

Posttraumatic Stress and Related Impairment in Survivors of Childhood Cancer in Early Adulthood Compared to Healthy Peers

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Objective To compare rates of posttraumatic stress disorder (PTSD) and related impairment between childhood cancer survivors in early adulthood and healthy peers. **Methods** Cancer survivors ($n = 57$) and comparison group ($n = 83$) completed measures of PTSD, depression, health-related quality of life (HRQOL), mood, and satisfaction with life (SWL). **Results** The cancer survivor group was more likely to have PTSD than the control group (odds ratio = 4.67, $p < .05$) but was not more likely to experience subclinical PTSD symptoms. The groups differed on physical HRQOL, $F(1, 140) = 15.02$, $p < .001$, and positive affect, $F(1, 140) = 7.03$, $p < .01$, but did not differ on depression, SWL, psychosocial HRQOL, and negative mood. Those in the survivor group with PTSD ($n = 10$) experienced more depression and negative affect, worse HRQOL and SWL, perceived their cancer to impact developmental tasks more, and were older at the time of diagnosis compared with those without PTSD ($n = 47$). **Conclusions** Although most are well adjusted, childhood cancer survivors in early adulthood are more likely to have PTSD and to experience significant impairment compared with healthy peers.

Key words childhood cancer survivor; early adulthood; impairment; PTSD; PTSS.

With many more children surviving cancer than in previous decades (Greenlee, Hill-Harmon, Murray, & Thau, 2001), there is great interest in understanding the psychosocial sequelae of childhood cancer survivorship and identifying needed areas of intervention (Kazak, 2005; Patenaude & Kupst, 2005). Although most studies have found that most childhood cancer survivors are well adjusted (Kazak, 1994; Kupst et al., 1995), one potential psychological outcome of cancer survival (for both adult and child cancer) that has received increasing attention and empirical support in the past decade is posttraumatic stress (Stuber, Kazak, Meeske, & Barakat, 1998). Posttraumatic stress is thought to result from exposure to a traumatic event that is perceived as life threatening or as violating a sense of safety and is associated with debilitating cognitive, behavioral, and physiological reactions when a memory of the event is activated (Foa, Steketee, & Rothbaum, 1989). Using posttraumatic stress as a framework for

understanding the psychological sequelae of cancer is beneficial given that it acknowledges the threat to life experienced by cancer survivors and helps also to make sense of the avoidance, reexperiencing, and hyperarousal commonly found in cancer survivors and necessary for a diagnosis of posttraumatic stress disorder (PTSD; Stuber et al., 1998; Kazak, Alderfer, et al., 2004). In addition to such posttraumatic stress symptoms (PTSS), a diagnosis of PTSD requires exposure to a traumatic event that results in feelings of fear, helplessness, or horror; 1 month duration; and related impairment.

Although it is well documented that survivors of adult cancer and parents of children with cancer are at increased risk for PTSD, fewer studies have identified PTSD in childhood cancer survivors (for reviews, see Smith, Redd, Peyser, & Vogl, 1999; Taieb, Moro, Baubet, Revah-Levy, & Flament, 2003). However, there is reason to believe that childhood cancer survivors are at an increased risk for PTSD given that they are likely to

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Journal of Pediatric Psychology 31(4) pp. 356–366, 2006

doi:10.1093/jpepsy/jsj018

Advance Access publication March 23, 2005

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have experienced many traumas related to threat to life, invasive medical procedures, long hospitalizations, and current health threats related to late effects or potential cancer recurrence. Childhood cancer survivors transitioning out of adolescence may be at an even greater risk for PTSD than their younger peers for many reasons. For one, early adults may be better able to understand the implications of their cancer experience and survival than children and adolescents (Hobbie et al., 2000; Kazak, Alderfer, et al., 2004). Second, often times, early adulthood introduces new developmental tasks (e.g., completion of education, getting pregnant) that may be directly affected by the cancer and its late effects, which may in turn force survivors to revisit their cancer experience (Eiser, 1998; Vannatta & Gerhardt, 2003). Third, early adulthood is a time of increased socioemotional vulnerability given new responsibilities and challenges of emerging adulthood (Arnett, 2000). Finally, PTSD has been found to be a relatively common psychiatric diagnosis in young adults regardless of health history (Breslau, Davis, Andreski, & Peterson, 1991).

Unfortunately, to our knowledge, no study has specifically looked at PTSS/PTSD in a sample of survivors in very early adulthood only. However, two studies have examined PTSD in adult survivors of childhood cancer. One study found that 21% (16 of 78) of the sample (ages 18–40) met criteria for a diagnosis of PTSD at some point since their cancer treatment ended (Hobbie et al., 2000). PTSD was positively related to treatment intensity, elevated state and trait anxiety, higher levels of distress, and perceived life threat. Another study found that 22% (11 of 51) of survivors (ages 18–37) met criteria for current PTSD (Meeske, Ruccione, Globe, & Stuber, 2001). PTSD was related to lower levels of health-related quality of life (HRQOL) and higher levels of distress. Cancer- and treatment-related variables were unrelated to PTSD with the exception of the presence of more severe late effects being positively associated with PTSD.

Other studies have compared rates of PTSD and PTSS in healthy individuals without histories of illness to samples of childhood cancer survivors that included late adolescents and young adults in their early 20s. One study found no differences between a group of survivors of childhood leukemia (ages 8–20) and a healthy comparison group on PTSS (Kazak, Barakat, et al., 1997). Another study found that cancer survivors (ages 12–23) endorsed more PTSS than healthy adolescents (Brown, Madan-Swain, & Lambert, 2003). However, no survivors met clinical criteria for PTSD. Only the number of medical late effects and lower ratings of social desirability were related to PTSS. Finally, one other study compared rates

of PTSD in a sample of childhood cancer survivors (ages 13–23) to healthy adolescents and adolescents with physical abuse histories (Pelcovitz et al., 1998). There was a significant difference between the groups in rates of lifetime PTSD with the cancer survivor group having the highest rate (35%, 8 of 23). However, there were no significant differences among the three groups in the proportion of adolescents with current PTSD. Nonetheless, there was still a large amount (17%) of the cancer survivor group who met criteria for current PTSD.

Thus, collectively, the results of these studies provide evidence that childhood cancer survivors are more at risk for PTSS/PTSD when entering adulthood. Findings also suggest that perceived intensity and impact of cancer and its treatment may be more related to PTSS/PTSD than objective medical and disease variables. However, these studies of PTSS/PTSD in childhood cancer survivors that included young adult samples share many limitations. For one, none of the previous studies excluded survivors who were diagnosed and treated in infancy; thus, some participants may not have remembered their cancer experience. Additionally, the studies included a very wide age range from school-age children to middle adulthood, thus, limiting conclusions about the prevalence of PTSD in survivors transitioning to adulthood. Moreover, the two studies that did specifically examine PTSD in adult survivors of childhood cancer did not include comparison groups (e.g., Hobbie et al., 2000; Meeske et al., 2001). Therefore, it cannot be concluded that the relatively high prevalence of PTSD in these studies differed from healthy peers. Also, one of the two studies (e.g., Hobbie et al., 2000) specifically examining adult survivors assessed for a history of PTSD rather than identifying the current prevalence of PTSD. Knowing the current prevalence of PTSD in young adult survivors is important for targeting assessment and intervention efforts, especially given increasing awareness of the need to address the medical and psychosocial problems of young adult survivors (MacLean, Foley, Ruccione, & Sklar, 1996). Finally, it is unclear whether or not both the amount of PTSS and rates of PTSD are higher in survivors of childhood cancer compared with peers without a history of chronic illness.

To address some of the limitations of previous studies, this study sought to identify whether or not individuals who survived childhood cancer in early adulthood have current higher rates of PTSS or PTSD than a comparison group without a history of illness. This study included only survivors of childhood cancer diagnosed at age 4 or later (so that they are more likely to remember and be affected by the cancer experience) and used a sample in

early adulthood between the ages of 18 and 28. Also, to support previous research that posttraumatic stress is a viable model for understanding psychosocial outcomes of childhood cancer, the childhood cancer survivors in early adulthood were compared with a group of never ill peers on levels of PTSS and rates of PTSD, in addition to depression, mood, HRQOL, and satisfaction with life (SWL).

This study also aimed to describe the impairment associated with PTSD in early adult childhood cancer survivors. PTSD has been shown to be comorbid with many other psychological problems (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995) and associated with lower HRQOL and higher levels of distress in adult childhood cancer survivors (Hobbie et al., 2000; Meeske et al., 2001). Additionally, given that early adulthood is a time when individuals are expected to become fully independent and to achieve certain developmental milestones, young adult cancer survivors with PTSD may be especially vulnerable to lower levels of SWL and positive affect and may have difficulty achieving developmental tasks of young adulthood. Thus, this study extended previous research by assessing such outcomes related to PTSD in childhood cancer survivors in early adulthood, which is important for understanding the impact of PTSD and to help identify potential areas of intervention in early adulthood.

Based on previous research, it was hypothesized that childhood cancer survivors in early adulthood would experience more PTSS and higher rates of PTSD (Hobbie et al., 2000; Meeske et al., 2001) and worse physical HRQOL due to medical late effects (Zebrack & Chelser, 2002), but would not differ on depression, mood, psychosocial HRQOL, and SWL when compared with never ill individuals in early adulthood. Based on research demonstrating the significant morbidity of PTSD (Hobbie et al., 2000; Meeske et al., 2001), it was also hypothesized that the childhood cancer survivors with PTSD would have worse HRQOL, depression, mood, SWL, and would perceive the impact of cancer on the achievement of developmental tasks to be worse than cancer survivors without PTSD. Also, because it has been found that patient perceived impact of cancer is related to PTSD and that late effects are related to PTSD, it was hypothesized that patient perceived late effects would be related to PTSD (Brown et al., 2003; Meeske et al., 2001). Moreover, given the lack of evidence of a relationship between objective medical and cancer-related variables and PTSD, it was hypothesized that the type of cancer, age at diagnosis, duration of treatment, time since treatment ended, and presence of cancer relapse would not be related to PTSD (Brown et al., 2003; Hobbie et al., 2000; Meeske et al., 2001).

Methods

This study was part of a larger study intended to assess the relationship between self-identified personal goals and well-being of young adults with a history of childhood chronic illness and with no chronic illness history. Only participants with a history of childhood cancer and without a history of chronic illness who completed the measures required of this study were included in this study. This study was approved by the Institutional Review Board of the hospital at which the study took place.

Sample

Survivors of childhood cancer in early adulthood ($n = 57$) and young adults without a history of chronic illness ($n = 83$) completed the study. Eligibility criteria included participants who are between the ages of 18 and 28, speak English, and do not have a known learning disability or cognitive impairment that would make them incapable of completing the study. Additional criteria for participants with a history of childhood cancer were that they were diagnosed with cancer between the ages of 4 and 18 and are currently in remission or cured and have not received active treatment for their disease for at least 1 year. Additional eligibility criteria for the healthy comparison group included individuals who have not been treated for childhood cancer and do not have a current chronic health condition or a history of chronic health conditions, have not had a life-threatening illness or accident (e.g., serious car accident, traumatic brain injury), and do not have an immediate family member (e.g., sibling, parent, spouse, or child) with a history of chronic illness. The aim was to have a healthy comparison group that had not experienced a medical trauma.

Potential participants with a history of childhood cancer were identified by the division of oncology at a Midwest children's hospital. Eligible participants ($n = 165$) were sent a letter by the division of oncology that introduced them to the study and notified them that they would be contacted by the first author for the study recruitment. Of the 85 participants who were able to be reached via phone, 80 agreed to participate in the study. Of the five that refused, four were unable to be directly contacted because the contact number for them was that of their parents and the parents refused participation on behalf of their children. The other refusal was due to lack of time. Of the 80 individuals who agreed to participate, 57 completed the study. Noncompletion was due to not wanting to answer the questions ($n = 4$), not having enough time ($n = 17$), feeling too sick ($n = 1$), and incarceration ($n = 1$). The cancer diagnoses of the participants

who completed the study were as follows: acute lymphocytic leukemia ($n = 15$), acute myelogenous leukemia ($n = 4$), Hodgkin's lymphoma ($n = 12$), non-Hodgkin's lymphoma ($n = 8$), osteosarcoma ($n = 8$), astrocytoma ($n = 1$), pituitary tumor ($n = 1$), Wilms' tumor ($n = 1$), brain tumor ($n = 1$), hepatic sarcoma ($n = 1$), Ewing's sarcoma ($n = 3$), primitive neuroectodermal tumor ($n = 1$), and pineal germinoma ($n = 1$). Fifty-six of the 57 cancer survivors were treated with chemotherapy, 24 of the participants were treated with radiation, 23 were treated with surgery, and 3 had a bone marrow transplant. The average age at diagnosis was 11.35 ($SD = 3.91$, range = 4–18), the average number of reported late effects was 1.05 ($SD = 1.27$, range = 0–6), the average number of years of treatment was 1.23 ($SD = .92$, range = .21–3.76), and the average number of years since treatment was 9.25 ($SD = 4.41$, range = 1.78–18.83). The number of cases who relapsed was 3 (5.3%). There were no significant differences on age, gender, type of diagnosis, or time since diagnosis for those who completed the study and those who did not complete.

The healthy comparison group consisted of peers of the participants with a history of childhood chronic illness (based on the recruitment of a healthy comparison group from the larger study explained above). Using a peer comparison group of healthy individuals has been used in previous studies with chronic illness populations and has been shown to increase the likelihood of groups being demographically similar (Levi, 2000; Noll et al., 1999). Participants with a history of childhood chronic illness were asked to distribute flyers about the study with corresponding envelopes to peers without a history of chronic illness. The flyer instructed interested individuals to email, call, or return the flyer in the provided envelope with their contact information to the first author. Once the potential participants opted in and provided contact information, the first author phoned them and explained the study in detail and also verified their eligibility. Once healthy participants completed the study, they, too, could provide information about the study to their healthy peers, thus extending recruitment of the healthy comparison group. Among the healthy peer comparison group, 28 were recruited by childhood cancer survivors, 5 were recruited by participants with cystic fibrosis (from the larger study described above), and 50 were recruited from other healthy peers. There were no significant differences between these subsamples of the healthy comparison group on PTSS, HRQOL, mood, depression, or SWL.

Demographic information for the two groups is reported in Table I. *T* tests and chi-square analyses were

used to compare the two groups on demographic information. There was a significant difference between the groups on education attained which was subsequently used as a covariate in analyses comparing the two groups.

Procedures

Eligible participants were told that the study assessed goals and well-being in young adults. Once eligible individuals agreed to participate in the study, they were mailed a packet which included: (a) a written consent form, (b) the study questionnaires, (c) specific instructions for completing the study, (d) a stamped and addressed envelope in which to return the materials, and (e) three envelopes with information sheets about the study that they had the option to distribute to healthy peers potentially interested in doing the study. When 7 to 10 days from the time the packet was mailed to each participant had passed, the participants were contacted to assure their receipt of the packet, to check on their progress, answer questions, and to encourage them to return the packet as soon as possible. Follow-up phone calls or emails were made approximately every week following the first follow-up call until the packets were returned or until approximately five contact attempts were made. When the completed packets were received, participants were sent a thank-you note along with financial compensation for their time (\$25).

Table I. Sociodemographic and Disease Information on Participants

	Cancer survivor ($n = 57$)	Control ($n = 83$)
Male gender	27 (47.4%)	31 (37.3%)
Age, <i>M</i> (<i>SD</i>)	21.70 (2.65)	22.17 (3.02)
Marital status		
Married	7 (12.3%)	9 (10.8%)
Involved with partner	17 (29.8%)	32 (38.6%)
Single/separated	33 (57.9%)	42 (50.6%)
Employment status		
Working full-time	17 (29.8%)	31 (37.3%)
Working part-time	21 (36.8%)	27 (32.5%)
Not working	19 (33.3%)	25 (30.17%)
Education*		
High school or less	15 (26.3%)	2 (2.4%)
More than high school	42 (73.7%)	81 (97.6%)
Income		
<30,000	17 (29.8%)	20 (24.1%)
30,000–60,000	11 (19.3%)	19 (22.9%)
>60,000	21 (36.8%)	35 (42.2%)
Ethnicity		
Caucasian	54 (94.7%)	77 (92.8%)
Minority	3 (5.3%)	6 (7.2%)

There is missing data related to Income.

* $p < .001$.

Measures

Demographics

All participants completed a demographic form that inquired about age, marital status, parental status, employment status, educational level, ethnicity, and income.

Health Status/Disease History

Survivors of Childhood Cancer. The participants with a history of childhood cancer were asked to report their cancer late effects, whether or not they have had a relapse of their cancer or a new cancer diagnosis as adults, and other current health problems. This information was also reviewed in their medical charts in addition to the type of cancer, date of diagnosis, the date treatment ended, and type of treatment.

Healthy Comparison Group. The healthy comparison group completed a form listing chronic health conditions or other disqualifying life-threatening events and asked to endorse any that applied to them. This provided reassurance that the healthy comparison group was healthy, without the experience of a life-threatening illness or accident or a chronic health condition.

PTSD

The Posttraumatic Stress Disorder Checklist—Civilian Version (PCL-C; Weathers, Litz, Herman, Juska, & Keane, 1993) was used to assess PTSD. This measure has been validated with cancer survivors (Andrykowski, Cordova, Studts, & Miller, 1998; Smith, Redd, DuHamel, Vicksberg, & Ricketts, 1999) and scores on the PCL-C have been shown to correspond to PTSS and PTSD as assessed by structured clinical interviews (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Manne, Du Hamel, Galelli, Sogen, & Redd, 1998). Responders are asked to rate on a 5-point scale the extent to which they have felt each symptom in the past month. The 17 items of the measure are the same as the 17 symptoms that make up the clinical criteria of the symptom clusters of B, C, and D of the Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition (DSM-IV) diagnosis of PTSD (Criterion A requires exposure to a traumatic event with associated feelings of fear, helplessness, and horror; Criterion E requires 1 month duration; and Criterion F requires related impairment; American Psychiatric Association, 1994). Thus, it is possible to make a tentative diagnosis of PTSD by using this measure by considering a score of 3 (moderate symptom endorsement) or higher on an item as an endorsement of the symptoms on Clusters B, C, and D (Weathers et al., 1993). To be considered for a diagnosis of PTSD, responders must endorse one of the five reexperiencing items (Cluster B), three of the seven avoidance items (Cluster C), and two

of the five arousal items (Cluster D) to meet criteria for PTSD as defined by the DSM-IV.

Therefore, as recommended (Weathers et al., 1993), we operationalized PTSD in this study as whether or not a participant met criteria for Clusters B, C, D, and E on the PCL-C. (Criterion E is assumed given that the measure asks for 1-month recall.) However, it should be noted that PTSD as operationalized in the current study by using the PCL-C is not a confirmatory diagnosis given the lack of information on exposure to a traumatic event and related feelings of fear, horror, and helplessness (Criterion A) and impairment specifically related to the PTSD (Criterion F). A subclinical level of PTSD was defined as meeting criteria for two of the three symptom clusters (Manne et al., 1998). Additionally, given that respondents can rate the extent to which they feel each of the 17 symptoms, the measure can also yield a continuous score of PTSS in addition to identifying scores on the three subscales assessing avoidance, reexperiencing, and arousal.

Typically, the items ask the extent to which a respondent feels a certain way in response to a target trauma that is identified. Because our study used a control group, we did not specify cancer as the traumatic event given that it did not apply to the entire group. Instead, all the participants were prompted to think of their own personally relevant traumatic event when completing the PCL-C. Scores range from 17 to 85 with higher scores indicating worse functioning. The Cronbach's α for this sample was .91 for the total score, .84 for the avoidance items, .84 for the reexperiencing items, and .79 for the arousal items.

HRQOL

The Short Form Health Status Questionnaire (SF-36; Ware, 1993) was used to assess physical and psychosocial HRQOL. Most questions ask the respondents to rate themselves on quality of life in the past 4 weeks. The measure includes eight subscales that form two composite scales of physical and psychosocial HRQOL that were used in analyses. Higher scores indicate better functioning. The measure has shown good construct validity with both healthy and chronic illness populations. The Cronbach's α for this sample was .76 for both the physical health composite score and the psychosocial health composite score.

Mood

The brief mood rating scale (Diener & Emmons, 1985) consists of four adjectives describing positive affect (happy, joyful, enjoyment/fun, pleased) and five adjectives describing negative affect (depressed/blue, unhappy, angry/hostile, frustrated, worried/anxious). By using a 7-point scale,

participants rated how likely the adjectives described them in the previous week. Higher scores indicate better positive affect and worse negative affect. The positive affect and negative affect subscales were used separately in the analyses. Scores range from 0 to 24 for positive affect and 0 to 30 for negative affect. The measure has demonstrated good reliability and validity (Diener & Emmons, 1985). The Cronbach's α for this sample was .88 for negative affect and .92 for positive affect.

Depression

The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) was used to assess depressive symptoms and was designed to assess depressive symptomatology in community samples. The measure consists of 20 items that ask individuals to rate actions and feelings in the past week on a 4-point scale. Scores range from 0 to 60 with higher scores indicating more severe depression. Construct validity is good as indicated by strong correlations with other measures of depression (Radloff & Locke, 2000). Good reliability and validity have also been established with adolescents and young adults (Radloff, 1991). The Cronbach's α for this sample was .89.

Life Satisfaction

The Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffen, 1985) was chosen to represent a global rating of life satisfaction. Respondents indicate the extent to which they agree with five global statements of life satisfaction on a 7-point scale. Scores range from 5 to 35 with higher scores indicating higher satisfaction. Validity is supported by strong correlations with other scales of subjective well-being (Diener et al., 1985). The Cronbach's α for this sample was .88.

Perceived Impact of Cancer on Developmental Tasks

This five-item measure was designed for this study to assess the degree to which childhood cancer survivors believed that their cancer experience has affected typical developmental tasks of early adulthood. In particular, the measure assessed the extent to which cancer and its treatment adversely affected participants' educational achievement, participation in social activities or ability to interact socially, achievement of career goals, pursuit of or ability to maintain romantic relationships, and ability to live independently. Responders rated the impact of cancer on a 10-point scale with one being "did not affect it at all" and ten being "extremely affected it." A total score is yielded from summing the score on the five items. Higher scores represent higher perceived impact of cancer. The Cronbach's α for this sample was .81.

Data Analyses

Group Comparisons Between Cancer Survivor Group and Control Group

ANCOVAs that controlled for education were used to compare the two groups on the SF-36, brief mood rating scale, CES-D, SWLS, and the PCL-C scores. Two logistic regressions were used to compare the two groups on whether or not they met criteria for subclinical PTSD and PTSD. Group membership and the covariate of education were entered as independent variables with the dichotomous variables of PTSD (yes or no) or subclinical PTSD (yes or no) as the dependent variables.

Group Comparisons Between Cancer Survivors With and Without PTSD

T tests and chi-squares were used to compare those in the childhood cancer survivor group who met criteria for PTSD based on the PCL-C to those in the cancer survivor group who did not meet criteria for PTSD on demographic information and on cancer-related variables. *T* tests were used to compare the two groups on the SF-36, mood rating scale, CES-D, SWLS, and perceived impact of cancer on developmental tasks.

Results

Comparison of Cancer Survivor Group and Control Group on PTSD Outcomes

As hypothesized, logistic regression indicated that those in the cancer survivor group were more likely to have PTSD than those in the control group based on the PCL-C after controlling for education (odds ratio = 4.67, 95% confidence interval = 1.14–19.15, $p < .05$). Ten participants out of 57 (17.5%) of the cancer survivor group met criteria for PTSD compared with 3 out of 83 (3.6%) for the comparison group. However, there was not a significant difference between the groups on subclinical PTSD diagnosis, on the continuous score of the PCL-C, or on the subscales assessing avoidance, arousal, and reexperiencing when controlling for education. See Table II for a summary of group comparisons.

Comparison of Cancer Survivor Group and Control Group on Psychosocial Outcomes

As predicted, the groups also differed on the physical health summary score on the SF-36 with the cancer survivor group experiencing worse physical HRQOL when controlling for education, $F(1, 140) = 15.02$, $p < .001$. Also as predicted, there were no statistically significant differences between the groups on psychosocial HRQOL, depression, SWL, or negative affect when controlling for

Table II. Summary of Scores of Outcome Measures for Cancer Survivor Group and Control Group

	Cancer survivor (<i>n</i> = 57)	Control (<i>n</i> = 83)
PCL-C summary score	31.58 (13.42)	26.84 (7.88)
PCL-C avoidance	12.86 (6.44)	10.54 (3.39)
PCL-C arousal	10.07 (4.69)	8.29 (2.93)
PCL-C reexperiencing	8.65 (3.96)	8.01 (3.24)
PCL-C subclinical diagnoses	16 (28.1%)	14 (16.9%)
PCL-C PTSD diagnoses*	10 (17.5%)	3 (3.6%)
CES-D	13.98 (11.09)	10.75 (6.72)
Mood: negative affect	11.21 (7.87)	10.18 (5.70)
Mood: positive affect**	14.79 (5.56)	17.60 (4.04)
SF-36	45.69 (11.42)	46.89 (9.30)
Psychosocial health		
SF-36	51.64 (9.50)	59.91 (5.99)
Physical health***		
SWLS	22.60 (7.78)	25.76 (5.90)

PCL-C, Posttraumatic Stress Disorder Checklist-Civilian Version; CES-D, Center for Epidemiological Studies Depression Scale; PTSD, posttraumatic stress disorder; SF-36, Short Form Health Status Questionnaire; SWLS, Satisfaction with Life Scale.

The scores for PCL-C subclinical and clinical diagnoses represent the actual number of participants who met criteria based on the measure.

Percentages of the sample are in parentheses. All other scores reported are means for the sample with standard deviations in parentheses. Significance of differences is based on ANCOVAs controlling for education.

* $p < .05$. ** $p < .01$. *** $p < .001$.

education. However, there was a significant difference between the groups on positive affect with the cancer survivor group experiencing less positive affect than the healthy comparison group, $F(1, 140) = 7.03$, $p < .01$. See Table II for a summary of group comparisons.

Comparison of Cancer Survivors With and Without PTSD on Demographic and Cancer-Related Variables

The groups of cancer survivors with and without PTSD did not differ on demographic variables. Thus, no covariates were used when comparing the groups on outcome variables. Contrary to the hypothesis, the groups differed on age at diagnosis with the PTSD group being older at the time of their cancer diagnosis than the group without PTSD, $t(55) = 7.03$, $p < .01$. The average age at the time of diagnosis for the group with PTSD was 13.60 ($SD = 3.28$) and the average age at diagnosis for the survivor group without PTSD was 10.87 ($SD = 3.90$). Also contrary to the hypothesis, the cancer survivors with PTSD did not report more cancer late effects than those without PTSD. As predicted, the groups did not differ on duration of treatment, time since treatment, diagnosis, or occurrence of cancer relapse.

Comparison of Cancer Survivors With and Without PTSD on Psychosocial Outcomes

As hypothesized, those with PTSD among the cancer survivor group evidenced worse physical HRQOL, $t(55) = 3.79$, $p < .05$; worse psychosocial HRQOL, $t(55) = 4.20$, $p < .01$; more depressive symptoms $t(55) = -7.13$, $p = .00$; worse SWL, $t(55) = 4.10$, $p = .00$; more negative affect, $t(55) = -5.35$, $p = .00$; less positive affect, $t(55) = 4.02$, $p = .00$; and perceived their cancer experience to have more of an impact on developmental tasks, $t(55) = -3.43$, $p < .001$, than the cancer survivors without PTSD. See Table III for a summary of comparisons.

Discussion

This study was the first to our knowledge to compare amount of PTSS and rates of PTSD in a sample of childhood cancer survivors in early adulthood to a comparison group without a history of chronic health conditions. In addition to the inclusion of a control group, this study also addressed other limitations of previous related research by excluding participants diagnosed with cancer before age 4, by using a sample with a limited age range reflective of very early adulthood, and assessing current, as opposed to a history of, PTSS/PTSD to understand current psychological symptoms unique to a young adult survivor population. The study also extended previous findings on PTSD-related impairment by describing the impairment and impact associated with PTSD in individuals in early adulthood who survived childhood cancer.

Table III. Summary of Scores (Means and Standard Deviations) of Outcome Measures for Participants in Cancer Survivor Group With and Without PTSD

	Cancer survivors with PTSD (<i>n</i> = 10)	Cancer survivors without PTSD (<i>n</i> = 47)
CES-D****	30.50 (10.32)	10.47 (7.55)
Mood: negative affect****	21.10 (6.14)	9.11 (6.50)
Mood: positive affect****	9.10 (4.41)	16.00 (5.03)
SF-36	30.77 (13.11)	48.86 (8.15)
Psychosocial health*		
SF-36	42.35 (13.32)	53.62 (7.25)
Physical health**		
SWLS****	14.50 (6.19)	24.32 (7.00)
Impact of cancer on developmental tasks***	30.44 (11.40)	17.15 (10.48)

CES-D, Center for Epidemiological Studies Depression Scale; PTSD, posttraumatic stress disorder; SF-36, Short Form Health Status Questionnaire; SWLS, Satisfaction with Life Scale.

* $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0001$.

In general, results of the study support previous research on young adult cancer survivors showing that PTSD is a significant problem for some survivors (Hobbie et al., 2000; Meeske et al., 2001). As predicted, rates of PTSD differed for the two groups and those who survived cancer were almost five times more likely to have PTSD than the control group. The rate of PTSD in our sample (18%) was comparable with the rates found in previous research with young adult survivors of childhood cancer (e.g., 21% in Hobbie et al., 2000; 22% in Meeske et al., 2001; 17% in Pelcovitz et al., 1998).

The fact that there were no differences between survivors of cancer and healthy young adults on subclinical PTSD or PTSS indicates that what sets the two groups apart are rates of those that meet actual clinical criteria for PTSD. That is, although young adults who survived childhood cancer may evidence significant PTSS, the rates of subclinical symptoms as demonstrated in the current study did not differ from those of peers without a history of chronic illness. The prevalence of PTSD in this sample relative to other psychological outcomes of childhood cancer survival is not surprising given the traumatic nature of cancer including diagnosis, treatment, ongoing threats to health that are related to late effects and increased potential for new cancer diagnoses, and the special developmental challenges of young adulthood. Epidemiological research has also shown that for young adults, PTSD is a relatively common psychiatric diagnosis (Breslau et al., 1991).

Also, given previous findings related to the significant psychiatric comorbidity of PTSD (Kessler et al., 1995) and impairment associated with PTSD in young adults (Hobbie et al., 2000; Meeske et al., 2001), it is not surprising but important that those with PTSD among the cancer survivors experienced problematic functional outcomes including a great deal of distress and health-related problems. In particular, as predicted, those with PTSD in the cancer survivor group experienced significantly worse HRQOL, mood, depressive symptoms, and SWL than those without PTSD in the cancer survivor group. Additionally, as expected, those with PTSD reported that their cancer experience had a greater impact on important young adult developmental tasks than those without PTSD. These differences between the groups were quite remarkable despite the small sample of 10 in the PTSD group. However, contrary to our prediction and to other research (e.g., Brown et al., 2003; Meeske et al., 2001), those with PTSD did not report more psychological late effects. Also, contrary to our prediction and previous research (e.g., Brown et al., 2003; Meeske et al., 2001), those with PTSD were significantly older at the time

of their cancer diagnosis than those without PTSD. This finding may indicate that older age at diagnosis is related to a better understanding of the threat of cancer at the time of the diagnosis. Consistent with previous research and with our prediction, those with PTSD did not differ from those without PTSD on the duration of cancer treatment, time since cancer treatment, or number of cancer relapses.

As predicted, the cancer survivor and control groups differed on physical HRQOL indicating that those who survived cancer are more likely to experience physical symptoms that affect functional status. This finding highlights the long-term physical problems related to cancer survival which may include, but are not limited to, pain and fatigue, cardiac and pulmonary dysfunction, and sensory problems with hearing or eye sight. On the other hand, the fact that the groups did not differ on psychosocial HRQOL, depressive symptoms, negative affect, or SWL supports previous research showing that survivors of childhood cancer are generally well adjusted (Kazak, 1994; Kupst et al., 1995) and that PTSD seems to be a more likely psychological outcome of childhood cancer survival (Stuber et al., 1998). Contrary to our prediction, the groups differed on positive affect indicating that, although most childhood cancer survivors are well adjusted, they may experience less positive affect than healthy peers. Previous research has demonstrated the independence of positive and negative affect (Diener & Emmons, 1985), which underscores the need to assess both positive and negative affect when examining mood-related outcomes.

The findings of this study provide support that although most young adult survivors of childhood cancer are well adjusted and typically do not experience worse distress than healthy peers, a significant number of early adult childhood cancer survivors are likely to experience PTSD and to experience a great deal of related morbidity and impairment beyond distress and poor HRQOL. This finding indicates the need to routinely screen for PTSD as part of follow-up care for childhood cancer survivors in early adulthood. The 17-item PCL-C may provide an optimal and quick tool to screen for PTSD in clinics (Andrykowski et al., 1998). Those who meet criteria can then be followed up with more thorough assessments of PTSD such as by using a structured clinical interview. The morbidity associated with PTSD indicates that those childhood cancer survivors in early adulthood who meet criteria for PTSD will likely need ongoing psychosocial services such as cognitive-behavioral therapy aimed to alleviate the symptoms of PTSD and related morbidity and to help them achieve important developmental tasks of early adulthood. The fact that young adult survivors

of childhood cancer experience worse physical HRQOL than peers without a history of cancer also supports the need to continue medical follow-up with cancer survivors and to help them cope with the impact of the continued physical sequelae of childhood cancer.

Many limitations of this study need to be considered in interpreting our findings. One limitation is the use of the PCL-C to assess PTSD rather than using the Structured Clinical Interview for DSM (SCID), which is considered the gold standard of PTSD assessment tools (Foa & Meadows, 1997). Although the PCL-C is a well-validated measure, a diagnosis of PTSD cannot be conclusively made based on the PCL-C alone without confirming the presence of a target trauma and related feelings of fear, horror, or helplessness; duration of symptoms; and the functional impairment associated with the symptoms endorsed. Similarly, because the sample did not identify a specific trauma, it cannot be assumed that those who survived childhood cancer had PTSD because of the cancer experience and it cannot be assumed that all the participants in the healthy comparison group had previously been exposed to a traumatic event. Moreover, the study did not assess age of onset of PTSD symptoms so that the duration of the PTSD is unknown. A diagnosis of PTSD could have been made with more confidence if a structured clinical interview were used such as the SCID to assess for trauma history, duration of symptoms, and related feelings and impairment.

Also, the study is limited in that it did not have data on the participants' subjective cancer experience except for their reported late effects. Data on their perceived cancer experience may shed light as to who was more at risk for PTSD among the cancer survivor group. Although patient report of late effects was intended to provide a better indication of the participants' perceived impact of cancer, a limitation of the study also relates to the lack of objective medical data on the current health status of the survivors. Another weakness of the study is the lack of assessment of posttraumatic growth, which has also been found to be an important outcome of cancer experience (Eiser, 1998). Unfortunately, the groups in the sample were not perfectly matched given the significant difference between the groups on education attained. In addition, generalizability of the findings to individuals of ethnic minority status is also limited given that most of the sample were Caucasian. Finally, the amount of individuals in the cancer survivor group was relatively small, especially given the small amount of those identified as having PTSD.

Future research is needed to replicate current findings and to extend the findings to clinical settings. In particular, results need to be replicated with comprehensive struc-

tured clinical interviews to assess PTSD. Also, the feasibility and use of brief PTSD screeners such as the PCL-C needs to be tested in clinical settings and interventions need to be developed and tested to address the significant difficulties of those identified as having PTSD. The finding that cancer survivors in the sample experienced less positive affect than peers also indicates a need to further research positive outcomes such as happiness and the potential implications of feeling less positive affect as a childhood cancer survivor in early adulthood. Also, additional research is needed to confirm the finding that later age at diagnosis is a potential risk factor for PTSD in early adulthood. Prospective studies are also needed that assess for risk of PTSD of children with cancer from the time of diagnosis. In particular, the assessment of risk and resiliency factors such as family history of PTSD and anxiety, coping abilities, social support, and perceptions of threat and distress related to the cancer and its treatment is needed to identify who may be at risk for PTSD following childhood cancer.

Acknowledgements

This work was supported by National Institute of Mental Health grant 18330, research training in pediatric psychology, and by the Lance Armstrong Foundation.

The authors thank all the cancer survivors and their peers for their participation. We thank also Lindsay Duerr for her assistance with the study. Finally, we thank the physicians and the medical team associated with the care of the cancer survivors and young adults with CF for their assistance with participant recruitment.

Received June 29, 2004; revisions received October 28, 2004 and February 11, 2005; accepted February 24, 2005

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