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Posttraumatic Stress Symptoms in Parents of Pediatric Cancer Patients: A Mediational Analysis

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Abstract

Objective—Prior research finds that anxiety and depression among parents of pediatric cancer patients are associated with posttraumatic stress symptoms in response to children's cancer. This study examined whether this relationship is mediated by parents' negative affective reactions in response to their children's cancer-related treatment procedures.

Methods—Participants were parents of 101 patients within six months of diagnosis who had completed at least two treatment-related procedures. Parents completed measures of trait anxiety and depression at baseline and posttraumatic stress symptoms at 3-month follow-up assessment. On the day of each treatment procedure, parents completed measures of state anxiety immediately before and negative mood and distress immediately after the procedure.

Results—Trait anxiety was positively associated with state anxiety immediately before procedures and negative mood after procedures. Depression was positively associated with state anxiety immediately before procedures and negative mood and distress after procedures. Both trait anxiety and depression were positively associated with posttraumatic stress symptoms at 3-months follow-up. Parent state anxiety, negative mood, and distress partially mediated the effects of trait anxiety and/or depression on posttraumatic stress symptoms. Controlling for child age and social desirability did not affect these relationships.

Conclusions—Parents' trait anxiety and depression may influence cancer-related posttraumatic stress partially through their effect on parents' negative affective reactions at the time of their child's treatment procedures. These findings provide a more nuanced understanding of how

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parents' affect in response to procedures contributes to parent posttraumatic stress and suggest that interventions targeting treatment-related affective reactions of parents with high trait anxiety and/or depression may reduce the risk for longer-term distress and posttraumatic stress symptoms.

Keywords

Families; Pediatric; Cancer; Anxiety; Depression; Posttraumatic stress

Introduction

Having a child with cancer affects parents' psychological and physical health [1]. For example, Stuber et al. [2] reported that 39% of mothers and 33% of fathers of pediatric cancer survivors reported symptoms consistent with severe posttraumatic stress (PTSS). Using cutoff scores suggested by Rash et al. [3], Dunn et al. [4] reported similar levels of PTSS among parents whose children were within 6 months of diagnosis. Although it is not clear whether scores above these cutoffs actually represent posttraumatic stress disorder [5], parents of pediatric cancer patients are likely at risk for ongoing elevated distress. Dunn et al. [4] found a positive relationship between parents' current levels of anxiety and depression and PTSS and concluded "PTSS may be part of a broader pattern of emotional distress (experienced by) a substantial portion of mothers and fathers of children and youth with cancer..." (p. 176).

The present study extends Dunn et al. [4] and other research on PTSS among parents of pediatric cancer patients [6] in two ways. First, Dunn et al. assessed anxiety and depression concurrently with PTSS; the present study assessed anxiety and depression up to 7 months before assessing PTSS and investigated whether parents' subsequent PTSS was correlated with parents' baseline anxiety and/ or depression. Second, the study examined whether the relationship between parents' trait anxiety and depression and PTSS is mediated by parents' negative affective reactions specific to treatment-related procedures (i.e., port-starts, lumbar punctures, or bone marrow aspirations). It was hypothesized that parents' negative affective reactions at the time of children's procedures would mediate the relationship between parents' trait anxiety and depression at baseline and subsequent PTSS.

Methods

Participants and procedures

This study is part of an ongoing longitudinal study that began in 2009 at two children's hospitals; data were collected between 2009 and 2013. Participants were 101 parents (80% mothers) of pediatric cancer patients who were present at two or more of their children's treatment-related procedures (M_{age}=34.44, *SD*=7.18; range=20-54). Self-reported ethnicities were White (71%), Black (19%), Hispanic/ Latino (7%), and other (3%). Seventy percent had completed some college; 52% were unemployed; and 56% reported incomes <$60,000 per year. Children (61% male; M_{age}= 6.47, *SD*=3.15; range=3-12) were within 6 months of initial diagnosis and receiving outpatient treatment. The majority of children (79%) were diagnosed with Acute Lymphoblastic Leukemia. On average, children had been in treatment 9.09 weeks (*SD*=5.34; range=4-21.86 weeks) when they entered the study, and in the two

months prior to study entry, had undergone 3.94 (*SD*=2.63; range=0-12) lumbar punctures (LP), 2.07 (*SD*=1.58; range=0-7) bone marrow aspirations (BMA), and 9.65 (*SD*=9.93; range=0-30) port-start procedures. Procedures observed were either port starts for chemo infusion (using topical anesthesia) or BMAs, LPs, or combined BMA/LP (using general anesthesia). Parents completed assessments of trait anxiety and depression at study entry and state negative affective reactions at each procedure. Procedures observed were separated by at least 2 weeks with the first procedure typically occurring 2-4 weeks after baseline. Parents completed the PTSS measure 3 months after the last observed procedure. Mean amount of time from baseline to the assessment of PTSS in the present study was 7.61 months (*SD*=2.78; median=7.08 months).

The study protocol was reviewed and approved by human subjects review boards at each institution. All eligible families were initially approached by clinic staff members. Parents signed informed consent forms, and when appropriate, children provided verbal assent. Approximately 87% of families approached agreed to participate. Parents received $15 gift cards for the baseline assessment and each video-recorded procedure and $20 for the 3-month follow-up. Children were paid $10 for each of these data collection points.

Questionnaires

At study entry, parents reported their own demographic characteristics and levels of anxiety and depression and children's demographics and medical history. *Trait anxiety* was assessed with the 20-item trait subscale of the State-Trait Anxiety Inventory (STAI [7]). (Coefficient alpha (α)=.89; note: all reliabilities are for this sample.) *Depression* was measured with the original 20-item Center for Epidemiologic Studies—Depression Scale [8] (α=.88). The tendency to give answers biased toward a favorable self-presentation was assessed with a 13-item measure (*yes/no* response format) of *Social Desirability* [9] (odd-even item correlation [Spearman-Brown correction]=.72).

Parents completed three measures of negative affective reactions at the time of each procedure. *State anxiety* was measured with the state subscale of the STAI [7] immediately *before* each procedure (αs≥.92 at each procedure). Parents remained with their children throughout port-start procedures and left immediately after the child was sedated for an LP or BMA procedure. Immediately *after* each procedure, parents completed the *Positive and Negative Affect Scale* (PANAS; [10]), which assessed how they felt during the *procedure* (αs ≥.90 at each procedure; only the PANAS Negative was used in the analyses). Immediately after each procedure, parents also reported their level of *Distress* during procedures using the Faces Scale [11]. To control for differences in responses to type of anesthesia, scores were standardized within type of anesthesia and combined into a single distribution.

Post-traumatic stress symptoms—Three months after the last observed procedure, parents completed the 22-item Impact of Events Scale-Revised [12], which mirrors *DSM-IV* criteria for PTSD; it was keyed to parents' experience of their child's cancer treatment procedures [13] (α=.92).

Data preparation and analysis

Values for sporadic missing data (≤1% of all items) were imputed using mean substitution. The temporal stability of the measures of parent negative affective reactions across treatment procedures in this sample is quite high [14]; therefore, each of the affect measures (i.e., state anxiety, negative affect, and parent distress) was converted into a single average standardized score for that measure, which was used in the analyses. Statistical analyses were performed using IBM Statistical Package for the Social Sciences, Release 22.0. Mediational analyses used Hayes' [15] PROCESS SPSS macros (Models 4 and 6), which estimate path coefficients and calculate bootstrap confidence intervals for total and indirect effects in mediator models. The test of indirect effects is whether the product of the path from predictor to mediator and path from mediator to outcome differs significantly from zero.

To provide stable values of estimators in all models, bootstrapping was used with 5,000 samples.

Results

Parent gender differences

There were no differences between mothers and fathers with respect to their own or their child's demographic/medical characteristics, amount of time spent with the child during procedures (*p*s>.05), or on any of the assessments (*p*s>.18). As there were no significant gender differences, and there were only 16 fathers in the sample, mothers and fathers were included in the same analyses.

Correlates of predictor/outcome measures

Child medical factors (i.e., time in treatment, number of procedures, type of procedure, diagnosis) were not significantly related to any predictor or outcome variables. However, child age was significantly related to parents' distress at the time of treatments (r=-.25, p<.05) and was therefore controlled in all analyses.

Table 1 presents means and SDs for all measures and inter-correlations. Trait anxiety and depression were significantly correlated with each another (r=.58, p<.001), and as shown in Table 1, with PTSS. Parents' affective reactions to treatments (i.e., state anxiety, negative mood, and parent distress) were significantly and positively correlated with depression and PTSS; only state anxiety and negative mood were significantly correlated with trait anxiety.

Mediation models

Six meditational models were tested; in all models, parents' PTSS at 3-month follow-up assessment was the outcome variable. Trait anxiety was the predictor in the first three models, and each of the affective reactions to treatments (i.e., state anxiety, negative mood, and parent distress) served as the mediator in each model. The other three models used depression as the predictor and parents' affective reactions as the mediators. All analyses controlled for child age and parent social desirability. Table 2 presents the results of the tests of the models.

Mediators of trait anxiety—In the first model, state anxiety partially mediated the relationship between trait anxiety and PTSS; that is, in the full mediational model, while trait anxiety had a significant effect on PTSS, the indirect effect of state anxiety was also significant (*indirect effect*=.26, *SE*=.08, 95% *CI* [.12,.46]). In the second mediational model, negative mood also partially mediated relationship between parent trait anxiety and PTSS; that is, trait anxiety had a significant effect on PTSS, but the indirect effect of negative mood was also significant (*indirect effect*=.10, *SE*=.06, 95% *CI* [.01,.25]). In the third model, the indirect effect of trait anxiety through parent distress was *not* significant (*indirect effect*=.06, *SE*=.05, 95% *CI* [-.02,.19]).

Mediators of depression—In the first model, state anxiety partially mediated the relationship between parent depression and PTSS (*indirect effect*=.24, *SE*=.09, 95% *CI* [.09,.42]). In the second model, negative mood also partially mediated this relationship (*indirect effect*=.15, *SE*=.06, 95% *CI* [.05,.31]). In the third model, parent distress partially mediated this relationship as well (*indirect effect*=.12, *SE*=.07, 95% *CI* [.02,.28]).

Post-hoc analyses were conducted to further explore the causal sequence of parents' negative affective reactions to the procedures. Specifically, we tested serial models with trait anxiety and depression as predictors and state anxiety *before* and negative mood and distress *after* treatment as mediators. The overall model with trait anxiety as the predictor, state anxiety and negative mood as mediators, and PTSS as the outcome was significant, $F[4,95]=13.72$, $p<.001$, $R^2=.37$. The only significant indirect path was a serial one in which state anxiety *before* treatment *causes* negative mood *after* treatment, which then causes PTSS (*indirect effect*=.10, *SE*=.06, 95% CI [.02,.25]). There were no significant indirect paths in the serial mediation model with depression as the predictor, state anxiety, negative mood, and parent distress as mediators, and PTSS as the outcome.

Discussion

The mean PTSS score was 27.18 in this sample. Consistent with Dunn et al. [4], a substantial percentage of parents (36%) had PTSS scores ≥34. This level is despite the fact that children with relapse were not included and PTSS was measured much later in treatment. However, replicating previous findings on PTSS levels among parents of pediatric cancer patients was not the focus of this study. Indeed, without a control group of parents of children without cancer (as used by [13]), one cannot determine the relative elevation of PTSS for parents of children with cancer.

The current study used a longitudinal design in which measures of trait anxiety and depression were obtained approximately 7 months before the measure of PTSS. There were significant correlations between parents' baseline trait anxiety, baseline depression, and PTSS at 3-month follow-up. The major research question was whether parents' negative affective reactions at the time of treatment procedures mediated the relationship between their baseline anxiety and/or depression and subsequent PTSS. The answer is a qualified yes. The models testing state anxiety, negative mood, and parent distress as mediators found that all were partial mediators of the relationships between anxiety and/or depression and subsequent PTSS. This pattern of findings suggests that a parsimonious and plausible model

is one in which parents' trait anxiety and/or depression are directly related to PTSS and also impact parents' negative affective reactions to children's individual treatment procedures, which in turn also influence levels of PTSS.

The temporal precedence of anxiety and depression over PTSS suggests this causal model is quite tenable. However, in the absence of baseline measurements of parent PTSS, we can only conclude that causality is plausible. That is, we cannot definitively state that baseline anxiety/depression *caused* PTSS without accounting for parents' level of PTSS at baseline. Thus, it is unclear whether anxiety, depression, and PTSS are part of a broader pattern of emotional distress for parents, as argued by Dunn et al. [4], or whether they are distinct, but interrelated constructs, as argued by other researchers (e.g., [16]). Future research could more directly address this issue by including baseline measures of PTSS and by modeling the impact of multiple successive treatment procedures on PTSS (while controlling for baseline PTSS).

The post hoc analysis of models with multiple mediators showed a significant causal sequence in which trait anxiety affects state anxiety before treatment, which affects negative mood after treatment, which in turn impacts subsequent PTSS levels. However, the same model with depression as the predictor was not significant, suggesting caution in interpreting this causal relationship.

The primary benefit of these findings is offering practical implications for interventions intended to help parents of pediatric cancer patients. First, it may be possible to identify parents who are dispositionally more likely to experience strong negative affective reactions to their children's procedures relative to other parents. Further, these affective reactions may have an impact on the parents' longer-term distress (e.g., PTSS). Thus, our findings suggest that interventions could be targeted to "at-risk" parents (i.e., those with a greater dispositional propensity toward negative affective reactions) to help them modify their affective reactions to their children's treatments.

Understanding parents' dispositional tendencies toward negative affective reactions may provide professionals who work with parents of pediatric cancer patients with a well-defined and malleable target for interventions designed to reduce parents' longer-term distress in response to their child's cancer.

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Table 1

Descriptive Statistics and Correlations with Parents' PTSS (N=101).

	Trait Anxiety ***M=36.59 (SD=9.50)***	**Depression** ***M=15.25 (SD=9.86)***	**PTSS** ***M=27.18 (SD=15.43)***
State Anxiety *M=38.98 (SD=11.59)*	.50***	.58***	.53***
Negative Mood *M=16.07 (SD=6.35)*	.23*	.40***	.45***
Parent Distress *M=2.35 (SD=1.04)*	.18	.40***	.41***
PTSS	.46***	. 61***	---

All analyses control for child age. Trait anxiety and depression were measured at baseline. State anxiety was assessed before each treatment; PANAS negative mood and parent distress were assessed after each treatment; and average scores across the treatments were computed. PTSS was assessed three months after the last observed treatment.

For comparison, means based on national norms for the original version of the CES-D range from 7.1 (men) to 10.0 (women). Trait anxiety means range from 32.13 (men) to 38.39 (women) for adults between 20-49; state anxiety means range from 35.88 to 36.54 for adults in the same age range. A mean of 16.89 for PANAS Negative Mood is equivalent to the 69th percentile for a general adult population. Normative data are not available for parent distress.

* $p<.05$.

*** $p\leq.001$.

Table 2

Parents' Negative Affective Reactions as a Mediators of Parents' Trait Anxiety/Depression and Parent PTSS at 3-month Follow-Up.

Predictors	**Coefficient**	***SE***	**Overall *F***	**Predictors**	**Coefficient**	***SE***	**Overall *F***
Trait Anxiety	.36**	0.13	11.94***	Depression	.75***	0.15	17.53***
State Anxiety	6.66***	1.61		State Anxiety	4.41*	1.6	
Indirect effect=.26, Boot SE=.08, 95% CI [.12,.46]				Indirect effect=.24, Boot SE=.09, 95% CI [.09,.42]			

Predictors	**Coefficient**	***SE***	**Overall *F***	**Predictors**	**Coefficient**	***SE***	**Overall *F***
Trait Anxiety	.51***	0.12	12.29***	Depression	.82***	0.14	17.81***
Negative Mood	6.35***	1.49		Negative Mood	4.25**	1.47	
Indirect effect=.10, Boot SE=.06, 95% CI [.01,.25]				Indirect effect=.15, Boot SE=.06, 95% CI [.05,.31]			

Predictors	**Coefficient**	***SE***	**Overall *F***	**Predictors**	**Coefficient**	***SE***	**Overall *F***
Trait Anxiety	.55***	0.12	11.55***	Depression	.86***	0.14	16.56***
Parent Distress	6.61**	1.66		Parent Distress	3.80*	1.66	
Indirect effect=.06, Boot SE=.05, 95% CI [−.02,.19]				Indirect effect=.12, Boot SE=.07, 95% CI [.02,.28]			

All analyses control for child age and parent social desirability.

* $p<.05$.

** $p\leq.01$.

*** $p \leq.001$.