et al. Influence of overanxious disorder of childhood on the expression of anorexia nervosa. *The International journal of eating disorders*. 2008 May; 41(4):326–332. [PubMed: 18213688]
11. Troisi A, Massaroni P, Cuzzolaro M. Early separation anxiety and adult attachment style in women with eating disorders. *The British journal of clinical psychology / the British Psychological Society*. 2005 Mar; 44(Pt 1):89–97. [PubMed: 15826346]
12. Fairburn CG, Welch SL, Doll HA, Davies BA, O'Connor ME. Risk factors for bulimia nervosa. A community-based case-control study. *Archives of general psychiatry*. 1997 Jun; 54(6):509–517. [PubMed: 9193191]
13. Deep A, Nagy L, Weltzin T, Rao R, Kaye W. Premorbid onset of psychopathology in long-term recovered anorexia nervosa. *International Journal of Eating Disorders*. 1995; 17:291–298. [PubMed: 7773266]
14. Bulik C, Sullivan P, Carter F, Joyce P. Lifetime anxiety disorders in women with bulimia nervosa. *Comprehensive psychiatry*. 1996; 37:368–374. [PubMed: 8879912]
15. Hudson JI, Hiripi E, Pope HG Jr, Kessler RC. The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biological psychiatry*. 2007 Jun 30; 61:348–358. [PubMed: 16815322]
16. Attie I, Brooks-Gunn J. Development of eating problems in adolescent girls: a longitudinal study. *Developmental psychology*. 1989; 25:70–79.

17. Graber J, Brooks-Gunn J, Paikoff R, Warren M. Prediction of eating problems: An 8-year study of adolescent girls. *Developmental psychology*. 1994; 30(6):823–834.
18. Killen J, Taylor C, Hayward C, Haydel K, Wilson D, Hammer L, et al. Weight concerns influence the development of eating disorders: a 4-year prospective study. *Journal of consulting and clinical psychology*. 1996; 64:936–940. [PubMed: 8916622]
19. Leon GR, Fulkerson JA, Perry CL, Keel PK, Klump KL. Three to four year prospective evaluation of personality and behavioral risk factors for later disordered eating in adolescent girls and boys. *Journal of Youth and Adolescence*. 1999; 28:181–196.
20. Patton GC, Selzer R, Coffey C, Carlin JB, Wolfe R. Onset of adolescent eating disorders: population based cohort study over 3 years. *British medical journal*. 1999 Mar 20; 318(7186):765–768. [PubMed: 10082698]
21. Stice E. Risk and maintenance factors for eating pathology: a meta-analytic review. *Psychological bulletin*. 2002 Sep; 128(5):825–848. [PubMed: 12206196]
22. Allen KL, Byrne SM, Forbes D, Oddy WH. Risk factors for full- and partial-syndrome early adolescent eating disorders: a population-based pregnancy cohort study. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2009 Aug; 48(8):800–809. [PubMed: 19564799]
23. Nicholls DE, Viner RM. Childhood risk factors for lifetime anorexia nervosa by age 30 years in a national birth cohort. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2009 Aug; 48(8):791–799. [PubMed: 19564797]
24. Tanofsky-Kraff M, Shomaker LB, Olsen C, Roza CA, Wolkoff LE, Columbo KM, et al. A prospective study of pediatric loss of control eating and psychological outcomes. *Journal of abnormal psychology*. 2011 Feb; 120(1):108–118. [PubMed: 21114355]
25. Ollendick TH, Yang B, King NJ, Dong Q, Akande A. Fears in American, Australian, Chinese, and Nigerian children and adolescents: a cross-cultural study. *Journal of child psychology and psychiatry, and allied disciplines*. 1996 Feb; 37(2):213–220.
26. Feng X, Shaw DS, Silk JS. Developmental trajectories of anxiety symptoms among boys across early and middle childhood. *Journal of abnormal psychology*. 2008 Feb; 117(1):32–47. [PubMed: 18266484]
27. Duchesne S, Larose S, Vitaro F, Tremblay RE. Trajectories of anxiety in a population sample of children: clarifying the role of children's behavioral characteristics and maternal parenting. *Development and psychopathology*. 2010 May; 22(2):361–373. [PubMed: 20423547]
28. Weissman MM, Wickramaratne P, Nomura Y, Warner V, Verdelli H, Pilowsky DJ, et al. Families at high and low risk for depression: a 3-generation study. *Archives of general psychiatry*. 2005 Jan; 62(1):29–36. [PubMed: 15630070]
29. Bernstein GA, Layne AE, Egan EA, Nelson LP. Maternal phobic anxiety and child anxiety. *Journal of anxiety disorders*. 2005; 19(6):658–672. [PubMed: 15927779]
30. Hirshfeld-Becker, DR.; Biederman, J.; Rosenbaum, JF. Behavioral inhibition. In: Morris, TL.; March, JS., editors. *Anxiety disorders in children and adolescents*. New York: Guilford Press; 2004. p. 27–58.
31. Cicchetti D, Toth SL. The development of depression in children and adolescents. *The American psychologist*. 1998 Feb; 53(2):221–241. [PubMed: 9491749]
32. Sterba SK, Prinstein MJ, Cox MJ. Trajectories of internalizing problems across childhood: heterogeneity, external validity, and gender differences. *Development and psychopathology*. 2007 Spring; 19(2):345–366. [PubMed: 17459174]
33. Abebe DS, Lien L, von Soest T. The development of bulimic symptoms from adolescence to young adulthood in females and males: a population-based longitudinal cohort study. *The International journal of eating disorders*. 2012 Sep; 45(6):737–745. [PubMed: 22886952]
34. Neumark-Sztainer D, Wall M, Larson NI, Eisenberg ME, Loth K. Dieting and disordered eating behaviors from adolescence to young adulthood: findings from a 10-year longitudinal study. *J Am Diet Assoc*. 2011 Jul; 111(7):1004–1011. [PubMed: 21703378]
35. Costello EJ, Mustillo S, Erkanli A, Keeler G, Angold A. Prevalence and development of psychiatric disorders in childhood and adolescence. *Archives of general psychiatry*. 2003 Aug; 60(8):837–844. [PubMed: 12912767]

36. National Institute of Child H, Human Development Early Child Care Research N. Child care and common communicable illnesses: results from the National Institute of Child Health and Human Development Study of Early Child Care. *Archives of pediatrics & adolescent medicine*. 2001 Apr; 155(4):481–488. [PubMed: 11296076]
37. Muthén, B.; Asparouhov, T. Using Mplus Monte Carlo simulations in practice: A note on non-normal missing data in latent variable models. 2002. [July 21, 2013]; Available from: <http://www.statmodel.com/download/webnotes/mc2.pdf>.
38. Achenbach TM. Child Behavior Checklist: National survey of problems and competencies among 14–16 year olds - Parents reports for normative and clinical samples. *Monographs of the Society for Research in Child Development*. 1991; 56(3):R5–R119.
39. Achenbach, TM.; Rescorla, LA. *Manual for the ASEBA School-Age Forms & Profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families; 2001.
40. March JS, Parker JD, Sullivan K, Stallings P, Conners CK. The Multidimensional Anxiety Scale for Children (MASC): factor structure, reliability, and validity. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1997; 36(4):554–565. [PubMed: 9100431]
41. Spence SH. A measure of anxiety symptoms among children. *Behaviour research and therapy*. 1998; 36:545–566. [PubMed: 9648330]
42. Hock, E.; DeMeis, D.; McBride, S. Maternal separation anxiety: Its role in the balance of employment and motherhood in mothers of infants. In: Gottfried, A.; Gottfried, A., editors. *Maternal employment and children's development: Longitudinal research*. New York: Plenum Press; 1987. p. 191–229.
43. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1:385–401.
44. Carey WB, McDevitt SC. Revision of the Infant Temperament Questionnaire. *Pediatrics*. 1978 May; 61(5):735–739. [PubMed: 662513]
45. Garner D, Olmsted M, Bohr Y, Garfinkel P. The Eating Attitudes Test: psychometric features and clinical correlates. *Psychological medicine*. 1982; 12:871–878. [PubMed: 6961471]
46. Garfinkel PE, Newman A. The eating attitudes test: twenty-five years later. *Eat Weight Disord*. 2001 Mar; 6(1):1–24. [PubMed: 11300541]
47. Maiano C, Morin AJ, Lanfranchi MC, Therme P. The Eating Attitudes Test-26 Revisited using Exploratory Structural Equation Modeling. *Journal of abnormal child psychology*. 2013 Jul; 41(5):775–788. [PubMed: 23344702]
48. Colton PA, Olmsted MP, Rodin GM. Eating disturbances in a school population of preteen girls: assessment and screening. *The International journal of eating disorders*. 2007 Jul; 40(5):435–440. [PubMed: 17497707]
49. Muthen B, Muthen LK. Integrating person-centered and variable-centered analyses: growth mixture modeling with latent trajectory classes. *Alcohol Clin Exp Res*. 2000 Jun; 24(6):882–891. [PubMed: 10888079]
50. Muthén, LK.; Muthén, BO. *Mplus User's Guide*. Sixth Edition. ed. Los Angeles, CA: Muthén & Muthén; 1998–2011.
51. Hallquist, M. *MplusAutomation: Automating Mplus Model Estimation and Interpretation*. R package version 0.5–3. 2012. Available from: <http://CRAN.R-project.org/package=MplusAutomation>.
52. Wickham, H. *Ggplot2: Elegant graphics for data analysis*. New York NY: Springer; 2009.
53. Buckner JD, Silgado J, Lewinsohn PM. Delineation of differential temporal relations between specific eating and anxiety disorders. *Journal of psychiatric research*. 2010 Sep; 44(12):781–787. [PubMed: 20185151]
54. Sihvola E, Keski-Rahkonen A, Dick DM, Hoek HW, Raevuori A, Rose RJ, et al. Prospective associations of early-onset Axis I disorders with developing eating disorders. *Comprehensive psychiatry*. 2009 Jan-Feb; 50(1):20–25. [PubMed: 19059509]
55. Zehr JL, Culbert KM, Sisk CL, Klump KL. An association of early puberty with disordered eating and anxiety in a population of undergraduate women and men. *Hormones and behavior*. 2007 Nov; 52(4):427–435. [PubMed: 17707381]

56. Crosby RD, Wonderlich SA, Engel SG, Simonich H, Smyth J, Mitchell JE. Daily mood patterns and bulimic behaviors in the natural environment. *Behaviour research and therapy*. 2009 Mar; 47(3):181–188. [PubMed: 19152874]
57. Lavender JM, De Young KP, Wonderlich SA, Crosby RD, Engel SG, Mitchell JE, et al. Daily patterns of anxiety in anorexia nervosa: associations with eating disorder behaviors in the natural environment. *Journal of abnormal psychology*. 2013 Aug; 122(3):672–683. [PubMed: 23647124]
58. Berg KC, Peterson CB, Crosby RD, Cao L, Crow SJ, Engel SG, et al. Relationship between daily affect and overeating-only, loss of control eating-only, and binge eating episodes in obese adults. *Psychiatry research*. 2014 Jan 30; 215(1):185–191. [PubMed: 24200217]

Figure 1. Predicted trajectories of anxiety symptoms represented by total Child Behavior Checklist (CBCL) anxiety scale scores among girls from ages 5 to 12. Trajectory classes: 1=low-decreasing class (N=86, 22.9%); 2=high-decreasing class (N=133; 35.4%); 3= high-increasing class (N=156; 41.6%).

Table 1

Descriptive statistics for child anxiety variables over time, covariates, and disordered eating (distal outcome).

	N	M ¹ (%)	SD ²
Distal Outcome: Disordered Eating			
Eating Attitudes Test Score	450	6.56	7.3
Eating Attitudes Test score 11 (yes)	450	18.0%	—
Child Anxiety			
Pre-Kindergarten (54 months)	423	3.3	2.6
Kindergarten (5–6 years)	424	3.0	2.6
1 st grade (6–7 years)	425	3.0	2.6
3 rd grade (8–9 years)	434	2.9	2.6
4 th grade (9–10 years)	426	2.7	2.5
5 th grade (10–11 years)	433	3.0	2.7
6 th grade (11–12 years)	433	2.5	2.4
Risk Factors			
Maternal Depression	436	9.5	8.7
Maternal Sensitivity	426	17.7	2.3
Maternal Separation Anxiety	409	62.4	14.0
Child Temperament	440	3.2	4.7

¹ Mean

² Standard Deviation

Table 2

Parameter estimates of anxiety trajectory latent class membership by risk factors.

Class 3 ¹ vs. Class 1 ³	Estimate ⁴	SE ⁵	95% Confidence Interval	
			Lower Limit	Upper Limit
Maternal Depression	0.090*	0.037	0.017	0.163
Maternal Sensitivity	0.085	0.122	-0.154	0.324
Maternal Separation Anxiety	0.030*	0.015	0.001	0.059
Child Temperament	-0.132	0.524	-1.159	0.895
Class 2 ² vs. Class 1				
Maternal Depression	0.111*	0.037	0.038	0.184
Maternal Sensitivity	-0.253	0.133	-0.514	0.008
Maternal Separation Anxiety	0.024	0.02	-0.015	0.063
Child Temperament	2.041	1.148	-0.209	4.291
Class 3 vs. Class 2				
Maternal Depression	-0.021	0.029	-0.078	0.036
Maternal Sensitivity	0.338*	0.167	0.011	0.665
Maternal Separation Anxiety	0.006	0.025	-0.043	0.055
Child Temperament	-2.173*	1.085	-4.300	-0.046

¹ Class 3= high-increasing class

² Class 2=high-decreasing class

³ Class 1=low-decreasing class

⁴ Log Odds Ratio

⁵ Standard Error

* p<.05