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Comorbid Anxiety and Depression: Do they Cluster as Distinct Groups in Youth?

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COMORBID ANXIETY AND DEPRESSION:
DO THEY CLUSTER AS DISTINCT GROUPS IN YOUTH?

A Thesis

Submitted to the Graduate Faculty of the
University of New Orleans
in partial fulfillment of the
requirements for the degree of

Master of Science
in
Psychology

by

Melinda Fabian Cannon

B.S., Louisiana State University, 2003

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Abstract

One of the most common pairs of co-occurring psychological disorders in children and adolescents is anxiety and depression. This high frequency of co-occurrence has led to research examining the structure of these syndromes. Factor analytic research has shown that anxious symptoms and depressive symptoms can be structurally distinguished. Research on the tripartite model has suggested their conceptual distinction by proposing that the overlap between the disorders is due to a shared feature of negative affect, while they can be differentiated by their unique features of physiological hyperarousal (anxiety) and low positive affect (depression). The current study examined whether anxiety and depression cluster as distinct symptoms in a community sample of youth. It was hypothesized that the sample could be grouped as: anxiety only, depression only, comorbid anxiety and depression, and low/no symptoms. Further analyses indicated that the tripartite model is a useful tool in differentiating anxious symptoms from depressive symptoms.

Introduction

Comorbidity is common in the psychopathological disorders of childhood and adolescence (Compas & Oppedisano, 2000). Comorbidity involves the co-occurrence of two or more disorders in a single individual, and it is especially common for anxiety and depression. Research has shown that depression and anxiety are highly correlated and that anxiety disorders and depressive disorders often co-occur in youth (Lewinsohn, Hops, Roberts, Seely, & Andrews, 1993; Orvaschel, 1990; Essau, Conradt, & Petermann, 2000). Understanding comorbidity between anxiety and depression is important because the level of psychological distress tends to increase with multiple disorders (Essau, 2003). Additionally, symptoms of anxiety and depression in childhood are usually predictive of similar difficulties in adulthood (Pine, Cohen, Gurley, Brook, & Ma, 1998; Hammen & Rudolph, 1996).

There have been varying explanations for the phenomenon of comorbid anxiety and depression in children and adolescents. Some researchers have suggested that in youth anxiety and depression are two facets of a single disorder called mixed anxiety-depression because the co-occurrence of anxious and depressed emotions and symptoms is so strong that they are practically indistinguishable (Achenbach, 1991; Achenbach, Verhulst, Baron, & Akkerhuis, 1987; Finch, Lipovsky, & Casat, 1989). Another opinion for the phenomenon of comorbidity holds that anxiety and depression are two distinct disorders that often co-occur because they share common characteristics and risk (Hammen & Compas, 1994; King, Ollendick, & Gullone, 1991). This position is supported by the tripartite model, which was proposed by Clark and Watson (1991a). They have theorized that anxiety and depression share the common feature of negative affect (i.e., general psychological distress), but they also each have unique features.

Anxiety is thought to be uniquely characterized by physiological hyperarousal and depression by low positive affect (i.e., anhedonia).

A middle position between the two previous positions, which is not entirely contradictory to the tripartite model, is that they both occur alone and together. For example, the task force of the Diagnostic and Statistical Manual for Mental Disorders-IV (American Psychiatric Association, 1994) conducted a field trial for a new category labeled “mixed anxiety-depression” based on evidence that many people with anxious or depressed symptoms do not meet criteria for a DSM-III-R (American Psychiatric Association, 1987) anxiety or mood disorder, but still suffer impairment related to symptoms of both anxiety and depression (Zinbarg, Barlow, Liebowitz, et al., 1994). This research suggests that these persons are high in negative affect but lack the pervasive anhedonia as seen in depressed individuals and the excessive worry and tension as seen in individuals with anxiety disorders. The results of the field trial have not been sufficient to suggest a new category in the DSM or to change the definitional thresholds of the current anxiety disorders and major depression categories (Zinbarg et al., 1994). This research suggests that some individuals’ may have a few symptoms of anxiety and, at the same time, a few symptoms of depression, while other individuals may have only anxious symptoms or only depressive symptoms.

The following sections will review the current knowledge relevant to understanding comorbid anxiety and depression in children and adolescents. Although there has been a large amount of research on these two disorders, research focusing on this particular comorbid pattern in youth is still needed.

Comorbid Anxiety and Depression

Research has shown that anxiety disorders in children and adolescents are more likely to occur with other anxiety disorders than to occur alone. On average in clinical samples, 80% of anxious youth have more than one anxiety disorder (Francis, Last, & Strauss, 1992; Strauss & Last, 1993; Weems, Hammond-Laurence, Silverman, & Ginsburg, 1998). Similarly, depression in youth does not frequently occur on its own; and, it is equally as likely to be comorbid with internalizing as externalizing disorders (Sameroff, 2000). Research is consistent in suggesting that the most common comorbid pattern is that of anxiety and depression (Essau, 2003; Sameroff, 2000).

Comorbidity estimates of anxiety and depression in youth have ranged from 30% to 70% (Angold & Costello, 1993; Lewinsohn, Zinbarg, Seeley, Lewinsohn, & Sack, 1997; Essau et al., 2000). Rates have varied by type of sample and age of sample. As noted earlier, explanations for this phenomenon are inconclusive. In addition to those mentioned previously, one reason for the high comorbidity may be methodological. It is necessary to be aware of the content validity of the measures used to evaluate anxious and depressive symptoms. Measures that do not accurately pull apart the unique symptoms of each disorder may inflate comorbidity estimates.

Although comorbidity rates in many samples are high, anxiety and depression occur alone in many cases (i.e., some youth may be diagnosed with one disorder). In general population studies, 0.4% to 18.8% of the child and adolescent population (ages 9-18) have been found to have anxiety but not depression; and, 1.0% to 19.5% of the youth population were found to have depression but not anxiety (See Costello, Egger, & Angold, 2004 for a review). In addition to epidemiological studies, factor analysis studies have suggested the structural distinctiveness of anxiety and depression in youth.

Factor Analysis Research

Factor analysis has been a useful technique in examining the symptoms that make up anxiety and depression. Chorpita, Yim, Moffitt, Umemoto, & Francis (2000) created the Revised Child Anxiety and Depression Scales (RCADS), as an adaptation of the Spence Children's Anxiety Scale (SCAS; Spence, 1994, 1997), to specifically measure the DSM-IV symptoms of anxiety and depression. These authors factor analyzed the items on the RCADS in order to test the factorial validity of this new measure. In a sample of 1,641 children and adolescents recruited from 13 public and private schools (grades 3-12; 54.4% female, 45.6% male), they were able to obtain factors corresponding to major depressive disorder and the anxiety disorders listed in the DSM-IV. These findings suggest the structural distinctiveness of anxiety and depression.

In another study, Ollendick, Seligman, Goza, Byrd, & Singh (2003), used the Children's Depression Inventory (CDI; Kovacs, 1981) and the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978) with a sample of 510 boys and girls in the 4th, 7th, and 10th grades to determine the goodness of fit of single-factor, two-factor, and three-factor models. The authors hypothesized that a single factor model would indicate one underlying construct of negative affectivity, a two-factor model would reflect anxiety and depression as two separate constructs, and a three-factor model would produce the three components of the tripartite model. It is worth noting that the authors used only measures of anxious and depressive symptoms; they did not use measures specific to the tripartite variables. Results from confirmatory factor analyses indicated that a two-factor model provided the best fit to the data in the full sample, for boys only, for girls only, and for individuals in each grade level separately. This study supports

the distinctiveness of anxiety and depression in children and adolescents; however, the authors noted that anxiety and depression in the two-factor model remained highly correlated.

Although factor analysis has provided information on the structural distinctiveness of anxious symptoms and depressive symptoms (i.e., it is useful in grouping specific questionnaire items that distinguish the disorders), research has also shown that they can be conceptually distinguished. The following section will present research on the tripartite model and how this theory has been used to conceptually distinguish anxiety and depression.

The Tripartite Model

As noted, the tripartite model, which was proposed by Clark and Watson (1991a), is a valuable theory developed to explain why anxiety and depression may often exist together and how they can be differentiated. The tripartite model states that anxiety and depression share the common feature of negative affect (general psychological distress or negative mood), while anxiety has the unique feature of physiological hyperarousal (nervousness, tension, shakiness) and depression has the unique feature of low positive affect/anhedonia (loss of interest or pleasure, hopelessness). Since the model proposes that negative affect is a common symptom of both anxious and depressed individuals, this may be one important reason for reported comorbidity. Anxiety and depression can often be highly correlated in research studies because many of the commonly used measures have symptom overlap. That is, items for both anxiety and depression measure generalized negative affect and subjective distress, which characterize both disorders (Watson, Clark, Weber, Assenheimer, Strauss, & McCormick, 1995; Watson & Kendall, 1989). For example, items from the following three questionnaires all tap negative affect: “I feel unhappy” (State Trait Anxiety Inventory for Children), “Other children are happier

than I” (Revised Children’s Manifest Anxiety Scale), and “I am sad all the time” (Children’s Depression Inventory).

Anxiety and depression can be best distinguished by their unique, specific symptoms. Children with anxiety disorders may have an abnormal physiological response to certain stimuli, such as increased heart rate and cortisol levels (Gunnar, 2001; Carrion, Weems, Ray, Glasser, Hessel, & Reiss, 2002). Examples from the Revised Children’s Manifest Anxiety Scale (RCMAS) that measure this construct are: “My hands feel sweaty” and “Often I have trouble getting my breath.” Children with depressive disorders, on the other hand, often experience low positive affect and the loss of pleasure in previously enjoyed activities. The Revised Child Anxiety and Depression Scales (RCADS) taps this symptom with items such as, “Nothing is much fun anymore” and the Children’s Depression Inventory (CDI) uses the similar item, “Nothing is fun at all.”

Research on the Tripartite Model

Research studies have provided empirical support for the tripartite model. Clark and Watson (1991a) researched the convergent and discriminant validity of several different measures of anxiety and depression, including self-report and clinician ratings, in five adult samples. In an additional study, Clark and Watson (1991b) factor analyzed ten commonly used anxiety and depression scales and obtained a good three-factor solution in every sample. The anxiety scales with the best discriminant validity focused on somatic symptoms and the depression scales with the best discriminant validity tended to measure anhedonic symptoms. This research led them to propose the tripartite division of symptoms. They suggested that the problems of diagnostic comorbidity could best be explained in terms of the tripartite model.

In later research, Watson and colleagues (Watson, Weber, Assenheimer, Clark, Strauss, & McCormick, 1995) tested the discriminant validity of two sets of anxiety and depression scales in five adult samples—three samples of college undergraduates ($n = 516, 381, \text{ and } 552$ in samples one, two, and three, respectively), one middle-aged adult sample ($n = 329$), and one sample from an outpatient clinic ($n = 470$). One scale was composed of general distress—
anxious symptoms and general distress—depression symptoms; the other was composed of
anxious arousal and anhedonic depression. In support of the tripartite model, the general distress
scales were highly correlated and the arousal/anhedonia scales were weakly related (i.e., good
discriminant validity). This study supported their original statement regarding the model that
anxiety and depression can be better distinguished when using their nonspecific components,
rather than the common feature of negative affect.

As a second direct test of the tripartite model, using the same five samples from the
previous study, Watson and colleagues (Watson et al., 1995) factor analyzed symptoms relevant
to anxiety and depression on the Mood and Anxiety Symptom Questionnaire (MASQ; Watson &
Clark, 1991) in order to test the tripartite model. They found that the factor composed of anxious
arousal symptoms and the factor composed of anhedonic depression symptoms were each very
good discriminant measures of the underlying disorders. That is, they obtained factors from the
questionnaire items that could accurately measure physiological hyperarousal and anhedonia.
This is an important finding in that the theoretically proposed conceptual distinctions between
anxiety and depression were used to accurately predict anxiety and depression as distinct
disorders.

Research examining the tripartite model in children and adolescents has recently been
increasing. Joiner, Catanzaro, and Laurent (1996) used selected items from the Children's

Depression Inventory (CDI; Kovacs, 1981) and the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985) with a sample of 116 youth psychiatric inpatients (ages 8-16). The total RCMAS score was used as a measure of general anxiety; and, as in the present study, the Physiological Hyperarousal scale of the RCMAS was used as a measure of that component in the tripartite model. Factor analyses obtained the three-factor solution of negative affect, positive affect, and physiological hyperarousal. The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988), which was revised for children in this study, was used to provide further support for the model. The correlation between the PANAS positive affect subscale and the positive affect extracted factor was significantly higher than its correlations with the other two factors. Likewise, the PANAS negative affect subscale correlated significantly with the negative affect factor, and not with the other factors. This research study was one of the first to provide support for the tripartite model in children and adolescents.

In trying to improve the measurement of the tripartite variables in children and adolescents, Chorpita and colleagues (Chorpita, Daleiden, Moffitt, Yim, & Umemoto, 2000) created the Affect and Arousal Scales (AFARS). Preliminary research with a normative sample supported the structural validity of this scale as well as its test-retest reliability. In later research, Chorpita and Daleiden (2002) examined the utility of both the AFARS and the Positive and Negative Affect Schedule for Children (PANAS-C; Laurent, Catanzaro, Joiner, Rudolph, Potter, Lambert, et al., 1999) as, specifically, tripartite measures. The sample included 226 children and adolescents ages 6 to 17 (66.8% boys, 33.2% girls, mean age = 12.2 years) from an outpatient clinic. The CDI, the RCMAS, and the RCADS were used in this study as self-report measures of anxiety and depression, as well as the Anxiety Disorders Interview Schedule for DSM-IV, Child and Parent Versions (ADIS-IV-C/P; Silverman & Albano, 1996) and clinician severity ratings

(Chorpita, Plummer, & Moffitt, 2000) as diagnostic measures. The authors created a composite anxiety scale by taking the mean across all the RCADS anxiety scales—a technique that was also utilized in the present study. The AFARS included PA, NA, and PH scales, and the RCMAS Physiological Hyperarousal scale was also used.

Results from this study suggested that the PANAS-C appears to be a more accurate measure of the tripartite variables. That is, it was more strongly correlated with measures of anxiety and depression in ways consistent with the tripartite model theory. The authors also employed a series of regression equations predicting anxiety (measured by the RCADS anxiety composite) and depression (measured by the CDI). Both the AFARS and the PANAS-C were used as predictors and performed similarly, but the PANAS-C, in general, accounted for more variance. These results showed that the negative affect scale of the PANAS-C was a significant predictor of both anxiety and depression, and the positive affect scale significantly (negatively) predicted depression but not anxiety. Regarding the AFARS-PH scale, it was significantly correlated with the RCMAS-PH scale as well as other measures of general anxiety; however, against predictions, it was also significantly correlated with depression. The authors noted that more research is needed in determining the role of the physiological hyperarousal construct in relation to anxiety and depression in youth.

In summary, research has provided evidence for the factorial distinctiveness of anxiety and depression. Moreover, the tripartite model suggests that the disorders can be conceptually distinguished. However, research has not shown that symptoms of anxiety and depression cluster in ways that we would expect based on a view that these are two different disorders (i.e., some youth with depression only, some with comorbid anxiety and depression, etc.). Further research is needed to examine the extent to which anxiety and depression cluster as distinct

symptoms in samples of youth. Although epidemiological research suggests that they do occur alone, these studies use DSM-IV categorical diagnoses. In reality, anxiety and depression occur on a continuum (e.g., an individual may receive a diagnosis of depression and still have high levels of anxiety not identified by a disorder). Cluster analysis of anxiety and depression symptoms will help to clarify the distinctiveness of these problems.

The Present Study

The current study examined the patterns of comorbid anxiety and depression in children and adolescents. The first major hypothesis was that the two disorders are distinct and will not always occur together to the same degree or with the same amount of symptoms in samples of youth. The expectation was to be able to identify four separate groups of youth based on their levels of anxiety and depression: those with (1) low anxiety and low depression (normal); (2) high anxiety and low depression (anxious); (3) low anxiety and high depression (depressed); and (4) high anxiety and high depression (comorbid). That is, individuals will not always have the same quantity of anxious and depressive symptoms because these are two separate disorders.

As a second part of the first hypothesis, it was predicted that the clusters would emerge best when measures were used that tapped the distinctive symptoms of anxiety and depression. Two measures of depression were used (CDI and RCADS-depression scale) and two measures of anxiety were used (STAIC-T and RCADS-anxiety scale). The four combinations of these measures were tried to determine which pair proved to be the best in pulling out the four predicted groups.

The second major hypothesis of the present study was that the tripartite model would confirm that the characteristic symptoms of each group could be further validated by measures of positive affect, negative affect, and physiological hyperarousal. First, the four clusters were

compared to determine if differences exist in the tripartite variables across groups. Secondly, specific pairs of groups were contrasted in terms of specific tripartite variables in accordance with which comparisons seemed most notable in testing tripartite theory predictions. Those contrasts were: (1) depression group versus anxiety group on positive affect and physiological hyperarousal; (2) comorbid group versus depression group on physiological hyperarousal; (3) comorbid group versus anxiety group on positive affect; and, (4) normal group versus each other group on negative affect.

Lastly, exploratory analyses were conducted to compare two different age groups—6 to 11-year-olds and 12 to 17-year-olds. Research on the developmental psychopathology of anxiety and depression has suggested that these disorders may become gradually more distinct with age (Cole, Truglio, & Peeke, 1997). However, there have been other studies that have found the exact opposite—that the structure of anxious and depressive symptoms does not vary with age (Chorpita, Albano, & Barlow, 1998; Chorpita et al., 2000). In a recent study, Jacques & Mash (2004) compared a sample of elementary school students ($n = 246$; grades 4 and 5) with a sample of high school students ($n = 218$; grades 10 and 11) in examining possible age differences in the tripartite constructs and their relation to anxiety and depression. Results of structural equation modeling techniques revealed that the tripartite variables were significantly related to anxiety and/or depression in the manner predicted by the tripartite model; and, better model fit was exhibited with the sample of older youth, as evidenced by several model fit indices (e.g., chi square, standardized root mean square residual). Since the research on the applicability of the tripartite model in various age groups is somewhat inconsistent, the final goal of the present study was to examine whether the clustering of symptoms would differ in older versus younger children. Given the contradictory evidence, no specific hypotheses were made.

Method

Participants

Data was collected as part of the ongoing research project of the Youth and Family Stress, Phobia, and Anxiety Research Lab. Participants included children ages 6-17 and one parent for each child (father or mother). They were recruited from psychology classes at the University of New Orleans and through advertisements posted on campus. Students were able to participate if they had a child in this age range or they could refer a parent from outside of the university who would like to participate. All parents who participated were compensated \$30 for each child with whom they participated.

The sample was composed of 116 females and 112 males ($N = 228$), with a mean age of 11.5 years and an age range of 6 to 17 years. The ethnicity of the sample was: 49.1% Caucasian, 38.6% African-American, 5.3% Hispanic, 2.2% Asian, and 4.8% of other ethnic backgrounds. The range of the family income of the sample was as follows: \$0 - \$11,999 (20.2%), \$12,000 - \$20,999 (14.5%), \$21,000 - \$30,999 (13.2%), \$31,000 - \$40,999 (7.0%), \$41,000 - \$50,999 (16.2%), over \$51,000 (25.9%), and 3.1% did not report their family income.

Measures

The Children's Depression Inventory (CDI; Kovacs, 1981) was used to assess depressive symptoms. It was developed from the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and it includes 27 items regarding the cognitive, behavioural, and affective signs of depression. Each item has three statements from which the child chooses which is true for him/her. An example item is "I hate myself," "I do not like myself," or "I like myself." Kovacs (1981) reported adequate internal consistency (.86) and one-month test-retest reliabilities (.72) for the CDI. In the present sample, coefficient alpha for the

total CDI scale was .84. This measure has been well validated and it correlates significantly ($r = .55$) with clinician-rated depression (Kovacs, 1992). The convergent validity of the CDI with the RCADS depression subscale was $r = .52, p < .01$ in the present sample. Convergent validity of the CDI with the RCADS-depression was also evaluated in the age groups—for 6 to 11-year-olds, $r = .56, p < .01$, and for 12 to 17-year-olds, $r = .60, p < .01$.

The Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978) assesses trait anxiety. The RCMAS is a widely used and well-researched 37-item scale designed to assess general anxiety in children. Twenty-eight items are summed from 'yes' or 'no' responses to yield a Total Anxiety score. The RCMAS also yields three factor sub-scales: Worry-Oversensitivity, Physiological, and Concentration. The other nine items comprise the social desirability or "lie" sub-scale. The Physiological subscale of the RCMAS was used as a self-report measure of hyperarousal in the present study. Example items on the physiological scale are "Often I have trouble getting my breath" and "Often I feel sick in my stomach." Internal consistency coefficients of the RCMAS have ranged from .80 to .90 (Paget & Reynolds, 1984), and three-week test-retest reliabilities have ranged from .90 to .99 (Pela & Reynolds, 1982). In the present sample, coefficient alpha was .86 for the total scale and .70 for the physiological subscale. The scale has also been well validated (Reynolds and Richmond, 1985). Convergent validity of the RCMAS physiological subscale with the STAIC-T in the present sample was $r = .52, p < .01$ for the full sample, $r = .45, p < .01$ for the 6 to 11-year-old age group, and $r = .62, p < .01$ for the 12 to 17-year-old group.

The State Trait Anxiety Inventory for Children-Trait Version (STAIC-T; Spielberger, 1973) also assesses trait anxiety. The Trait version of the STAIC is a 20-item self-report measure of anxious symptoms in children. Example test items are "I have trouble making up my

mind” and “I worry about things that may happen.” The STAIC is a widely used, extensively researched measure with satisfactory reliability and validity estimates (Spielberger, 1973). The STAIC-T has high internal consistency and good convergent validity estimates with other self-report measures of childhood anxiety, interview assessed internalizing symptoms as well as clinician ratings of diagnostic symptoms (e.g., see Hodges, 1990; Weems, Silverman, & LaGreca, 2000). Coefficient alpha in the present sample for the scale was .83. Convergent validity in the present sample of the STAIC-T with the RCADS anxiety subscale was $r = .60$, $p < .01$ for the full sample, $r = .43$, $p < .01$ for 6 to 11-year-old youth, and $r = .78$, $p < .01$ for the older youth in the sample.

The Revised Child Anxiety and Depression scales (RCADS; Chorpita et al. 2000; Spence, 1994, 1997) was used to evaluate diagnostic status and the DSM-IV anxiety and depression disorder symptoms. The RCADS is a 47-item adaptation of the Spence Children’s Anxiety Scale. Example statements on the questionnaire are “Nothing is much fun anymore,” “I feel worthless,” and “I have to do some things over and over again, like washing my hands, cleaning or putting things in a certain order.” The RCADS has adequate internal consistency for the overall scale and its subscales. It was also found to have good convergent validity based on moderate to strong correlations between the subscales of the RCADS with scores on the RCMAS and the CDI. Chorpita et al. (2000) reported one-week test-retest reliabilities in the high .70s. In the present sample, coefficient alpha for the total scale was .94, for the depression scale .79, and for the anxiety scale .93. Convergent validity in the present sample for the RCADS depression subscale with the CDI was $r = .52$, $p < .01$ for the full sample, $r = .56$, $p < .01$ for the younger age group, and $r = .60$, $p < .01$ for the older age group. Convergent validity for the RCADS anxiety subscale with the STAIC-T was $r = .60$, $p < .01$ for the full sample, $r = .43$, $p < .01$ for the 6 to 11-

year-olds, and $r = .78, p < .01$ for the 12 to 17-year-olds. As mentioned previously, a composite anxiety scale was created by taking the mean across all of the RCADS anxiety scales, as done by Chorpita and Daleiden (2002).

The Positive and Negative Affect Schedule – Child Version (PANAS-C; Laurent et al. 1999) evaluated the affective components of anxiety and depression—positive affect (PA) and negative affect (NA). The scales demonstrate good convergent and discriminant validity with existing self-report measures of childhood anxiety and depression. Laurent et al. (1999) reported adequate reliability for the PA scale (.89-.90) and the NA scale (.92-.94) of the PANAS-C. In the present sample, coefficient alpha was .85 for the PA scale and .89 for the NA scale. Discriminant validity of the PA scale with the CDI in the present sample was $r = -.33, p < .01$ for the full sample, $r = -.26, p < .01$ for the younger age group, and $r = -.38, p < .01$ for the older age group. Convergent validity of the NA scale was evaluated with the CDI and the STAIC-T, respectively: for the full sample, $r = .52/.56$ for the full sample, $r = .57/.45$ for 6 to 11-year-olds, and $r = .60/.63$ for the 12 to 17-year-olds, all p 's $< .01$.

The externalizing scale of the Child Behavior Checklist (CBCL; Achenbach, 1991) was used in the analyses in order to control for externalizing symptoms. The CBCL was completed by a parent of each child and yielded a total externalizing problems score. The CBCL has been widely used and has shown to have good reliability and validity (Achenbach, 1991). This measure was used to ensure that comorbid externalizing symptoms were not influencing the results of the cluster analyses.

Procedure

Participants were recruited through the University of New Orleans. The assessments were conducted at the Youth and Family Stress, Phobia, and Anxiety Research Lab at the

university. They were each completed in one session and lasted approximately two hours. When the parent and child first arrived, parental consent and youth assent forms were thoroughly explained and any questions were answered. The parent and child were placed in separate rooms in the lab to ensure confidentiality and to foster accurate, honest answers. During the session, the child was administered the battery of questionnaires and the parent was administered the Child Behavior Checklist. The child questionnaires measured different aspects of anxiety and depression as well as positive and negative affect; and, they were read to the child if he or she required assistance. A research assistant was present during the entire session.

Results

Preliminary data screening revealed four outliers in the data. Three participants had scores more than three standard deviations above the mean on the CDI and one participant scored more than three standard deviations above the mean on the STAIC. These participants were removed; remaining for further analyses were 224 youth.

Table 1 displays the mean score, standard deviation, range, and skew for each measure used in the present study. All measures had skewness statistics within acceptable range. The slightly positive skew of some measures is not unexpected given that a community sample was used and, therefore, should generally have lower levels of depression, anxiety, and negative affect. Table 1 also displays the bivariate correlations among the measures. All measures are significantly correlated except for positive affect and negative affect.

Cluster Analyses – Full Sample

The multivariate statistical technique cluster analysis was used in order to discover the natural classification of individuals based on their levels of anxiety and depression. Specifically, a k-means cluster analysis was used because it is designed for large data sets. In this technique,

Table 1. Means, Standard Deviations, Ranges, Skews, and Correlations among the Measures for the Sample ($N = 224$)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Mean | Standard Deviation | Range | Skew |
|-----------------|--------|--------|--------|--------|-------|-------|---|-------|--------------------|--------|------|
| 1. CDI | | | | | | | | 7.83 | 5.87 | 0-27 | .87 |
| 2. STAIC-T | .47** | | | | | | | 35.78 | 6.52 | 21-51 | -.08 |
| 3. RCADS – dep. | .52** | .55** | | | | | | 16.59 | 4.49 | 10-34 | .85 |
| 4. RCADS – anx. | .50** | .60** | .72** | | | | | 62.59 | 15.67 | 37-109 | .53 |
| 5. PANAS-C – PA | -.33** | -.24** | -.22** | -.19** | | | | 52.27 | 11.22 | 22-75 | -.23 |
| 6. PANAS-C – NA | .52** | .56** | .53** | .60** | -.10 | | | 28.93 | 10.67 | 15-67 | .72 |
| 7. RCMAS - PH | .40** | .52** | .54** | .49** | -.14* | .51** | | 3.88 | 2.39 | 0-10 | .33 |

Note: ** $p < .01$; * $p < .05$; CDI = Children’s Depression Inventory; STAIC-T = State Trait Anxiety Inventory for Children-Trait Version; RCADS-dep. and RCADS-anx. = Revised Child Anxiety and Depression scales, depression subscale and anxiety subscale; PANAS-C – PA and PANAS-C – NA = Positive and Negative Affect Schedule – Child Version, positive affect and negative affect subscales; RCMAS – PH = Revised Children's Manifest Anxiety Scale, physiological anxiety subscale.

all cases are assigned to clusters based on their similarity to other members of the cluster. Cluster analysis requires an a priori decision on the number of clusters that should be produced. Based on the hypotheses of the current study, a four-cluster solution was specified; however, three-cluster and five-cluster solutions were also examined to determine which one produced the most dissimilar clusters (i.e., the best fit to the data).

Before running the analyses, raw scores were converted to standardized scores for all measures used in the study in order to more easily compare individuals' scores on the different measures. This resulted in all measures having a mean of zero and a standard deviation of one. For the purposes of consistency in describing the findings, the following descriptors will be used. When describing the mean score of each cluster's individuals on anxiety and depression measures, the level of symptoms was considered "low" when the score was below zero, "moderate" when in the 0 to .70 range, and "high" when above .70. In addition, for the depression only and anxiety only groups, a difference in the mean scores of one standard deviation was employed.

Anxiety and depression were evaluated and groups were created using different combinations of the two measures of anxious symptoms and two measures of depressive symptoms. The first combination of measures used in creating a four-cluster solution was a measure of general trait anxiety (STAIC) and a measure of the cognitive and behavioral signs of depression (CDI). This produced three of the hypothesized clusters—low anxiety/low depression, high anxiety/high depression, and low anxiety/high depression, but failed to produce a distinct cluster of high anxiety/low depression (i.e., no anxious only group). Next, a five-cluster solution was tried with the same variables; however, this solution also did not produce the hypothesized groups. Two low anxiety/low depression clusters were formed, one moderate

anxiety/low depression, one low anxiety/high depression, and one of both high levels. A three-cluster solution, also, did not produce well-defined groups—clusters were low anxiety/low depression, moderate anxiety/low depression, and moderate anxiety/high depression.

The second combination of measures used was the RCADS-anxiety and RCADS-depression scales. In all cluster solutions—three, four, and five, these variables produced groups that were similar in their levels of anxiety and depression within a cluster. That is, all clusters could be described as low/low, moderate/moderate, or high/high. This is more likely in this instance given that measures of each disorder came from the same instrument.

The third combination of measures included the STAIC and the RCADS-depression scale. The three-cluster solution produced a normal group (low both), a comorbid group (high both), and an unclear group of moderate anxiety/low depression. The four-cluster solution did not produce clusters to support the hypotheses of the study. This solution contained two normal groups, one comorbid group, and one high anxiety/low depression group. The five-cluster solution produced two normal groups, two comorbid groups, and one group of moderate anxiety/moderate depression.

The last combination of measures used to test the first hypothesis of the study was the RCADS-anxiety scale and the CDI. The three-cluster solution did not produce clearly defined groups—they were a normal group, a high anxiety/moderate depression, and a low anxiety/high depression. The five-cluster solution also produced imprecise groups—a normal group, a comorbid group, and the other three clusters had moderate levels of either anxiety or depression. The four-cluster solution, on the other hand, using these measures proved to be the best method of classification. This solution produced four clusters that corresponded to those that were hypothesized—normal, depression only, anxiety only, and comorbid anxiety and depression.

Table 2. RCADS-anxiety and CDI standardized mean scores for cluster-defined groups (four-cluster analysis) and additional characteristics of each group ($N = 224$)

| | Normal | Depressed | Anxious | Comorbid |
|---------------------------------|--------------|---------------|---------------|--------------|
| RCADS-anxiety scale | -.73 | -.52 | .81 | 1.32 |
| CDI | -.73 | .71 | -.21 | 1.46 |
| RCADS interference rating (SD) | 1.49 (1.97) | 2.31 (2.48) | 3.25 (2.69) | 3.93 (3.10) |
| CBCL externalizing T-score (SD) | 48.78 (9.72) | 53.91 (10.35) | 50.08 (11.53) | 54.73 (9.67) |
| <i>n</i> | 101 | 37 | 54 | 32 |
| Girls | 45.5% | 43.2% | 57.4% | 62.5% |
| Boys | 54.5% | 56.8% | 42.6% | 37.5% |
| Age 6-11 years | 42.6%* | 54.1% | 64.8%** | 50.0% |
| Age 12-17 years | 57.4%* | 45.9% | 35.2%** | 50.0% |
| Caucasian | 51.5% | 46.0% | 50.0% | 43.8% |
| African American | 33.7% | 37.8% | 40.7% | 50.0% |
| Other ethnicity | 14.8% | 16.2% | 9.3% | 6.2% |

Note. RCADS-anxiety scale = Revised Child Anxiety and Depression Scales—anxiety subscale; CDI = Children’s Depression Inventory; RCADS interference rating = mean score on the Revised Child Anxiety and Depression Scales functional impairment rating (scale from 0 to 8); CBCL externalizing T-score = mean T-score on the Child Behavior Checklist externalizing symptoms scale; SD = standard deviation of each mean score; *Significant within-group difference in age, $\chi^2 = 25.87, p < .05$; **Significant within-group difference in age, $\chi^2 = 24.67, p = .01$.

Table 2 presents the mean RCADS-anxiety and CDI scores for each group and the number of individuals in each cluster, as well as additional characteristics of the cluster-defined groups.

This cluster solution was the focus of additional analyses.

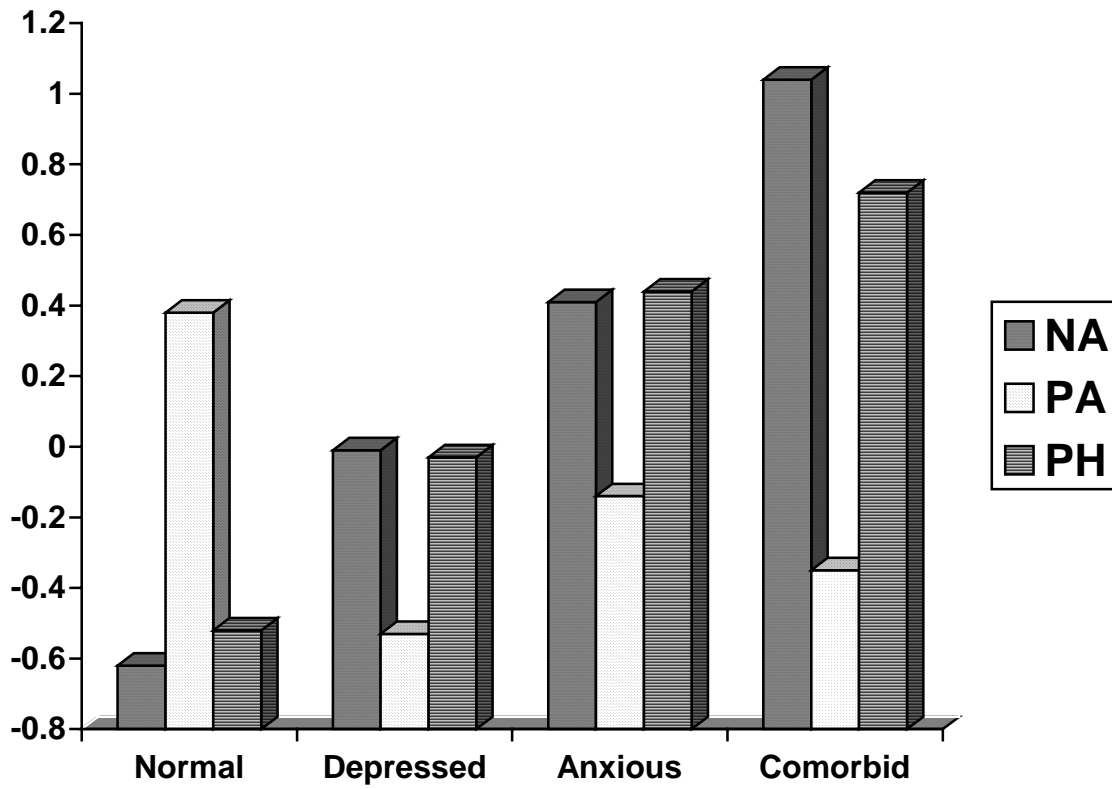
The replicability of the four-cluster solution using the RCADS-anxiety scale and the CDI was tested by using random 50 % and 60% subsamples taken from the full sample. These tests produced very similar clusters across subsamples.

Test of the Tripartite Model

The theories of the tripartite model were used in running additional analyses to confirm the accurate classification of individuals based on their levels of positive and negative affect (measured by the PANAS-C) and physiological hyperarousal (measured by the RCMAS-PH scale). The group means on each tripartite variable were examined. Figure 1 displays the four-cluster solution produced by the RCADS-anxiety scale and the CDI and the standardized mean levels of positive affect, negative affect, and physiological hyperarousal for each cluster. The general pattern of group means was consistent with the hypotheses of the study.

An analysis of variance showed that the four clusters significantly differed in positive affect, $F(3, 220) = 11.56, p < .001$; negative affect, $F(3, 220) = 49.71, p < .001$; and physiological hyperarousal, $F(3, 220) = 25.26, p < .001$. In order to further examine the hypothesized specific differences of the members of each cluster, single degree of freedom contrasts were run, as recommended by Jaccard & Guilamo-Ramos (2002). This was done to compare specific groups on the particular traits of interest in a more focused way than an analysis of variance. Seven specific single degree of freedom contrasts (independent samples t-tests) were analyzed. Results from all contrasts are presented in Table 3.

Figure 1. Standardized scores of cluster-defined groups on measures of negative affect, positive affect, and physiological hyperarousal.



Note. NA = PANAS-C negative affect scale; PA = PANAS-C positive affect scale; PH = RCMAS physiological anxiety scale.

Table 3. Single degree of freedom contrasts for the cluster-defined groups (four-cluster analysis)

| | Test Variable | Parameter | Standard Error | <i>t</i> Value | <i>p</i> Value | Lower Limit | Upper Limit |
|-----------------|---------------|-----------|----------------|----------------|----------------|-------------|-------------|
| Dep/Anx | PA | -.396 | .194 | -2.04 | .044 | -.782 | -.010 |
| Dep/Anx | PH | -.468 | .181 | -2.59 | .011 | -.827 | -.109 |
| Comorbid/Dep | PH | .746 | .214 | 3.48 | .001 | .319 | 1.174 |
| Comorbid/Anx | PA | -.217 | .194 | -1.12 | .266 | -.603 | .168 |
| Normal/Dep | NA | -.616 | .137 | -4.50 | .000 | -.887 | -.346 |
| Normal/Anx | NA | -1.036 | .109 | -9.51 | .000 | -1.251 | -.821 |
| Normal/Comorbid | NA | -1.661 | .123 | -13.49 | .000 | -1.905 | -1.417 |

Note. Test variables are standardized. Dep = cluster identified as depression only; Anx = cluster identified as anxiety only; Comorbid = cluster identified as comorbid anxiety and depression; Normal = cluster identified as normal/no symptoms; PA = PANAS-C positive affect scale; PH = RCMAS-physiological anxiety scale; NA = PANAS-C negative affect scale.

First, the depression only group and the anxiety only group were compared on the basis of positive affect and physiological hyperarousal—the traits that, theoretically, distinguish the two disorders. Results indicated that the groups were different in both positive affect ($p < .05$) and hyperarousal ($p < .05$), in support of the tripartite theory. Second, the comorbid group was contrasted with the depression group on the basis of physiological hyperarousal, a trait that should only be characteristic of individuals with anxiety, and these groups were significantly different ($p < .01$). Third, positive affect was tested in comparing the comorbid cluster with the anxiety only cluster—a trait that should only be related to depressive symptoms. This test, however, did not support the tripartite theory; the groups were not different in their mean levels of positive affect. Lastly, the normal group was compared to each other group (3 t-tests) on the basis of negative affect, which should not be characteristic of the normal group. These results did support the theory—the normal cluster was different from each other cluster in negative affect ($p < .01$).¹

Exploratory Cluster Analyses – Separate Age Groups

The data set was split into two age groups—youth ages 6-11 and ages 12-17—in order to determine if anxiety and depression becomes more distinct with age. In the same way as with the full sample, a varying number of clusters were tested and different measures were used to determine the solution that best fit the data. In both age groups, the RCADS anxiety and depression scales produced groups that had similar levels of anxiety and depression within each cluster. As with the analyses in the full sample, this occurrence is likely because the scales come from the same instrument.

In the clusters determined by the STAIC-T and CDI, the five-cluster and three-cluster solutions for both age groups were similar to that found in the full sample—the groups were not

clearly distinguishable. The four-cluster solution did generate slightly different results in the different age groups. A normal group (low anxiety/low depression) and a comorbid group (high anxiety/high depression) were produced in the analyses for both age groups. However, the 6 to 11-year-old group failed to produce a clear anxiety only cluster (there was a moderate anxiety/low depression cluster), although they did produce a clear depression cluster. The 12 to 17-year-olds did not have clear depression or anxiety clusters (there were moderate levels in both of these).

The RCADS-anxiety and the CDI were then used to produce groups in the same manner as with the full sample. Three, four, and five-cluster solutions were explored for each age group. The five-cluster solutions did not produce distinct clusters in either age group. In the younger age group, a three-cluster solution produced clear groups of anxiety only, normal, and comorbid, while this solution in the older age group produced only a clear normal group but no other distinct clusters. With a four-cluster solution, the age groups also differed. In the 6 to 11-year-olds, there was a normal, a comorbid, and an anxiety only group, but no well-defined depression only group (there was a low anxiety/moderate depression group instead). In the 12 to 17-year-olds, on the other hand, there was a normal, a comorbid, and a depression only group, but no distinct anxiety only (there was a moderate anxiety/low depression group). Although the four-cluster solution using the RCADS-anxiety and the CDI produced the hypothesized clusters in the full sample, this did not occur with the separate age groups. Table 4 displays the standardized mean scores of anxiety and depression for the members of each cluster as well as the number of individuals in each cluster.

Table 4. RCADS-anxiety and CDI standardized mean scores for cluster-defined groups (four-cluster analysis): Younger age group (ages 6-11; $N = 113$) shown in bold type and older age group (ages 12-17; $N = 109$) shown in regular type.

| Age = 6-11 | Normal | Depressed | Anxious | Comorbid |
|---------------------|-------------|-------------|-------------|-------------|
| RCADS-anxiety scale | -.67 | -.56 | .97 | 1.66 |
| CDI | -.84 | .58* | -.19 | 1.52 |
| <i>n</i> | 41 | 22 | 35 | 15 |
| <hr/> | | | | |
| Age = 12-17 | | | | |
| RCADS-anxiety scale | -.76 | -.53 | .54** | .97 |
| CDI | -.67 | .88 | -.19 | 1.46 |
| <i>n</i> | 57 | 15 | 21 | 16 |

Note. RCADS-anxiety scale = Revised Child Anxiety and Depression Scales—anxiety subscale; CDI = Children’s Depression Inventory; *no clear high depression cluster; **no clear high anxiety cluster.

Discussion

The present study examined the occurrence of anxiety and depression as comorbid and as unique syndromes in a community sample of youth. Current research has shown that the disorders often co-occur in children and adolescents, but there is little research showing how the distinct and unique symptoms of anxiety and depression are actually manifested in populations of youth. The current study supports the idea that anxiety and depression can occur together and alone in youth. Using levels of anxiety and depression to base cluster membership, the hypothesized groups of normal youth, depressed youth, anxious youth, and youth with comorbid anxiety and depression were formed, indicating that the disorders are distinct and will not always occur together with the same degree or amount of symptoms. And, because a varying number of clusters were examined in all analyses, the natural classification of these symptoms into four groups could be better supported. These results argue against the idea that anxiety and depression are two facets of a single disorder.

The RCADS-anxiety scale and the CDI proved to be the best measures in pulling out the distinctive symptoms of anxiety and depression without much overlap. Although this was the only pair of measures out of the four trials that produced the clusters, the content and format of these scales made them the more effective in discriminating the symptoms. They were superior to the STAIC-T, which contains several items tapping depressive symptoms, and the RCADS-depression scale, which was highly correlated with the RCADS-anxiety scale, likely due to response bias (i.e., scales from the same questionnaire).

As a measure of the behavioral and affective signs of depression, results suggested that the CDI adequately evaluated the common feature of negative affect/general psychological distress as well as the feature of low positive affect/loss of pleasure or interest. Although this

measure has been noted to have some discriminant validity problems, especially with anxiety (Kovacs, 1992), it appeared to efficiently measure those symptoms of depression that the tripartite model proposes help to distinguish it from anxiety. Additionally, the measure's discriminant validity may have been improved because the RCADS-anxiety scale was used, rather than the STAIC-T, which has more overlap with the CDI. The RCADS-anxiety scale was useful in measuring the shared and unique symptoms of anxiety described in the tripartite model. It includes a wide array of anxious symptoms, including chronic worry, compulsive checking, obsessive thoughts, increased heart rate, and unwarranted fears, and it does not measure symptoms of depression. These two measures helped to support the idea that anxious and depressive symptoms can be distinguished.

The tripartite model appears to be a useful tool in considering the conceptual distinctiveness of anxiety and depression in youth. Measures of positive affect, negative affect, and physiological hyperarousal support the theory that depression and anxiety can be differentiated from each other and do not share all common symptoms. The individuals with depression only were different from those without depression in their levels of positive affect, supporting the tripartite theory of low positive affect being unique to depression. Individuals with anxiety, as compared to those without, were distinguished by their levels of physiological hyperarousal, which is unique to anxiety in the tripartite model. Results also support that negative affect is characteristic of both anxious and depressive youth and is a shared, non-specific feature of the disorders. The individuals with no symptoms or a very low level of symptoms were significantly different from all other groups in negative affect. The tripartite variables can help to elucidate the complex relationship of anxiety and depression in youth by further clarifying and describing the nature of these syndromes. These affective and

physiological states go beyond the overt symptoms of anxiety and depression listed in the DSM-IV.

In addition, the usefulness of the tripartite model in differentiating anxiety and depression has important implications regarding how these disorders should be defined and identified. Current instruments used for measurement and assessment should incorporate more comprehensive definitions of the disorders. Findings were consistent with Weems & Stickle (2005) in recommending that the adequate inclusion of the features of negative affect, positive affect, and physiological hyperarousal is important in the assessment and classification of anxious and depressive disorders. A different method of classification may affect the high rates of comorbidity if it results in better distinction of the syndromes.

A striking clinical implication of this study is the elevation in symptoms that youth with comorbid anxiety and depression experience compared to the other youth in this sample. In addition to their scores on measures of anxiety and depression being higher than all other groups, their mean level of negative affect was also much higher. This is consistent with past research in suggesting that psychological distress is increased by having multiple disorders (Essau, 2003). Treatment for children with comorbid disorders should be specific to this pattern of symptoms, which appears to be qualitatively different from the sum of anxiety symptoms and depressive symptoms. As Kendall and colleagues (Kendall, Kortlander, Chansky, & Brady, 1992) have recommended, treating a child with comorbid anxiety and depression should involve the adaptable application of interventions designed for both disorders; and, the manner in which interventions simultaneously address both disorders should depend on the child's symptom constellation and developmental level. Future research should examine a method of treatment that is most effective for children who have symptoms of both anxiety and depression. A

valuable treatment model should address all symptoms together, rather than an anxiety treatment followed by a depression treatment, or vice versa.

Results regarding age differences in the distinctiveness of anxiety and depression are inconclusive. Generally, it appears that the differences in the structure of these disorders in older versus younger children are variable. It is not clear whether one age group exhibits a more distinct form of anxiety or depression. Different combinations of measures did not effectively pull apart the distinguishing symptoms of anxiety and depression. There were no solutions similar to the final four-cluster solution using the full sample. More research is needed concerning whether anxiety and depression vary with age and which aspects of the disorders may vary with age.

A limitation of the study is the use of child-report only. Support for the tripartite model in this sample may have been compromised if various measurement approaches were used, such as clinician rating or parent-report, because disagreement between multiple reporters of a child's symptoms is always possible. However, this may not be as applicable to symptoms of internalizing disorders, relative to externalizing disorders. Research has suggested that individuals themselves may be the best reporters of their own internal states (Lonigan, Phillips, & Hooe, 2003; Silverman & Eisen, 1992; Weems et al., 1998).

Furthermore, this study was cross-sectional in nature and could not examine changes over time in symptoms. That is, examination of different age groups at one point in time cannot provide the same information as following a sample of individuals over time. Research has suggested that anxious symptoms are likely to precede depressive symptoms (Brady & Kendall, 1992; Orvaschel, Lewinsohn, & Seeley, 1995). Also, several research studies have found that anxiety symptoms in youth were predictive of later depression (Cole, Peeke, Martin, Truglio, &

Seroczynski, 1998; Lewinsohn, Gotlib, & Seeley, 1995; Reinherz, Stewart-Berghauer, Moeykens, Pakiz, Frost, & Holmes, 1989; Sanford, Szatmari, Spinner, Munroe-Blum, Jamieson, Walsh, & Jones, 1995). In addition to the clinical utility of this research regarding depression prevention interventions for anxious youth, these findings also have significant implications for the structure of anxious and depressive symptoms. That is, there may be underlying mechanisms associated with these syndromes connecting them in a causal relationship. Whether there is a common mechanism that helps to explain the frequent association of anxious and depressive symptoms or a process mechanism of anxiety that predisposes an individual to later depression is yet to be discovered. Future longitudinal research is needed to examine the mechanisms and symptoms of anxiety and depression and how these change over time.

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Footnote

¹The externalizing scale of the Child Behavior Checklist (CBCL; Achenbach, 1991) was used in the analyses of the study in order to control for possible comorbid externalizing symptoms.

Analyses of covariance (ANCOVA), with the cluster-defined groups as the independent variable and each of the tripartite variables as the dependent variables, were conducted. Results indicated that externalizing behavior was not a significant covariate and the effect of the cluster-defined groups was still significant when controlling for the effect of externalizing symptoms ($p < .001$).

Vita

Melinda Cannon was born in New Orleans, Louisiana. She graduated Magna Cum Laude from Louisiana State University in May 2003, receiving a B.S. in Psychology. In August 2003, she entered the Applied Developmental Psychology Doctoral Program at the University of New Orleans. Currently, Melinda is conducting research with Dr. Carl F. Weems in the Youth and Family Stress, Phobia, and Anxiety Research Laboratory. Her specific research interests involve the development and maintenance of anxious and depressive disorders in childhood and adolescence. She plans to continue her research on childhood internalizing disorders for her dissertation.