The association of metacognitive beliefs with emotional distress and trauma symptoms in adolescent and young adult survivors of cancer

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ABSTRACT

Purpose/Objectives: Adolescent and young adults who have survived cancer are at an increased risk of psychological distress. This study investigated whether metacognitive beliefs are associated with emotional distress and trauma symptoms in adolescent and young adult (AYA) survivors of cancer independent of known covariates, including current physical health difficulties. Design: Cross-sectional survey using multiple self-report measures. Sample and Methods: Eighty-seven AYA survivors of cancer were recruited from follow-up appointments at an oncology unit and completed self-report questionnaires measuring emotional distress, posttraumatic stress symptoms, metacognitive beliefs, demographic information, and current physical health difficulties. Data were analysed using correlational and hierarchical multiple regression analyses. Findings: Metacognitive beliefs explained an additional 50% and 41% of the variance in emotional distress and posttraumatic stress symptoms, respectively, after controlling for known covariate effects, including current physical health difficulties. Conclusions/Implications for Psychosocial Providers or Policy: The metacognitive model of psychopathology is potentially applicable to AYA survivors of cancer who present with elevated general distress and/or posttraumatic stress symptoms. Prospective studies are required to determine whether metacognitive beliefs and processes have a causal role in distress in AYA survivors of cancer.

Introduction

Improvements in diagnosis and advances in treatment have increased survival in patients diagnosed with cancer in childhood, adolescence and young adulthood,
with approximately 80% of patients now surviving into adulthood (Cancer Research UK 2017, Lewis, Seibel, Smith, & Stedman, 2014, Oeffinger, Mertens, & Sklar, 2006, Skinner, Wallace, & Levitt, 2006). Adolescent and young adult (AYA) survivors of cancer often experience physical and psychosocial late-effects that are secondary to their cancer and its treatment. Over 60% of long-term survivors are left with at least one chronic health condition, while at least 40% experience moderate-to-severe or life-threatening sequelae (Oeffinger et al., 2006, Skinner, Wallace, & Levitt, 2006, Woodward, Jessop, Glaser, & Stark, 2011). These physical health difficulties, coupled with the occurrence of cancer at a critical stage in identity formation and personal and social development, mean that AYA survivors of cancer are particularly vulnerable to experiencing emotional distress (Abrams, Hazen, & Penson, 2007, Evan & Zeltzer, 2006, Zebrack & Landier, 2011). There are several robust predictors of emotional distress in AYA survivors of cancer, including being female, experiencing physical health problems, receiving a cancer diagnosis at a younger age, and being in the transition phase from end of acute medical treatment to survivorship (Kazak, DeRosa, & Schwartz, 2010, McCarthy, McNeil, & Drew, 2016, Michel, Rebholz, von der Weid, Bergstraesser, & Kuehni, 2010, Recklitis, Lockwood, Rothwell, & Diller, 2006, Wenninger et al., 2012).

For most of the AYA survivors, emotional distress diminishes naturally over time (Langeveld, Stam, Grootenhuis, & Last, 2002, Stam, Grootenhuis, & Last, 2005). However, around a third of long-term survivors experience clinically significant levels of emotional distress (Hobbie, Stuber, & Meeske, 2000, Seitz, Besier, & Debatin, 2010, Zebrack & Landier, 2011), which, if left untreated, can persist for a decade or more (Seitz et al., 2010, Zebrack & Landier, 2011). Psychological morbidity reduces quality of life, treatment adherence and follow-up with oncology services, intensifies physical symptoms, and increases economic burden (Dejong & Fombonne, 2006, Hobbie et al., 2000, Stam et al., 2005). Although clinical guidelines and guidelines for commissioning healthcare services recognize the importance of providing effective, timely, and acceptable psychological interventions to those patients who need it (National Institute for Health & Care Excellence 2014), considerable room for improvement in treatment efficacy exists (Bradford & Chan, 2017, Naaman, Radwan, Fergusson, & Johnson, 2009).

Arguably, more efficacious interventions for emotional distress experienced by AYA survivors of cancer will be achieved if the treatment is based on a theoretical model that can accommodate the diverse range of presentations and psychological comorbidity intrinsic to the AYA survivor population (Seitz et al., 2010). One potential model is the Self-Regulatory Executive Function (S-REF) model (Wells, 2009), a transdiagnostic model of emotional distress. The S-REF model posits that emotional distress becomes persistent when stored metacognitive beliefs guide an individual to respond to commonly occurring negative thoughts and feelings in a specific way (Wells, 2009). This response style is termed the ‘Cognitive Attentional Syndrome’ (CAS), and has three broad components: (i) perseverative thinking (e.g., worry, rumination, over-analysing, doubting); (ii) threat-monitoring (e.g.,
focusing attention on thoughts, emotions, or physical sensations); and (iii) maladaptive cognitive/behavioral coping strategies that impair cognitive and emotional regulation (such as avoidance, reassurance-seeking, and thought suppression).

The S-REF model states that several types of metacognitions activate and maintain the CAS, which in turn maintains distress. Cartwright-Hatton and Wells (Cartwright-Hatton & Wells, 1997) devised the Metacognitions Questionnaire and subsequently developed an abbreviated version, the Metacognitions Questionnaire-30 (Wells & Cartwright-Hatton, 2004), to assess five metacognitive domains used in the present study. Positive metacognitive beliefs concern the usefulness of each aspect of the CAS (e.g., “worrying will help me cope”). Negative metacognitive beliefs pertain to the uncontrollability and danger of the CAS (e.g., “I can’t stop worrying about cancer recurrence”). Cognitive confidence relates to beliefs about lack of confidence in one’s attention and memory (e.g., “I don’t trust my memory”), while beliefs about the need to control thoughts relate to the extent to which one believes certain thoughts must be suppressed (e.g., “it’s bad to have thoughts about cancer”). Finally, cognitive self-consciousness pertains to the degree to which one monitors their thoughts and focuses their attention inwards (e.g., “I monitor my mind for negative thoughts about cancer”).

Preliminary evidence supports the applicability of the S-REF model to adult cancer survivors experiencing emotional distress (Cook et al., 2015a, Cook et al., 2015b). Metacognitive beliefs are associated with symptoms of anxiety, depression and trauma among patients with breast or prostate cancer at both the time of diagnosis, and 12-month postdiagnosis, with negative metacognitive beliefs demonstrating the strongest association with each outcome (Cook et al., 2015a, Cook et al., 2015b). Metacognitive beliefs also explain additional variance in these outcomes after controlling for age, gender, and negative illness perceptions (Cook et al., 2015a, Cook et al., 2015b) and, consistent with the central predictions of the S-REF model, cause and maintain distress both directly and indirectly, by driving worry (Cook et al., 2015a, Cook et al., 2015b). However, the utility of the metacognitive model in understanding emotional distress in AYA survivors of cancer has not yet been empirically studied.

The current study investigates whether the metacognitive beliefs positively predict emotional distress and trauma symptoms in AYA survivors of cancer after controlling for known covariate effects (current age, gender, age at time of cancer diagnosis, time since the end of acute medical treatment and current physical health difficulties) (Kazak et al., 2010). Specifically, we hypothesize that (i) metacognitive beliefs will be positively correlated with emotional distress and posttraumatic stress symptoms; (ii) metacognitive beliefs will explain a statistically significant proportion of the variance in emotional distress and posttraumatic stress symptoms after controlling for known covariates; and (iii) negative metacognitive beliefs will show the strongest association with emotional distress and posttraumatic stress symptoms.
Methods

Research design

A cross-sectional research design, drawing from a sample of consecutive consenting patients and using multiple self-report measures, was adopted.

Participant characteristics

AYA survivors of cancer were recruited from outpatient clinics at a teenage and young adult oncology unit. Inclusion criteria were that participants (i) were aged between 16 and 24 years; (ii) had finished acute treatment for cancer at least three months previously; and (iii) were sufficiently literate in English to give informed consent and complete the questionnaires. Patients whose clinical notes indicated that they had moderate-to-severe neurological impairment were excluded.

Measures and covariates

Demographic and clinical information

A 7-item self-report measure was used to gather demographic and clinical information, including current age, gender, age at time of cancer diagnosis and time since the end of acute medical treatment.

Emotional distress

Emotional distress was assessed using the Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983). The HADS is a 14-item self-report scale, which assesses the presence of symptoms of anxiety (seven items) and depression (seven items) in the preceding seven days. Respondents rate each item on a four-point Likert scale, with options that extend from 0 (absence) to 3 (extreme presence). Responses produce two subscale scores: depression and anxiety. Scores range from 0–21 with high scores indicating high levels of anxiety and/or depression. Scores can also be combined to produce a total scale score, ranging from 0–42. The HADS total scale score demonstrates good construct validity for measuring emotional distress in cancer patients (Norton, Cosco, Doyle, Done, & Sacker, 2013) and is recommended as the optimal measure of general distress when evaluating treatment efficacy in heterogeneous cancer populations (Luckett, Butow, & King, 2010). The internal consistency for the total scale score in this sample was very good (Cronbach’s α = 0.88).

Posttraumatic stress symptoms associated with cancer

The Impact of Event Scale-Revised (IES-R) (Weiss & Marmar, 1997) was used to assess posttraumatic stress symptoms associated with cancer. The IES-R is a 22-item measure of trauma-related symptoms with three subscales, reflecting intrusions, avoidance, and hyper-arousal. Respondents rate each item for frequency of occurrence over the last seven days on a 4-point Likert scale, with
options extending from 0 (“not at all”) to 4 (“extremely”). Responses are summed to give a total score, ranging from 0–88, with low scores indicating low posttraumatic stress symptoms. The IES-R has been used extensively in the adult cancer population to measure intrusion and avoidance symptoms anchored to the experience of cancer (Civilotti, Castelli, & Binaschi, 2015, Kangas, Henry, & Bryant, 2002, Meisel, Domchek, & Vonderheide, 2012), and demonstrated excellent internal consistency in this study (Cronbach’s α = 0.95). For the purposes of this study, participants were asked to focus on their experience of cancer as a stressful life event.

**Metacognitive beliefs**

Metacognitive beliefs were assessed using the 30-item self-report Metacognitions Questionnaire-30 (MCQ-30) (Wells & Cartwright-Hatton, 2004), which assesses five dimensions of metacognition. Respondents are asked to rate whether they “generally agree” with each statement using a 4-point scale, with options extending from 1 (“do not agree”) to 4 (“agree very much”). Responses are summed to give subscale scores (ranging from 6 to 24) and a total score (ranging from 30 to 120), with higher scores indicating higher levels of unhelpful metacognitions. The MCQ-30 has been validated for use with cancer patients (Cook et al., 2015, Cook, Salmon, Dunn, & Fisher, 2014), with the exception of the ‘Need to Control Thoughts’ subscale (Cronbach’s α = 0.64), all subscales demonstrated very good internal consistency in this study (all Cronbach’s α > 0.80).

**Current physical health difficulties**

Current physical health difficulties were assessed using the Short Form Health Survey (SF-12) (Ware, Kosinski, & Keller, 1996), a 12-item measure that assesses limitations in role functioning as a result of physical and mental health across eight subscales. Responses are weighted and scored using software provided by the test publisher, producing two summary scores: the physical component summary (PCS) and the mental component summary (MCS). Each are represented as t-scores positioned on a normal distribution curve with a mean score of 50 and standard deviation of 10. The PCS is derived from four subscales: physical functioning, pain, limitations due to physical health, and general quality/perception of health, and was used as a proxy for current physical health difficulties in this study. The MCS was not used because it assesses functioning and well-being related to mental health, and therefore does not provide information regarding current physical health difficulties. The PCS demonstrates good test–retest validity (r = 0.86) and excellent construct validity against the SF-36 (r = 0.95) (Ware et al., 1996); it was not possible to determine the psychometric properties of the PCS in this study, given that scores are computed by the test publisher.
Sampling procedure

Ethical approval was obtained from the regional National Health Service research ethics committee (09/H1014/4). Potentially eligible patients were identified from their medical records and, one to two weeks prior to their routine clinic appointment, were sent a study information sheet and cover letter. Upon arrival at the unit, patients were asked by the receptionist whether they would speak to the researcher, a clinical psychologist (KM), who answered questions and obtained informed consent from those who agreed to participate. Participants then completed the survey in the clinic or took home to complete and return in a stamped addressed envelope.

Statistical analysis

Data were then analysed using SPSS version 22.0. Correlational analyses were used to test the first hypothesis. To test the second and third hypotheses, two bootstrapped (n = 1,000) hierarchical multiple linear regression analyses were conducted with (i) emotional distress (HADS total scores) and (ii) posttraumatic stress symptoms (IES-R scores) as the dependent variables, respectively. After controlling for known covariates (current age, gender, age at diagnosis, time since acute medical treatment and current physical health difficulties; Step 1), the five subscales of the MCQ-30 were entered (Step 2). We consider findings to be statistically significant at the p < 0.05 level, and report bias-corrected and accelerated (BCa) estimates and 95% confidence intervals for regression coefficients, as BCa estimates adjust for potential bias and skew in the bootstrap distribution to produce more reliable parameter estimation.

Results

Participant characteristics

Of the 136 patients approached to participate, 32 declined to take part in the study and a further 17 patients failed to return the questionnaires. The final sample, therefore, comprised 87 patients. Table 1 displays their clinical and demographic characteristics.

Association between metacognitive beliefs and anxiety, depression and posttraumatic stress symptoms

Table 2 displays descriptive statistics and zero-order correlations for key variables. As hypothesized, MCQ-30 subscales were all positively correlated with HADS and IES-R total scores, with the Negative Beliefs about Worry subscale of the MCQ-30 demonstrating the strongest correlation with both the HADS (r = 0.74, p < 0.01) and the IES-R (r = 0.70, p < 0.01) total scores.
### Table 1. Participant characteristics ($N = 87$).

| Characteristic                                      | Mean (SD) | Range |
|-----------------------------------------------------|-----------|-------|
| Age at the time of recruitment                      | 20.4 (2.03) |       |
| Age at the time of cancer diagnosis                 | 13.4 (6.57) |       |
| Months since completion of the acute medical treatment | 72.4 (81.45) |       |
| Gender                                              |           |       |
| Male                                                | 41 (47)   |       |
| Female                                              | 46 (53)   |       |
| Educational/occupational status                     |           |       |
| School                                              | 5 (6)     |       |
| College                                             | 12 (14)   |       |
| University                                          | 27 (31)   |       |
| Employed                                            | 26 (29)   |       |
| Unemployed                                          | 11 (12)   |       |
| Unemployed due to ill-health                        | 2 (2)     |       |
| Full-time mother                                    | 2 (2)     |       |
| Diagnosis                                           |           |       |
| Leukemia                                            | 11 (12.6) |       |
| Lymphoma                                            | 26 (29.8) |       |
| Brain and central nervous system cancer             | 19 (20.6) |       |
| Bone cancer                                         | 8 (9.1)   |       |
| Soft tissue sarcoma                                 | 11 (12.6) |       |
| Germ cell tumor                                     | 2 (2.3)   |       |
| Other                                               | 10 (11.5) |       |
| Number of cancer episodes (%)                       |           |       |
| 1                                                    | 74 (85.1) |       |
| 2                                                    | 10 (11.5) |       |
| 3                                                    | 3 (3.4)   |       |
| Treatment(s) (%)                                    |           |       |
| Chemotherapy                                        | 10 (11.5) |       |
| Surgery                                             | 7 (8.0)   |       |
| Radiotherapy                                        | 1 (1.1)   |       |
| Chemotherapy and surgery                            | 16 (18.4) |       |
| Chemotherapy and radiotherapy                       | 17 (19.5) |       |
| Surgery and radiotherapy                            | 10 (11.5) |       |
| Chemotherapy, surgery, and radiotherapy             | 21 (24.1) |       |
| Chemotherapy, radiotherapy, and stem cell transplant| 4 (4.6)   |       |
| Chemotherapy, surgery, radiotherapy, and stem cell transplant | 1 (1.1) |       |

### Table 2. Descriptive statistics and Spearman’s rho correlations.

| Scale Description         | 2      | 3      | 4      | 5      | 6      | 7      | 8      | Mean | SD   |
|---------------------------|--------|--------|--------|--------|--------|--------|--------|------|------|
| 1. HADS total             | 0.69** | -0.21  | 0.47** | 0.74** | 0.46** | 0.52** | 0.47** | 10.43| 7.55 |
| 2. IES-R total            | -0.28* | 0.40***| 0.70***| 0.43***| 0.59** | 0.40** | 21.10  | 18.15|      |
| 3. SF-12 PCS              | -0.08  | -0.25  | -0.27  | -0.21  | -0.02  | 45.72  | 11.62  |      |      |
| 4. MCQ-30 POS             | 0.50** | 0.13   | 0.33** | -0.31* | 9.18   | 3.65   |        |      |      |
| 5. MCQ-30 NEG             | 0.38** | 0.45** | 0.48** | 0.67   | 11.63  | 5.06   |        |      |      |
| 6. MCQ-30 CC              | 0.41** | 0.25** | 10.94  | 5.13   |        |        |        |      |      |
| 7. MCQ-30 NC              | 0.60** | 10.55  | 3.14   |        |        |        |        |      |      |
| 8. MCQ-30 CSC             | —      | 14.06  | 4.35   |        |        |        |        |      |      |

**Note:**

*p < 0.05; **p < 0.01; HADS total = Hospital Anxiety and Depression Scale total scores; IES-R total = Impact of Events Scale: Revised total scores; MCQ-30 POS = Metacognition Questionnaire-30: Positive Beliefs about Worry Subscale; MCQ-30 NEG = Metacognition Questionnaire-30: Negative Beliefs about Worry Subscale; MCQ-30 CC = Metacognition Questionnaire-30: Cognitive Confidence Subscale; MCQ-30 NC = Metacognition Questionnaire-30: Need to Control Thoughts Subscale; MCQ-30 CSC = Metacognition Questionnaire-30: Cognitive Self-Consciousness Subscale; SF-12 PCS = Short Form Health Survey Physical Component Summary.
The results of the regression analyses are shown in Table 3. After controlling for known covariates, metacognitive beliefs accounted for an additional 50% of the variance in emotional distress, and 41% of the variance in posttraumatic stress symptoms. The final model for emotional distress accounted for 60% of the variance (adjusted $R^2 = 0.598$, $F(10, 76) = 13.78$, $p < 0.01$). Two specific metacognitive belief domains (negative beliefs about the uncontrollability and danger of worry and lack of cognitive confidence) made independent contributions to the model; no covariate made a significant independent contribution. As hypothesized, negative metacognitive beliefs showed the strongest association with emotional distress.

The final model for posttraumatic stress symptoms accounted for 56% of the variance (adjusted $R^2 = 0.559$, $F(10, 76) = 11.88$, $p < 0.01$). Two metacognitive belief domains made independent contributions: negative beliefs about the uncontrollability and danger of worry, and the need to control thoughts. No covariate made a significant contribution to the final model. As in the emotional distress model, negative metacognitive beliefs showed the strongest association with posttraumatic stress symptoms.

**Discussion**

This is the first study to examine the association between metacognitive beliefs and emotional distress and trauma symptoms in AYA survivors of cancer, with the aim of testing predictions derived from the S-REF model. As hypothesized, metacognitive beliefs were positively correlated with emotional distress and posttraumatic stress symptoms, and accounted for an additional 50% of the variance in emotional distress and 41% of the variance in posttraumatic stress symptoms after controlling for known covariates, including current physical health difficulties. Moreover, negative metacognitive beliefs showed the strongest association with both emotional distress and posttraumatic stress symptoms, and made the largest independent contribution to each of the final models. Collectively, these data support the findings of previous research (Cook et al., 2015a, Cook et al., 2015b) and are consistent with the main thesis of the S-REF model, which states that negative beliefs about the uncontrollability and danger of worry contribute to multiple forms of emotional distress and may be a transdiagnostic psychological mechanism (that is, a mechanism associated with symptomatology across a range of psychological disorders, rather than being disorder-specific).

Furthermore, and consistent with the findings of Cook et al. (Cook et al., 2015), a lack of cognitive confidence contributed to emotional distress, while a need to control intrusive thoughts contributed to posttraumatic stress symptoms. These data are also consistent with the S-REF model, which states that the other domains of metacognitions can make additional contributions depending on the type of distress or disorder (Cook et al., 2015, Wells & Matthews, 1996). Specifically, the S-REF model theorizes that threat-focused modes of processing, such as suppression
and control of thoughts, serve to maintain symptoms of posttraumatic stress by extending threat-related thinking and preventing cognition from “retuning” to the current threat-free environment (Wells & Colbear, 2012).

### Limitations and future research directions

This study has several limitations that may have influenced the generalizability of these findings. First, although all analyses were adequately powered (post-hoc

### Table 3. Final regression models predicting (i) emotional distress (HADS total) and (ii) posttraumatic stress symptoms (IES-R).

| Variable                                      | Cumulative | Simultaneous |
|-----------------------------------------------|------------|--------------|
|                                              | $R^2$      | $\Delta R^2$| $F$ change | $B$  | $\beta$ | 95% CI for $B$ |
| Model 1: Known covariates and metacognitive domains as predictors of emotional distress (HADS total scores; $n = 87$)$^a$ |
| Step 1: Covariates                           |            |              |            |      |        |               |
| Current age                                  | 0.15       | 0.10         | $F (5, 86) = 2.87^*$ | -0.07 | -0.019 | -0.69 to 0.72 |
| Gender                                       | 1.49       | 0.099        | -0.90 to 3.86 |      |        |               |
| Age at diagnosis                              | -0.03      | -0.028       | -0.53 to 0.32 |      |        |               |
| Time since end of the treatment               | 0.00       | 0.020        | -0.03 to 0.03 |      |        |               |
| SF-12 PCS                                     | -0.01      | -0.022       | -0.11 to 0.01 |      |        |               |
| Step 2: Metacognitive domains                 |            |              |            |      |        |               |
| MCQ-30 POS                                   | 0.50       | 0.50         | $F (10, 86) = 13.78^{**}$ | 0.31  | 0.152  | -0.04 to 0.60 |
| MCQ-30 NEG                                   | 0.73       | 0.488**      | 0.47 to 1.05 |      |        |               |
| MCQ-30 CC                                    | 0.28       | 0.192*       | 0.06 to 0.53 |      |        |               |
| MCQ-30 NC                                    | 0.41       | 0.170*       | -0.11 to 0.96 |      |        |               |
| MCQ-30 CSC                                   | 0.04       | 0.024        | -0.21 to 0.27 |      |        |               |
| Model summary                                | 0.65       | 0.60         |            |      |        |               |
| Model 2: Known covariates and metacognitive domains as predictors of posttraumatic stress symptoms (IES-R scores; $n = 87$)$^a$ |
| Step 1: Covariates                           |            |              |            |      |        |               |
| Current age                                  | 0.20       | 0.15         | $F (5, 86) = 3.93^{**}$ | -0.87 | -0.097 | 2.59 to 0.93 |
| Gender                                       | 0.64       | 0.018        | -4.52 to 5.17 |      |        |               |
| Age at diagnosis                              | 0.63       | 0.230        | -0.49 to 1.79 |      |        |               |
| Time since end of the treatment               | 0.04       | 0.167        | -0.05 to 0.14 |      |        |               |
| SF-12 PCS                                     | -0.21      | -0.135       | -0.57 to 0.10 |      |        |               |
| Step 2: Metacognitive domains                 |            |              |            |      |        |               |
| MCQ-30 POS                                   | 0.41       | 0.41         | $F (10, 86) = 11.88^{**}$ | -0.06 | -0.012 | -1.04 to 0.98 |
| MCQ-30 NEG                                   | 1.55       | 0.434**      | 0.71 to 2.26 |      |        |               |
| MCQ-30 CC                                    | 0.42       | 0.118        | -0.16 to 1.20 |      |        |               |
| MCQ-30 NC                                    | 2.33       | 0.402**      | 1.10 to 3.75 |      |        |               |
| MCQ-30 CSC                                   | -0.44      | -0.104       | -1.10 to 0.14 |      |        |               |
| Model summary                                | 0.61       | 0.56         |            |      |        |               |

Note:
- $^* p < 0.05$
- $^{**} p < 0.01$
- $^a$post-hoc power $= 0.99, p = 0.001$; CI = confidence interval; HADS = Hospital Anxiety and Depression Scale; IES-R = Impact of Events Scale: Revised; MCQ-30 POS = Metacognition Questionnaire-30: Positive Beliefs about Worry Subscale; MCQ-30 NEG = Metacognition Questionnaire-30: Negative Beliefs about Worry Subscale; MCQ-30 CC = Metacognition Questionnaire-30: Cognitive Confidence Subscale; MCQ-30 NC = Metacognition Questionnaire-30: Need to Control Thoughts Subscale; MCQ-30 CSC = Metacognition Questionnaire-30: Cognitive Self-Consciousness Subscale; SF-12 PCS = Short Form Health Survey Physical Component Summary. For both models, the fit of data within the assumptions of multiple linear regression was assessed by examining the distribution and heteroscedasticity of regression residuals; no violations were identified. There was no evidence of multicollinearity in either model (all variance inflation factors <2.5).
power for both final regression models $= 0.99; p = 0.001$), the sample size was modest in comparison to other published studies (Cook et al., 2015a, Cook et al., 2015b), which is likely reflective of the niche population studied. This meant that it was not possible to perform subgroup analyses (e.g., comparing findings among AYA survivors of childhood cancer and survivors of AYA cancer), which may have provided further clarity on the relationship between metacognitive beliefs and emotional distress. Second, the study’s cross-sectional nature meant that it was not possible to imply causality or direction from the findings, nor was it possible to explore changes in the observed variables or associations over time. Third, the low internal consistency of the “Need to control thoughts” subscale of the MCQ-30 may have influenced the findings as the items of the subscale may have lower coherence than has typically been obtained for this subscale (Field, 2013).

Future research should aim to clarify the nature of the relationships between metacognitive beliefs and distress in both survivors of AYA cancer and in AYA survivors of childhood cancer, together with potential mediating and moderating factors, including prior psychological support. Of particular interest may be the specific and generalized relationships between metacognitive belief domains and different aspects of distress. Researchers should adopt prospective designs to mitigate against the limitations of the current study, and should recruit large and representative samples of patients from both clinical and nonclinical settings.

**Conclusions**

In summary, our findings indicate that metacognitive belief domains are strongly associated with emotional distress in AYA survivors of cancer, and account for substantial variance in emotional distress and posttraumatic stress symptoms after controlling for the effects of known covariates, including current physical health difficulties. These data support the utility of the metacognitive model in understanding emotional distress in AYA survivors of cancer. Prospective studies are required to determine whether metacognitive beliefs and processes have a causal role in distress in AYA survivors.

**Acknowledgements**

We appreciate the effort of Prof. Tim Eden in the development of this study and are very grateful to the staff at the Young Oncology Unit at Christie’s Hospital.

**Funding**

This work was supported by CLIC Sargent (CEN/DRND/RSED).

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