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Symptoms of Posttraumatic Stress in Parents of Children on Cancer Treatment

*Factor Structure, Experiential Avoidance, and
Internet-based Guided Self-help*

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Abstract

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Having a child diagnosed with cancer is stressful and many parents of children on treatment for cancer report symptoms of posttraumatic stress (PTSS). The overall purpose was to, among parents of children on treatment for cancer, investigate the factor structure of PTSS; investigate the relationships between experiential avoidance (EA), rumination, PTSS and depression; and to develop, test, and evaluate a guided self-help intervention provided via the internet.

In a longitudinal study with three assessments (n = 249-203) results indicated that a four-factor solution of PTSS including the factors re-experiencing, avoidance, dysphoria, and hyper-arousal provided best fit and that the pattern and size of factor loadings were equivalent across the three assessments (Study I). In a case study with pre-, post-, and follow-up assessments a guided self-intervention was well received with clinical significant and reliable improvements in PTSS, depression, and quality of life (Study II). Furthermore, in cross-sectional analyses (n = 79) EA and rumination were positively associated with PTSS and depression and provided incremental explanation in depression while controlling for demographic characteristics, anxiety, and PTSS. In longitudinal analyses (n = 20), EA but not rumination predicted PTSS and depression while controlling for initial levels (Study III). Finally, in a randomized controlled trial with parents fulfilling the modified symptom criteria on the PTSD-Checklist allocated to guided self-help via the internet (n = 31) or to a wait-list control condition (n = 27) there was a significant intervention effect with a large effect size for the primary outcome PTSS. Similar results were observed for the secondary outcomes depression and anxiety, but not for EA and rumination. Exploratory analyses suggested that the relationships between EA and PTSS and between EA and depression were weakened in the intervention group (Study IV).

The studies included in the current thesis suggest that a four-factor solution should be used when assessing PTSS in parents of children on cancer treatment. Furthermore, rumination and EA in particular seem to be important constructs to consider when understanding PTSS and depression in this population. Finally, guided self-help via the internet shows promise in reducing PTSS and depression among parents of children on cancer treatment who report a high level of PTSS.

Keywords: Cancer and oncology, Children, Parents, Cognitive behavior therapy, Experiential avoidance, Posttraumatic stress symptoms, Depression

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To Morgan, Helmer and Hedvig

List of Papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.

- I Cernvall, M., Alaie, I., von Essen, L. (2012) The factor structure of traumatic stress in parents of children with cancer: a longitudinal analysis. *Journal of Pediatric Psychology*, 37(4): 448-457. Erratum. (2013) *Journal of Pediatric Psychology*, 38(2): 237–240.
- II Cernvall, M., Carlbring, P., Ljungman, G., von Essen, L. (2013) Guided self-help as intervention for traumatic stress in parents of children with cancer: conceptualization, intervention strategies, and a case study. *Journal of Psychosocial Oncology*, 31(1):13-29.
- III Cernvall, M., Skogseid, E., Carlbring, P., Ljungman, L., Ljungman, G., von Essen, L. Experiential avoidance and rumination in parents of children on cancer treatment: relationships with posttraumatic stress symptoms and depression. *Manuscript submitted*.
- IV Cernvall, M., Carlbring, P., Ljungman, L., Ljungman, G., von Essen, L. Internet-based guided self-help for parents of children on cancer treatment: a randomized controlled trial. *Manuscript submitted*.

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Abbreviations

CBT	Cognitive behavior therapy
CFA	Confirmatory factor analysis
CNS	Central nervous system
DSM	Diagnostic and statistical manual of mental disorders
EA	Experiential avoidance
IQR	Interquartile range
LOCF	Last observation carried forward
PTSS	Posttraumatic stress symptoms
PTSD	Posttraumatic stress disorder
TAU	Treatment-as-usual

Introduction

Children diagnosed with cancer

During the years 1985-2010 the annual incidence of primary cancer in Swedish children < 15 years was estimated to 16.0 in 100 000 children, corresponding to about 250 children per year (Gustafsson, Kogner, & Heyman, 2013). The most common diagnostic categories are leukemias, tumors in the central nervous system (CNS), lymphomas, and solid tumors. The last decades has seen an increase in survival from around 25% in the 1960's with a dramatic increase mostly during the 1970's and 1980's to almost 80% in 2010 (Gustafsson, Heyman, & Vernby, 2007; Gustafsson et al., 2013). These figures correspond with results from the rest of Europe (Gatta et al., 2009). Treatment is often intensive including chemotherapy, radiotherapy, surgery, high dose chemotherapy with stem cell rescue, immunomodulating therapies, molecularly targeted therapies or various combinations of these. In cancer diseases abnormal cells divide without control and invade other tissues. The treatments mentioned above aim to impinge cell division and kill or remove cancer cells (Lanzkowsky, 2005).

Despite improvements in care the treatment for pediatric cancer is often taxing and up to 38% of children treated for cancer will need intensive care within three years of diagnosis (Dalton, Slonim, & Pollack, 2003; Rosenman, Vik, Hui, & Breitbart, 2005). Many children on treatment for cancer suffer from symptoms of their disease and side-effects from the treatment. Common symptoms are lack of energy, pain, drowsiness, nausea, feeling sad and feeling nervous, while feeling sad, pain, nausea and lack of appetite have been reported as the most distressing symptoms (Collins et al., 2000). In a Swedish study, parents of children on cancer treatment reported emotional distress, fatigue, nutrition, and pain as their children's most problematic symptoms (Hedén, Pöder, von Essen, & Ljungman, 2013; Pöder, Ljungman, & von Essen, 2010).

Parents of children diagnosed with cancer

Even though survival has increased substantially most parents of children receiving a cancer diagnosis react with fear and horror and face a difficult situation that can take an emotional toll. Caring for a child undergoing inten-

sive treatment not only includes uncertainty about the disease progress and fear for the child's life but also stress due to lengthy treatment, occupational and financial strains, and strains in social relationships. Research on parents of children diagnosed with cancer show that they report uncertainty after the child's diagnosis and throughout the disease trajectory (e.g., Boman, Lindahl, & Björk, 2003), more anxiety immediately after diagnosis than later during the disease trajectory (e.g., Moore & Mosher, 1997; Yeh, 2002), more symptoms of depression compared to parents of healthy children at multiple time-points after diagnosis (Dockerty, Williams, McGee, & Skegg, 2000; Norberg, Lindblad, & Boman, 2005), and worse physical and psychosocial quality of life compared to population norms (e.g., Klassen et al., 2008). One domain of psychological distress in parents of children diagnosed with cancer that has received specific interest is posttraumatic stress symptoms (PTSS).

Posttraumatic stress in parents of children diagnosed with cancer

The past decade has witnessed an increase in the number of studies reporting on the level of PTSS and prevalence of posttraumatic stress disorder (PTSD) among parents of children diagnosed with cancer. Cross-sectional studies indicate that parents of children recently diagnosed with cancer report a higher level of PTSS and are assessed with a higher frequency of a formal PTSD diagnosis compared to parents of children off treatment (Kazak et al., 2004; Kazak, Boeving, Alderfer, Hwang, & Reilly, 2005; Lindahl, Lindblad, & Boman, 2005; Phipps, Long, Hudson, & Rai, 2005), and that parents of children diagnosed with cancer report a higher level of PTSS and are assessed with a higher frequency of a formal PTSD diagnosis compared to parents of healthy children (e.g., Barakat et al., 1997; Brown, Madan-Swain, & Lambert, 2003). Furthermore, it has been shown that PTSS is positively associated with symptoms of depression (Dunn et al., 2012) and anxiety (Phipps, Larson, Long, & Rai, 2006). Longitudinal studies indicate that parents typically report a level of PTSS in the moderate to severe range shortly after diagnosis, with a declining level as time passes (Dolgin et al., 2007; Pöder, Ljungman, & von Essen, 2008). In addition, there is evidence of distinct subgroups during the child's treatment with different development trajectories such as high-declining, moderate-stable, and low-stable distress levels (Dolgin et al., 2007). Even though research suggest that symptoms are declining with time since diagnosis there is also evidence of a subgroup experiencing distress years after end of treatment (Ljungman et al., 2014).

Mothers have reported a higher level of PTSS than fathers (Alderfer, Cnaan, Annunziato, & Kazak, 2005; Phipps et al., 2005; Pöder et al., 2008; Yeh, 2002), while other studies have found no difference (Kazak et al., 2004; Magal-Vardi et al., 2004). In a comprehensive review, Bruce (2006) identified the following factors as associated with elevated PTSS and a high-

er frequency of PTSD in parents of children diagnosed with cancer: female gender, increased number of prior traumatic life events, poor psychosocial support, emotion-focused coping, and perceived severity of cancer and treatment.

Posttraumatic stress in the DSM-IV vs. the DSM-5

The growing body of research has built on the PTSD symptomatology as described in the *Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition* (DSM-IV; American Psychiatric Association, 2000). The criteria for PTSD require exposure to a potentially traumatic event, after which a response of intense fear, helplessness, or horror follows (Criterion A). According to the DSM-IV, medical stressors such as learning that one's child has a life-threatening illness can be such a potentially traumatic event. PTSD comprises 17 posttraumatic stress symptoms pertaining to three factors or symptom clusters: re-experiencing (Criterion B), avoidance/numbing (Criterion C), and hyper-arousal (Criterion D).

The conceptualization and assessment of PTSS and PTSD in parents of children with serious illnesses is not unproblematic and has been called into question given the difference between common traumatic stressors and medical stressors (Mundy & Baum, 2004). One key difference is that common traumatic stressors generally are past-event oriented, whereas medical stressors not only refer to past events, such as the specific situation surrounding diagnosis and the actual disease and its treatment, but also to future-oriented aspects relating to fears and worries about future treatment, recurrence, survival, and so forth. One could argue that PTSS/PTSD typically concerns a discrete past event, whereas parents of children diagnosed with cancer often live under circumstances that could be described as an ongoing trauma.

The problems of applying PTSS/PTSD in the context of parents of children diagnosed with cancer was brought to the fore when the DSM-5 was published in 2013 (American Psychiatric Association, 2013). In DSM-5, the A criteria for PTSD has been modified so that fewer events qualify as potentially traumatic and the individual no longer needs to react with intense fear, helplessness or horror. The events that qualify as potentially traumatic in the DSM-5 focus on death, threatened death, actual or threatened serious illness, and actual or threatened sexual violence either through direct exposure or by witnessing in person. Learning that a close relative was exposed to a traumatic event qualifies as a traumatic event, but the event needs to have been violent or accidental. With these new criteria for PTSD in the DSM-5, being a parent of a child diagnosed with cancer no longer qualifies as a potentially traumatic event that can elicit PTSS/PTSD. Instead the DSM-5 puts forth that adjustment disorders “are common accompaniments of medical illness and may be the major psychological response to a medical disorder” (Ameri-

can Psychiatric Association, 2013, p. 289). Adjustment disorders are defined as emotional or behavioral symptoms occurring within three months in response to an identifiable stressor and may include symptoms of anxiety and depression, and deviations in conduct. Finally, in the DSM-5 the term for symptoms assessed in the B criteria is intrusions rather than re-experiencing, and the C criteria in the DSM-IV (avoidance/numbing) has been separated into avoidance and negative alterations in cognitions and mood. An outline of the major criteria for PTSD in DSM-IV and DSM-5 are presented in Figure 1.

Despite conceptual problems imposed by the DSM-5, one could argue that assessment of PTSS/PTSD captures distress that is significant for parents of children diagnosed with cancer. With the DSM-5 this distress should not be called PTSS/PTSD, but emotional and behavioral symptoms of adjustment disorder. Given the recent publication of the DSM-5 and the fact that the studies included in this thesis were planned and conducted before the publication of the 5th edition and explicitly used the DSM-IV criteria, the terms PTSS and PTSD as a parent's responses to a child's cancer are used in this thesis.

DSM-IV diagnostic criteria for PTSD	DSM-5 diagnostic criteria for PTSD
A. The person has been exposed to a traumatic event in which both of the following have been present (1) the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others, (2) the person's response included intense fear, helplessness, or horror.	A. Exposure to actual or threatened death, serious injury, or sexual violence.
B. The traumatic event is consistently re-experienced (memories, dreams, flashbacks).	B. Presence of intrusion symptoms (memories, dreams, flashbacks) associated with the traumatic event.
C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma).	C. Persistent avoidance of stimuli (memories, thoughts, feelings, people, places) associated with the traumatic event beginning after the event occurred.
D. Persistent symptoms of increased arousal (not present before the trauma).	D. Negative alterations in cognitions and mood associated with the traumatic event, beginning or worsening after the traumatic event occurred.
E. Duration of the disturbance is more than one month.	E. Marked alterations in arousal and reactivity associated with the traumatic event, beginning or worsening after the traumatic event occurred.
F. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.	F. Duration of the disturbance is more than one month.
	G. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

Figure 1. DSM-IV and DSM-5 criteria for PTSD.

Consequences of PTSS in parents

PTSS/PTSD in parents after their child's serious illness or injury is associated with negative effects for their children. In a study of parents of chil-

dren diagnosed with cancer, type-1 diabetes, or who had experienced an injury, Landolt, Ystrom, Sennhauser, Gnehm, and Vollrath (2012) found that a high level of PTSS reported by mothers and fathers five to six weeks after the diagnosis or event predicted less decrease in interview-assessed PTSS in their children at a 12 month follow-up. Similarly, in a longitudinal study of parents of children who had experienced an injury Le Brocq, Hendrikz, and Kenardy (2010) found that children of parents reporting chronic subclinical trajectories of PTSS were more likely to report less decrease in PTSS compared to children of resilient parents. Furthermore, Bronner, Knoester, Bos, Last, and Grootenhuis (2008) found that the strongest predictor of self-reported child potential PTSD nine months after intensive care treatment was self-reported maternal potential PTSD three months after intensive care treatment. Finally, in a review and meta-analysis of studies examining the association between self-reported and clinician assessed parent PTSD and depression, and their children's self-reported or clinician assessed PTSD after experiencing a trauma, Morris, Gabert-Quillen, and Delahanty (2012) found moderate associations between parent depression and child PTSD and between parent PTSD and child PTSD. Consistent with these results, a review of the literature regarding the determinants of quality of life in children on cancer treatment and childhood cancer survivors found that parents' reports of symptoms of anxiety, depression, psychological distress, and poor quality of life were related to poor quality of life reported in their children (Klassen, Anthony, Khan, Sung, & Klaassen, 2011).

Exploring the mechanisms regarding the association between parent distress and negative outcome in children van der Geest et al. (2014) conducted a study with parents and children newly diagnosed with cancer and found that parents' reports of negative mood and parenting stress was related to parents' reports of behavior problems in the child, and that parenting stress mediated the relationship between negative mood and child behavior problems for fathers but not for mothers. Okado, Long, and Phipps (2014) compared associations between parents' self-reported distress and their children's self-reported distress in families with and without pediatric cancer and found parental and child symptoms to be associated in the cancer group only, and that the children's experience of other significant life events weakened this relationship.

Taken together these results indicate that there is a relationship between parents' distress and outcomes in their children. In light of this one could argue that one potential pathway of reducing the psychological impact of childhood cancer would be to reduce parents' psychological distress.

Interventions for parents of children on cancer treatment

There have been several studies investigating the clinical efficacy of psychological interventions for parents of children on cancer treatment. Table 1

outlines the characteristics of eight identified studies. Seven of these were conducted in the USA (of which two also included participants in Israel) and one in the Netherlands. Seven studies compared an intervention to treatment-as-usual (TAU) or standard care with a randomized design, and one study compared an intervention to an active control group with a randomized design. Seven studies included parents of children with all types of cancer and one study excluded parents of children with CNS-tumors. All studies included participants within 16 weeks from the child's diagnosis. Sample size ranged from 38 to 429 with a median of 106 (interquartile range [IQR] = 141). Four studies included only mothers, two studies included mothers and fathers, and two studies required that two caregivers of each child consented to participation. Six studies used PTSS as an outcome, other outcomes were general psychological distress, depression, anxiety, social support, and problem solving. All interventions were provided face-to-face and most included principles and strategies from cognitive behavioral therapy (CBT) such as psycho-education, relaxation training, problem-solving, and the ABC-model. However, the intensity of the interventions varied from eight 90-minute sessions over six months to three 45-minute sessions during four-six weeks. Two studies evaluated the Surviving Cancer Competently Intervention Program for Newly Diagnosed Families (SCCIP-ND). The first of these did not conduct any formal hypothesis testing and the second found no differences between the intervention and the TAU group at follow-up. Two studies evaluated CBT-techniques and CBT stress management and found no differences between study groups at post-assessment. However, one study found that participants who reported low perceived social support at pre-assessment reported greater benefits from the intervention. One study evaluated a 12-week interdisciplinary intervention consisting of sessions with a psychologist and phone-calls from a nurse and a significant decrease in distress was shown for the intervention group. Three studies evaluated Problem Solving Skills Training (PSST) for mothers. Two of these showed that PSST increased problem solving skills and reduced negative affectivity compared to TAU. One study compared PSST with non-directive support (NDS) with equal amount of therapist time. The results indicated that both groups reported less negative affectivity at post-assessment but that only participants receiving PSST reported a continued improvement at the three-month follow up.

None of the reviewed intervention studies utilized a cut-off to screen for distress hence participants reporting low and high distress respectively were included and provided the same intervention. However, it has been argued that parents of children diagnosed with cancer may have different needs in

Table 1. *An overview of psychological intervention studies with parents of children on cancer treatment.*

Authors	Country	Design	Cancer type	Recruitment timing	Participants	Interventions	Outcome measures	Results
Hoekstra-Weebers, Heuvel, Jaspers, & Klip (1998)	The Netherlands	Two-group RCT: intervention vs. standard care. Pre, post, and six months FU.	All types.	Shortly after dx (range 2-21 days).	61 intervention (31 mothers), 59 standard care (32 mothers).	Eight 90 min sessions during six months after dx. Psycho-education and CBT techniques.	GHQ, SCL, STAI, SSL-D	No between group effects on any outcomes at post or FU.
Kazak et al. (2005)	USA	Two-group RCT: intervention vs. standard care. Pre and post.	All types.	Shortly after dx (median 6 days).	18 intervention (9 mothers), 20 standard care (10 mothers). Required two care-givers.	SCCIP-ND: integrated CBT and family therapy interventions, three sessions.	IES-R, STAI	Feasibility study with no formal hypothesis testing.
Marsland et al. (2013)	USA	Two group RCT: intervention vs. TAU. Pre and post.	No CNS-tumors.	Shortly after dx (median 23 days, range 2-89 days).	30 intervention (27 mothers), 15 TAU (15 mothers).	Cognitive behavioral stress management, six sessions, weekly telephone calls, web-resource.	BDI, STAI, PSS, IES, ISEL	No group differences on any outcomes. Caregivers with low social support at pre assessment reported greater benefit from the intervention.
Mullins et al. (2012)	USA	Two group RCT: intervention vs. TAU. Pre, post, and eight-week FU.	All types.	Mean months since dx = 2.42 (range 1-4 months).	27 intervention, 25 TAU. Mothers only.	12 weeks interdisciplinary (psychologist and nurse), six sessions, six phone calls.	PPUS, SCL-90-R, IES-R, CMCC	Effects or trends in favor of the intervention group for pre to post change in distress.
Sahler et al. (2002)	USA, Israel	Two group RCT: intervention vs. TAU. Pre, post, and three-month FU.	All types.	Newly diagnosed, mean weeks since dx = 9.1.	50 intervention, 42 TAU. Mothers only.	Eight one-hour sessions of PSST.	SPSI-C, POMS	Enhanced problem solving and decreased negative affectivity in intervention group compared to control at post..

Sahler et al. (2005)	USA, Israel	Two group RCT: intervention vs. TAU. Pre, post, and three-month FU.	All types.	Two-16 weeks after dx, mean weeks since dx = 9.3.	217 intervention, 212 TAU. Mothers only.	Eight one-hour sessions of PSST.	SPSI-C, POMS, NEO-FFI, BDI-II, IES-R	Enhanced problem solving and decreased negative affectivity in intervention group compared to control at post. Some effects maintained at FU.
Sahler et al. (2013)	USA	Two group randomized trial: PSST vs. NDS. Pre, post, and three-month FU.	All types.	Two-16 weeks after dx.	157 PSST, 152 NDS. Mothers only.	PSST: Eight one-hour sessions of problem solving skills training. NDS: Eight one-hour sessions of non-directive support.	SPSI-C, POMS, BDI-II, IES-R	Enhanced problem solving in PSST group at post. Equal improvements in negative affectivity at post. Continued improvements in negative affectivity at FU for PSST group.
Stehl et al. (2009)	USA	Two group RCT: intervention vs. TAU. Pre and one-month FU.	All types.	Newly diagnosed (median days since dx = 15).	76 intervention (38 mothers), 76 TAU (38 mothers). Required two care-givers.	SCCIP-ND: Three 45 minute sessions during four-six weeks and three booster sessions. Cognitive behavioral and family therapy components.	ASDS, STAI, IES-R	No differences between groups.

Note. ASDS = Acute Stress Disorder Scale, CMCC = Care of My Child with Cancer Scale, dx = diagnosis, GHQ = General Health Questionnaire, IES-R = Impact of Events Scale - Revised, ISEL = Interpersonal Support Evaluation List, NEO-FFI = NEO-Five Factor Inventory, NDS = Non-directive support, POMS = Profile of Mood States, PPUS = Parents' Perception of Uncertainty Scale, PSS = Perceived Stress Scale, PSST = Problem Solving Skills Training, SCCIP-ND = Surviving Cancer Competently Intervention Program for Newly Diagnosed Families, SCL = Symptom Checklist, SPSI-C = Social Problem-Solving Inventory-Cancer, SSL-D = Social Support List-Discrepancies, STAI = State Trait Anxiety Inventory.

terms of intensity in support. Kazak (2006) presented the Pediatric Psychosocial Preventative Health Model (PPPHM) in which service users within pediatric health care are categorized in three groups according to need. The largest group labeled Universal consists of competent and adaptive families. A smaller group labeled Targeted is at a somewhat elevated risk for ongoing psychosocial difficulties and the smallest group labeled Clinical/Treatment exhibits evident symptomatology. According to this model interventions for the Universal group may include general support, education, and access to resources that support and enhance child and family coping. Interventions for the Targeted group may include counselling from a social worker or referral to a psychologist for evaluation and consideration of an evidence-based intervention. Finally, interventions for the Clinical/Treatment group are the most intense and may include referral to specialized mental health services.

In the current literature there is no published example of an intervention study that targets parents of children diagnosed with cancer who would be regarded as member of the Targeted or Clinical/Treatment group as indicated by the presence of certain risk factors or a high level of distress.

Concluding and prelude remarks

To sum up, having a child diagnosed with cancer is a stressful and potentially traumatic event for parents which can elicit distress, including PTSS and PTSD. When assessing PTSS/PTSD in this population the three-factor theory of PTSD as outlined in the DSM-IV has most often been used explicitly or implicitly, but the question remains whether this is the best fitting solution. In the DSM-5 a competing factor structure is presented and before the publication of the DSM-5 there were indications from research with other populations that the DSM-IV factor structure was inappropriate. Elucidating the construct validity of PTSS/PTSD in the current population would contribute to the understanding of such responses and using instruments correctly when assessing these constructs among parents of children diagnosed with cancer.

There have been several attempts to evaluate the clinical efficacy of psychological interventions to reduce general distress and PTSS in parents of children diagnosed with cancer, albeit with mixed results. Evidence indicates that an individualized and relatively extensive intervention including problem solving skills training might be most successful in reducing general distress during the child's treatment. However, these studies have only included mothers. Furthermore, the fact that pediatric cancer care is highly specialized and only provided at six pediatric oncology centers in Sweden implies that the child and family often live quite far from where the child receives its care. In addition, the nature of the treatment protocols often result in the child spending a couple of days up to a week at the center, then going back

home for a couple of weeks, often with visits to the local hospital for management of treatment side-effects, then going back to the center and so forth. This may result in difficulties for parents of children diagnosed with cancer to maintain a continuous contact with health-care personnel including psychologists. The question remains whether it is possible to deliver psychological interventions that are flexible and easily accessible for this population. Furthermore, there is a paucity of conceptual and empirical work addressing mechanisms of change of such interventions for this population. This includes work on factors hypothesized to be related to or maintaining the main outcome, and establishment of empirical evidence supporting such relationships. These are questions that the current thesis is concerned with.

The current thesis

The factor structure of posttraumatic stress

Before the publication of the DSM-5 in 2013, a growing body of evidence indicated that the predominant PTSD model, as defined in the DSM-IV, was a question at issue. Prior research encompassing both exploratory factor analytic (EFA) and confirmatory factor analytic (CFA) techniques repeatedly failed to prove empirical support for the DSM-IV three-factor model (Baschnagel, O'Connor, Colder, & Hawk, 2005; DuHamel et al., 2004; Elklit & Shevlin, 2007; King, Leskin, King, & Weathers, 1998; Krause, Kaltman, Goodman, & Dutton, 2007; Marshall, 2004; McWilliams, Cox, & Asmundson, 2005; Palmieri, Weathers, Difede, & King, 2007; Palmieri & Fitzgerald, 2005; Simms, Watson, & Doebbellling, 2002). Instead, two competing four-factor models (King, et al., 1998; Simms, et al., 2002) gained the strongest empirical support when evaluated against proposed models of PTSD. In one of these, King et al. (1998) distinguished the symptoms pertaining to the factor of avoidance/numbing (Criterion C) into two factors: effortful avoidance (C1 and C2) and emotional numbing (C3-C7). Thus, the King et al. (1998) model was comprised of the re-experiencing (B1-B5), effortful avoidance (C1 and C2), emotional numbing (C3-C7), and hyper-arousal (D1-D5) factors.

However, Simms et al. (2002) found that a different four-factor model provided the best fit to their data. In conformity with the King et al. (1998) model, Simms et al. (2002) found an intrusion (or re-experiencing) factor (B1-B5) and an avoidance factor (C1 and C2) comprising only two symptoms. However, the Simms et al. (2002) model included a factor of non-specific, general distress termed dysphoria, which comprised symptoms of emotional numbing (C3-C7) and hyper-arousal (D1-D3). The remaining two symptoms loaded on a distinctive factor, termed hyper-arousal (D4 and D5).

See Table 2 for item mapping in the DSM-IV, King et al. (1998), and Simms et al. (2002) factor structures of PTSD.

Table 2. *Item mapping in factor structure models of PTSD.*

DSM-IV PTSD symptom	DSM-IV	King et al.	Simms et al.
	Three factors	(1998) Four factors	(2002) Four factors
B1. Intrusive thoughts of trauma	R	R	R
B2. Recurrent dreams of trauma	R	R	R
B3. Flashbacks	R	R	R
B4. Emotional reactivity towards trauma cues	R	R	R
B5. Physiological reactivity towards trauma cues	R	R	R
C1. Avoiding thoughts of trauma	A/N	A	A
C2. Avoiding reminders of trauma	A/N	A	A
C3. Inability to recall aspects of trauma	A/N	N	D
C4. Loss of interest	A/N	N	D
C5. Detachment	A/N	N	D
C6. Restricted affect	A/N	N	D
C7. Sense of future cut short	A/N	N	D
D1. Sleep disturbance	H	H	D
D2. Irritability	H	H	D
D3. Difficulty concentrating	H	H	D
D4. Hypervigilance	H	H	H
D5. Exaggerated startle response	H	H	H

Note. Factors on which symptoms are loaded: R = re-experiencing, A = avoidance, N = numbing, H = hyper-arousal, D = dysphoria.

In the published CFA studies that supported either the King et al. (1998) model (DuHamel, et al., 2004; King, et al., 1998; Marshall, 2004; McWilliams, et al., 2005; Palmieri & Fitzgerald, 2005) or the Simms et al. (2002) model (Baschnagel, et al., 2005; Elklit & Shevlin, 2007; Krause, et al., 2007; Palmieri, et al., 2007; Simms, et al., 2002), data had been collected from a variety of populations, e.g., undergraduate students in New York after the September 11th 2001 terrorist attacks (Baschnagel, et al., 2005), survivors of bone marrow or stem cell transplantation (DuHamel, et al., 2004), low-income minority women exposed to intimate partner violence (Krause, et al., 2007), victims of community violence (Marshall, 2004), and sexually harassed women (Palmieri & Fitzgerald, 2005). In a meta-analytic investigation of the structure of PTSS, aggregating 50 data sets with different samples, Yufik and Simms (2010) found best support for the Simms et al. (2002) and King et al. (1998) models, with evidence for slightly better fit for the Simms et al. (2002) model. In line with this, the DSM-5 presents a four-factor structure of PTSD including the factors intrusions, avoidance, negative alterations in cognitions and mood, and hyper-arousal which reflect the empirical support of an alternate four-factor model.

Understanding posttraumatic stress in parents of children on cancer treatment

Despite growing interest in the assessment of PTSS in parents of children diagnosed with cancer there is a paucity of conceptual work on how to understand these responses and factors that elicit, exacerbate, and maintain such responses. Such knowledge would be valuable not at least in terms of developing psychological interventions for this group. In Study I, a preliminary conceptualization regarding the understanding of PTSS among parents of children on cancer treatment is presented. In this, PTSS such as having recurrent thoughts about events related to the child's disease, a tendency to avoid reminders of such events, and feelings of hyper-arousal, are seen as normal given the circumstances. At the outset of this work is the assumption that human beings have a capacity of dealing with such distressing situations. It has probably been an evolutionary advantage for the human race to adapt to such situations, and such characteristics should have been selected during the course of natural selection. Thus, the human being has an inborn capacity to recover from stressful situations and process difficult emotions. However, some individuals might engage in behavioral processes that can interfere with adaptation which can maintain PTSS and even cause increased general psychological distress. The current conceptualization hypothesize that experiential avoidance (EA) and rumination are behavioral processes that interfere with adaptation in relation to the ongoing stressful event of having a child on cancer treatment.

Experiential avoidance

EA has been defined as "the phenomenon that occurs when a person is unwilling to remain in contact with private experiences (e.g., bodily sensations, emotions, thoughts, memories, behavioral predispositions) and takes steps to alter the form and frequency of these events and the contexts that occasion them" (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996, p. 1154). The suggested process in which EA leads to negative psychological consequences is that avoidance of inner experiences have paradoxical effects with an increase in the phenomena (e.g., thought or feeling) that the individual is trying to get rid of (e.g., Campbell-Sills, Barlow, Brown, & Hofmann, 2006; Wenzlaff & Wegner, 2000). Such avoidance increases physiological reactivity (e.g., Gross & Levenson, 1997; Wegner, Shortt, Blake, & Page, 1990). Avoidance is suggested to narrow behavioral repertoires and result in psychological inflexibility which may hamper the individual's resources when coping with stressful situations, and hence ability to engage in behaviors that have valued consequences. EA has been operationalized with the Acceptance and Action Questionnaire (AAQ: Hayes et al., 2004) and its successor AAQ-II (Bond et al., 2011) and is suggested as a core psychological

process underlying many forms of psychological distress and difficulties to adjust. There is evidence that EA is associated with PTSS (e.g., Marx & Sloan, 2005; Orcutt, Pickett, & Pope, 2005). Furthermore, there is evidence that EA is more related to general distress than to PTSS, and that EA contributes to general distress when PTSS is controlled for (e.g., Plumb, Orsillo, & Luterek, 2004; Tull, Gratz, Salters, & Roemer, 2004), indicating that individuals who engage in EA subsequent to a stressful event are more likely to report impaired psychological functioning.

Rumination

Rumination has been described as excessive conceptual processing characterized of “long chains of predominantly verbal thought in which the person attempts to answer “What if...?” questions or questions about the meaning of events” (e.g. “Why do I feel this way?”) (Wells, 2008, p. 11) and has been suggested to be related to anxiety and depression. There are different theories on rumination and it has recently been suggested as an emotion regulating strategy driven by meta-cognitive beliefs about its efficacy in remediating perceived discrepancies serving to avoid processing of negative emotion (Smith & Alloy, 2009). There is evidence that trauma-related rumination predicts PTSS and depression (e.g., Ehlers, Mayou, & Bryant, 1998; Ehling, Frank, & Ehlers, 2008; Murray, Ehlers, & Mayou, 2002), and trauma-related rumination has been operationalized by one of the subscales in the Responses to Intrusions Questionnaire (Clohessy & Ehlers, 1999; Murray et al., 2002; Steil & Ehlers, 2000).

Conceptualization and intervention

At the outset of this work is the view that PTSS (i.e. re-experiencing, numbing, and hyper-arousal) briefly after ones child is diagnosed with a cancer disease is a normal and understandable reaction. However, from a behavioral perspective, individuals experiencing aversive conditions are at risk for narrowed behavior repertoires characterized by escape and avoidance, which may make them more vulnerable to distress (e.g., Martell, Addis, & Jacobson, 2001). For parents of children with cancer it may be difficult to escape or avoid situations that having a child diagnosed with cancer dictate, however one can engage in behaviors that have the function of escape and avoidance of representations of these circumstances, such as thoughts about the child’s disease and related feelings. From this perspective it is hypothesized that parents who have a tendency to engage in EA and/or rumination as a response to the aversive condition of having a child diagnosed with cancer are at risk for maintained and/or increased PTSS and general distress. If such a hypothesis was to receive empirical support this could be of value for the

clinical practice with and development of new psychological interventions in this population, as both EA and rumination are modifiable constructs.

This preliminary conceptualization guided the development of the guided self-help intervention evaluated in the current thesis. The content of the intervention is outlined in the Methods-section and includes several components with the emphasis on building skills to foster cognitive and behavioral flexibility in relation to the adverse situation of having a child diagnosed with a severe illness. The intervention includes general CBT-components such as psycho-education, relaxation training, problem-solving, and general self-care. However, there is also a specific focus of teaching skills aiming to reduce experiential avoidance and rumination. Training of such skills include exercises in detached mindfulness (Wells, 2008) and defusion (Hayes, Strosahl, & Wilson, 1999). Such exercises include detecting oneself when “stuck” or “caught-up” in negative or unproductive thinking, and the participant is instructed to detach from this psychological content. An example of such an exercise is the “leaves in the stream exercise” where the participant is instructed to visualize a stream passing by and to place thoughts that come in to mind on leaves in the stream and watch them pass by. From a behavioral perspective, the purpose of such exercises is to change the context in which psychological content is experienced, from “being one’s thoughts” to “observing one’s thoughts”, and thereby alter the behavior regulating functions of the psychological content (Hayes et al., 2007).

Internet-based guided self-help

The recent decade has seen an increase in the interest of delivering psychological interventions in a format characterized by guided self-help. Typically, such interventions are delivered via some technological platform such as a computerized interface utilizing the internet for distribution of treatment material and communication between client and therapist. Such guided self-help programs have been shown to be effective in terms of symptom reduction and cost-effectiveness in the treatment of anxiety and mood disorders and various health problems (e.g., tinnitus, headache, pain, irritable bowel syndrome) (Andersson, 2009; Hedman, Ljótsson, & Lindefors, 2012). Such mode of delivery can be of value when reaching individuals in remote areas and individuals who have difficulties attending face-to-face meetings with providers of health-care. Parents of children on cancer treatment face stressing circumstances and may have difficulties in scheduling appointments with health-care providers. Guided self-help via the internet may be a viable alternative for these parents as it provides a flexible mode of administration which can be adapted to the parents’ current life schedule.

Aims

The aims were to, for parents of children on cancer treatment, compare three theoretical models of the underlying dimension of PTSS (Study I), to present a preliminary conceptualization and evaluation of a guided self-help intervention (Study II), to investigate the relationship between EA, rumination, PTSS, and depression (Study III), and to evaluate the efficacy of an internet-based guided self-help intervention (Study IV).

Hypotheses

- In Study I, it was hypothesized that a four-factor model would provide better fit than the current DSM-IV three-factor conceptualization of PTSS with data collected from parents of children on cancer treatment. Based on the findings by Krause et al. (2007) it was hypothesized that the best-fitting factor solution would evidence stability over time when testing model invariance with data collected two weeks, and two and four months after the child's diagnosis.
- In Study II, it was hypothesized that improvements in PTSS, depression, and quality of life would be evident during the course of a guided self-help intervention.
- In Study III, it was hypothesized that EA and rumination would be associated with PTSS, depression, and anxiety, and that EA and rumination would account for unique variance in PTSS and depression when controlling for demographic characteristics, anxiety, depression, and PTSS respectively. Furthermore, it was explored whether EA and rumination would predict PTSS and depression while controlling for initial levels.
- In Study IV, it was hypothesized that parents receiving internet-based guided self-help would report greater reductions in the primary outcome PTSS, and the secondary outcomes depression and anxiety, compared to parents in a wait-list control condition. Furthermore, it was hypothesized that the intervention would be associated with reductions in EA and rumination. Finally, it was explored whether the intervention was associated with an attenuation of the relationship between EA and PTSS and depression, and rumination and PTSS and depression respectively, which would suggest a potential mechanism of action.

Method

Design

An overview of Study I-IV characteristics is presented in Table 3.

Data in Study I were collected in a project with a longitudinal design with the overall aim to investigate level and development of PTSS and prevalence of potential PTSD among parents of children diagnosed with cancer. The design covers seven assessments: two weeks after diagnosis (T1), two (T2) and four (T3) months after diagnosis, one week after end of treatment (T4), and three (T5), 12 (T6) and 60 (T7) months after end of treatment or the child's death. Data collected at T1, T2, and T3 were used in Study I.

Study II was conducted as part of the pilot-phase during the development of a guided self-help intervention for parents of children diagnosed with cancer. The results from one case study is presented including pre-, post-, and follow-up assessments.

Study III and IV utilize data collected in a randomized controlled trial investigating the efficacy of a self-help intervention delivered via the internet where included parents after the screening/pre-assessment were allocated to the intervention or a wait-list control condition. Study III uses a cross-sectional design with parents participating in the screening/pre-assessment, and a longitudinal design with parents allocated to the wait-list condition.

Table 3. *Overview of Study I-IV.*

Study	Design	Participants	Data collection	Inclusion
I	Longitudinal and cross-sectional design	249-203 parents of children on cancer treatment	Structured interview via telephone	April 2002 – February 2004
II	Case-study	One mother of a child on cancer treatment	Self-report questionnaires via paper and pencil	October 2009
III	Longitudinal and cross-sectional design	79 parents of children on cancer treatment in cross-sectional analyses, 20 parents in longitudinal analyses	Self-report questionnaires via the internet and structured interview via telephone	April 2010 – May 2014
IV	Randomized controlled trial	58 parents of children on cancer treatment	Self-report questionnaires via the internet and structured interview via telephone	April 2010 – May 2014

Study IV reports results from the randomized controlled trial using pre- and post-assessments. Participants allocated to the intervention received the intervention immediately after randomization and participants in the wait-list condition received the intervention 12 months after randomization. Twelve and 24-month follow up assessments are included in the design but data from these assessments are not reported here.

Procedure and participants

An overview of participants' characteristics in Study I-IV is presented in Table 4.

Table 4. *Overview of participants' characteristics in Study I-IV.*

Characteristics	Study I (T1: n=249)	Study II (n=1)	Study III (n=79)	Study IV (n=58)
Mothers <i>n</i> (%)	128 (51)	1	55 (70)	39 (67)
Mean age (SD)	37 (6.3)	38	39 (7.2)	38 (7.2)
University <i>n</i> (%)	82 (33)	0	37 (48)	30 (52)
Children's mean age (SD)	8 (5.2)	4	8 (5.4)	5 (9.0)†
Children's disease <i>n</i> (%)				
Leukemia	55 (40)	1	42 (53)	24 (52)
Lymphoma	26 (19)	-	6 (8)	3 (7)
Sarcoma	19 (14)	-	11 (14)	8 (17)
CNS-tumor	18 (13)	-	10 (13)	7 (15)
Other malignancies	19 (14)	-	10 (13)	4 (9)

Note. T1 = two weeks after the child's diagnosis.

† median and interquartile range.

Study I

Swedish or English speaking parents of children (0-18 years) diagnosed with cancer and scheduled for chemotherapy and/or radiotherapy were eligible. Participants were included within two weeks after their child's diagnosis at four Swedish pediatric oncology centers. Potential participants were approached by a nurse who provided written and oral information about participation. The same nurse collected oral informed consent to participate and to be contacted via telephone by a research assistant. The research assistant conducted the interview via telephone where the PTSD-Checklist Civilian Version (PCL-C: Weathers, Litz, Herman, Huska, & Keane, 1993), a self-report instrument corresponding to the DSM-IV model of PTSD (American Psychiatric Association, 2000), and other instruments (not reported herein) were administered. Permission to be contacted again was obtained at the end of the interview. The procedure was approved by the ethical review board at the respective faculty of medicine (Dnr: Ups 02-006).

There were 315 eligible parents during the inclusion period. 249 parents (128 mothers and 121 fathers) of 137 children consented to participation representing a 79% response rate. Out of the 249 parents at T1, 234 provided data at T2, and 203 at T3.

Study II

Maria was a 38-year old mother of a four year old girl diagnosed with acute lymphoblastic leukemia three months prior to the intervention start. Maria lived together with the girl's father and they had another daughter, aged nine. At the time of the intervention Maria was receiving higher education. She lived 150 km from the pediatric oncology center where her daughter received her treatment and the location of the research group. At the time of the intervention Maria's daughter was on chemotherapy with four to five days stays at the center every other week. Maria had a history of an episode of depression and occasional panic attacks (around six years ago) for which she had received successful drug therapy.

The procedure was approved by the regional ethics review board (Dnr 2008/238) and the participant provided written informed consent.

Study III and IV

Eligible participants in Study III were Swedish speaking parents of children on treatment for any type of cancer disease with access to a computer with an internet connection. In addition, to be eligible for Study IV, participants had to meet the modified symptom criteria on the PCL-C and not suffer from a psychiatric disorder in immediate need for treatment. The modified symptom criteria on the PCL-C constitutes of scoring ≥ 3 on at least 1/5 symptoms of re-experiencing, 1/7 symptoms of avoidance, and 1/5 symptoms of hyperarousal, corresponding to partial PTSD (Breslau, Lucia, & Davis, 2004). Potential participants at five Swedish pediatric oncology centers were approached by a nurse or physician and asked to participate in a RCT of internet-based guided self-help. At the start of the study, parents were approached the week after diagnosis and asked whether they consented to be contacted five weeks later by a research assistant. Due to the fact that parents were approached later than intended the procedure was modified and from June 2011 parents were approached four to 12 weeks after their child's diagnosis. Consenting parents conducted self-report assessments via the internet and were interviewed via telephone. The procedure was approved by the regional ethics review board in Uppsala (Dnr 2008/238) and all participants provided written consent.

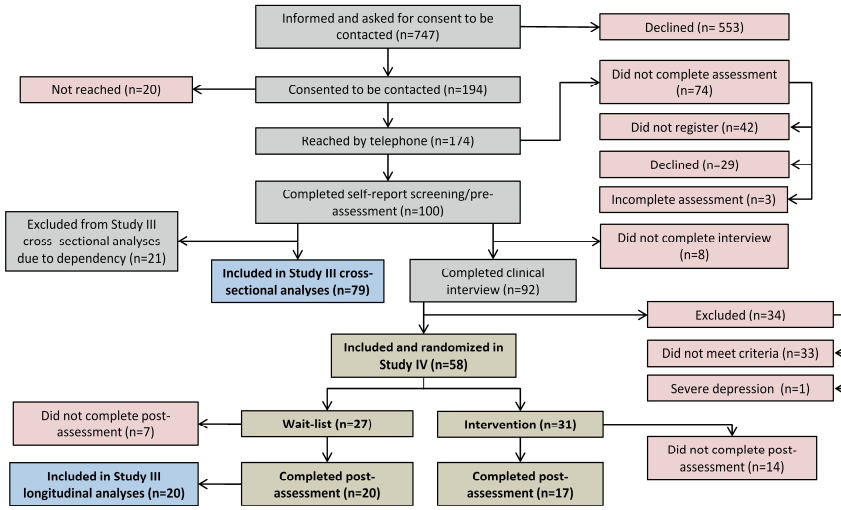


Figure 2. Participant flow through Study III and IV.

Participant flow through Study III and IV is outlined in Figure 2. Seven-hundred and forty-seven parents were approached and asked for consent to be contacted again, 100 of these completed the self-report screening and pre-assessment via the internet. Due to the fact that some of these parents were nested in the same child, and in order to not have dependency among data points (Kenny, 2011) in Study III, 21 parents who completed the assessment were excluded from Study III due to having a partner already in the study. In the case there were two parents, data from the parent who first provided data were retained in the analyses. The sample included in cross-sectional analyses in Study III consists of 79 parents of children on cancer treatment. Excluded parents did not differ from included on demographic characteristics or any of the study variables except for time since diagnosis for which excluded parents completed the assessment later (median = 4 months, IQR = 3) compared to included parents (median = 3 months, IQR = 1), $p < .05$. For Study IV, parents had to complete a clinical interview via telephone, which 92 completed. In the end, 58 parents were included in Study IV and randomized to the intervention ($n=31$) or wait-list ($n=27$) condition. Twenty participants in the wait-list condition completed the post-assessment and were included in the longitudinal analyses in Study III. These did not differ from those included in the cross-sectional analyses in terms of demographic characteristics but reported a significantly higher level of PTSS, depression, anxiety, EA, and rumination at the screening/pre-assessment.

Measures

An overview of constructs and corresponding measures used in Study I-IV is presented in Table 5.

Table 5. *Overview of constructs and measures used in Study I-IV.*

Construct	Measure	Study I	Study II	Study III	Study IV
PTSS	PCL-C	X	X	X	X
Depression	MADRS-S		X		
Depression	BDI-II			X	X
Anxiety	BAI			X	X
Experiential avoidance	AAQ-PCC		X		
Experiential avoidance	AAQ-II			X	X
Rumination	RIQrum		X	X	X
Quality of Life	QOLI		X		

Note. AAQ-II = Acceptance and Action Questionnaire-II, BAI = Beck Anxiety Inventory, BDI-II = Beck Depression Inventory II, MADRS-S = Montgomery Åsberg Depression Rating Scale – Self Assessment, PCL-C = PTSD-Checklist Civilian Version, QOLI = Quality of Life Inventory, RIQrum = Rumination subscale of the Responses to Intrusions Questionnaire.

PTSD-Checklist

In study I-IV, PTSS was assessed with the PTSD-Checklist Civilian Version (PCL-C: Weathers, Litz, Herman, Huska, & Keane, 1993) which contains 17 items rated on a 5 point scale (1-5), corresponding to the DSM-IV symptom clusters of re-experiencing (items 1-5), avoidance/numbing (6-12), and hyper-arousal (13-17). In Study I the PCL-C was administered over telephone, in Study II via paper-and-pencil and in Study III and IV via the internet. The respondents were asked to rate to which extent they had been bothered by each symptom during the previous month. Items were keyed to the child's disease. Ruggiero, Ben, Scotti, and Rabalais (2003) report that the instrument has adequate internal consistency, test-retest reliability, and that there is evidence for convergent and discriminant validity when compared to other well-established PTSS-measures as well as measures of depression and general anxiety. A value of 44 or above on the full scale has been suggested as suggesting a diagnosis of PTSD (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996).

Montgomery Åsberg Depression Rating Scale – Self Assessment

In Study II, depression was assessed with the Montgomery Åsberg Depression Rating Scale – Self Assessment (MADRS-S: Svanborg & Åsberg, 1994). It includes nine items assessing symptoms of depression, i.e., mood changes, anxiety, changes in sleeping patterns, appetite, ability to concentrate, initiative-taking, emotional engagement, pessimism, and attitude to

life. Each item is rated on a 7-point scale with four defined anchors. MADRS-S has shown good test-retest reliability (.80-.94), high correlations between expert assessments and self-reports (Svanborg & Åsberg, 1994), and high correlations with the Beck Depression Inventory (Svanborg & Åsberg, 2001). The total score varies from 0-54, a score of 7-19 has been suggested to indicate mild depression, and a score from 20-34 moderate depression.

Beck Depression Inventory-II

In Study III and IV, depression was assessed with the Beck Depression Inventory II (BDI-II: Beck, Steer, & Brown, 1996). The BDI-II consists of 21 items rated on a 4-point scale (0-3). The BDI-II has shown good convergent validity with its precursor BDI and with the Hamilton Psychiatric Rating Scale, and suggested cut-offs are: 0-13 indicating minimal, 14-19 mild, 20-28 moderate, and 29-63 severe depression (Harris & D'Eon, 2008).

Beck Anxiety Inventory

In Study III and IV, general anxiety was assessed with the Beck Anxiety Inventory (BAI: Beck, Epstein, Brown, & Steer, 1988). BAI consists of 21 items rated on a 4-point scale (0-3). Suggested cut-offs are: 0-7 indicating minimal, 8-15 mild, 16-23 moderate, and 24-63 severe anxiety and the instrument has shown good test-retest reliability and convergent validity (Beck et al., 1988).

Acceptance and Action Questionnaire-II

In Study III and IV, EA was assessed with the Acceptance and Action Questionnaire-II. The original AAQ-II consisted of 10 items rated on a 7-point scale (1-7) (Bond et al., 2011). In Study II, a 16 item version called the Acceptance and Action Questionnaire Parents in Pediatric Oncology (AAQ-PCC) was used. In this version the first 10 items are identical to the items in the original AAQ-II but the instrument also includes an additional six items generated by our research group to assess EA in parents of children diagnosed with cancer. The original AAQ-II with 10 items has shown satisfactory test-retest reliability and construct validity in different populations. However, a 7-item version (excluding items 1, 6, and 10) has shown the best psychometric properties (Bond et al., 2011), thus this version was used in Study III and IV. Scores can be calculated either as higher scores reflecting more EA (Study III and IV), or as higher scores reflecting more acceptance and action in the presence of difficult thoughts and feeling (Study II).

Rumination subscale of the Responses to Intrusions Questionnaire

In Study II, III, and IV, rumination was assessed with the rumination subscale from the Responses to Intrusions Questionnaire (RIQrum). The subscale which consists of eight items rated on a 4-point scale (0-3), has shown adequate test-retest reliability and predictive validity (Clohessy & Ehlers, 1999; Murray et al., 2002; Steil & Ehlers, 2000).

Quality of Life Inventory

In Study II, quality of life was assessed with the Quality of Life Inventory (QOLI; Frisch, Cornell, Villanueva, & Retzlaff, 1992) consisting of 16 areas rated by the respondent concerning importance (0 to 2) and satisfaction (-3 to 3). The ratings are multiplied yielding a score between -6 and 6 for each area. Area-scores are summed and divided by the frequency of areas scored as important (1) or very important (2), giving an overall quality of life score. The instrument's internal consistency has been shown to be high, between .77 and .89, and one month test-retest reliability lies between .80 and .91 (Frisch et al., 1992).

Interventions

Study II and IV

The self-help material used in Study II and IV consists of approximately 100 written pages divided in eight chapters/modules in Study II and nine chapters/modules in Study IV, and a CD with exercises. The material was developed by the author, a licensed psychologist and PhD student, under the supervision of an experienced licensed psychologist, licensed psychotherapist, and PhD. It was designed to enable the participant to work with the material independently by reading and conducting homework assignments and receive feedback via e-mail or telephone from a psychologist. It was developed based on principles from CBT including components such as psychoeducation, relaxation training, detached mindfulness/defusion, problem solving, behavioral experiments, emotional writing, and maintenance. Table 6 outlines the intervention components.

In Study II the participant was provided the self-help material in print. Maria had three in-vivo meetings with a psychologist (the author) and six phone calls.

In Study IV the intervention was provided via the internet. Participants logged in to a secure portal where they accessed the material as pdf-files and

Table 6. *Overview of intervention components and content in Study II and IV.*

Module 1	<i>Introduction to treatment model and psycho-education.</i> Participants are introduced to the treatment model and provided psycho-education regarding emotional responses when being a parent of a child with serious illness.
Module 2	<i>Bodily tension and introduction to relaxation training.</i> Participants are provided with information regarding bodily tension and trained to discriminate between tension and relaxation.
Module 3	<i>The power of thinking and introduction to detached mindfulness and defusion.</i> Participants are introduced to the concepts of defusion and detached mindfulness. They are taught “to catch themselves” when stuck with cognitive content and trained in applying strategies for defusing from cognitive content, i.e., to shift their style of cognitive processing.
Module 4	<i>How rules and assumptions affect our behavior and introduction to behavioral experiments.</i> Participants are introduced to the concepts of rules and assumptions and how these may affect subsequent behavior and their consequences. Participants are taught to analyze the consequences of following rules and to try out new behaviors, if consequences are unwanted, i.e., behavioral experiments.
Module 5	<i>Structured writing assignments, acceptance, and willingness.</i> Participants are introduced to the concepts of acceptance and willingness. They are introduced to practicing acceptance and willingness through a series of writing assignments.
Module 6†	<i>Problem solving.</i> Participants are introduced to the concept of structured problem solving. They are instructed to choose a problem, generate possible solutions, evaluate each solution, choose one solution, execute the solution, and evaluate the results.
Module 7	<i>Structured writing, perspective taking, self-compassion, and sharing with others.</i> Participants are introduced to the concept of perspective taking as a way of fostering self-compassion. They are taught to practice shift in perspective through writing assignments.
Module 8	<i>Values, goals, and valued action.</i> Participants are introduced to the concepts of values, goals, and valued action. Participants practice generating goals that are in accord with their values and acting on these goals
Module 9	<i>Recap, maintenance, and general self-care.</i> Participants get a précis of the entire program. They are instructed to generate a maintenance-plan and introduced to general self-care activities, i.e., general sleep-hygiene, exercise, and good eating habits.

Note. † This module was not included in the intervention provided in Study II.

uploaded completed assignments. The portal had a secure messaging system via which participants communicated with the psychologist who provided feed-back to completed assignments. Three psychologists worked with the study, one licensed psychologist (the author) and two non-licensed psychologists with a master’s degree in Psychology.

Data analysis

Study I

Confirmatory factor analyses (CFA) using Mplus 6.1 (Muthén & Muthén, 2010) were performed as the primary method of analyses. The analytic strategy consisted of subjecting three theoretical models (DSM-IV, Simms et al. (2002) and King et al. (1998) outlined in the Introduction) of PTSS/PTSD factor structure to CFA to determine the best model fit to data. This was conducted by performing a longitudinal CFA and testing for measurement invariance across time for each of the three models. In order to control for the dependent nature of the data, i.e., parent dyads nested in children, which can potentially bias standard errors and χ^2 estimates, the TYPE = COMPLEX and CLUSTER commands in Mplus were used. MLR estimation which is the default estimator in Mplus for this procedure which produces estimates of χ^2 and standard errors that are robust to non-independence and non-normality (Muthén & Muthén, 2010) were used. Measurement invariance was tested in three steps. First a configural model was tested where all factor loadings and co-variances were allowed to be freely estimated. Secondly, metric invariance was tested by constraining factor loadings to be equal across time. Thirdly, phi invariance was investigated by adding constraints on factor co-variances to be equal across time. Measurement invariance was investigated with the Satorra-Bentler scaled $\Delta\chi^2$ -test which is recommended when using MLR estimation (Satorra, 2000), and Δ CFI where convention suggests values equal to or lower than .01 as non-significant (Cheung & Rensvold, 2002). Model test statistics of fit included χ^2 -tests and approximate fit indexes used were Steiger-Lind root mean square error of approximation (RMSEA; Steiger, 1990) and Bentler comparative fit index (CFI; Bentler, 1990). According to Byrne (2010) RMSEA values <.05 indicate good fit and values ranging between .08-.10 moderate fit, while CFI values close to .95 indicate good fit and values >.90 acceptable fit. For the purpose of comparing fit between models sample size adjusted Bayesian information criteria (BIC; Raftery, 1995) was used, with lower values indicating better model fit.

Study II

In order to determine the clinical significance and reliability of change subsequent to intervention statistical methods suggested by Jacobson and Truax (1991) were used. This approach involves comparing individual change to norms of clinical and non-clinical populations. Clinical significance is suggested when either (i) the level of functioning subsequent to intervention falls within the range of a non-clinical population, where range is defined as

within two standard deviations of the mean of that population, or (ii) the level of functioning subsequent to intervention places the individual closer to the mean of the non-clinical population than the mean of the clinical population, which correspond to the (b) and (c) criteria suggested by Jacobson and Truax (1991). (i) was used when the distributions were non-overlapping and (ii) when distributions were overlapping.

Study III

Pearson correlations were used to investigate the relationships among the study variables including the demographic characteristics for parents and children: age and gender; children: diagnosis (leukemia vs. other diagnosis) and time since diagnosis; and parents: level of education, employment status, marital status, and experience of previous trauma. Hierarchical multiple regression analyses with PTSS and depression as the dependent variables were used to investigate the incremental explained variance of the study variables according to the hypotheses. Standardized regression coefficients were used to determine the relative contribution of included variables. Multiple regression analyses were used to explore longitudinal relationships.

Study IV

Mixed effects modelling was used to examine the effects of the intervention (Singer & Willet, 2003). A random intercept model was used and analyses were conducted according to the intention-to-treat (ITT) principle where all randomized participants are included in the analyses assuming missing data to be missing at random (Salim, Mackinnon, Christensen, & Griffiths, 2008). The data missing mechanism was explored prior to the main analyses by exploring relationships between characteristics at the pre-assessment and missing data. Standardized effect sizes (Cohen's *d*) between groups at post-assessment were calculated using estimated means and standard deviations from pre-assessment (Feingold, 2009). Cohen's *d* for within groups over time were calculated using estimated means and standard deviations adjusted for the correlation between pre and post measures (Borenstein, Hedges, Higgins, & Rothstein, 2009). The magnitude of the effect expressed in *d* was interpreted according to Cohen (1988), i.e., 0.2 = small effect, 0.5 = medium effect, and 0.8 = large effect. Clinical significant and reliable change was calculated for the primary outcome PCL-C using the framework by Jacobson and Truax (1991). Finally, a series of regression analyses with visual inspection of the plotted slopes and simple contrast between coefficients tests were used to explore whether there was a difference between groups at pre- and post- assessment regarding the relationship of EA and PTSS and depression, and rumination and PTSS and depression respectively.

Results

Level of PTSS across samples

For comparison purposes, Table 7 outlines the mean level of PTSS and 95% confidence intervals across the samples in Study I, III, and IV. It is evident from the non-overlapping confidence intervals that the participants in Study I reported a lower level of PTSS compared to participants in Study III and IV. Participants in Study IV reported a higher mean level compared to participants in Study III, however the confidence intervals are slightly overlapping so it cannot be ascertained at the confidence level of 95% that the means differ.

Table 7. *Mean level of PTSS across samples in Study I, III, and IV.*

Sample	PCL-C mean [95% CI]
Study I at T2 (n=234)	36.4 [37.9 - 34.8]
Study III (n=79)	43.5 [46.5 - 40.5]
Study IV (n=58)	49.1 [51.7 - 46.4]

Note. CI = confidence interval, T2 = two months after the child’s diagnosis.

The factor structure of PTSS (Study I)

As a first step three models (DSM-IV, King et al. (1998), Simms et al. (2002)) were evaluated cross-sectionally with data from each of the three assessments. All models evidenced good to acceptable fit at all assessments. Inspection of BIC revealed that the Simms et al. (2002) model provided best fit at T1 and T2, and that the King et al. (1998) model provided best fit at T3. The primary analyses consisted of incorporating data from all assessments in longitudinal CFA which are presented in Table 8. When comparing baseline configural models the Simms et al. (2002) model had the highest CFI (indicating acceptable fit), equally low RMSEA as the King et al. (1998) model (indicating good fit), and the lowest BIC value, indicating that this was the best representation of a longitudinal analysis of the factor structure. When testing for metric invariance (i.e., factor loadings constrained to be equal across time) both the King et al. (1998) and the Simms et al. (2002) model evidenced non-significant Satorra-Bentler scaled $\Delta\chi^2$ -test and Δ CFI closer to zero than -.01. In comparison, the DSM-IV model exhibited a sig-

nificant increase in the Satorra-Bentler scaled $\Delta\chi^2$ -test and a ΔCFI closer to -.01. However, when testing for phi invariance all models had significant Satorra-Bentler scaled $\Delta\chi^2$ -tests and ΔCFI closer to -.01 than zero. Thus, both the King and the Simms model evidenced acceptable to good fit, metric invariance, and phi non-invariance. However, when comparing models with BIC, the Simms model including the four factors (re-experiencing, avoidance, dysphoria and hyper-arousal) evidenced best fit (i.e., lower value).

Table 8. *Fit statistics for longitudinal models and test of model invariance in Study I.*

Model	S-B $\Delta\chi^2$	CFI	ΔCFI	RMSEA [90% CI]	BIC
DSM-IV					
Config.		.898		.042 [.046-.037]	31498.86
Metric	56.37**	.892	-.006	.043 [.047-.038]	31497.94
Phi	64.77**	.891	-.007	.043 [.047-.038]	31496.72
King					
Config.		.900		.042 [.046-.037]	31494.73
Metric	34.18	.898	-.002	.041 [.046-.037]	31470.64
Phi	56.94**	.895	-.005	.042 [.046-.038]	31481.19
Simms					
Config.		.902		.041 [.046-.037]	31487.22
Metric	26.49	.902	.000	.041 [.045-.036]	31455.22
Phi	52.36**	.898	-.004	.041 [.046-.037]	31468.30

Note. DSM-IV = *Diagnostic Manual for Mental Disorders – 4th edition*; S-B = Satorra – Bentler, CFI = Bentler comparative fit index; RMSEA = Steiger-Lind root mean square error of approximation; CI = confidence interval; BIC = sample size adjusted Bayesian information criteria.

** $p < .01$

Guided self-help in a case study (Study II)

An overview of the results from the case study is presented in Table 9. At pre-assessment Maria reported a high level of PTSS, moderate depression, and low quality of life. Her responses on the RIQrum indicated that she often engaged in ruminative thinking and responses on the AAQ-PCC indicated that she used acceptance strategies to some extent but had difficulties handling distressing thoughts and emotions. In the initial contact, Maria described high levels of tension and stress and a predominant fear that her child would die. She suffered from headaches, neck- and shoulder-pain, and what she referred to as "stress-stomach" resembling symptoms of irritable bowel syndrome. Furthermore, she described mood swings and that she often felt irritated and had frequent outbursts of anger. She ruminated about why this had happened to her family, what the purpose was, worried about being abandoned and left alone, and that nobody would care for her. In addition, she described difficulties concentrating, such as listening to others.

Table 9. *Results for Maria compared to clinical and nonclinical norms, Study II.*

	Pre	Post	FU	Clinical norms <i>M (SD)</i>	Nonclinical norms <i>M (SD)</i>	Critical cut-off	Critical change
Maria							
PCL-C	48	31*	29*	49.9 (9.1) ^a	29.0 (7.5) ^a	38.5	5.5
QOLI	-0.25	2.06*	1.63	0.9 (1.6) ^b	2.6 (1.1) ^c	1.9	1.7
MADRS-S	24	8*	10*	20.1 (5.7) ^d	7.85 (8.4) ^e	15.2	5.0
RIQrum	11	3	6	NA	NA	NA	NA
AAQ - PCC	67	83	82	NA	NA	NA	NA

Note. *Denotes clinical significant and reliable change from pre-assessment.

^a(Pöder et al., 2008), ^b(Carlbring et al., 2005), ^c(Frisch et al., 1992), ^d(Bergström et al., 2003), ^e(Holländare et al. 2008).

During the intervention Maria worked with relaxation training and practiced detached mindfulness and defusion strategies. She identified verbal rules that affected her behavior negatively, such as “I must not lose control” and “Others cannot see me sad”, and was encouraged to practice detached mindfulness when these rules came into mind and to reduce avoidant behavior triggered by such thinking and instead engage in valued behaviors and activities. Maria appreciated the writing assignments and put forth the value of practicing self-compassion.

At the end of the intervention Maria stated that she found the relaxation training and detached mindfulness components most useful. She reported that she didn’t feel as tense anymore and that she was confident in her new strategy when faced with new stressors. She reported that she had more distance to her own thoughts and not being caught up in them as much as before. She reported that her “stress-stomach” was much better. Her post-assessments indicated a low level of PTSS, mild depression, and good quality of life, all representing clinical significant and reliable change from the pre-intervention assessment. In addition, responses on the RIQrum indicated reductions in ruminative thinking whereas responses on the AAQ-PCC indicated increased acceptance and action. These results were maintained at the six-month follow-up except for quality of life which was reduced, no longer representing clinically significant and reliable change from pre-assessment.

Experiential avoidance and rumination and their relationships with PTSS and depression (Study III)

As presented in Table 10 there were positive and significant correlations among all main study variables. In line with our hypotheses, both EA and rumination had positive correlations with PTSS, depression, and general anxiety.

Table 10. *Correlations between study variables and descriptive statistics, Study III.*

Variable	BDI-II	BAI	AAQ-II	RIQrum	<i>M</i>	<i>SD</i>
PCL-C	.73***	.74***	.61***	.54 [†] ***	43.5	13.6
BDI-II		.70***	.72***	.64 [†] ***	18.1	9.9
BAI			.61***	.53 [†] **	12.4	8.0
AAQ-II				.53 [†] ***	20.0	8.0
RIQrum					7.3 [†]	4.8 [†]

Note. *n* = 79. PCL-C = PTSD Checklist Civilian Version, BDI-II = Beck Depression Inventory-II, BAI = Beck Anxiety Inventory, AAQ-II = Acceptance and Action Questionnaire - II, RIQrum = Rumination subscale of the Responses to Intrusions Questionnaire.

[†]*n* = 77

** $p < .01$, *** $p < .001$.

Results from the hierarchical multiple regression analysis with PCL-C and BDI-II as dependent variables are presented in Table 11. In models with PCL-C as the dependent variable level of education was included in Step 1 together with BAI resulting in a significant overall model, $F(2, 74) = 48.61$, $p < .001$, accounting for 57% of the variance in PCL-C. BAI was the only contributor to PCL-C in this initial step ($\beta = 0.70$, $p < .001$). In Step 2, BDI-II was added to the equation which resulted in an increase in model explanation, $\Delta F(1, 73) = 15.93$, $p < .001$, accounting for an additional 8% of the variance in PCL-C. Table 11 shows that BDI-II contributed to this model after accounting for education and BAI. AAQ-II and RIQrum was added in Step 3 resulting in a non-significant change in model explanation, $\Delta F(2, 71) = 0.53$, $p = .59$. Table 11 shows that neither AAQ-II nor RIQrum contributed to this model after accounting for demographic variables, BAI, and BDI-II. Overall, AAQ-II and RIQrum did not provide incremental explanation of the variance in PCL-C, over and above the variance accounted for by the variables already included in the model.

In models with BDI-II as dependent variable level of education, employment status, and marital status were included in Step 1 together with BAI resulting in a significant overall model, $F(4, 72) = 20.12$, $p < .001$, accounting for 53% of the variance in BDI-II. BAI was the only significant contributor to BDI-II in this step ($\beta = .62$, $p < .001$). In Step 2, PCL-C was added to the equation which resulted in an increase in model explanation, $\Delta F(1, 71) = 20.08$, $p < .001$, accounting for an additional 10% of the variance in BDI-II. Table 11 indicates that PTSS contributed to this model after accounting for demographic variables and anxiety. AAQ-II and RIQrum were added in Step 3 resulting in an increase in model explanation, $\Delta F(2, 69) = 12.93$, $p < .001$, accounting for an additional 10% of the variance in BDI-II. Table 11 indicates that both AAQ-II and RIQrum were significant predictors in this

Table 11. Hierarchical multiple regression with PCL-C and BDI-II as dependent variables, Study III.

	PCL-C			BDI-II		
	β	R^2_{adj}	ΔR^2	β	R^2_{adj}	ΔR^2
Step1		.56	.57***		.50	.53***
Control variables ^a						
Step 2		.63	.08***		.61	.10***
BDI-II or PCL	0.40***			0.50***		
Step 3		.63	.01		.71	.10***
AAQ-II	0.07			0.32***		
RIQrum	0.07			0.21**		

Note. n = 77. PCL-C = PTSD Checklist Civilian Version, BDI-II = Beck Depression Inventory-II, BAI = Beck Anxiety Inventory, AAQ-II = Acceptance and Action Questionnaire - II, RIQrum = Rumination subscale of the Responses to Intrusions Questionnaire.

^aControl variables included level of education and BAI in models predicting PCL-C and level of education, employment status and BAI in models predicting BDI-II.

** $p < .01$, *** $p < .001$.

model after accounting for demographic variables, BAI, and PCL-C, with AAQ-II being a slightly stronger predictor. Overall, AAQ-II and RIQrum provided incremental explanation of the variance in BDI-II, over and above the variance accounted for by the variables already included in the model.

Table 12. Multiple regression analyses predicting PCL-C and BDI-I, Study III.

	PCL-C		BDI-II	
	β	R^2_{adj}	β	R^2_{adj}
Models with AAQ-II		.49		.52
Initial level	0.31		0.31	
AAQ-II	0.50*		0.52*	
Models with RIQrum		.43		.44
Initial level	0.43		0.31	
RIQrum	0.36		0.45	

Note. n = 20. PCL-C = PTSD Checklist Civilian Version, BDI-II = Beck Depression Inventory-II, BAI = Beck Anxiety Inventory, AAQ-II = Acceptance and Action Questionnaire - II, RIQrum = Rumination subscale of the Responses to Intrusions Questionnaire.

* $p < .05$.

Inspection of the variance inflation factors (VIF) revealed no indication of multi-collinearity for the two hierarchical regression models (VIF's ranging between 1.08-3.12).

Finally, Table 12 presents results from the longitudinal analyses indicating that AAQ-II was a significant predictor of PCL-C and BDI-II at the second assessment while controlling for initial levels. RIQrum was not a significant predictor of PCL-C or BDI-II at the second assessment while controlling for initial levels, however β -coefficients and p -values suggested a trend.

Internet-based guided self-help (Study IV)

Fifty-eight parents of 46 children were included and randomized to intervention ($n=31$) or wait-list ($n=27$). There were no differences in baseline characteristics between the groups except for the BAI which was higher in the intervention group.

Fourteen participants in the intervention group (45%) and seven in the wait-list group (26%) did not provide post-assessments ($\chi^2=2.31$, $df=1$, $p=.13$). At pre-assessment there were no differences in terms of demographic characteristics or outcome measures between those who provided post-assessments and those who did not (p ranging .15-.91), hence missing data was assumed to be missing at random.

The number of accessed treatment modules and logins to the portal were measured as indicating adherence to the intervention. Six participants did not start the intervention and seven discontinued before completion. For the ITT-sample, the median number (interquartile range = IQR) of accessed modules was four (4) and the median number (IQR) of logins was 13 (22). For the completer-sample, the median number of accessed modules was five (3.5) and the median number (IQR) of logins was 20 (20).

Table 13 presents the results from the mixed effects models and effect sizes. For the primary outcome PCL-C there was a significant effect of the intervention and the estimated between group effect size at post-assessment was large. There was a reduction in symptoms in the intervention group with a large within group effect size, but minimal reduction in the wait-list group. Twelve of 31 participants in the intervention group exhibited clinical significant and reliable improvement compared to four of 27 participants in the control group and this difference was significant in ITT-analyses using LOCF ($\chi^2=4.13$, $df=1$, $p<0.05$). For BDI-II there was a significant effect of the intervention and the estimated between group effect size at the post-assessment was large. There was a reduction in symptoms in the intervention group with a large within group effect size, but minimal reduction in the wait-list group. There was also a significant effect of the intervention on BAI with a reduction in symptoms in the intervention group with a large within group effect size but minimal reduction in the wait-list group. However, due to a higher level on BAI in the intervention group at pre-assessment the between group effect size at post-assessment was small. For AAQ-II and RIQrum there were no significant effects of the intervention, but estimated within group effect sizes indicated small to medium reductions in the intervention group and minimal to small reductions in the wait-list group. There was a lower level of AAQ-II in the intervention group with a small effect size at post-assessment.

Table 13. *Estimated outcomes and effect sizes, Study IV.*

	Estimated means (SE)		Time*Group	Effect sizes Cohen's <i>d</i> [95% CI]	
	Pre	Post	<i>F</i>	Between group post-assessment	Within group pre-post
PCL-C					
Intervention (n=31)	51.5 (2.1)	35.9 (2.6)	16.5***	0.88 [1.42 – 0.34]	1.62 [2.56 – 0.67]
Wait-list (n=27)	46.3 (2.2)	45.1 (2.5)			0.09 [0.72 – -0.54]
BDI-II					
Intervention (n=31)	21.6 (1.4)	12.9 (1.7)	15.1***	0.92 [1.46 – 0.37]	1.09 [1.88 – 0.30]
Wait-list (n=27)	19.3 (1.5)	19.8 (1.6)			-0.07 [0.56 – -0.69]
BAI					
Intervention (n=31)	17.2 (1.4)	10.1 (1.8)	7.1*	0.17 [0.69 – -0.35]	0.85 [1.56 – 0.14]
Wait-list (n=27)	11.9 (1.5)	11.3 (1.8)			0.06 [0.67 – -0.54]
AAQ-II					
Intervention (n=31)	21.1 (1.3)	18.1 (1.6)	0.5	0.27 [0.79 – -0.24]	0.51 [1.13 – -0.12]
Wait-list (n=27)	20.3 (1.4)	18.8 (1.7)			0.16 [0.76 – -0.45]
RIQrum					
Intervention (n=31)	8.7 (0.9)	7.0 (1.1)	0.1	0.09 [0.61 – -0.42]	0.41 [1.02 – -0.21]
Wait-list (n=27)	8.3 (1.0)	7.0 (1.2)			0.26 [0.93 – -0.41]
<i>Note.</i> PCL-C = PTSD Checklist Civilian Version, BDI-II = Beck Depression Inventory-II, BAI = Beck Anxiety Inventory, AAQ-II = Acceptance and Action Questionnaire - II, RIQrum = Rumination subscale of the Responses to Intrusions Questionnaire, CI = confidence interval.					
Cohens <i>d</i> is the standardized mean difference and was calculated using the estimated means and the standard deviation of the complete sample at the pre-assessment.					
* <i>p</i> < .05, ** <i>p</i> < .01, *** <i>p</i> < .001.					

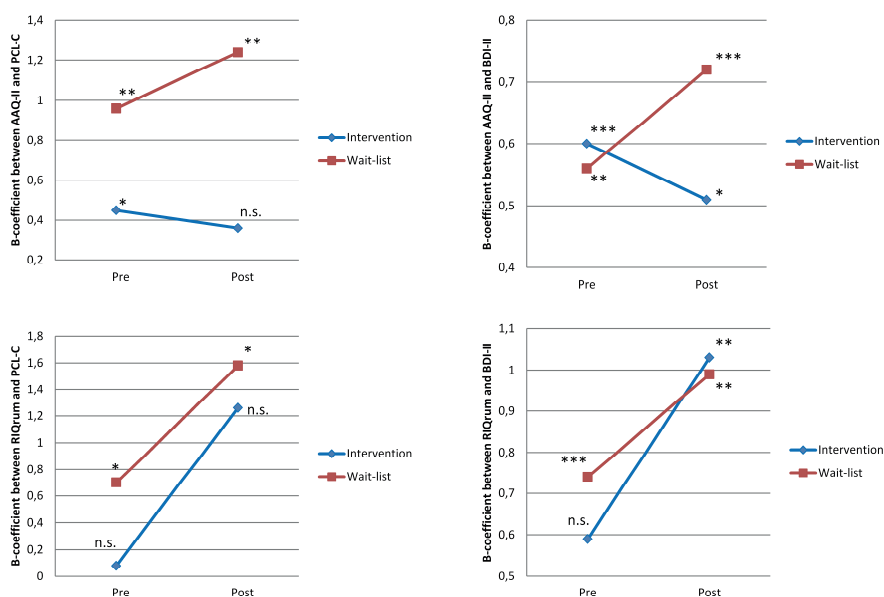


Figure 3. Plotted slopes for the relationships between EA and PTSS and depression, and between rumination and PTSS and depression, Study IV. Y-axes represent the unstandardized B-coefficients in linear regression and asterisks denote whether coefficients are different from zero, * $p < .05$, ** $p < .01$, *** $p < .001$, n.s. = non-significant.

Results from the exploratory analyses regarding the potential mechanisms of change of the intervention are presented in Figure 3. For AAQ-II, a visual inspection of the plotted slopes indicates that the relationship between AAQ-II and PCL-C and BDI-II was weakened in the intervention group and strengthened in the wait-list group across assessments. At pre-assessment, AAQ-II predicted PCL-C in both groups and the contrast between coefficients was non-significant ($B = -0.52$, $p = .12$). At post-assessment, PCL-C was no longer predicted by AAQ-II in the intervention group but in the control group. The contrast between coefficients was non-significant ($B = -0.88$, $p = .09$). For AAQ-II and BDI-II there was a significant relationship in both groups at pre- and post-assessment. The contrast between coefficients was non-significant at both assessments (Pre: $B = 0.05$, $p = .85$; Post: $B = -0.21$, $p = .43$).

For RIQrum, a visual inspection of the plotted slopes indicates that the relationship with PCL-C and BDI-II was strengthened in both groups between assessments. At pre-assessment, RIQrum predicted PCL-C in the wait-list group but not in the intervention group. The contrast between coefficients was non-significant ($B = -0.61$, $p = .24$). There was a similar pattern at post-assessment and a non-significant contrast between coefficients ($B = -0.32$, p

=.24). At pre-assessment, the relationship between RIQrum and BDI-II was significant in the wait-list group only but the contrast between coefficients was non-significant ($B = -0.15, p = .68$). At post-assessment the relationship was significant in both groups and the contrast between coefficients was non-significant ($B = -0.04, p = .94$).

Discussion

Main findings

As hypothesized, Study I found support for a four-factor model of PTSD providing better model fit than the three-factor model outlined in the DSM-IV. There was also support for metric invariance over time indicating that factor loadings did not differ across the three assessments. In Study II there was evidence for clinically significant and reliable improvements in PTSS, depression, and quality of life during the guided self-help intervention, and these improvements were mainly maintained at follow-up. In Study III, there was support for the hypothesis that EA and rumination provide incremental explained variance in depression while controlling for anxiety, demographic characteristics, and PTSS, but not in PTSS when controlling for anxiety, demographic characteristics, and depression. In exploratory longitudinal analyses, EA but not rumination, predicted PTSS and depression while controlling for initial levels. Finally, in Study IV, there was evidence for an intervention effect for PTSS, depression, and anxiety with substantial reductions in the intervention group, but not for EA and rumination. Exploratory analyses indicated that the relationships between EA and PTSS and between EA and depression were attenuated in the intervention group.

The factor structure of posttraumatic stress

The results from Study I are in line with research from other populations indicating that the Simms et al. (2002) four-factor model of PTSS/PTSD provide better model fit compared to other models (Baschnagel et al., 2005; Elklit & Shevlin, 2007; Krause et al., 2007; Palmieri et al., 2007; Simms et al., 2002). However, it should be noted that the Simms et al. (2002) model and the King et al. (1998) model provided almost equally good fit to the data and both evidenced metric invariance across time. These findings are consistent with a meta-analytic investigation of the structure of PTSS, aggregating 50 data sets with different samples, which found best support for the Simms et al. (2002) and King et al. (1998) models, with evidence for slightly better fit for the Simms et al. (2002) model (Yufik & Simms, 2010). Even though past evidence has slightly favored the Simms et al. (2002) model the four factor model of PTSD recently outlined in the DSM-5 (American

Psychiatric Association, 2013) reflects the model suggested by King et al. (1998).

Experiential avoidance, rumination, posttraumatic stress, and depression

Results from Study III are in line with a growing literature suggesting that EA may be a core process in the development and maintenance of various negative psychological states (Chawla & Ostafin, 2007; Hayes et al., 1996). To the author's knowledge this is the first investigation of this construct in the current population and results are in line with those for other populations within the pediatric field. For example, Greco et al. (2005) found that EA mediated the relationship between perceived stress surrounding pre-term birth and post-discharge adjustment difficulties in mothers of pre-term born infants. Similarly, EA was found to predict PTSS and depression while controlling for initial levels which is consistent with research showing that EA is a risk factor for emotional disorder (Spinhoven, Drost, de Rooij, van Hemert, & Penninx, 2014). This suggests that relying on EA in the context of stressful life events may have negative effects on well-being and adjustment which is consistent with other findings (Fledderus, Bohlmeijer, & Pieterse, 2010; Kashdan & Kane, 2011; Machell, Goodman, & Kashdan, 2014).

Rumination in response to intrusive thoughts was positively associated with PTSS and depression and provided incremental explained variance in depression while controlling for demographic characteristics, anxiety, and depression, but not in PTSS while controlling for demographic characteristics, anxiety, and PTSS. Previous research has found rumination to predict PTSS and depression after a trauma (Ehlers et al., 1998; Ehling, Ehlers, & Glucksman, 2006), however no such support was found in the current study even though results suggested a trend.

EA and rumination were associated with depression while controlling for PTSS, but not with PTSS when controlling for depression, which suggests that the associations between EA, rumination, and PTSS may be due to their shared association with depression. Morina (2011) showed that EA and rumination were associated to PTSS and depression in widows who lost their husband in the Kosovo war. However, the analyses did not adjust for the shared variance between PTSS and depression.

Guided self-help

Results from Study II indicated that the intervention developed for a guided self-help format might hold the potential as a feasible and efficacious alter-

native for parents of children diagnosed with cancer who report a high level of distress. Results from Study IV confirmed the potential efficacy of the self-help program when provided via the internet for parents of children on cancer treatment who fulfilled the modified symptom criteria on the PCL-C. The author is not aware of any published research that has investigated the efficacy of interventions provided via the internet for parents of children on cancer treatment. However, the current results are in line with results from the face-to-face administration of problem solving skills training for mothers of children on cancer treatment (Sahler et al., 2002, 2005) and from the face-to-face administration of a trauma-focused intervention for mothers of pre-term infants (Shaw et al., 2013).

Providing psychological interventions to parents shortly after their child's cancer diagnosis is associated with several challenges, not least in terms of recruitment and several studies have evidenced problems in this domain (e.g., Sahler et al., 2005; Stehl et al., 2009). One challenge is to balance the demand that participating in an intervention poses against the potential to get help. The current intervention was developed for parents reporting a relatively high level of distress, operationalized as fulfilling the modified symptom criteria on the PCL-C, cohering with the Targeted and Clinical/Treatment groups as outlined in PPPHM (Kazak, 2006). As such the intervention was quite comprehensive and included several components in order to meet the needs of distressed parents.

In line with behavioral theory the purpose of the intervention was to increase cognitive and behavioral flexibility in relation to the aversive situation of having a child diagnosed with cancer and the thoughts, feelings, and behaviors it elicits. Consistent with this, reductions in EA and rumination was observed in Study II. However, in Study IV, there were no significant effects of the intervention on EA and rumination, but results from exploratory analyses tentatively suggested that the relationship between EA and PTSS and depression respectively was attenuated which might indicate a potential mechanism of the intervention. Such evidence would be in line with research in other populations showing that reductions in EA mediate the effect between the intervention and negative affectivity (Bohlmeijer, Fledderus, Rokx, & Pieterse, 2011; Forman, Herbert, Moitra, Yeomans, & Geller, 2007). Results also indicated that the relationship between rumination and PTSS and between rumination and depression was strengthened in both groups. This is a surprising finding. It might be the case that participants through repeated assessments became more observant of their own rumination and the negative impact it may have had in their daily lives.

Methodological considerations

The studies presented in this thesis have some characteristics that need consideration and they mainly concern the concepts of design, sample selection, measurement, sample size, attrition, and generalizability. Even though these concepts are closely related in terms of how they affect validity of research findings they will be discussed in turn below.

Design

Study I relied on self-reported PTSS collected via telephone in a cohort at three assessments. One limitation of this study is that other constructs such as depression and anxiety were not assessed which could have been helpful to further investigate the construct validity of the factor structure findings.

Study II was designed as one case study with pre-, post-, and follow-up assessments. As such the study lacks internal validity, i.e., it is impossible to make casual inferences regarding the effect of the intervention. Observed improvements could be a result of spontaneous remission. It would have been more stringent to use a multiple baseline design with several baseline assessments and continuous assessment throughout the intervention (e.g., Barlow, Nock, & Hersen, 2009).

In Study III, the main analyses were conducted with cross-sectional data which preclude inferences regarding the temporality of the relationships between constructs studied. Only a small sub-sample was included in the longitudinal analyses which hence had to be limited in terms of complexity and number of included predictors. Furthermore, this sub-sample was different from the sample included in the cross-sectional analyses in terms of self-reported level of distress.

Study IV utilized a randomized controlled design which in general allows for casual inferences regarding the effect of an intervention and the highly structured guided self-help format enhances treatment integrity. However, one limitation of the design is that it precludes from inferences regarding the specificity of observed effects, i.e., we do not know if it was the actual components in the intervention that caused the improvements or whether it was some common factor such as attention (Wampold, 2013). Dismantling designs with active comparisons are needed for such inferences.

Across all studies it would have been informative to assess child functioning in terms of PTSS and depression. As prior research suggest that parent distress predicts child's outcome (Landolt et al., 2012; Le Brocque et al., 2010) it would have been elucidating to investigate whether parental participation in the intervention was associated with reductions in children's distress.

Sample selection

In Study I all parents at four Swedish pediatric oncology centers were invited to participate and the response rate was high resulting in a population-based sample. In Study II, III, and IV participants were recruited to an intervention study potentially resulting in a possible selection in terms of who consented to participate and who did not. As presented above, participants in Study III and IV reported a higher level of PTSS compared to participants in Study I. In addition participants in Study III and IV were to a greater extent mothers and had to a greater extent finished university education compared to the participants in Study I. In Study III and IV the majority of approached and informed parents did not want to participate but unfortunately data from declining parents was not collected. The consent rate in Study III and IV is similar to that in an intervention study with parents of children on cancer treatment conducted in the USA where 23% of approached parents were interested in participation (Stehl et al., 2009). It has been shown that 28% of parents of children diagnosed with cancer report symptoms indicating potential PTSD two months after their child's diagnosis (Pöder et al., 2008) and that 46% report a need to meet with a psychologist at the same assessment (Pöder & von Essen, 2009). In the current study, 26% of the approached parents expressed an interest in participating in the RCT and consented to be contacted. This figure might adequately reflect the proportion of parents who experienced a need of psychological help at the time when they were offered participation in Study IV.

Measurement

Measurement in the current thesis relied on self-report. The constructs PTSS, depression, anxiety, and quality of life were assessed with well-used and well validated self-report questionnaires. However, EA and rumination were assessed with less used and less validated instruments, which warrant some caution in the interpretation of the findings.

Data was collected with self-report questionnaires via telephone in Study I, via paper-and-pencil in Study II, and via the internet in Study III and IV. These differing modes of administration might warrant some caution in the comparability of levels of distress across studies as research suggest that psychometric properties and level of distress may vary between paper-and-pencil and telephone interview administration (Jörngården, Wettergen, & von Essen, 2006). With regard to comparisons between paper-and-pencil assessment and internet-based assessment research suggest comparable properties (Carlbring et al., 2007; Hedman et al., 2010; Holländare et al., 2008).

Sample size and statistical analyses

Although the sample size in Study I is large for research on parents of children diagnosed with cancer it is to be considered on the smaller side in terms of power when applying CFA and tests for measurement invariance (Meade, 2005). The sample size precluded from analyses of invariance by gender.

In Study III the sample is of medium size for the cross-sectional analyses and small for the longitudinal analyses. In general a recommendation is to have at least 10 participants per predictor in multivariate regression analysis (Hair, Black, Babin, & Anderson, 2010) and meeting these requirements the sample size in the longitudinal analyses precluded inclusion of additional predictors.

In Study IV, a power calculation in the planning phase indicated that 72 participants needed to be included to, with a power of 0.80, detect a large effect size (Cohen's $d = 0.80$) on the PCL-C, assuming $\alpha < .05$. Due to administrative reasons, recruitment had to be terminated before this sample size was reached, and hence the study is somewhat underpowered.

Attrition

In Study IV, the attrition was relatively extensive in the intervention group which could threaten internal and external validity. However, there was no significant difference in number of participants who dropped out between groups which reduces this threat (Miller & Hollist, 2007). Furthermore, by examination of the missing data mechanism data could be assumed as missing at random and under this assumption maximum likelihood estimation provides more unbiased estimates compared to for example estimation with last observation carried forward (LOCF: Salim et al., 2008). The attrition rate is similar to that in a recent RCT investigating the efficacy of an internet-based psycho-educational intervention with the purpose of preventing PTSS/PTSD in parents following an injury in their child, where 61% of participants completed the six week follow-up (Marsac et al., 2013).

Generalizability

Regarding Study I one could fairly confidently assume that the findings are generalizable to parents of children on cancer treatment. This is also corroborated by similar findings for other populations and the recent conceptualization of PTSD in the DSM-5. However, the participants in Study II, III, and IV arguably came from a different population. Taking the perspective of the PPPHM model one could argue that these parents belong to the Targeted and Clinical/Treatment groups as suggested by Kazak (2006). Participants in Study III and IV were generally more educated compared to participants in Study I. This agrees with findings showing that participants in studies on

internet-based guided self-help in Sweden are better educated compared to the general population (e.g., Ivarsson et al., 2014; OECD, 2014; Ljótsson et al., 2011). Hence, generalizability of the findings in Study III and IV extends to parents of children with cancer who report a relatively high level of PTSS and experience a need for guided self-help provided via the internet.

General comments on methodology

The main aim of the current thesis was to develop, test, and evaluate an intervention that could be administered as guided self-help via the internet. The main methodology was development work characterized by a case-study and a subsequent RCT. The experiences from the development phase and the case study were good. However, in hindsight one could argue that the RCT was launched somewhat prematurely. The low inclusion rate and relatively high attrition indicate that more work could have been done during the development phase to test and establish the feasibility of the intervention content and the general study infra-structure. It would probably have been useful to more explicitly use the guidelines regarding the development and evaluation of complex interventions as outlined by the British Medical Research Council (MRC: Craig et al., 2008). These stress the importance of feasibility and pilot studies before launching a main study evaluating the efficacy of a complex intervention. It might also have been useful to include the intended end-users, i.e., parents of children with cancer, as active partners in the development work, e.g., by using the framework suggested by participatory action research (Baum, MacDougall, & Smith, 2006).

Ethical considerations

All participants in Study I-IV provided informed consent. In Study II-IV this consisted of written informed consent and in Study I oral informed consent. Participants in Study I were included during April 2002 to February 2004 and according to the legislation at that time ethical approval from an ethical review board was not mandatory for the type of research conducted in Study I. However, an advisory opinion was obtained from the respective faculty of medicine. In 2004 the legislation regarding research with humans was changed and more clearly specified the type of research that needs approval. Study II-IV was approved by the regional ethics review board in Uppsala.

The use of control groups in research on psychosocial interventions have been criticized on ethical grounds as the design may involve withholding treatment from participants (e.g., Schwartz, Chesney, Irvine & Keefe, 1997). In Study IV, a wait-list control group was utilized as part of the design. Participants allocated to this group were offered the intervention 12 months after randomization. From the participants' perspective it might have been

preferable to use a shorter wait-list period. However, given that there are no prior studies of psychological interventions via the internet in this population it could be argued that it was important to obtain a controlled evaluation of the long term effect of participating in an intensive and time-consuming intervention such as the one evaluated in Study IV.

Conclusions and implications

Keeping potential limitations in mind the studies included in the current thesis indicate that PTSS/PTSD should be interpreted as four factors when assessed in parents of children on cancer treatment. Given the publication of the DSM-5, the future application and assessment of the PTSS/PTSD construct among parents of children diagnosed with cancer is somewhat unclear. The DSM-5 suggests that adjustment disorder is the concept to be used when conceptualizing emotional and behavioral symptoms occurring as a consequence of somatic illness. In this view, PTSS could be assessed in parents of children diagnosed with cancer and be conceptualized as adjustment difficulties. Irrespective of what these symptoms are called one could argue that they tap into an important phenomenon which parents of children with severe illnesses may experience.

Secondly, Study III and IV to some extent, show that rumination and EA in particular seem to be important constructs in the understanding of PTSS and depression among parents of children on cancer treatment who report a relatively high level of PTSS and experience a need of a psychological intervention via the internet. In line with research with other populations, this could inform clinical practice with these parents and encourages the use of interventions that target these constructs specifically. It would be of value if future research could elucidate whether and if so how EA and rumination is related to adjustment in these parents daily life using more fine-grained assessments such as experience sampling methods.

Finally, the results indicate that guided self-help via the internet shows promise in terms of reducing PTSS and depression among parents of children on cancer treatment who fulfill the modified symptom criteria on the PCL-C. This suggests that the intervention developed, tested, and evaluated in Study II and IV could be a viable complement to the regular psychosocial services provided to parents of children on cancer treatment.

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