Testing the Theoretical Framework of the COPE Program for Mothers of Critically Ill Children: An Integrative Model of Young Children's Post-Hospital Adjustment Behaviors

Bernadette Mazurek Melnyk,[1] Hugh F. Crean,[2] Nancy Fischbeck Feinstein,[2] Eileen Fairbanks,[2] and Linda J. Alpert-Gillis,[3]

[1]*Arizona State University College of Nursing & Healthcare Innovation,* [2]*University of Rochester School of Nursing, and* [3]*University of Rochester School of Medicine & Dentistry*

Objective   To test a theoretical model examining processes through which a parent-focused educational–behavioral intervention [Creating Opportunities for Parent Empowerment (COPE)] relates to children's post-hospital adjustment problems.   **Methods**   Mothers ($n = 143$) and their 2–7-year-old children, unexpectedly hospitalized in two pediatric intensive care units, were randomized to COPE or control conditions. Maternal measures included parental beliefs, anxiety, negative mood, and child adjustment 3 months post discharge. Observers rated maternal support of their children during hospitalization.   **Results**   Structural equation modeling suggested that the model tested provided a reasonable fit to the data [χ^2 (97 df) $= 129.43$; $p = .016$; root mean square error of approximatio $n = .048$; comparative fit index $= .95$]. COPE effects on children's post-hospital externalizing behaviors were indirect, via associations with parental beliefs and maternal negative mood state. Furthermore, COPE participation was associated with more maternal support of their children, which was also associated with less internalizing and externalizing behaviors 3 months post discharge.   **Conclusion**   Implementing COPE may help avert future mental health problems in this high risk population. Understanding the processes by which an already empirically validated program relates to child outcomes is likely to aid clinicians and administrators in the widespread uptake of the COPE program.

Key words   coping; critically ill children; mental health; parental beliefs; parents; PICU; structural equation modeling.

The number of children who require intensive care in the United States has increased over the past decade and it is projected that there will be continued growth in the number of pediatric intensive care unit (PICU) beds with a higher acuity of illness for those children occupying them (Odetola, Clark, Freed, Bratton, & Davis, 2005). While greater and more sophisticated use of technology has been a major factor in improving survival rates, it remains the case that these critically ill children are at higher risk for negative academic outcomes and mental health problems than are matched hospitalized children who do not require intensive care (Jones, Fiser, & Livingston, 1992). Parents of these children also are at high risk for the development of depression and anxiety

disorders, including post-traumatic stress disorder (PTSD; Heiney, Neuberg, Myers, & Bergman, 1994; Melnyk et al., 2004). Despite these adverse effects, there are only five studies reported in the literature that have developed and tested interventions to ameliorate the negative mental health outcomes of critically ill children and/or their parents (Bouve, Rozmus, & Giodano, 1999; Curley, 1988; Curley & Wallace, 1992; Melnyk, Alpert-Gillis, Hensel, Cable-Billing, & Rubenstein, 1997; Melnyk et al., 2004). Furthermore, there has been a paucity of research conducted for the purpose of systematically explaining how these interventions exert effects on parental and child outcomes. Explanations for how interventions work are essential for clinicians to

transport evidence-based interventions into clinical practice.

The purpose of this study, conducted on data obtained from a full-scale randomized controlled trial (RCT) that tested the effects of an educational–behavioral intervention program (COPE—Creating Opportunities for Parent Empowerment) on the mental health/coping outcomes of critically ill children and mothers, was to test a theoretically driven model constructed to explain the process through which the COPE program exerts its positive outcomes. In the original RCT (Melnyk et al., 2004), mothers who received the COPE program reported significantly less stress and participated in their children's care more than mothers who received a control program. In addition, COPE mothers also reported less negative mood state, less depression, and fewer PTSD symptoms following hospitalization than did control mothers. Compared to control children, the children in the COPE program had significantly fewer withdrawal symptoms 6 months after hospitalization, as well as fewer negative behavioral symptoms 12 months post discharge. One year after hospitalization, a significantly higher percentage of control group children (25.9%) displayed clinically significant behavioral symptoms compared to only 2.3% of the COPE children.

Theoretical Framework

Johnson and Leventhal's self-regulation theory, Carver and Scheier's control theory, and the emotional contagion hypothesis guided the development of the COPE intervention and comprised the theoretical framework for this study. Self-regulation theory (Johnson, Fieler, Jones, Wlasowicz, & Mitchell, 1997) contends that concrete objective information provided to a patient undergoing an intrusive/stressful procedure or event facilitates the development of a cognitive schema, that is similar to the real-life experience. As a result, the individual's coping is enhanced through a decreased discrepancy between what is expected and what occurs, increased understanding and an ability to predict aspects of the event, and confidence in one's ability to deal with the stressor. Ultimately, knowing what to expect in a stressful event lessens anxiety and allows the individual to have more energy to invest in functional or problem-focused coping. Guided by self-regulation theory, one component of the COPE program provided audiotaped and matched written information to the parents regarding their children's likely emotional and

behavioral responses to hospitalization. It was expected that provision of this type of information would strengthen mothers' beliefs about their ability to understand and predict their children's behaviors and emotions, which would subsequently lessen maternal anxiety (the emotional outcome of coping) and facilitate increased participation in their children's care during hospitalization (the functional outcome of coping).

Another component of the COPE program, parental role information and activities (e.g., performing therapeutic medical play and puppet play), was guided by control theory. Control theory postulates that when there is a discrepancy between a standard or goal and a current state, that discrepancy motivates behaviors to allow an individual to reach the standard (Carver & Scheier, 1999). When a child is hospitalized, parents experience a large discrepancy between their typical parenting standard and the manner in which they are able to care for their children in the hospital (Melnyk, 1995). According to control theory, the discrepancy should motivate parents to engage in the physical and emotional care of their children during hospitalization. However, multiple barriers exist during hospitalization that limit the initiation of effective parenting behaviors (e.g., anxiety, uncertainty about how best to parent, unfamiliar environment/professional staff). Therefore, the parent role information and activities in the COPE program are designed to remove the barriers that block parent behaviors during hospitalization so that parents can engage in their children's care and obtain a similar standard of parenting to which they are accustomed.

Finally, the emotional contagion hypothesis contends that emotional states, especially anxiety, are transferred from one individual to another by being in each other's presence as well as modeling these emotions (Gump & Kulik, 1997; Hatfield, Cacioppo, & Rapson, 1994). Thus, highly anxious parents tend to have highly anxious children. Therefore, COPE children were expected to have better adjustment outcomes (i.e., fewer externalizing and internalizing behaviors) than control children because of their parents' ability to cope effectively with the stressful events surrounding hospitalization in the PICU, resulting in less anxiety.

In summary, from this theoretical framework, it was hypothesized that the COPE program would positively affect post-hospital child adjustment through maternal beliefs about their children's responses to hospitalization and their role, as well as maternal state anxiety and level of support provided to their children during hospitalization. Figure 1 graphically presents
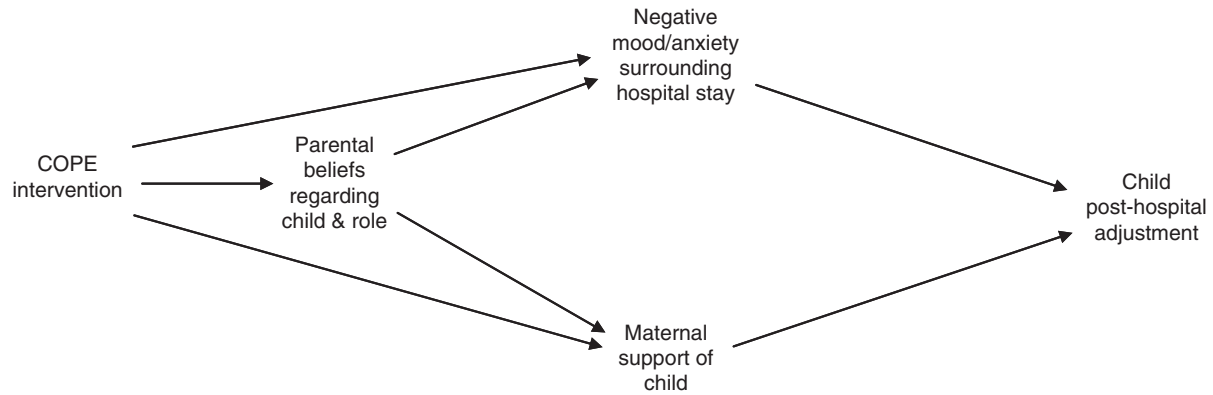
Figure 1. Theoretical model of COPE intervention effects.

this model. As noted in the figure, we hypothesized that the intervention effects on child adjustment are not direct, but rather work via their associations with important parenting variables. That is, the intervention was expected to: (a) promote more positive beliefs in one's abilities to parent, (b) reduce anxiety surrounding the hospital stay, and (c) enhance positive supportive parenting behaviors during hospitalization. Furthermore, more positive parental beliefs were hypothesized to influence later child adjustment indirectly, via associations with parental anxiety and support. Each of these, in turn, was hypothesized to influence later child adjustment.

Method
Participants

The sample for the main study included 174 of 212 eligible mothers (82.1%) and their 2–7-year-old children who were unexpectedly hospitalized in the PICUs of two children's hospitals in the northeast region of the US. Mothers were targeted and approached to participate in the study if their children: (a) experienced an unplanned admission to the PICU, (b) were between the ages of 2 and 7 years, (c) were expected to survive, (d) had no prior ICU admissions, (e) had no diagnosis of cancer, and (f) had no suspected or diagnosed physical abuse. There were 38 refusals (17 mothers were too tired or stressed, 7 wanted to focus only on their child, and 14 stated other reasons). The final sample for the main study included 163 mothers and their children, with 11 parents removed because of changes in their children's eligibility status (readmission to PICU, $n = 6$; PICU admission >30 days, $n = 1$; prior PICU admission, $n = 1$; death of child, $n = 2$; and a planned admission to PICU, $n = 1$). Additionally, data from 20 mothers were dropped from the current study because of missing data for the

variables of interest—9 mothers only completed the trait anxiety measure and 11 mothers provided reports of trait anxiety and father's education only.

Mothers ranged in age from 18 to 52 years with a mean of 31.1 years. Seventy-six percent of the 143 mothers were white and 87.7% completed high school. The household income for 67% of the mothers was at least $15,000 per year. The mean age of the critically ill children was 51.5 months. Sixty-two percent of the children were male and 38% were female. The unplanned admission diagnoses were categorized as respiratory problems ($n = 59$, 41%), accidental trauma ($n = 29$, 20%), neurologic problems ($n = 24$, 17%), and infection ($n = 15$, 11%), with the remaining 16 (11%) children having various other conditions (e.g., renal problems). In terms of COPE versus control group differences, there was a trend towards significance with mothers participating in the COPE intervention ($n = 78$) being better educated [61% having attended at least some college vs. 40% of the control mothers ($n = 65$); χ^2 (6 df) $= 10.46$; $p = .107$]. Similarly, there was a statistical trend with mothers participating in the COPE intervention reporting more family income than did control mothers (46% of the COPE mothers reported a family income of $30,000 or more versus 37% of the control mothers; χ^2 (5 df) $= 9.25$; $p = .099$). There were no other COPE versus control group differences on maternal or child demographic variables (the interested reader is referred to Melnyk et al., 2004 for further descriptions of the sample and procedures). To help control for the socioeconomic differences noted above, a socioeconomic status (SES) latent variable was added to the model as a source variable. Mother's and, father's education, and family income level were used as indicators of this SES latent variable. Additionally, trait anxiety was included as a source variable to help account for the more stable anxiety characteristics of the mothers.

Given the 35% attrition rate by the 3 months post hospital discharge in the current sample, analyses were conducted to examine whether baseline differences existed between mothers who remained in the study and those who were missing at the final time point. It is important to note that there were no statistical differences between mothers who remained in the study and those whose data were not available at 3 months post-discharge on experimental condition, maternal age, race, marital status, education of mother, education of father, trait anxiety, child age, prism score, type of admission, length of stay in PICU, or length of stay in the pediatric unit. However, there was a statistically significant difference between the groups on family income. Typical of many longitudinal studies (Bell, Garaleck, & Ellickson, 1990; Ribisl et al., 1996), families who attrited were poorer at baseline than those that remained in the study.

Measures

Parental Beliefs about Their Hospitalized Children and Their Role
The Parental Beliefs Scale (PBS) for Parents of Hospitalized Children (Melnyk, 1995) was used to assess parental beliefs about their hospitalized child's responses to hospitalization (e.g., *I know what changes in behavior to expect in my hospitalized child*) and their role (e.g., *I am clear about the things I can do to best help my child*). Parents answered each of the 20 items on a 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Item scores were summed, with a possible range of scores from 20 to 100. Higher scores indicated stronger beliefs. Cronbach's α for this sample was .91.

Trait and State Anxiety
Mothers' trait and state anxiety were assessed with the State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Lushene, 1977). The STAI is a 40-item questionnaire designed to assess transient or situational (state), and stable or dispositional (trait) symptoms of anxiety. The questionnaire consists of two series of 20 statements that describe individuals (e.g., *I feel nervous and restless*). Participants are asked to respond to the first 20 statements (assessing state anxiety) according to how well each describes them at the moment they complete the questionnaire and to the second 20 items (assessing trait anxiety) according to how they generally feel. Responses are rated from 1 (*not at all/almost never*) to 4 (*very much so/almost always*). Scores are summed to provide a state and a trait anxiety score; higher scores indicate higher anxiety levels. The Cronbach's αs for state and trait anxiety for this sample were .95 and .93, respectively.

Maternal Negative Mood
The Profile of Mood States (short form) (Lorr & McNair, 1989) was used to measure maternal negative mood state. This instrument yields scores of six negative mood states and a total score. The total score was used in the current study. Subjects respond to 30 items on a 5-point Likert scale that ranges from 0 (*not at all*) to 4 (*extremely*). Scores on the instrument range from 0 to 120. Construct validity has been supported through numerous studies (Lorr & McNair, 1989) and Cronbach's α was 0.95 with this sample.

Maternal Support
The children's primary care nurses, who were blind to study condition, were asked to make hatch marks on two visual analog scales that were 10 cm in length, indicating the extent to which the children's mothers participated in the physical and emotional care of their children. The possible range of scores was from 0 to 100. Higher scores on these scales indicated greater involvement by mothers in their child's care.

Children's Adjustment
The Behavioral Assessment System for Children (BASC) parent rating scale, with its established construct validity and consistently reported high internal consistency reliability, was used to assess children's adjustment (Reynolds & Kamphaus, 1992). The BASC is a comprehensive measure of both adaptive and problem behaviors. Mothers rated their children, during the past 3 months, for each of the 131 items on a 4-point Likert scale, ranging from 1 (*never*) to 4 (*always*). The 131 items constitute 10 syndrome scores and 3 broadband scores: *Internalizing Problems* (characterized by more thought-oriented symptoms such as depression and anxiety), *Externalizing Problems* (characterized by more action-oriented symptoms such as aggression and hyperactivity), and *Adaptive Skills* (characterized by the level of individual assets, such as adaptability and social skills). For the current study, the latent variables of internalizing adjustment problems using the BASC *t*-scores (which take gender and age into account), comprised of *depression* (α = .87 for the current study), *anxiety* (α = .87), *somatization* (α = .76), and *withdrawal* (α = .83) as indicators, and externalizing adjustment problems, comprised of *aggression* (α = .90), *hyperactivity* (α = .88), and *attention problems* (α = .82) as indicators,

were used. The residual variances of these two latent variables were allowed to be correlated in the model tested.

Timing of Measures

The STAI trait scale was completed by mothers within 6–16 hr after admission to the PICU. Maternal state anxiety, mood state, parental beliefs, and nurses' ratings of parental support for their children were completed 24–36 hr after transfer from the PICU to the pediatric unit. Mothers completed the BASC at 3 months after their child's discharge from the hospital. The measures were planned at these various times throughout the study to allow time for the phases of the intervention to exert their effects (e.g., parental beliefs were expected to be strengthened as a result of both the Phases I and II COPE interventions).

Procedure

Participants were randomly assigned to receive either the COPE or control group program by 1-week blocks of time in order to decrease the probability of staff-to-parent and parent-to-parent contamination (i.e., the likelihood that parents in the PICU who were in different study groups would exchange content that was provided to them in their experimental program). To ensure treatment fidelity, both groups received an audiotaped and written educational–behavioral intervention program (i.e., COPE or control) delivered in a consistent manner by trained interventionists in three phases: (a) Phase I: within 6–16 hr of their child's admission to the PICU, (b) Phase II: within 2–16 hr after their child was transferred from the PICU to the general pediatric unit, and (c) Phase III: within 2–3 days after their child was discharged from the hospital. Mothers in the control group received a structurally equivalent control program in three phases that focused on hospital policies. Manipulation checks, completed by the mothers, verified that they processed their group-specific information. Further description of these manipulation checks can be found in Melnyk et al. (2004).

The COPE Program

The experimental program focused on increasing: (a) parents' knowledge and understanding of the range of behaviors and emotions that young children typically display during and following hospitalization and (b) direct parental participation in their children's emotional and physical care. Phase I of the intervention in the PICU consisted of audiotaped and matched written information.

Phase II of the COPE intervention, a ''booster'' intervention that occurred shortly after transfer from the PICU to the general pediatric unit, consisted of: (a) audiotaped and written information that reinforced critical content of the initial audiotape and provided additional information on children's responses during and following hospitalization, as well as provided mothers with further suggestions to enhance coping outcomes in their children, and (b) a parent–child activity skills building workbook. The workbook contained three activities to be completed before discharge from the hospital; puppet play to encourage expression of emotions in a nonthreatening manner, therapeutic medical play to assist children in obtaining some sense of mastery and control over the hospital experience, and reading and discussing *Jenny's Wish*, a story about a young child who successfully copes with a stressful hospitalization.

Phase III of the COPE intervention program, the second ''booster'' intervention, occurred 2–3 days after hospital discharge and consisted of a telephone call during which a 5 minute script was read that reinforced the following: (a) young children's typical post-discharge emotions and behaviors, and (b) parenting behaviors which would continue to facilitate positive coping outcomes in their children. Mothers were encouraged to continue to perform the activities from the workbook that they received during hospitalization. Immediately following the telephone intervention, mothers were mailed the telephone script.

The COPE program was delivered in phases because of the high anxiety levels that parents experience shortly after their children's admission to the PICU (Melnyk et al., 1997) and the importance of not providing parents with an overwhelming amount of information at this very stressful time. The Phase II intervention was designed to build and expand upon the information provided in the PICU at a time when parental anxiety diminishes and their opportunity to work more interactively with their children increases (i.e., after transfer from the PICU to the general pediatric unit). The Phase III intervention was conducted shortly after discharge to reinforce to parents that continued changes in children's behaviors and emotions for a time after hospitalization were ''normal,'' as well as to encourage further use of the parent–child activities to enhance coping outcomes in their children. The previous pilot study supported this 3-phase approach to delivering the COPE program (Melnyk et al., 1997).

The Control Program

The structurally equivalent control program also consisted of three phases, which occurred at the same times as the COPE program. Phase I provided audiotaped and written information about the PICU's services and policies. Phase II consisted of: (a) audiotaped and written information about the general pediatric unit and its policies, and (b) a parent–child activity workbook containing "control" activities (e.g., reading a non-hospital-related book; working with play dough). Phase III of the control program consisted of a telephone call 2–3 days after discharge during which time mothers were informed that they should contact their primary healthcare providers if their children were having any problems or unusual symptoms. They also were asked to comment on their children's hospital stays during this telephone call.

Results

Table I presents the means, SDs, and correlations among the study variables. The *Mplus* statistical package (v 4.0) was used in all modeling procedures (Muthen & Muthen, 2006). To provide a metric for the latent constructs and to identify the measurement model, the first construct loading for each of the latent variables was set to 1.00. Typical of many longitudinal intervention studies, missing data was an issue (16% missing values) as the amount and timing of data collection activities was quite complex. The full-information maximum-likelihood estimation method was employed as a means of efficiently incorporating all of the available information. Full-information estimation has been shown to provide more realistic parameter estimates than other missing data techniques (e.g., listwise, pairwise, mean imputation; Arbuckle, 1996). Goodness of fit of the model was assessed using the associated chi-square, the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993), and the comparative fit index (CFI; Bentler, 1990). The standardized coefficients and the goodness-of-fit indices [χ^2 (97 df) $= 129.43$; $p = .016$; RMSEA $= .048$; 90% confidence interval (CI) $= .022–.070$; CFI $= .95$] suggested that this model provided a satisfactory fit of the model to the data. We attribute the significant chi-square to be due largely to the complexity of the model and to the significant univariate and multivariate departures from normality in the variables.

Measurement Results

Figure 2 presents the standardized measurement loadings and structural results for the tested model. As shown, the standardized parameter estimates for the measurement model were reasonably high and all were significant ($p < .01$). Each of the BASC subscales were statistically significant as indicators of either internalizing or externalizing child adjustment problems and it is interesting to note that the less common problems of *somatization* (.53) and *withdrawal* (.45) were the least strong of the internalizing indicators, while the three indicators of externalizing problems were fairly equal. Nurses' ratings on the quality of physical support (.93) and emotional support (.91) were used as indicators of *Mother's Support of Child*. Two indicators were used to assess the level of *Mother's Negative Mood State;* the total negative mood scale of the Profile of Mood States (.89) and the state anxiety score from the STAI (.94). All three indicators of the *Socioeconomic Status* latent variable were significant, and all were approximately equal (i.e., family income $= .68$; mother's education $= .70$; father's education $= .77$). The remaining latent constructs of *Group Membership* (COPE $= 1$; control grou $p = 0$), *Trait Anxiety*, and *Parental Beliefs* were each measured using a single indicator. Both *Trait Anxiety* and *Parental Beliefs* indicators were adjusted for the effects of unreliability in the model (i.e., the unstandardized measurement loading was fixed at $1 - \alpha$ times the variance). *Group membership*'s residual variance was assumed to be 0.

Structural Results

As noted in Fig. 2, participation in the COPE intervention was associated with stronger parental beliefs regarding the child and the parenting role (.19, $p < .05$) which, in turn, were related to less negative mood state in mothers ($-.35$, $p < .01$). Mothers' negative mood state was associated with externalizing adjustment problems in the children (.36, $p < .01$), such that less negative mood state was associated with reduced acting-out problems in the children. However, mothers' negative mood state was not significantly associated with children's internalizing adjustment problems (.25, $p =$ n.s.). The direct associations between parenting beliefs and child internalizing ($-.06$, $p =$ n.s.) or externalizing ($-.04$, $p =$ n.s.) adjustment problems also were not significant. Participation in the COPE intervention was associated with stronger beliefs/confidence in parenting. Such beliefs were associated with less maternal negative mood regarding the hospital stay, which in turn was associated with fewer externalizing adjustment problems in the children.

Table I. Means, *SD*s, and Correlations of Study Variables

| Variable	*N*	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Group	143	.55	0.50	1.00																
2. Trait anxiety	143	38.12	11.09	−.05	1.00															
3. Family income	137	3.88	1.83	.02	−.28***	1.00														
4. Mother education	142	3.75	1.34	.14	−.12	.45***	1.00													
5. Father education	138	3.59	1.32	.06	−.22*	.48***	.56***	1.00												
6. Parental beliefs	141	70.72	12.24	.19*	−.28***	−.13	.07	.12	1.00											
7. Profile of Mood States	139	38.76	21.83	−.06	.49***	−.05	−.10	−.07	−.41***	1.00										
8. State anxiety	141	40.68	13.11	−.07	.54***	−.06	−.14	−.11	−.45***	.84***										
9. Physical support	130	71.66	22.64	.26**	−.11	.27**	.22*	.29***	.05	−.08	−0.07	1.00								
10. Emotional support	130	74.01	20.73	.25**	−.12	.24**	.18*	.21*	.06	−.07	−0.04	.84***	1.00							
11. Somatization	93	52.44	14.65	.00	.17	−.14	.00	−.14	−.13	.23*	.23*	−.15	−.11	1.00						
12. Withdrawal	93	46.67	10.87	.01	.34**	−.29*	.09	.02	−.00	.32**	.31**	.05	−.02	.35***	1.00					
13. Depression	93	49.57	14.67	−.09	.31**	−.19	−.02	−.19	−.21*	.39***	.34***	−.34***	−.37***	.52***	.44***	1.00				
14. Anxiety	92	48.64	13.69	−.10	.15	−.08	.06	−.10	−.21*	.26*	.27**	−.24*	−.21	.52***	.29***	.76***	1.00			
15. Attention Problems	94	52.02	13.46	.14	.23*	−.17	.05	−.16	−.17	.42***	.34***	−.28*	−.33**	.39***	.36***	.65***	.54***	1.00		
16. Aggression	93	51.12	13.45	−.14	.31**	−.19	−.05	−.23*	−.26*	.40***	.36***	−.37***	−.43***	.34***	.43***	.69***	.47***	.62***	1.00	
17. Hyperactivity	93	52.11	13.46	−.14	.32**	−.04	.03	−.20	−.18	.44***	.34***	−.29**	−.34**	.28**	.31**	.64***	.40***	.75***	.63***	1.00

*p < .05, **p < .01, ***p < .001.
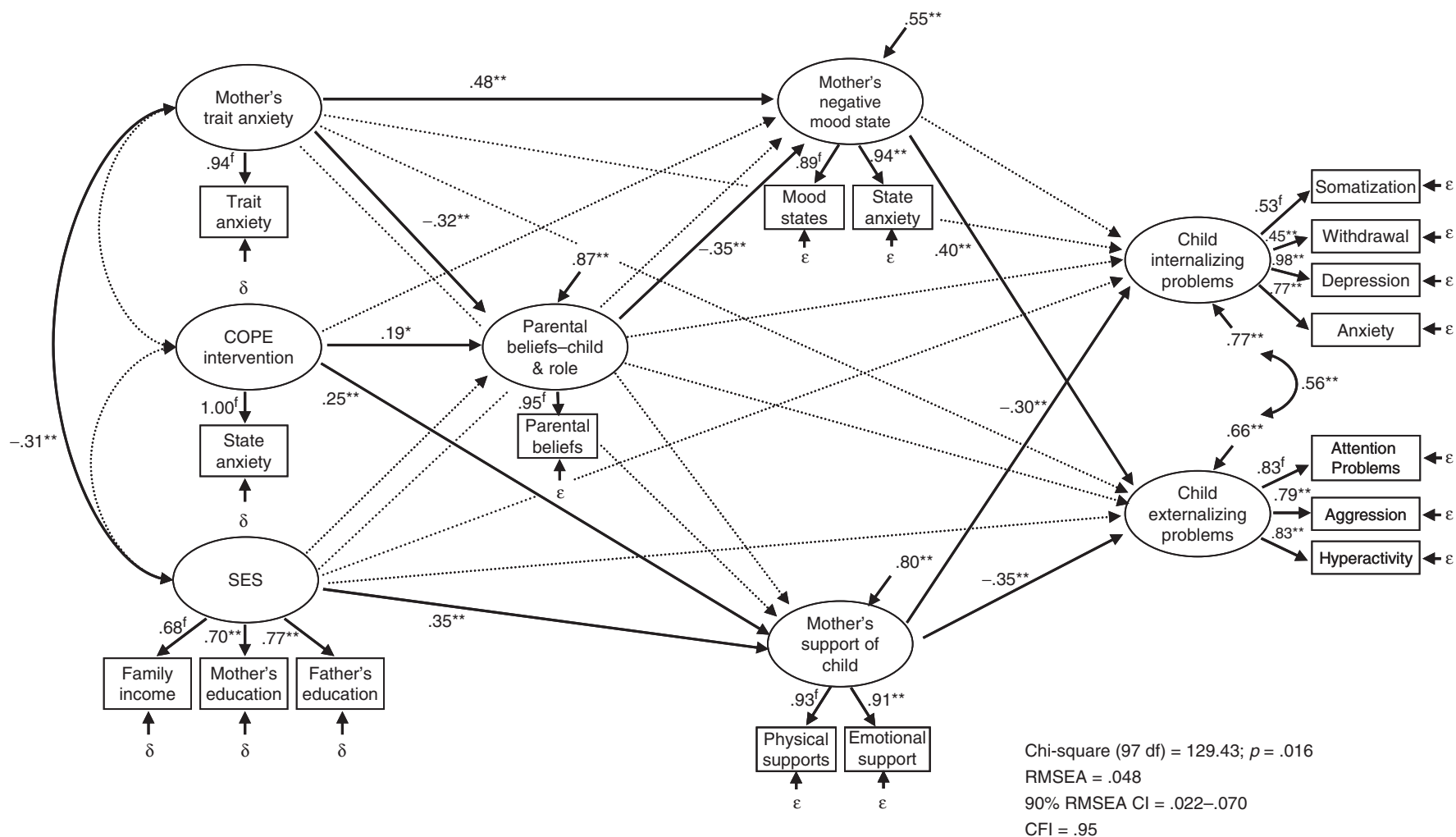
Figure 2. Standardized results of structural equation (solid lines represent significant effects, dashed lines represent nonsignificant paths) and measurement models predicting post-hospital childhood internalizing and externalizing problems. Latent constructs are shown in ellipses and observed variables are shown in rectangles. δ and ε represent unique variance in the observed X and Y variables, respectively. The unlabeled arrows pointing to the endogenous latent variables show the residual (unaccounted for) variance for each of these variables. A superscript f indicates a parameter set to 1.0 in the unstandardized solution. *$p < .05$, **$p < .01$; SES, socioeconomic status.

A second mechanism by which participation in the COPE intervention was associated with reduced child adjustment problems was via mother's support of her child. Here, mother's support of her child was related to both child internalizing (−.30, $p < .01$) and externalizing (−.34, $p < .01$) adjustment problems (i.e., more support being associated with less internalizing and externalizing adjustment problems in the child). Furthermore, participation in the COPE intervention was directly associated with mother's support of her child (.25, $p < .01$)—participation in the intervention was associated with higher scores of nurse-rated mother's support of child. Thus, the COPE intervention was associated with higher maternal support ratings by nurses who were blind to study group. Higher support, in turn, was associated with fewer post-hospital internalizing and externalizing adjustment problems in the children.

The indirect effects were tested using the bias-corrected bootstrap confidence limits. Significance was assessed by whether or not the 95% confidence limits contained zero. This approach takes the non-normality of the multiplicative distribution into account (resulting in asymmetric confidence limits) and has been shown to provide the most accurate confidence limits and greatest statistical power when compared with other existing approaches for detecting mediation (MacKinnon, Lockwood, & Williams, 2004; Shrout & Bolger, 2002). Using 1000 resamples, the COPE intervention's indirect effects to both internalizing (total estimate = −1.44; 95% CI = −3.67 to −.31) and externalizing adjustment problems (total estimate = −1.92; 95% CI = −5.21 to −.60) were significant. Moreover, each specific indirect effect was significant. That is, the specific indirect effect from the COPE intervention to mother's support to externalizing adjustment problems was significant (−1.47; 95% CI = −4.75 to −.12), suggesting that the link between COPE and externalizing adjustment via mother's global support is significant. Additionally, the indirect effect from the COPE intervention to global support to internalizing adjustment was significant (−1.17; 95% CI = −3.71 to −.08) as was the indirect effect from the COPE intervention to parental beliefs to maternal negative mood state to children's externalizing adjustment problems (−0.45; 95% CI = −2.10 to −.11).

Finally, the effects of mother's trait anxiety and SES also were examined in the structural model tested. As expected, mother's trait anxiety was significantly associated with mother's negative mood state (.48, $p < .01$). Mother's trait anxiety also was associated with parental beliefs (−.32, $p < .01$). Higher mother's trait anxiety was associated with less positive parental beliefs regarding the child and the parental role. Further, parental beliefs were associated with maternal negative mood state (−.35, $p < .01$)—higher beliefs were associated with less maternal negative mood state. Mother's trait anxiety, however, was not directly related to either children's internalizing adjustment problems (.10, p = n.s.) or their externalizing adjustment problems (.07, p = n.s.). Rather, the effects of mother's trait anxiety on child adjustment problems were indirect, via their associations with parental beliefs and mother's negative mood state. SES also had significant associations with important variables in the model. Specifically, SES was associated with mother's support of child (.34, $p < .01$)—higher SES being associated with increased mother support. As previously noted, mother's support of child was related to both internalizing and externalizing problems in the child. However, SES was not directly related to either internalizing or externalizing adjustment problems in the child. Finally, omitting mother's trait anxiety or SES from the model does not change the patterns of findings among the remaining variables (i.e., the effects of the COPE intervention on child adjustment still hold via the relationships with parental beliefs regarding the child and the parental role, mother's negative mood state, and mother's support of child).

Additionally, the residual variances among children's internalizing and externalizing problems were significantly related (.53, $p < .01$), even after accounting for the other relationships in the model. As found in a number of other studies [see Angold, Costello and Erkanli (1999) and Caron and Rutter (1991) for reviews], children's internalizing and externalizing problems are positively related and often comorbid.

Discussion

As hypothesized, the effects of the COPE program on children's post-hospital internalizing and externalizing adjustment problems were indirect, via associations with parental beliefs about their hospitalized child and their role as well as by maternal emotional and functional coping (i.e., maternal state anxiety and mothers' support of their children during hospitalization). Mothers who participated in the COPE program had stronger beliefs about what to expect in their children's behaviors and emotions as they dealt with hospitalization as well as what they could do to help their children cope with the

stressful experience, which was associated with less maternal anxiety surrounding the hospital stay. Subsequently, less maternal anxiety was associated with better child adjustment. Finally, the COPE program was directly related to the amount of support that mothers provided to their children during the hospital stay, which in turn was associated with better child internalizing and externalizing adjustment. There is now accumulating evidence across studies that provide empirical support for the functions of maternal beliefs, negative mood states, and support during hospitalization on children's post-hospital adjustment (Melnyk, 1995; Melnyk et al., 1997; Melnyk et al., 2004).

The unique contribution of this study is that it provides further understanding of the processes through which a theory-based intervention exerts its effects on children's post-hospital adjustment. From self-regulation theory, the evidence supports that when mothers are informed of their children's range of emotions and behaviors in response to hospitalization, they are able to create a cognitive schema that enables them to understand and interpret their children's behaviors. This understanding and confidence, in the form of beliefs, lessens maternal negative mood state and allows them to engage in problem-focused coping (i.e., participation in their hospitalized children's care). In addition, from control theory, being informed of specific strategies to engage in their children's care and assisting mothers in coping with the experience may have led to the removal of barriers that interfere with participation in their children's care. Participation in COPE also was associated with mothers being more supportive to their children during hospitalization than were control mothers.

Mothers' trait anxiety was not directly related to either internalizing or externalizing problems in the children, but rather was related indirectly via associations with parental beliefs and mother's negative mood state. That is, high maternal trait anxiety was related to lower parental beliefs in their ability to help their children cope during hospitalization. Additionally, lower parental beliefs were associated with increased negative mood, which was related to more externalizing problems in the children. While the emotional contagion hypothesis contends that highly anxious parents tend to have highly anxious children, internalizing problems were not higher in children whose mothers reported higher levels of anxiety. However, higher maternal trait and state anxiety was related to children's externalizing behavior problems. This finding might be explained by the fact that

anxiety in younger children is often exhibited as more externalizing type behaviors, specifically hyperactivity and attention problems (Campbell, 2002; Curry, March, & Hervey, 2004). Future research examining more long-term outcomes of critically ill children may help elucidate if those children high in externalizing behaviors begin to exhibit more anxiety and other internalizing problems as they get older.

Despite support for the model tested, some limitations of this study exist. First, the study was conducted in only two PICUs located in hospitals within the northeast region of the US. Potential differences in practice may exist in other institutions that could influence generalizability of the study findings. Additionally, with the exception of the blinded nurse ratings of mother's involvement in the physical and emotional care of the child, all measures were completed by the mothers. Thus, shared method variance may account for some of the relationships found in the model tested. Future studies should include additional measures from nonbiased objective observers (e.g., the children's teachers or day care providers). Similar findings from such studies would add to the robustness of the current findings. A further limitation of the present study is that a number of competing models also exist that might fit the data equally well. While we believe that the model tested does capture important processes regarding how the COPE intervention exerts positive effects on children's adjustment, other models may exist that should be tested (MacCallum, Wegener, Uchino, & Fabrigar, 1993). Related, while the randomization adds to the clarity of interpretation in that it preceded all other variables in the model, causal conclusions should be cautious and replication/extensions of the model should be conducted. Furthermore, the repeated assessments of key variables over time (starting at the baseline data collection point) coupled with temporally based analytic strategies are necessary to more firmly demonstrate the timing and direction of the indirect effects (Holland, 1988; Kraemer, Wilson, Fairburn, & Agras, 2002; Weersing & Weisz, 2002). It should also be noted that variables outside the model likely influence parental competencies and children's adjustment. For instance, the role of fathers and other caregivers clearly make unique contributions to children's adjustment, but were not examined in the model tested (Phares & Compas, 1992). Future research should include them as well as other important parenting variables.

Because the incidence of mental health problems is higher in children who experience a critical care

hospitalization versus a general pediatric hospitalization, administering preventive interventions such as the COPE program to parents could help protect these high-risk children from developing adverse mental health problems. This is especially important since there is a documented lack of mental health screening and early intervention services for children throughout the US, and the treatments associated with such disorders tend to be costly (Jones et al., 1992; Melnyk & Moldenhauer, 2006; Melnyk, Brown, Jones, Novak, & Kreipe, 2003).

The present study adds to an understanding of the processes related to patient outcomes in a successful intervention for high-risk children and their families. Because the COPE program is an easy-to-administer, reproducible, time-efficient intervention and the accumulating evidence is strong that it enhances maternal and child outcomes during and following hospitalization, its clinical significance is high in that it can be easily transported to pediatric hospitals and administered as standard family-centered care to all parents of young critically ill hospitalized children to reduce children's post-hospital behavior problems.

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