

Resilience in Adolescents with Cancer: Association of Coping with Positive and Negative Affect

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ABSTRACT: *Objective:* To examine the prospective association between adolescents' coping with cancer-related stress and observed positive and negative affect during a mother-adolescent interaction task involving discussion of cancer-related stressors. *Methods:* Adolescents (age 10–15 years) self-reported about their coping and affect approximately 2 months after cancer diagnosis. Approximately 3 months later, adolescents and mothers were video recorded having a discussion about cancer, and adolescents were coded for expression of positive affect (positive mood) and negative affect (sadness and anxiety). *Results:* Adolescents' use of secondary control coping (i.e., acceptance, cognitive reappraisal, and distraction) in response to cancer-related stress predicted higher levels of observed positive affect, but not negative affect, over time. *Conclusion:* Findings provide support for the importance of coping in the regulation of positive emotions. The potential role of coping in preventive interventions to enhance resilience in adolescents facing cancer-related stress is highlighted.

(*J Dev Behav Pediatr* 38:646–653, 2017) **Index terms:** stress, cancer, coping, adolescents, resilience, positive affect, negative affect.

Resilience in childhood and adolescence is broadly defined as the process of achieving positive outcomes despite exposure to significant stress or adversity.^{1,2} Conceptual models of risk and resilience in pediatric psychology suggest that exposure to stressors associated with childhood illnesses has implications for psychological adjustment.³ A cancer diagnosis presents adolescents with a range of uncontrollable and unpredictable sources of stress, including the unexpected diagnosis itself; aggressive treatments; disruptions in family, school, and social functioning; uncertainty about the outcome of treatment; and the possibility of recurrence of the disease.⁴ A previous meta-analysis indicates that children and adolescents with cancer have higher levels of internalizing symptoms than healthy peers, including moderate elevations in anxiety/depressive symptoms.⁵ However, not all children with cancer experience heightened emotional distress, suggesting that some children are vulnerable while others are resilient. The purpose of the current study is to examine the role of coping as a source of potential resilience in pediatric

cancer in a multimethod, prospective study of newly diagnosed adolescents during a sensitive developmental period when risk for onset of depressive disorders is high.⁶

Davidson⁷ describes resilience as “the maintenance of high levels of positive affect and well-being in the face of significant adversity” (p. 1198), highlighting the importance of understanding emotions when studying this process. However, previous research examining risk and resilience in childhood cancer has overwhelmingly focused on symptoms of depression and anxiety,⁵ whereas levels of both negative and positive affect in children and adolescents with serious illnesses have received relatively little attention.⁸ The ability to mobilize and experience positive emotions is important in responding to and repairing negative mood and increasing approach and active behavior.^{8,9} Therefore, it is plausible that adolescents who are faced with significant stress but do not develop symptoms of anxiety or depression may have the ability to experience higher levels of positive affect and lower levels of negative affect in response to stress. Indeed, previous studies have suggested that positive affect may serve as a buffer against the chronic, uncontrollable stress associated with chronic illness and lead to better mental health outcomes, whereas prolonged experiences of negative affect may put adolescents at risk for internalizing symptoms.¹⁰ Furthermore, previous studies have shown that observed affect is related to both physical and psychological functioning over time in adolescents with Type I diabetes.⁹ This is especially concerning during early adolescence, when children are at particular risk for onset of mood disorders.¹¹

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Coping is defined as efforts to regulate one's cognitions, emotions, behaviors, and physiology in response to a stressor and includes strategies to regulate emotions in the face of stress.¹² Coping emphasizes the ability to regulate emotions under stress, including the capacity to regulate both negative and positive affect when faced with stress and adversity.^{1,2,7} Control-based models of coping¹²⁻¹⁴ are organized around the degree to which stressors can be controlled and are central for understanding the ways with which children cope with chronic illness.¹⁵ Drawing on Weisz and colleagues' model of perceived control,¹⁴ 3 types of coping have been distinguished: primary control coping (strategies intended to directly change the source of stress or one's emotional reactions to the stressor), secondary control coping (efforts to adapt to stress), and disengagement coping (efforts to orient away from the source of stress or one's reactions to it). These 3 factors of coping, as measured by the Responses to Stress Questionnaire,¹³ have been supported by confirmatory factor analyses in samples of children and adolescents coping with a range of different types of stress, including illness-related stress.¹⁶ Models of coping and emotion regulation suggest that secondary control coping responses aimed at accommodating or adapting to sources of stress, as opposed to directly acting on or changing sources of stress, are most adaptive for stressors that are unpredictable and uncontrollable.^{15,17} Indeed, a recent review of coping with chronic illness in childhood has overwhelmingly suggested the importance of secondary control coping in the face of chronic, uncontrollable stress associated with illness.¹⁵ Given high levels of uncontrollable stress in childhood cancer,⁴ resilience in the face of cancer-related stress may involve the use of secondary control coping skills.

Secondary control coping is related to lower symptoms of anxiety and depression in children and adolescents with cancer near the time of their diagnosis, within and across self-reports and parents' reports about children's coping and symptoms.¹⁸ These findings suggest that secondary control coping can serve a protective function for children and adolescents faced with uncontrollable sources of stress. However, studies are limited to self-report and parent-report measures of both coping and outcomes and do not include observational measures of affect. Furthermore, the effective use of secondary control coping may increase with age during adolescence, as evidence suggests that the ability to effectively use secondary control coping skills and regulate emotions may be linked to the development of executive function skills¹⁹ which develop from early childhood into late adolescence.²⁰ As such, older children may be better able to use secondary control coping skills when faced with the uncontrollable stress of a cancer diagnosis.

In the current study, we expand on previous research on resilience in adolescents with cancer in 2 ways: (1) by examining the association of coping with negative and

positive affect and (2) by using adolescents' reports of coping and direct observations of adolescents' affect. We examined the prospective associations of adolescents' use of secondary control coping near the time of initial cancer diagnosis and levels of observed negative affect (anxiety and sadness) and positive affect (positive mood) during a discussion about cancer-related stressors with their mothers approximately 3 months later, controlling for mothers' concurrent affect. We hypothesized that adolescents' self-reported use of secondary control coping in response to cancer-related stress would predict (1) higher levels of observed positive affect and (2) lower levels of observed negative affect during a discussion task about cancer diagnosis and treatment. We also examined adolescent age and the age × secondary control coping interaction to test possible developmental differences in the association between coping and observed affect.

METHODS

Participants

Participants included 39 adolescents²¹ with cancer and their mothers. Adolescents ranged from 10 to 15 years old ($M = 12.36$, $SD = 1.87$); 46% were female; 92% were white, 8% African-American, and 1 child was Hispanic/Latino. Cancer diagnoses included leukemia (38%), lymphoma (18%), and other solid tumors (44%; no brain tumors). All were recruited after an initial diagnosis (no relapse cases). Mothers were on average 39.39 years old ($SD = 5.93$), with a range of educational backgrounds (high school level to 4-year graduate school; $M = 3$ years of college or technical school) and family income levels (21% \$25,000 or less; 23% \$25,001-50,000; 20% \$50,001-75,000; 13% \$75,000-100,000; 23% \$100,000 or above).

Procedure

Families were initially recruited to participate in a larger study of adjustment to pediatric cancer from 2 pediatric oncology centers in the Midwestern ($n = 19$) and Southern ($n = 20$) United States. Eligibility requirements included the following: (1) 5 to 17 years of age, (2) receiving treatment through the oncology division, and (3) no preexisting developmental disability. The study was reviewed and approved by institutional review boards at both sites, and informed consent and assent were obtained from participants. Families (mother-child dyads) were compensated for their participation with a check at each time point. Only data for adolescents experiencing new cancer diagnoses and ages 10 to 15 years old are reported here, as children younger than 10 years were not expected to be reliable reporters of their own coping and adolescence may be a time of increased vulnerability to stress.²² Age 15 was selected as the upper cutoff because this is the point at which depressive symptoms and disorders increase significantly²³ and adolescents begin to separate and become more independent from their families.²¹

Medical team members introduced the study to families with new cancer diagnoses, and study team members subsequently approached interested families during clinic visits. At Time 1 (T1), mothers completed information on family demographics and adolescents completed self-report measures of coping and positive and negative affect. These were usually completed at clinic visits, but some families requested to return questionnaires through mail or during subsequent clinic visits because of time limitations. At Time 2 (T2), families who completed T1 were invited to participate in a mother-adolescent interaction task that took place at the hospital. The purpose of this timeline was to examine prospective relations between reported coping and expressed affect during the interaction task.

The study team made contact with the family after the diagnosis as soon as possible and collaborated with families for timing of T1 and T2 assessments, taking into account distance between family's home and the medical center, frequency of upcoming medical visits, and well-being of the adolescent. T1 took place after the adolescent had initiated cancer treatment, ideally 2 months after diagnosis; T2 took place after T1, ideally 3 months after T1. The reason for the time lag was to allow the adolescent to face additional treatment-related stressors that may require coping and to allow the family to have time to process the diagnosis before being videotaped. However, because of the many challenges and stresses facing these families, there was considerable variability in range of times between diagnosis and T1 ($M = 51$ days, $SD = 30$; range = 7-140), between T1 and T2 ($M = 109$ days, $SD = 70$; range = 7-267), and between diagnosis and T2 ($M = 159$ days, $SD = 59$; range = 50-313). Despite the variability in days between assessments, each adolescent in the study had initiated treatment by the time T1 was collected. Importantly, T1 was always collected before T2, establishing temporal precedence between coping and observation of affect.

Of those initially approached for T1, 87% were enrolled. Of the 93 families with new cancer diagnoses that were eligible to participate and completed study assessments within this time frame, 39 had a mother-child dyad participate in the interaction. Reasons for declining to participate included lack of time or interest and not wanting to be videotaped. Families who completed the interaction task did not significantly differ from those who declined on adolescent self-reported affect or coping or on adolescent age, sex, cancer diagnosis, race, or ethnicity. The participation rate is similar to previous studies with pediatric populations that used videotaped observation.²⁴ Similarly, there were no significant differences in covariates or outcomes between the 2 study sites.

Measures

Family Demographics

Mothers reported their children's age and race/ethnicity and self-reported age, family income, and highest

obtained education level. Cancer diagnosis was obtained from medical records.

Treatment Intensity

Treatment intensity was measured with the Treatment Rating Scale 2.0.²⁵ The scale ranges from 1 to 4 (1 = least intensive to 4 = most intensive) and takes into account diagnosis, stage, and treatment modality (e.g., chemotherapy, surgery, radiation, and stem cell transplantation). This scale has been validated in pediatric cancer studies and used frequently in previous cancer research.

Coping

Adolescents completed the Responses to Stress Questionnaire-Pediatric Cancer version (RSQ-PC)^{13,18} at T1. The RSQ-PC version includes 57 items that assess how the adolescent copes specifically in response to cancer-related stressors. Adolescents rated each item on degree/frequency with which the adolescent experienced the stressor and the degree with which the adolescent responded using a specific coping strategy when faced with cancer-related stressors on a 4-point scale (0 = not at all to 4 = a lot). Factor analyses of the Responses to Stress Questionnaire (RSQ) have identified 5 factors¹³: 3 coping (voluntary) factors and 2 stress reactivity (involuntary) factors.

Because the current study was interested in ways in which adolescents cope with uncontrollable stress in their lives and based on previous findings of children and adolescents coping with cancer²² and with chronic illness broadly,¹⁵ we focused on the secondary control coping factor. This subscale includes 12 items assessing the frequency that adolescents use acceptance, distraction, positive thinking, and cognitive reappraisal in response to stress associated with cancer. Example items include, "I tell myself that I will get through this or I will be ok," "I think about the things I'm learning from having cancer, or something good that will come from it," and "I do something to calm myself down." Proportion scores (the total score for each factor divided by the total score for the RSQ) were used in analyses to control for potential patterns of responses related to the total number of items endorsed (i.e., a tendency to overendorse items^{13,26}). The RSQ has demonstrated good psychometric properties with children and adolescents coping with a variety of stressors.^{13,16,18} Internal consistencies for secondary control coping for the current sample were $\alpha = .81$.

Self-Reported Positive and Negative Affect

Adolescents completed the Positive and Negative Affect Schedule (PANAS²⁷) at T1. The PANAS includes 20 items that assess both positive and negative emotions rated on a 5-point scale (1 = very slightly or not at all to 5 = extremely) that the adolescent is experiencing "currently." This scale is a standard measure of affect and has demonstrated high internal consistency and independence for positive and negative emotions.²⁷ Internal consistency of the PANAS positive and negative

affect scales in the current sample was $\alpha = .92$ and $.90$, respectively. The PANAS has been used previously in pediatric chronic illness populations, such as youth with Type 1 diabetes⁹ and children with cancer.²⁸

Observed Adolescent Positive and Negative Affect

Adolescents' and mothers' positive and negative affect during a mother-child discussion about the adolescents' cancer diagnosis and treatment were assessed at T2 using the Iowa Family Interaction Rating Scale (IFIRS²⁹), a macro-level system used to code participants' verbal and nonverbal communication. The frequency, intensity, and contextual and affective nature of the behavior are taken into consideration during ratings. A 9-point rating scale is used with 1 representing the absence of a behavior and 9 representing the highest level of frequency and intensity of a behavior. Validity of the coding system has been established through correlational analyses and confirmatory factor analysis.²⁹

Mothers and adolescents participated in a 15-minute video-recorded observation at the hospital that focused on the adolescent's recent cancer diagnosis and treatment. Mothers and adolescents were instructed to have a conversation about the child's cancer in whatever way felt natural to them. Mothers received a card with prompts to help guide the conversation: "What have we each learned about cancer and how it is treated?" "What parts of your cancer and its treatment have been the hardest for each of us?" "What kinds of feelings or emotions have we each had since we found out you have cancer?" "What are the ways we each try to deal with these feelings and emotions?" "What is it about cancer that has most affected each of our lives?" "How do we each feel about what might happen in the next year and after that?" "If we were writing a book about cancer for other children and parents, what would we each include?" All prompts were listed on a single card, and mothers were told that they could use the prompts to guide the conversation if they wished but were not required to use them. The prompts were open-ended and were designed to generate a conversation about the family's experience with cancer, including opportunities for expressions of both positive and negative affect. In response to the statement, "The discussion represented how I usually communicate with my mother/child about cancer," 100% of adolescents endorsed "somewhat" or "very" true. The observation task has been validated with a pediatric cancer sample.³⁰

The mother-adolescent interaction task was coded by trained graduate and undergraduate research assistants at a single study site. Coders passed a written test of code definitions and examples with 90% accuracy then reached 80% reliability on previously coded videos. All videos were double-coded independently by 2 research assistants. In accordance with the IFIRS manual, the higher score was used when ratings differed by a single point. Ratings that differed by more than 2 points were resolved through discussion and consensus.

The current study focused on 3 codes to assess observed positive and negative affect in both participants, adolescents and mothers: (1) positive mood (i.e., positive affect), which assesses the extent to which the participant appears or communicates that he/she is "content, happy, and optimistic and/or demonstrates positive behavior toward self, others, or things in general" (including nonverbal behaviors such as smiling or laughing and verbal positive statements); (2) sadness (i.e., negative affect), which assesses the extent to which the participant "communicates emotional distress that is conveyed as sadness, unhappiness, despondency, depression, and regret" (including nonverbal behaviors such as crying or appearing down and negative verbal statements); and (3) anxiety (i.e., negative affect), which assesses the extent to which the participant "communicates emotional distress that is conveyed as nervousness, fear, tension, stress, worry, and concern" (including nonverbal behaviors such as fidgeting or tense or rigid body movements and negative verbal statements). Examples of positive mood include smiling, laughing, and positive statements such as "this is fun!" or "we can do this." Examples of sadness include frowning, slow pace of speech, and statements such as "I wish I wasn't so miserable" or "I really made a mess of things." Examples of anxiety include trembling, wringing hands, and statements such as "I'm worried about what will happen." Interrater reliabilities were calculated with intraclass correlation coefficients (adolescent: ICC = 0.88 positive mood, 0.74 sadness, 0.53 anxiety; mother: ICC = 0.81 positive mood, 0.77 sadness, 0.79 anxiety). These codes have been used in previous research with adolescents with pediatric health conditions.²⁴

RESULTS

Preliminary Analyses

Mean values and SDs for coping, affect, and treatment intensity variables are presented in Table 1. Scores of 5 on each affect code indicate that the individual "sometimes" demonstrates behaviors consistent with that affect and reflects low-to-moderate intensity. Mean scores reflect moderately intense/frequent levels of both positive and negative affect. There were no significant sex differences for any variables listed in Table 1 (p 's > .10).

Preliminary analyses were also conducted to examine the potential impact of variability in time between assessments on the present analyses. Three variables examining time (days between diagnosis and T1, days between T1 and T2, and days between diagnosis and T2) were examined in relation to the other study variables. There were no significant correlations between any of these time variables and any predictor or outcome variable (age, reported affect, coping, observed affect).

Correlation Analyses

Correlational analyses between potential covariates and adolescent affect at T2 are presented in Table 2. As

Table 1. Mean Values and SDs of Adolescents' Treatment Intensity and Self-Reported Coping and Affect at T1 and Adolescents' and Mothers' Observed Positive and Negative Affect at T2

	M (SD)
Time 1 variables	
Treatment intensity ^a	2.76 (.64)
Secondary control coping ^b	.30 (.05)
PANAS positive affect mean ^c	4.18 (1.15)
PANAS negative affect mean ^c	2.75 (.96)
Time 2 variables	
Observed adolescent positive mood ^d	5.36 (1.61)
Observed adolescent sadness ^d	5.38 (1.63)
Observed adolescent anxiety ^d	5.46 (1.10)
Observed maternal positive mood ^d	5.64 (1.31)
Observed maternal sadness ^d	5.82 (1.07)
Observed maternal anxiety ^d	5.36 (1.46)

^aITR-2 possible range 0 to 4. ^bRSQ-PC possible range .00 to 1.00. ^cPANAS possible range 1.00 to 5.00. ^dIFIRS possible range 1.00 to 9.00. ITR-2, treatment rating scale 2.0; PANAS, positive and negative affect schedule; RSQ-PC, responses to stress questionnaire-pediatric cancer version; T1, Time 1; T2, Time 2.

seen in the table, age was significantly negatively related to observed adolescent anxiety. Both coping and mother's observed positive mood were significantly positively related to observed adolescent positive mood. Neither treatment intensity nor adolescent's self-reported affect on the PANAS at T1 were significantly related to observed affect at T2.

Of note, neither adolescent age nor coping at T1 were related to maternal affect at T2.

Adolescent age was not significantly related to coping at T1 or reported positive/negative affect at T1. Adolescents' secondary control coping was significantly related

Table 2. Correlations Between Adolescent Observed Affect and Adolescent Age, Treatment Intensity, Coping, Reported Positive and Negative Affect and Observed Maternal Positive and Negative Affect

Variable	Adolescent Positive Mood (T2)	Adolescent Sadness (T2)	Adolescent Anxiety (T2)
Adolescent age	-.03	-.23	-.33*
Treatment intensity	-.01	-.03	.02
Coping (T1)	.33*	-.08	-.02
PANAS positive mean (T1)	.10	.05	-.06
PANAS negative mean (T1)	-.24	.07	.22
Maternal positive mood (T2)	.46**	-.22	.16
Maternal sadness (T2)	.18	.01	.21
Maternal anxiety (T2)	.09	-.06	.24

Positive mood, sadness, and anxiety were all observed during parent-adolescent interaction at T2. + $p < .10$, * $p < .05$, ** $p < .01$. Coping, adolescent self-report of secondary control coping; T1, Time 1; T2, Time 2.

to both self-reported negative affect ($r = -.48, p < .01$) and positive affect ($r = .44, p < .01$), concurrently at T1. (Although hypotheses focused on the role of secondary control coping, as this is best suited for coping with uncontrollable stress such as stressors associated with cancer diagnosis and treatment, primary control coping was also examined in bivariate correlations. As expected, primary control coping was not significantly related to outcomes or covariates.)

Linear Multiple Regression Analyses

Linear multiple regression analyses were used to test the association between secondary control coping and adolescents' positive and negative affect approximately 3 months later (Table 2), controlling for variables that were significant in correlational analyses (adolescent age and maternal affect). In all regressions, coping was entered in the first step, age was entered in the second step, maternal affect was entered in the third step, and the Age \times Coping interaction was entered in the fourth and final step to test for age differences in the effects of coping.

In the regression predicting positive mood (Table 3), both coping ($\beta = .35, p = .04$) and maternal positive mood ($\beta = .38, p = .02$) remained significant predictors in the final step, indicating that greater use of coping at T1 predicted higher levels of observed adolescent positive mood approximately 3 months later.

In the regression predicting observed sadness, no predictors emerged as significant at any step. In the regression predicting observed anxiety, age remained a significant predictor in the final step ($\beta = -.38, p = .02$), indicating that younger age predicted higher levels of observed anxiety.

DISCUSSION

This multimethod, prospective study examined the role of coping as a source of resilience in adolescents newly diagnosed with cancer. The results suggest that secondary control coping with cancer-related stress, which encompasses efforts to adapt to stress (cognitive reappraisal, positive thinking, acceptance), may enhance the ability to experience positive affect. This study included multiple methods to capture these processes, including adolescent self-reports of coping with cancer at T1 and direct observations of adolescent affect during discussions with their mothers about cancer at T2.

Results provide evidence for the prospective relation between coping and positive affect, supporting our first hypothesis and suggesting that coping with cancer-related stressors by the use of distraction, acceptance, and cognitive reappraisal is particularly important for enhancing positive emotions. One possible explanation for this relation is that, by engaging in pleasant activities (distraction) and accepting the stressful parts of cancer, adolescents may be better able to upregulate their experience of positive emotions. Furthermore, previous studies have suggested that cognitive reappraisal is

Table 3. Regressions Predicting Adolescents' Observed Positive and Negative Affect at T2 from Coping at T1 Controlling for Age and Concurrent Maternal Affect

	Adolescent Positive Mood at T2				Adolescent, Sadness at T2				Adolescent, Anxiety at T2			
	B	β	<i>t</i>	R ²	B	β	<i>t</i>	R ²	B	β	<i>t</i>	R ²
Step 1				.11				.01				.00
Coping	10.13	.33	2.13*		-2.24	-.08	-.44		-.41	-.02	-.12	
Step 2				.11				.06				.11
Coping	10.13	.33	2.10*		-2.77	-.09	-.55		-.91	-.04	-.28	
Age	-.01	-.01	-.01		-.20	-.23	-1.44		-.19	-.33	-2.09*	
Step 3				.28				.06				.20
Coping	7.82	.26	1.74+		-2.82	-.09	-.55		-1.06	-.05	-.34	
Age	.04	.04	.29		-.20	.23	-1.42		-.23	-.39	-2.54*	
Maternal affect ^a	.52	.42	2.85**		.02	.02	.09		.24	.32	2.05*	
Step 4				.30				.07				.22
Coping	10.59	.35	2.06*		-4.27	-.14	-.73		.43	.02	.12	
Age	.04	.04	.29		-.21	-.24	-1.42		-.22	-.38	-2.44*	
Maternal affect ^a	.47	.38	2.55*		.04	.03	.17		.21	.27	1.69	
Coping × Age	2.72	.18	1.10		-1.48	-.10	-.52		1.55	.15	.86	

^aMaternal affect matches adolescent affect (i.e., positive mood predicting positive mood; sadness predicting sadness; anxiety predicting anxiety) and was observed at T2. +*p* < .10, **p* < .05, ***p* < .01. Coping, adolescent self-report of secondary control coping on RSQ-PC; PANAS, positive and negative affect schedule; PANAS, positive sum for regression predicting positive affect and negative sum for regression predicting sadness; RSQ-PC, responses to stress questionnaire-pediatric cancer version; T1, Time 1; T2, Time 2.

closely tied to the regulation of positive emotions specifically.¹⁹ It should be noted that this relation was significant on the bivariate level and in the final step of the regression model with the presence of the interaction term. However, the relation only approached significance when controlling for maternal positive affect as a covariate in the absence of the interaction term.

Surprisingly, the second hypothesis (i.e., higher levels of secondary control coping will be related to lower levels of observed sadness and anxiety) was not supported. Previous research has shown that secondary control coping is a strong predictor of symptoms of anxiety and depression based on parent and adolescent reports of these symptoms over periods of months or longer.¹⁸ The current findings suggest that moment-to-moment displays of anxiety and sadness may be more closely tied to other factors, such as maternal affect and parenting behaviors during direct interactions.

Results suggest that secondary control coping is prospectively related to the ability to generate and sustain positive affect. This is similar to Davidson's conceptualization of resilience via the maintenance of positive affect in the face of significant adversity.⁷ The experience of positive emotions may provide a respite from the stressful aspects of cancer, and previous research suggests that positive affect allows people to build resources that may be depleted during chronic, uncontrollable stress.³¹ Therefore, the ability to sustain positive affect may buffer adolescents with cancer in the face of considerable stress, promoting resilience.

However, support was not found for age differences in the association between coping and affect, as tested

by the interaction between age and coping. We expected to find support for developmental models in which adolescents become better with age in their use of the complex cognitive skills involved in secondary control coping.²⁰ However, our results suggest that the effects of the complex cognitive strategies involved in secondary control coping on affect may be relatively stable across the transition from early into mid-adolescence. Further research is needed to explore patterns in the effects of coping with age. Interestingly, age was a significant predictor of negative affect, such that younger age predicted higher levels of observed anxiety in adolescents. This may suggest that development during early adolescence is associated with increasing awareness of and perhaps increasing sensitivity to the stressful and anxiety-provoking aspects of cancer diagnosis and treatment.

The other significant predictor of observed adolescent affect was maternal affect. Specifically, maternal positive mood was a significant predictor of adolescent positive mood in regression analyses. Although both were measured concurrently, this may indicate that adolescents are better able to maintain a positive mood when mothers model this in interactions. Interestingly, maternal negative affect was not significant related to adolescent negative affect during these same interactions (although the correlation of adolescent anxiety with maternal sadness and maternal anxiety approached significance, *r* = .21 and .24, respectively). It may be that if either an adolescent or parent begins to demonstrate sadness or anxiety during the course of the interaction, the other member of

the dyad may try to support them by regulating their own affect.

Interestingly, adolescents' self-reports of affect with the PANAS at T1 were not related to observed affect at T2. This may represent task-related differences (discussing cancer diagnosis with a parent vs completing paper and pencil questionnaires alone) or methodological differences between self-report and observation. Similarly, emotions theorists make distinctions between the subjective experience of an emotion and the observable expression of an emotion.³² It is noteworthy that coping was significantly related to both self-reported positive and negative affect concurrently at T1. This may be due in part to shared method variance (i.e., both measured by self-report), but it is also similar to previous studies that have examined coping and self-reported affect concurrently.^{10,19}

In addition, findings from the current study are consistent with previous research investigating individual difference factors related to positive outcomes in pediatric oncology, including temperament and personality.^{33,34} For example, attentional control, which is considered a component of executive function and may underlie the ability to engage in secondary control coping skills such as distraction and cognitive reframing,¹⁹ has been linked to lower levels of distress during medical procedures.³⁴ Similarly, ego resilience, which has been described as the ability to cope flexibly and effectively, has been linked to higher quality of life in children in active cancer treatment.³³ As such, the current study adds to the growing body of research examining factors associated with positive outcomes in child cancer.

The current findings augment current models of resilience in pediatric cancer by suggesting a new and additional process through which adolescents may be achieving resilience, namely, with coping in a way that promotes positive affect.⁷ The current findings also build on previous research on resilience in pediatric cancer that have largely relied on cross-sectional self-reports of coping and symptoms of depression and anxiety.^{15,18} This multimethod, longitudinal study extends previous work to show that self-reported secondary control coping is also prospectively related to observed positive affect during mother-child discussions of cancer-related stressors. Future research should examine the role of positive affect in development and trajectory of affective symptoms in this population.

This study has several limitations that need to be addressed in future research. First, detection of significant effects was limited by sample size. The sample was also limited in ethnic and racial diversity. Although we made specific hypotheses with regards to age, we did not have predictions regarding sex. There were no significant differences in variables across boys and girls and the sample was limited to mothers due to the small number of fathers in this subsample who participated ($n = 3$). Previous research in child cancer has found that sex moderates the relation between child charac-

teristics and observed distress.³⁴ Therefore, future studies that examine coping and affect should examine the potentially moderating role of either parent or child sex.

Another limitation is the variability in time between diagnosis, T1, and T2. Ideal assessment time points (approximately 2 months between diagnosis and T1 and 3 months between T1 and T2) were chosen before the start of the study. These time points were selected so that adolescents would have initiated treatment by T1 and would have encountered treatment-related stressors and had time to process the diagnosis as a family before being videotaped at T2. However, as is the nature of behavioral research with pediatric cancer, sometimes the study team had to deviate from the ideal time lag between diagnosis and assessments to accommodate the challenges, stresses, and schedules of the families involved. Importantly, despite variability in time between diagnosis, T1, and T2, correlational analyses indicated that variability in assessment time did not have a significant statistical impact on the current findings. In addition, all study participants had initiated treatment before T1 was collected. Importantly, temporal precedence of assessments was constant across all participants and allowed for the testing of hypotheses about the prospective relation between reported coping and observed affect.

This study provides new evidence for processes that may underlie resilience in adolescents facing the stress of cancer diagnosis and treatment. Findings suggest that the importance of secondary control coping as a potential component of resilience, as it is prospectively related to the ability to generate and maintain positive affect. Interventions targeting secondary coping skills near the time of diagnosis may be an important pathway to building resilience in pediatric cancer.

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