

Posttraumatic Stress Symptoms in Young People with Cancer and their Siblings:

Results from a UK sample

Abstract

Purpose: This study investigated levels of posttraumatic stress symptoms (PTSS) in children with cancer and their siblings from a British sample. It also examined aspects of the Ehlers and Clark¹ model of posttraumatic stress disorder (PTSD) in the current population.

Methods: Sixty participants (34 children with cancer and 26 siblings) aged between 8-18 years completed measures of PTSS, maladaptive appraisals, trauma-centered identity, perceived social support and family functioning.

Results: Over a quarter of the sample scored above the clinical cut off on the Impact of Events Scale-Revised (IES-R). No differences were observed between patients and siblings with respect to levels of PTSS. Maladaptive appraisals and age were found to account for unique variance in levels of PTSS for the overall sample.

Conclusions: Rates of PTSS in the sample was relatively high. Support was found for aspects of the Ehlers and Clark¹ model in explaining PTSS for the current population.

3 Psychological trauma is triggered by events that are sudden, unexpected and in which the
4 individual perceives an intense loss of personal control and safety.² Symptoms of
5 posttraumatic stress disorder (PTSD) as described in the Diagnostic and Statistical Manual of
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7 Mental Disorders-Fifth Edition (DSM-5)³ consist of a combination of four cluster criteria
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9 (intrusions, avoidance, negative alterations in cognitions and mood, and marked alterations in
10 arousal and reactivity), which need to have been present for at least one month and cause
11 significant functional impairment.⁴ For individuals who only partly meet the diagnostic
12 criteria of the disorder, the terms ‘sub-threshold PTSD’, ‘partial PTSD’ or ‘posttraumatic
13 stress symptoms (PTSS) have been used.⁵ It is thought that cancer diagnosis and treatment
14 can be incorporated within this definition.⁶

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27 Estimates of PTSD in children with cancer vary from 4.7%⁷ to 21%.⁸ Estimates of
28 subclinical levels of PTSS have been reported as high as 78% endorsing at least one cluster
29 criterion.⁹ Furthermore, almost 70% of mothers and 60% of fathers expressed PTSS.¹⁰ The
30 importance of understanding these symptoms is accentuated by recent studies that highlighted
31 the functional impairment and distress associated with PTSS. Indeed, Varela et al¹¹ found that
32 the majority of childhood cancer survivors with partial PTSD (86.5%; *n*=105) reported
33 experiencing functional impairment related to these sub-threshold symptoms, with the
34 majority reporting impairment in multiple areas of functioning. Subclinical levels of PTSD
35 can have important implications in this population group. For example, avoiding cancer
36 related stimuli could influence decision-making regarding treatment.^{12,13} Furthermore,
37 avoidance in children with life threatening illnesses significantly correlated with non-
38 adherence to treatment regimen¹⁴ as well as the fact that patients may minimize their physical
39 difficulties to avoid reminders of the cancer diagnosis and treatment.^{15,16} The presence of
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55 PTSS has also been found to influence patients with general medical illnesses’ healthcare

3 utilization and medical outcome.¹⁷ It has been noted that the cancer experience has the
4 potential to bestow a series of traumatic events over time.¹⁸ This can include diagnosis
5 (including disease progression) and treatment/treatment complications (including invasive
6 procedures). Furthermore, other potentially traumatic events can also occur during the course
7 of treatment, including the death of other children known to the family, emergency surgery or
8 admission to intensive care units, as well as the threat of relapse.⁷ This can have an impact on
9 the young person with cancer, as well as their families. Indeed, Kazak and colleagues have
10 described symptoms of PTSD as ‘one of the most important psychological consequences of
11 childhood cancer’ (p. 493).⁷

12 The Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV;
13 APA 1994) broadened its taxonomy of PTSD to include being ‘diagnosed with a life
14 threatening illness’ or ‘learning that one’s child’¹⁹ (p. 426) has the aforementioned illness, as
15 a qualifying stressful event.²⁰ Furthermore, DSM-5 continues to posit that medical incidents
16 involving ‘sudden, catastrophic events’ qualify as traumatic stressors³ (p. 274).

17 Guidelines from the National Institute for Health and Clinical Excellence²¹ aimed at
18 improving outcomes in childhood cancer highlight the importance of psychological services
19 in cancer treatment. It is therefore crucial to investigate rates of PTSS in this population and
20 to highlight factors that may contribute to this in order to provide effective psychological
21 treatments for this population group.

22 The majority of previous research examining PTSD associated with childhood cancer
23 has focused on patients and their parents (particularly mothers). However, a recent systematic
24 review examining psychological functioning in siblings of children with cancer concluded
25 that a PTSD framework may provide a useful way of conceptualizing sibling distress.²²
26 Research in this area remains scant and the review identified only five studies examining
27 these symptoms in siblings of children with cancer. These studies reported that between 29%

3 and 38% of siblings reported moderate to severe PTSS, a rate greater than that found in a
4 comparison sample of healthy children.²³ Study limitations identified included failure to
5 detail the time since diagnosis and incorporating select samples (e.g. siblings attending a
6 summer camp). Furthermore, the studies did not provide information on which factors were
7 associated with increased risk of PTSS, thus failing to guide clinicians as to which siblings
8 may be most likely to experience these symptoms.
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10 Results from the Childhood Cancer Survivor Study (CCSS), a longitudinal cohort
11 study which examined over 18,000 adult survivors of childhood cancer and their siblings,
12 demonstrated that adult survivors of childhood cancer had more than a four-fold risk of
13 developing PTSD compared to siblings.²⁴ No studies were identified which compared
14 children and adolescents with cancer and siblings on levels of PTSD.
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16 Both Kangas and colleagues²⁵ and Bruce²⁰ underscored the importance of placing
17 cancer within a PTSD framework as informed by PTSD models. The cognitive model of
18 PTSD¹ reports that pathological responses to trauma arise when individuals process the
19 traumatic information in a method that produces a sense of current threat. This is maintained
20 by negative appraisals of the trauma and its sequelae, as well as the nature of the trauma
21 memory. Negative appraisals can be focused on the traumatic event itself, of one's own
22 actions, of others people's reactions or of life prospects. The importance of maladaptive
23 behavioral and cognitive strategies in maintaining the disorder is also highlighted.²⁶
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26 Evidence is accumulating regarding the relevance of cognitive models to explain the
27 development and maintenance of trauma symptoms within adult and child populations.²⁷⁻²⁹
28 Certain aspects of these models have been found to be particularly useful within child
29 populations. These include the role of maladaptive appraisals and trauma-centered identity in
30 predicting PTSD.³⁰ Furthermore, the inclusion of parental and environmental factors in order
31 address distinct developmental issues has been highlighted by a number of authors.³¹⁻³³
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3 These environmental factors include the child's perceived social support as well as
4 understanding the family's functioning.³⁴ A number of reviews have highlighted that these
5 factors can moderate the impact of the traumatic event, the impact of trauma reminders as
6 well as the influence of ongoing stressors.^{30,35} It has been suggested that future research
7 should conceptualize psychological distress in response to cancer using models such as the
8 cognitive appraisal model of PTSD¹ to guide research and facilitate specific hypotheses-
9 testing.¹⁶

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18 The aims of this study were two-fold. Firstly, the study aimed to examine whether
19 there were any differences between patients and siblings in levels of PTSS, as well as to
20 investigate the levels of PTSS for both groups in this study. This has implications for service
21 provision in pediatric psychology services in the UK. Secondly, the current research aimed to
22 explore the impact of maladaptive cognitive appraisals and trauma-centered identity on
23 PTSS, as indicated by the cognitive model of PTSD¹ for both children with cancer and their
24 siblings. Specifically, we hypothesized that cognitive (i.e. maladaptive appraisals and trauma
25 centered identity) and environmental variables (i.e. family functioning and perceived social
26 support) would explain variance in levels of PTSS for the current sample.
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40 **Methods**

41 **Participants**

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43 Participants included 60 children aged 8-18 years ($M = 12.38$, $SD = 2.85$). This included 34
44 patients and 26 siblings. One parent per family was also included to complete an assessment
45 of family functioning. Inclusion criteria were: both patients and siblings aged 8-18 years at
46 time of recruitment, patients (and siblings of patients) at least three months post diagnosis
47 and no more than five years post treatment. Exclusion criteria were: severe cognitive
48 impairment, patient deceased or receiving palliative care (or sibling of child receiving
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3 palliative care) and/or lack of fluency in English. Of the 34 patients who completed the study,
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5 11 (32%) were currently receiving treatment. Of the 52 patients who were approached by
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7 staff during outpatient appointments, 31 families consented to be contacted (60%). Five
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9 families declined participation following contact from the researcher (16%) and 6 families
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11 contacted the researcher independently via the poster advertisement. Of the initial 52 families
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13 approached, 26 participated in the study (overall response rate of 50%). Figure 1 provides an
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15 illustrative overview of the recruitment process. There were no significant differences in time
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17 since diagnosis or treatment duration between participants and non-participants ($p >.05$).
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19 Other demographic and treatment related data for non-participants were not recorded due to
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21 regulations relating to patient data protection in the hospital. Table 1 provides further
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23 information regarding the demographic and treatment variables of participants.
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29 **Procedure**

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31 The study was granted ethical approval by the Norfolk Research Ethics Committee
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33 (Ref: 13/EE/0143) in June 2013. Primarily, a member of the clinical care team reviewed the
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35 computerized register of pediatric cancer patients in order to identify families who met the
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37 initial inclusion criteria. Parents were approached during the child's usual outpatient
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39 appointment by a member of the clinical care team and were provided with an information
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41 pack explaining the study. In the case where the patient had a number of eligible siblings, the
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43 sibling closest in age to the patient was invited to take part.
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46 If parents were interested in obtaining more information about the study, they were advised
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48 to complete a 'consent to contact' form and the author would contact them to explain the
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50 study in more detail and answer any questions they had. If parents, the patient and/or their
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52 sibling were interested in participating in the study, the author organized a time, date and
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54 location to come and complete the questionnaires. Posters that outlined inclusion/exclusion
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3 criteria as well as contact details for the primary researcher (AD) were also placed in the
4 hospital waiting room. The majority of participants chose to complete the questionnaires at
5 home (97%; n = 58), and the remainder of participants (3%; n = 2) completed the
6 questionnaires during a hospital appointment. Children who scored above the cut off on the
7 IES-R at the time of assessment were offered an appointment with the clinical psychologist
8 within hospital's pediatric oncology department.
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10 11 12 13 14 15 16 17 18 19 20 **Measures**

21 *Child PTSS.* The Impact of Events Scale-Revised (IES-R)³⁶ was used to measure PTSS in
22 both the patient and sibling sample. This is a well-standardized, 22 item self-report
23 instrument designed to measure the three symptom clusters – intrusion, avoidance and
24 hyperarousal – associated with the DSM-IV criteria for PTSD. Participants are asked to think
25 about the part of the cancer experience which was most frightening for them and to report the
26 degree of distressed experienced for each item in the past 7 days. Items are rated from 0 – 4
27 (0 = not at all to 4 = extremely), relating to frequency of distress associated with intrusion
28 (e.g. “any reminder brought back feelings about it”), avoidance (e.g. “I stayed away from
29 reminders about it”) and hyperarousal (e.g. “I felt watchful and on guard”). Higher scores
30 indicate increased levels of PTSS. The IES-R has been used extensively with children with
31 cancer and their families.^{7,37} In the current study, the data confirmed the measures high
32 internal consistency (Cronbach's $\alpha = 0.86$ in the patient group and $\alpha = 0.88$ in the sibling
33 group).
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52 *Maladaptive Appraisals.* The Children's Posttraumatic Cognitions Inventory (CPTCI)³⁸ was
53 administered to both patients and siblings to measure maladaptive appraisals derived
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3 following the cancer diagnosis. The CPTCI, which was adapted from the Posttraumatic
4 Cognitions Inventory for adults (PTCI)³⁹ contains two subscales: permanent and disturbing
5 change (13 items; e.g. “My life has been destroyed by the frightening event,” “I will never be
6 able to have normal feelings again”) and feelings of vulnerability (12 items; e.g. “Bad things
7 always happen,” “Everyone lets me down”). Items are rated in terms of levels of agreement
8 (1 = don’t agree at all to 4 = agree a lot). Higher scores represent increased maladaptive
9 appraisals. In the current study, the scale was found to have excellent internal consistency for
10 both groups (Cronbach’s $\alpha = 0.90$ for the patient group and $\alpha = 0.91$ for the sibling group).

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22 *Trauma-Centered Identity.* The Centrality of Event 7-item Scale (CES-7)⁴⁰ was administered
23 to patients and siblings to measure how central the traumatic event(s) was to their identity
24 and life story (e.g. “the frightening event is part of who I am now” and “if I were to tell a
25 story about my life, the frightening event would be one of the most important parts”). Items
26 are rated on a 4-point scale indicating levels of agreement with each statement. An adapted
27 version of the scale for use with children who had experienced a traumatic event was
28 employed (CCES). In the current study, the data confirmed the measures high internal
29 consistency (Cronbach’s $\alpha = 0.84$ in the patient group and $\alpha = 0.85$ in the sibling group).

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43 *Family Functioning.* Family functioning was measured using the 12-item Global Functioning
44 Scale (GFS), which forms part of the Family Assessment Device (FAD).⁴¹ This was
45 completed by the patient’s or sibling’s primary caregiver. This scale is designed to assess
46 problematic family functioning⁴¹ (e.g. “We avoid discussing our fears and concerns,” “In
47 times of crisis, we can turn to each other for support”). The scale requires caregivers to rate
48 the degree to which each statement describes their family, with responses on a 4-point Likert
49 type scale, (1 = “strongly agree” and 4 = “strongly disagree”). Scores are reversed for certain
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3 items and lower scores reflect better functioning. The FAD emerged as one of the most
4 appropriate tools for assessment of family functioning in pediatric pain populations.⁴² In the
5 current study, the internal consistency of the FAD was established as $\alpha = 0.87$.
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14 *Perceived Social Support.* Perceived social support was assessed utilizing the
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16 Multidimensional Scale of Perceived Social Support (MSPSS)⁴³ for both patients and
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18 siblings. The MSPSS is a 12-item questionnaire used to measure how one perceives their
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20 social support system as well as the rating of sources of social support. Items are rated on a 7-
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22 point scale (1 = very strongly disagree and 7 = very strongly agree). Items relate to the
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24 perceived social support derived from various individuals in the participant's social system,
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26 including family (e.g. "I can talk about my problems with my family"), friends (e.g. "I can
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28 count on my friends when things go wrong") and significant others (e.g. "There is a special
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30 person who is around when I am in need"). Higher scores on the measure indicate higher
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32 levels of perceived social support. In the current study, the internal consistency of the MSPSS
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34 was $\alpha = 0.87$ for both the patient and sibling groups.
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39 **Statistical Analyses**

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42 All analyses were conducted using SPSS statistical software, Version 22, and inspected for
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44 departures from normality. The data were screened in accordance with the recommendations
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46 outlined by Tabachnick and Fidell.⁴⁴ The data were screened using both visual inspection
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48 (histogram and box plots) and statistical methods (testing of skew and kurtosis) to ensure that
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50 the data set was complete, clear of errors and to check the distribution.

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52 Data values were missing for four of a total of 60 participants (7%). Boxplots were produced
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54 to screen for any outliers or extreme values, in accordance with guidelines outlined by
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3 Pallant.⁴⁵ None of the outliers identified were considered extreme points. Power calculations
4 completed prior to data collection indicated that there was 80% power to detect correlations
5 of $r \geq .21$ for the sample at a significance level of 0.05. In order to control for Type 1 errors,
6 Bonferroni adjustments (according to the method outlined by Wright⁴⁶) were applied.
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10 Bivariate analyses were completed to examine the relationship between PTSS and the various
11 demographic, objective illness and psychological variables previously outlined.
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14 Subsequently, hierarchical multi linear regression modelling was used to examine the
15 variance in PTSS accounted for by the above variables. Variables were entered in a
16 hierarchical fashion, with age entered in a first step, and maladaptive appraisals and trauma-
17 centered identity entered in a second step; this procedure was undertaken to consider whether
18 psychological mechanisms improved the model over and above age. The sample was
19 combined for bivariate and multivariate analyses in order to increase the overall statistical
20 power to examine the relationship between psychological variables and PTSS in this
21 population. While the authors acknowledge the important conceptual distinction between
22 cancer patients and their sibling's experiences of cancer diagnosis and treatment, due to the
23 study's relatively low power, the decision was made to combine the samples for statistical
24 analyses. Furthermore, between group analyses indicated no significant difference in patients'
25 and their siblings' demographic backgrounds, therefore it was considered to offer further
26 justification –with accepted limitations – to the decision of combining the samples for
27 analyses.
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48 **Results**

49 **PTSD severity**

50 The data were not normally distributed and therefore patient and sibling groups were
51 compared using the Mann-Whitney U test. This indicated no significant differences in levels
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3 of PTSS between patient ($Md = 29$) and sibling ($Md = 33$) samples, $U = 389$, $p = .43$, $r = .10$.
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5 A Wilcoxon signed-rank test was conducted to evaluate differences in levels of PTSS
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7 between patient and sibling pairs (i.e. pairs from the same family; $n = 44$). There was no
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9 significant difference in levels of PTSS between patient ($Md = 23$) and sibling ($Md = 23$)
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11 pairs ($Z = -1.218$, $p = .223$).
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14 A total of 28% ($n = 17$) of the overall sample; 31% of the sibling group ($n = 8$) and
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16 27% of the patient group ($n = 9$) scored above the cut off (≥ 33) on the IES-R ($\chi^2 = .134$,
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18 $p = .714$). The primary stressor identified by participants is outlined in Table 2; in the majority
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20 of instances the primary stressor was the actual diagnosis.
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23 24 **Bivariate Analyses**

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26 Significant positive correlations were found between levels of PTSS in the total sample and
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28 age, maladaptive appraisals (both ‘permanent and disturbing change’ and ‘fragile person in a
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30 scary world’ appraisals) and trauma centered identity ($p < 0.05$). No other demographic,
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32 illness or psychosocial factor correlated significantly with levels of PTSS (see Table 3) in the
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34 total sample, but perceived social support was significantly and positively correlated with
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36 PTSS in the sibling group. There was no significant difference between patients and siblings
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38 with respect to gender.
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44 **Multivariate Analyses**

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46 Results from the multivariate analyses are displayed in Table 4. The entry of age in the first
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48 step did significantly improve the model, accounting for 14.7% of variance; the addition of
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50 the CPTIC and CES also further improved the model (for a total of 36.8% of variance).
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52 However, the only variable to account for unique variance in the final model was maladaptive
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54 appraisals (beta = .38).
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3 This model was repeated but with child's status (i.e. 'patient' or 'sibling') also entered in the
4 first step. This model was undertaken to ensure that this variable did not alter the pattern of
5 results. In this model, the first step account for 15.6% of variance, but only age and not child
6 status accounted for unique variance at this point. The second step also further improved the
7 model (for a total of 38.4% of variance). As before, only maladaptive appraisals (beta = .37)
8 accounted for unique variance in the final model.
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10 11 12 13 14 15 16 17 18 19 20 **Discussion**

21 The current study aimed to examine any potential differences in the levels of PTSS in a
22 British sample of children with cancer and their siblings. It also aimed to examine whether
23 cognitive aspects of the Ehlers-Clark¹ cognitive model of PTSD could be considered
24 applicable in this population.
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27 Although there were no significant differences in the levels of PTSS between children
28 with cancer and their siblings, the percentage of participants meeting cut-off for a potential
29 diagnosis of PTSD was substantial, with 27% of patients and 31% of siblings indicating
30 potential PTSD 'caseness'.⁴⁷ The individual symptoms assessed, albeit not achieving
31 diagnostic status, may have important implications. For instance, avoidance in children with
32 life threatening illnesses significantly correlated with non-adherence to treatment regimen.¹⁴
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35 Second, the relatively high rate of PTSS in siblings highlights the importance of
36 ensuring service provision for those individuals who may require psychological input.
37 Variable intervention provision in the UK may shed light on the higher rates of PTSS
38 demonstrated for this population compared to samples derived from the US.^{21, 23, 48}
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45 Research with adult survivors of childhood cancer suggests that the cancer experience
46 and late effects associated with treatment results in these individuals having a four-fold
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3 greater risk of developing PTSS compared to their siblings.²⁴ The authors were unable to
4 identify any other studies that directly compared levels of PTSS in children with cancer and
5 their siblings. The comparable rates of PTSS in children with cancer and siblings may be due
6 to the shared environmental and familial factors previously mentioned. Although not assessed
7 in the current study, previous research has indicated that parents of children with cancer have
8 a heightened risk of developing PTSS⁷, which may have an impact on levels of PTSS
9 expressed by both patients and siblings. These shared environmental and familial factors may
10 be less prevalent for adult survivors and their siblings. Indeed, a qualitative review⁴⁹
11 highlighted three main areas of stressors influencing young siblings' wellbeing. These
12 included; (i) tremendous changes in their lives, particularly with regards to family
13 relationships and routines, (ii) facing the constant unpredictability of the disease and (iii)
14 feeling isolated and on the periphery of family life.

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29 Participants within the current sample endorsed a range of maladaptive appraisals.
30 These appraisals are thought to maintain PTSD by generating negative emotions and
31 encouraging individuals to engage in dysfunctional coping strategies.¹ Given the robust
32 correlations between maladaptive appraisals and PTSS in the current study, as well as the
33 excellent internal consistency of the CPTCI measure in the sample, it may be that this
34 measure can prove clinically useful in attempts to identify the nature of young people's
35 maladaptive appraisals about cancer.

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44 Within their proposed cognitive model of maintenance, Ehlers & Clark¹ also aim to
45 explain a '*frozen in time*' phenomenon whereby individuals with chronic symptoms of PTSD
46 describe feeling locked into their past. It may be that this experience relates to cognitions
47 regarding 'permanent and disturbing change' explored within this study. Indeed, it is
48 proposed that patients may sense they have permanently changed (as described in the current
49 study). This may cause young people to find it difficult to return to activities that they
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3 considered important before the traumatic event, which contributes to the sense that their life
4 hasn't moved on. This is in line with participant's agreement on questions such as 'My life
5 has been destroyed by the frightening event'. This has important implications for individuals
6 diagnosed with cancer. Indeed, previous research has indicated that perceived social
7 competency and self-esteem are lower in children with cancer who are off treatment than
8 children who are on treatment.^{50, 51} Impairments in social competence have also been reported
9 for siblings of children with cancer.⁵² This may indicate that children find it more difficult to
10 return to activities that they previously enjoyed, even once they have completed treatment.⁵³
11 This may prevent alterations in maladaptive appraisals of the traumatic event.

21 The fact that illness-related factors were not associated with levels of PTSS supports
22 findings from previous studies.^{7, 16, 54} Importantly, time since diagnosis, treatment duration
23 and treatment status (on/off treatment) were not found to be associated with PTSS, suggesting
24 that these symptoms are more than just stress reactions in response to cancer diagnosis. This
25 finding indicates that early identification of cancer patients who are likely to require mental
26 health assistance should focus on psychological as well as medical variables. This supports
27 previous research within the child and adult psycho-oncology literature.⁵⁵

37 Findings from the current study implicating the role of cognitive variables, supports
38 the potential application of the Surviving Cancer Competently Intervention Program – Newly
39 Diagnosed (SSCIP – ND) to patients and siblings. The SSCIP-ND represents a three-session
40 manualized treatment program devised for parents of children newly diagnosed with cancer.⁵⁶
41 This program integrates cognitive-behavioral and family therapy principles by identifying
42 and altering the parent beliefs that may facilitate or hinder adaptive functioning following
43 diagnosis.

3 This study had some limitations. First, our study was cross-sectional which fails to
4 represent the dynamic nature of the cancer trajectory and the adaption process for patients
5 and siblings. Second, the study comprised a relatively small sample which may have resulted
6 in a lack of statistical power in testing some of the relationships between the variables.
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8 Furthermore, as previously mentioned, the authors acknowledge the important conceptual
9 distinction of cancer patients and their sibling's experiences of cancer diagnosis and
10 treatment, and therefore the limitations associated with merging the samples for
11 analyses. In this regard, the regression model outlined would also need to be tested in further
12 studies. Third, it would have been useful to include multi-informant data in assessing family
13 functioning (specifically self-report data from patients and siblings) and perceived social
14 support (specifically self-report data from parents). Indeed, previous studies examining
15 family functioning in childhood cancer and siblings have demonstrated that PTSS was
16 predicted by self-report but not parent-reported family functioning.^{57, 58} This may provide
17 some explanation for the lack of association between family functioning and PTSS in the
18 current study. The study would have also benefitted from the inclusion of a measure of
19 anxiety. This was omitted in the current study in an attempt to limit the length of the
20 questionnaire battery, particularly for those young people who were experiencing fatigue in
21 the context of cancer treatment.
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43 Alongside addressing the above limitations, future research with this population may
44 also benefit from examining other features implicated within cognitive models of PTSD,
45 including rumination, safety behaviors and memory quality. Indeed, it is possible that cancer
46 patients who do not adequately encode memories in the initial phase after their diagnosis may
47 be more prone to subsequent PTSS because they cannot integrate and process their
48 experiences optimally. This may also be an important factor for siblings who might also
49 experience difficulties encoding illness related information.⁵⁹
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3 Finally, given the growing literature on posttraumatic growth (PTG; a process
4 whereby those who have experienced a traumatic event apply positive interpretations to and
5 find meaning in the traumatic event) in children with cancer ⁶⁰ and their siblings⁶¹, it may be
6 of interest to unpick factors that lead to PTG as opposed to posttraumatic stress to shed light
7 on potential mediating variables, which could supplement current interventions.
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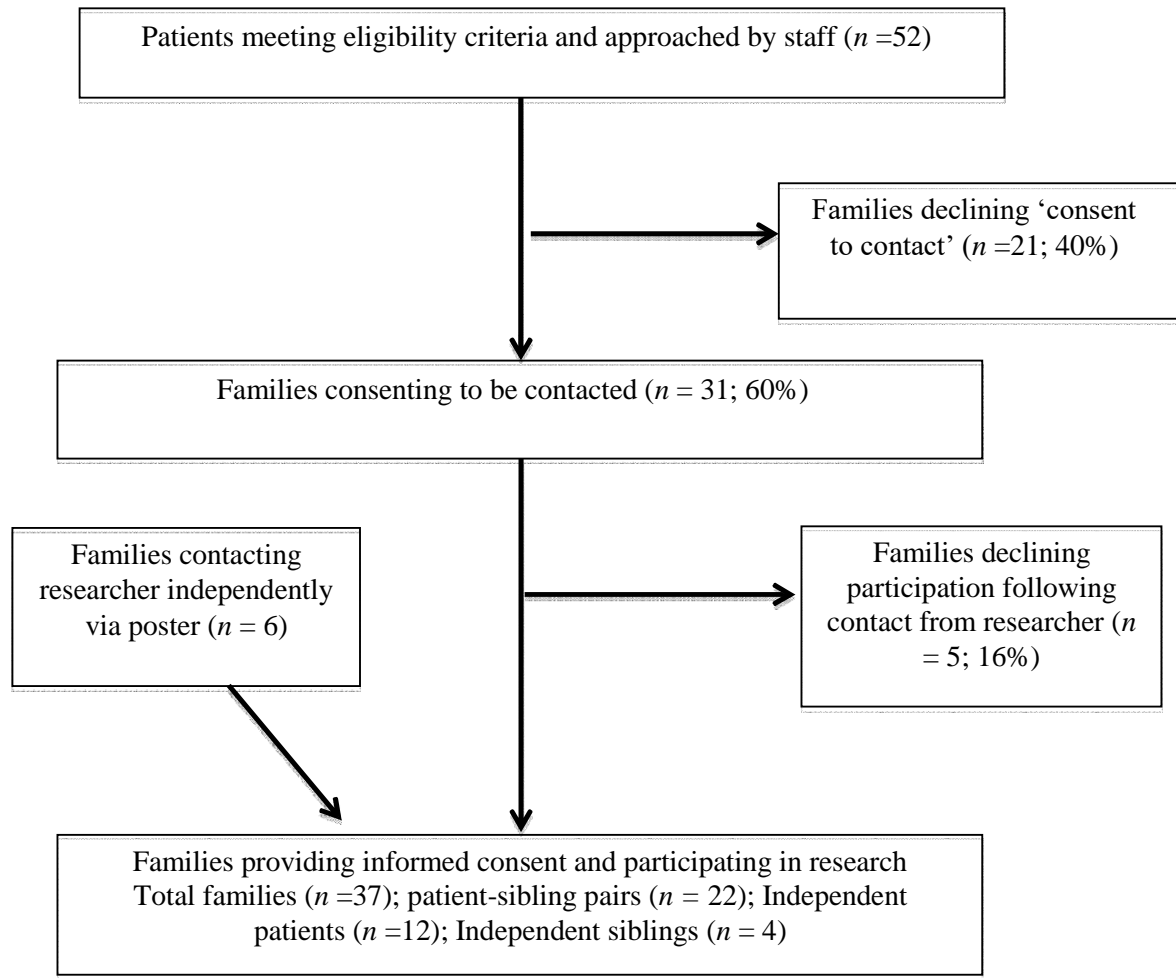


Figure 1: Recruitment Flow Chart

Table 1. Demographic and Medical Information of Sample ($N = 60$)

Characteristic	Patients ($n = 34$)	Siblings ($n = 26$) * Corresponding data
Age [mean (SD)]	12.24 (2.81)	12.58 (2.94)
Gender [n (%)]		
Male	13 (38)	14 (54)
Female	21 (62)	12 (46)
Diagnostic category [n (%)]		
ALL ^a	18 (53)	16 (61)
Other Leukemia	1 (3)	2 (8)
HD/NHL ^b	4 (12)	1 (4)
Solid tumor	6 (17)	3 (12)
Brain tumor	5 (15)	4 (15)
Treatment Received [n (%)]		
Chemotherapy	20 (59)	13 (50)
Radiotherapy & Surgery	2 (6)	2 (8)
Chemotherapy & Surgery	4 (12)	2 (8)
Chemotherapy & Radiotherapy	2 (6)	4 (15)
Transplant ^c	6 (17)	5 (19)
Treatment Stage [n (%)]		
Ongoing	11 (32)	9 (35)
Completed	23 (68)	17 (65)
Time Since Diagnosis [n (%)]		
≥ 1 -9 months	5 (15)	3 (12)
9 – 24 months	11 (32)	6 (23)
24 months to 5 years	18 (53)	17 (65)
Duration of Treatment [n (%)]		
≥ 1 – 6 months	7 (21)	4 (15)
6 – 12 months	4 (12)	5 (19)
12 – 24 months	8 (23)	3 (12)
24 – 40 months	15 (44)	14 (54)

*Note: Given previous research suggesting poorer psychological adjustment in parents according to specific cancer diagnoses and treatments (Fuemmeler et al., 2001; Bruce, 2006), descriptive data pertaining to the cancer diagnosis and treatment ‘experienced’ by siblings is included; *a* = Acute lymphocytic leukemia; *b* = Hodgkin’s disease/non-Hodgkin’s lymphoma; *c* = Included organ transplant and bone marrow transplant in conjunction with chemotherapy, radiotherapy or both.

Table 2. Primary Stressors Reported on IES-R

Primary Stressor [n (%)]	Patients (n = 34)	Siblings (n = 26)
Diagnosis	28 (82)	20 (77)
Admission to Intensive Care	3 (9)	4 (15)
Seeing sibling in an ambulance	-	2 (8)
Surgery	3 (9)	-

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Table 3. Correlations between PTSS and Demographic, Treatment-Related, Cognitive and Environmental Variables

	PTSS	Age	Time since Diagnosis	Treatment Duration	CPTCI – Total	CPTCI - PDC	CPTCI -FPSW	CES	MSPSS
PTSS									
Age	.308*								
Time Since Diagnosis	-.014	-.195							
Treatment Duration	-.193	-.092	.184						
CPTCI – Total	.566***	.177	-.209	-.187					
CPTCI – PDC	.568***	.307*	-.296*	-.226	.893***				
CPTCI – FPSW	.508***	.097	-.165	-.125	.956***	.743***			
CES	.417**	.506***	-.154	-.124	.362**	.512**	.278*		
MSPSS	.061	-.296*	.225	.196	-.153	-.131	-.135	.002	
FAD – Global	.200	.096	.152	-.014	.251	.268*	.211	.000	-.272

Note: PTSS = Posttraumatic Stress Symptoms; CPTCI-PDC = Post-Traumatic Cognitions Inventory–Child Version, Permanent and Disturbing Change subscale; CPTCI-FPSW = CPTCI, Fragile Person in a Scary World subscale, CES=Centrality of Events Scale; MSPSS = Multidimensional Scale of Perceived Social Support; FAD Global = Family Assessment Device Global Scale; These analyses reflect Spearman’s rho correlation co-efficients;

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

Table 4. Regression modelling of post-traumatic stress symptoms in all youth.

	Model R ²	F test	ΔR^2	F test	Beta (step two)
<i>MODEL ONE</i>					
<i>Step one</i>	.15	F _{1,56} = 9.65**	-	-	
Age					.19
<i>Step two</i>	.37	F _{3,54} = 10.46**	.22	F _{2,54} = 9.41***	
CPTCI					.38**
CES					.22
<i>MODEL TWO</i>					
<i>Step one</i>	.16	F _{2,55} = 5.10**	-	-	
Age					.17
Child status					.13
<i>Step two</i>	.38	F _{4,53} = 8.25***	.23	F _{2,53} = 9.78***	
CPTCI					.37**
CES					.25

Note: CPTCI = Child Post-Traumatic Cognitions Inventory; CES = Centrality of Events Scale

p<.01, *** = p<.001