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Structure of Anxiety Symptoms in Urban Children: Competing Factor Models of the Revised Children's Manifest Anxiety Scale

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The Revised Children's Manifest Anxiety Scale (RCMAS; C. R. Reynolds & B. O. Richmond, 1985) is among the most widely used self-report measures of children's anxiety. The authors compared its current empirically derived factor structure with theory-driven models derived from 8 experts on child anxiety using concept mapping. Confirmatory factor analyses compared models using data from 898 seventh graders in an urban public school system serving a high percentage of African Americans. The most parsimonious best-fitting model was an expert-derived model with factors reflecting anxious arousal, social evaluation–oversensitivity, worry, and a higher order factor. This model was theoretically meaningful, excluded items less relevant to anxiety, and was invariant across gender. Future research with the RCMAS should consider use of these dimensions. The combination of qualitative and quantitative methodology used in this study appeared to have considerable utility for refining measures.

The Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985) is among the most widely used self-report measures of children's anxiety for both clinical and research purposes (e.g., Kendall et al., 1997; Silverman et al., 1999). Although research has generally supported its psychometric properties, further work is needed to verify the underlying dimensions of childhood anxiety it assesses. Dimensions within the current scoring system were identified using exploratory factor analyses (Finch, Kendall, & Montgomery, 1974; Reynolds & Paget, 1981; Reynolds & Richmond, 1979). Although the factors identified by such an approach may be empirically optimum within a specific sample, the post hoc nature of their interpretation makes such exploratory analyses more appropriate for generating theories than for testing them. Moreover, this approach may suggest dimensions that are not consistent with relevant theories regarding the underlying construct being assessed (Farrell, 1999).

Others have raised concerns about the structure of the RCMAS, arguing that its subscales do not represent well-defined or stable factors (Chorpita, Albano, & Barlow, 1998; Gresham, 1989). This is also evident from an examination of individual items on the RCMAS that load on scales that appear inconsistent with their content and from the presence of items that appear to assess depression, fear, or hyperarousal. Concerns about the content validity of the RCMAS are of particular relevance to recent efforts to determine whether anxiety is distinct from other emotional states, such as negative affectivity (e.g., Chorpita et al., 1998; Lonigan, Hooe, David, & Kistner, 1999). The strong association between measures of different constructs may reflect overlap in the domain of items they include rather than similarity in the constructs they are designed to assess. In part, this may explain the conflicting findings of efforts to resolve this issue.

Research on the RCMAS has also been limited by its focus on samples of mostly suburban, middle-class Caucasian youth (Beidel, Turner, & Trager, 1994). Little is known about its psychometric properties with other populations. The need for further research with more ethnically diverse samples is evident from problems noted in using the RCMAS with minority children (Argulewicz & Miller, 1984) and findings indicating that the structure of anxiety may be different in such samples (Neal, Lilly, & Zakis, 1993).

We used a two-pronged methodology to examine the psychometric properties and factor structure of the RCMAS. In Study 1 we consulted experts to evaluate the content validity of the RCMAS and to develop an alternative, theoretically meaningful factor structure using concept mapping (Trochim, 1989). In Study 2 we used confirmatory factor analysis to compare the fit of the expert and empirical models in a community sample of predominantly African American children. We also examined the factorial invariance of the models across gender.

Study 1: Development of an Expert-Derived Factor Model

Method

Eleven nationally recognized experts in child anxiety were selected and contacted on the basis of their scholarly work and use of a cognitive–behavioral orientation. Of the 8 experts who participated (72% response rate), 4 were female. Each completed a card sort of the RCMAS items, labeled the resulting piles, and rated the importance of each item for the measurement of anxiety in children aged 10–14 years using a 5-point Likert scale.

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Results and Discussion

Experts sorted the cards into four to eight piles (M = 5.8), with 1–11 cards per pile (M = 5.2). An intraclass correlation (ICC [3, 8]; Shrout & Fleiss, 1979), representing the reliability of the experts' ratings of importance, was .91, indicating a high degree of agreement among the experts.

We conducted analyses using concept mapping software (Trochim, 1989) and procedures recommended by Trochim, Cook, and Setze (1994). These included a multidimensional scaling analysis of a matrix representing the similarity of items based on the card sort data. This then served as the input for a hierarchical cluster analysis that defined nonoverlapping clusters of items.

Several cluster solutions were examined, including an initial solution with approximately five items per cluster and solutions with successively higher and lower numbers of clusters. Two solutions were selected for further study on the basis of their interpretability and the theoretical distinctiveness of the clusters. One included five clusters representing dysphoric mood/low-self concept (7 items), worry (6 items), social evaluation/oversensitivity (6 items), anxious arousal (5 items), and nighttime fears (4 items). The other was a four-cluster solution similar to the first solution but without the nighttime-fears cluster; items from this cluster were blended into the worry and anxious arousal clusters. Each was graphed into a point map in which the similarity among items was represented by distance with boundaries drawn around items within each cluster. The point map also incorporated the average importance ratings, displayed as vertical depth, and labels for each cluster based on the experts' descriptions.

Several subscales based on the four-cluster solution derived from the experts were similar to those based on the original RCMAS scoring system (see Table 1). One striking difference was the emergence of an expert-derived scale labeled *dysphoric mood/low self-concept* that included items from the Concentration/Social Concerns scale and the Physiological Anxiety scale of the RCMAS. Examination of mean importance ratings indicated that the experts considered the items in this scale much less important to the assessment of anxiety than the other three subscales (i.e., 1.9 vs. 3.25–3.91).

Study 2: Examination of Competing Factor Structures

Method

Participants and procedure. This study was based on secondary analysis of data from a larger study of urban children within the public school system of a large city in the southeastern United States (see Farrell, Meyer, & Dahlberg, 1996, for a more detailed description of the population). The initial sample included all 7th graders in non-special education classrooms at three middle schools across 2 school years (September 1996, 1997). Measures were administered during homeroom periods by research assistants who explained procedures for protecting confidentiality. Students had the option of not participating by handing in blank booklets. Efforts were made to administer measures to absentees the following week. Data were obtained from 984 children. Of these, 49 returned incomplete measures, 18 met criteria for random responding (Farrell, Danish, & Howard, 1991), and 19 did not identify gender. The final sample included 898 children, 10.8–14.1 years old (M = 11.6, SD = 0.6); the majority (94%) identified themselves as African American or Black.

Measures. Measures included the RCMAS (Reynolds & Richmond, 1985) and the Impulse Control subscale of the Weinberger Adjustment

Table 1
Four-Factor Expert Model of the RCMAS Items Compared With the Original Reynolds and Richmond (1985) Subscales

Measure and variable	Reynolds and Richmond (1985) subscale
Dysphoric Mood/Low Self-Concept	
Other people are happier than I. (23)	Concentration/Social Concerns
A lot of people are against me. (35)	Concentration/Social Concerns
I am tired a lot. (21)	Physiological Anxiety
Others seem to do things easier than I can. (3)	Concentration/Social Concerns
I get mad easily. (9)	Physiological Anxiety
I feel alone even when there are people with me. (15)	Concentration/Social Concerns
It is hard for me to keep my mind on my schoolwork. (31)	Concentration/Social Concerns
Social Evaluation/Oversensitivity	
I feel someone will tell me I do things the wrong way. (27)	Concentration/Social Concerns
I feel that others do not like the way I do things. (11)	Concentration/Social Concerns
I worry about what my parents will say to me. (10)	Worry/Oversensitivity
I worry about what other people think of me. (14)	Worry/Oversensitivity
My feelings get hurt easily. (18)	Worry/Oversensitivity
My feelings get hurt easily when I am fussed at. (26)	Worry/Oversensitivity
Worry	
I worry a lot of the time. (6)	Worry/Oversensitivity
I am afraid of a lot of things. (7)	Worry/Oversensitivity
I worry when I go to bed at night. (30)	Worry/Oversensitivity
I have bad dreams. (25)	Worry/Oversensitivity
I worry about what is going to happen. (22)	Worry/Oversensitivity
I have trouble making up my mind. (1)	Physiological Anxiety
I get nervous when things do not go the right way for me. (2)	Worry/Oversensitivity
I often worry about something bad happening to me. (37)	Worry/Oversensitivity
Anxious Arousal	
Often I have trouble getting my breath. (5)	Physiological Anxiety
Often I feel sick in my stomach. (17)	Physiological Anxiety
My hands feel sweaty. (19)	Physiological Anxiety
It is hard for me to get to sleep at night. (13)	Physiological Anxiety
I wake up scared some of the time. (29)	Physiological Anxiety
I wiggle in my seat a lot. (33)	Physiological Anxiety
I am nervous. (34)	Physiological Anxiety

Note. Numbers in parentheses are Revised Children's Manifest Anxiety Scale (RCMAS) item numbers. The data in column 2 are from the Revised Children's Manifest Anxiety Scale manual (p. 5), by C. R. Reynolds and B. O. Richmond, 1985, Los Angeles: Western Psychological Services. Items from "What I Think and Feel" (The RCMAS) copyright 1985 by Western Psychological Services. Reprinted by permission of Western Psychological Services, 12031 Wilshire Boulevard, Los Angeles, CA 90025. No additional reprinting may be made, in whole or in part, without the prior written authorization of the publisher. All rights reserved.

Inventory (Weinberger, 1996). The 8-item Impulse Control subscale was included as a collateral measure because of its conceptual distinctiveness and its relation to anxiety (Epstein, Goldberg, Conners, & March, 1997). The convergent and discriminant validities of this measure were supported by a study that included self, teacher, and peer ratings of 6th graders (Weinberger, 1996).

Results and Discussion

Descriptive statistics for the RCMAS were examined and compared to normative data. Alpha coefficients ranged from .67 to .79 and were comparable to those previously reported for African American children (Reynolds & Paget, 1983). No significant gender differences were found on raw scores. Girls reported mean anxiety levels more than 1 *SD* below published norms for African American girls. The mean level of anxiety reported by boys was also below, but within 1 *SD* of, norms for African American boys.

We conducted confirmatory factor analyses to test a series of models representing relations among the items on the RCMAS using version 5.3 of EQS (Bentler, 1995) with maximum likelihood estimation procedures. Robust estimates were used because several scales were not normally distributed. Each analysis was based on 2–3 parcels or subsets of items within each subscale. Floyd and Widaman (1995) recommended the use of parcels for scales composed of dichotomous items to reduce potential bias. Items in each subscale were randomly assigned to parcels after matching them according to their correlation with the total score. This facilitates the construction of parcels with uniform internal consistency. Although differences in the assignment of items to factors necessitated the use of different parcels across models, the same strategy was followed for each model.[1] The fit of each model was evaluated on the basis of the comparative fit index (CFI) and root mean square error of approximation (RMSEA). Models with CFIs greater than .90 are generally considered to have an acceptable fit (Bentler, 1992). Browne and Cudeck (1993) suggested that RMSEA values less than .05 reflect a close-fitting model, and models with values of .1 or higher should not be accepted.

The first set of models examined the current scoring system for the RCMAS. Model 1 examined the extent to which the RCMAS items could be explained by a single anxiety factor. Model 2 represented the three subscales of the RCMAS. Although the CFIs for both models were acceptable, the RCMAS values were above the cutoff for a close fit. A chi-square difference test indicated that the three-factor model fit the data significantly better than the one-factor model. Within the three-factor model, standardized loadings for the item parcels were all significant ($p < .01$), and correlations among the three latent variables ranged from .81 to .86.

We conducted a second series of analyses on the four- and five-factor models derived from the experts in Study 1 (see Figure 1). Although the CFIs for both models were acceptable (.99 and .90, respectively), the four-factor model had a better fit based on the RMSEA (.04). Standardized factor loadings for this model were also significant and indicated strong relations among the variables and factors; all were greater than .63 ($p < .01$). Intercorrelations among the factors also were high, ranging from .80 to .94 ($p < .01$).

We also examined a three-factor expert model that did not include parcels related to the Dysphoric Mood factor. The exclusion of this factor was based on Study 1, in which experts rated these items low on importance for assessing anxiety, and the low internal consistency of these items ($\alpha = .62$). The resulting model achieved an excellent fit (CFI = .99, RMSEA = .046). Although the fit was not substantially better than the four-factor expert model, it does represent a more parsimonious and theoretically meaningful model of anxiety. It was therefore selected as the most appropriate of the three models based on the card sorts completed by the experts.

The preceding analyses identified a three-factor model representing the current RCMAS scoring system and a three-factor model based on the input of experts on childhood anxiety. We conducted further analyses to determine the extent to which the three factors within each of these models reflect a higher order construct of anxiety or three related but distinct constructs. One difficulty in answering this question is that models in which all three factors load on a single higher order factor cannot be distinguished from those that involve three correlated factors because both involve an identical number of parameters. We addressed this problem by introducing a fourth latent variable: impulse control. Impulse control was selected because it represented a construct meaningfully related to anxiety but was not expected to load on the higher order factor. This allowed us to determine whether the relations between the three first-order anxiety factors and a latent variable representing impulse control could be adequately explained by a higher order factor.

Two different models represented the relations between the three original RCMAS scales and the latent variable representing impulse control. One model hypothesized that the relations among the three anxiety factors and impulse control could be explained by allowing all four factors to correlate. In the second model the relation between impulse control and the three anxiety factors was represented by a single coefficient relating impulse control to the higher order anxiety factor. For both models the CFI was greater than .95. Results of the chi-square difference, however, indicated that the higher order model did not fit the data as well as the correlated-factors model. In other words, there was insufficient support for a higher order model based on the original RCMAS subscales.

A similar approach was used to evaluate a higher order factor within the three-factor model derived from the experts (see Figures 1D and 1E). Again, both models fit the data very well (CFI = .98, .99, respectively). In this case, however, results of the chi-square difference test indicated that the more parsimonious higher order model was not significantly different from the correlated factors model. Within this model, the correlation between the higher order factor and impulse control was .30 ($p < .05$). In other words,

[1] A series of analyses were run in which items were randomly assigned to parcels within each factor to ensure that the parcel assignment did not influence the outcome. All first-order models for both the RCMAS and the expert-derived factor structures were examined on the basis of randomly assigned item parcels rather than the matched-pairs random assignment parcels. These models provided only negligible differences in parameter estimates, and the overall findings were not empirically different from those of the matched-parcel analyses. Given this, the results of the first order CFAs based on the item parcels, regardless of their parcel assignment, appear to be consistent. We therefore decided to use item parcels to reduce the potential for bias in the analyses.

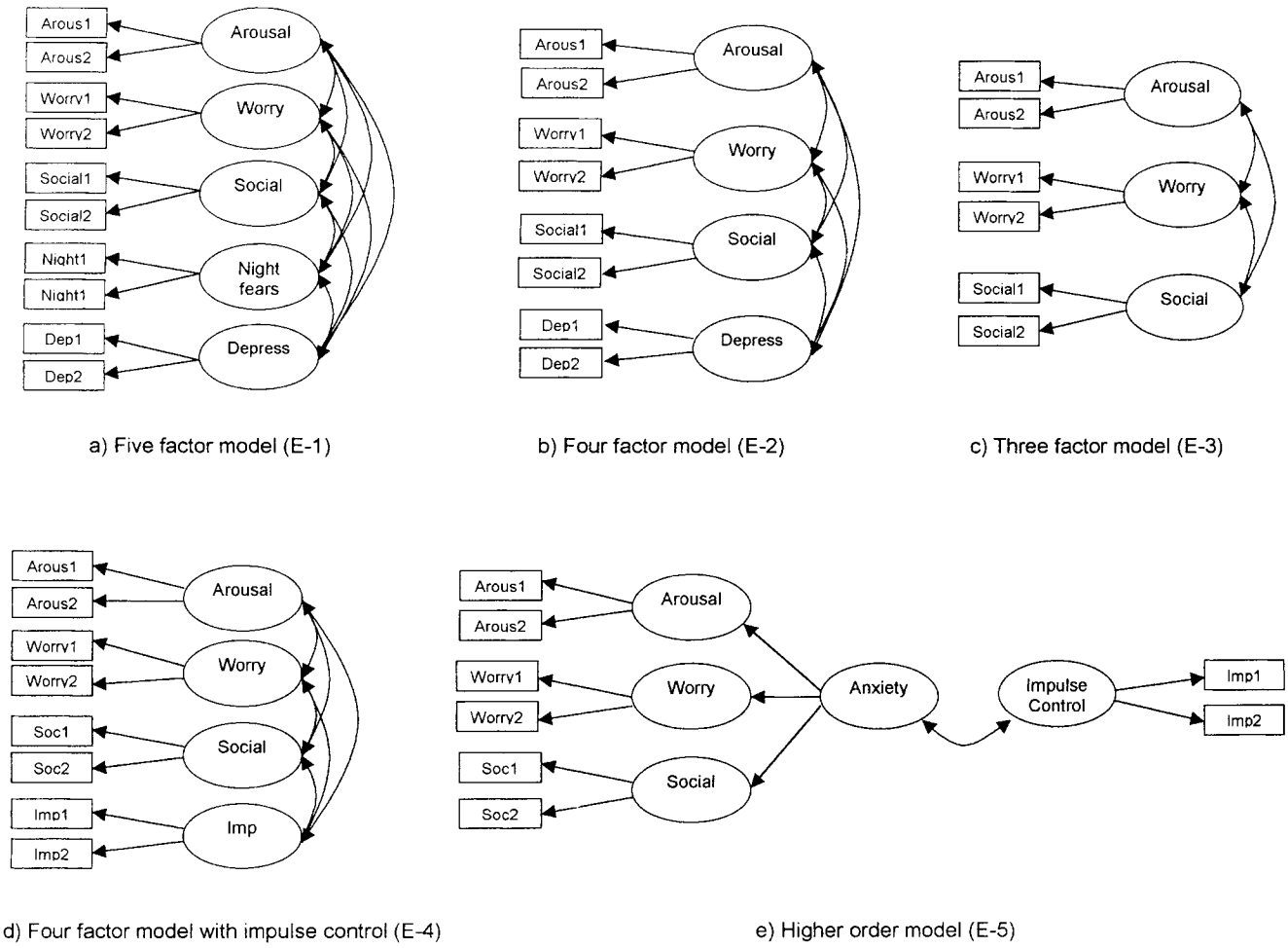

Figure 1. Competing models representing relations among expert-derived models of anxiety.

support was found for a higher order factor based on three subscales of the expert model that excluded items of dysphoric mood.

We next conducted multiple-group analyses to examine gender differences. Constraining factor loadings and correlations such that they were the same for boys and girls resulted in negligible decrements of fit compared to models in which these parameters were unconstrained. This confirmed the findings of the pooled data and indicated that the models were not different across gender.

General Discussion

Support was found for a three-factor model based on the current scoring system and an expert-derived three-factor higher order model. Researchers and clinicians may wish to consider using the factors identified by the experts. Compared to the current RCMAS scales, those suggested by the experts achieved comparable levels of internal consistency with fewer items. More important, the resulting scales reflect a conceptual model derived from experts in child anxiety rather than a post hoc explanation of empirically derived factors. Consistent with contemporary cognitive–behavioral conceptualizations (Kendall & Panichelli-Mindel, 1995), these scales emphasize the cognitive and physiological aspects of anxiety as well as the individual's internal processing of the environment. Because the model is grounded in expert conceptualizations, it does not suffer from item–scale anomalies found in the original RCMAS. It also eliminates items that experts considered to be of little relevance to anxiety. The resulting scales represent somewhat distinct dimensions of anxiety, yet they reflect an overall higher order anxiety factor.

The expert-derived models contribute unique, meaningful information toward improving our understanding of the assessment of anxiety using the RCMAS. They also support the notion that the RCMAS includes items related to a construct or dimension that resembles dysphoric mood. This finding is particularly relevant to the current controversy regarding the adoption of the concept of negative affectivity. Support for this construct is based, in part, on the high correlation between self-report measures of anxiety and depression. This finding has been used to suggest a lack of meaningful distinctiveness between these constructs. Many of these studies have used the RCMAS to assess anxiety. Emergence of a factor related to negative affectivity within the RCMAS suggests that it may not be the constructs that are indistinctive but the measures that assess them.

Several methodological limitations of this study warrant discussion. These findings cannot automatically be generalized to clinical samples, to very young children or older adolescents, or to samples composed of different ethnic composition. Also, the children in this sample reported lower levels of anxiety compared to the standardization sample, and future research could attempt to replicate these findings as well as cross-validate the factor structures with children from the majority culture. Conclusions regarding the stability of the factor structures across the developmental spectrum of childhood are limited by the cross-sectional design and lack of cross-validation. To fully understand the nature of anxiety and how it develops over time, longitudinal research is needed to follow children and their experience of anxiety throughout childhood. Reliance on self-report is also a potential limitation. Although it is our premise that anxiety is a uniquely internal experience best reported by the child, our results cannot rule out the contribution of method variance. A third limitation is that the results are inherently dependent on the instrument itself. Clearly, anxiety symptoms not included in the RCMAS could result in different findings regarding the structure of anxiety. Insightful feedback from the experts identified areas in need of further assessment (e.g., anxious apprehension, behavioral avoidance). Future work is needed to refine and expand the domains assessed by this measure. A clearer understanding of the factors that contribute to anxiety in children will ultimately lead to more effective prevention and intervention efforts.

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