

A systematic review on factors and consequences of parental distress as related to childhood cancer

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The literature including correlates of parental distress as related to childhood cancer is abundant. It is important to identify predictive factors and outcomes of this distress in parents. The objective of this review was to update previous syntheses on factors of distress and to identify outcomes of parents' distress in the recent literature (2007–2012). We performed a systematic review to identify all quantitative studies including measures of parental distress and associated factors during the study period. We found 56 eligible studies, of which 43 had a Low risk of bias (Cochrane guidelines). Forty-two reports included potential predictive factors. Significant relationships were found with clinical history of the child, sex of the parent, coping response and personal resources, pre-diagnosis family functioning, but not education/income or marital status. Twenty-five reports studied potential consequences of distress and focused on psychological adjustment in parents and children. Compared to past periods, a higher proportion of studies included fathers. Measures used to evaluate distress were also more homogeneous in certain domains of distress. This review underscores the need for appropriate methods for selecting participants and reporting results in future studies. Appropriate methods should be used to demonstrate causality between factors/consequences and distress.

Keywords: cancer, quality of life, psychological, emotional, families.

INTRODUCTION

Childhood cancer has been described as a life-changing experience for parents. Following diagnosis, parents are expected to rapidly learn a substantial amount of cancer-related information, adopt particular caregiving skills, as

well as reorganise their family roles and routines. These adjustments are all aimed at transitioning their focus from parent to parent and primary caregiver of a child with cancer. However, this transition to a dual role is not necessarily a seamless one, and for many it may lead to experiencing considerable emotional strain, which may persist over time (Brown *et al.* 2003; Wijnberg-Williams *et al.* 2006). The most extensive review on the subject indicated that approximately 27% of parents suffered from clinical levels of psychological distress up to 5 years post-diagnosis (Vrijmoet-Wiersma *et al.* 2008). Nevertheless, the literature mentioned in this review as well as more recent empirical studies show important differences in

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frequencies of distress across samples. Various factors may explain this phenomenon, but recent research has not been synthesised.

Parental stress or distress may refer to a vast array of symptoms, such as uncertainty, anxiety, depression, traumatic stress, psychological health, etc. According to the National Comprehensive Cancer Network (NCCN), distress is defined as 'a multifactorial unpleasant emotional experience of a psychological (cognitive, behavioural, emotional), social, and/or spiritual nature that may interfere with the ability to cope with cancer, its physical symptoms and its treatment' (National Comprehensive Cancer Network, 2013). Although it was originally proposed for adult oncology patients, we used this definition in paediatric oncology settings to identify parents' distress in relation to their child's cancer. As such, parental distress can be approached by a variety of measures including psychological symptom inventories, mixed distress scales, anxiety–depression inventories, mental quality of life (QoL) subscales or traumatic stress inventories. These make it possible to evaluate subclinical distress in the form of frequency or severity of symptoms and infer the presence of clinically significant distress when levels exceed predetermined cut-points.

Prior to undertaking the present review, we identified two wide-scope reviews on parental distress published in the last 15 years (Klassen *et al.* 2007; Vrijmoet-Wiersma *et al.* 2008) and three focused reviews on post-traumatic stress symptoms (PTSS), sex differences or long-term effects (Kazak & Baxt 2007; Rabineau *et al.* 2008; Ljungman *et al.* 2014). These reviews offered a portrait of parental distress as being more elevated at diagnosis for both parents and more elevated in mothers as compared to fathers. Early distress may also have detrimental effects for some parents in the long term (anxiety, depression and traumatic stress). These reviews underlined the fact that data on fathers were lacking and encouraged future longitudinal studies to provide a more representative depiction of parental distress across the cancer trajectory. Identified risk factors in the two wide-scope reviews included demographic factors (e.g. low socioeconomic status), child factors (e.g. behaviour problems), high caregiving demands, individual coping (e.g. low social support, high emotional coping) and family conflict. To date, only one review has included outcomes of parental distress, but focused predominantly on parenting (Rabineau *et al.* 2008). It found that parenting stress probably impaired cognitive skills necessary for caregiving (e.g. information processing), thus leading to poorer parental long-term adjustment to the illness and PTSS, and disrupted emotional adjustment and adherence behaviour in children.

Recent longitudinal follow-ups have found that parental distress tends to decline from diagnosis to the post-treatment period, generally reaching normative levels around 3 years post-diagnosis (Dolgin *et al.* 2007; Maurice-Stam *et al.* 2008b; Barrera *et al.* 2012; Tremolada *et al.* 2013). However, other reports suggested that a significant proportion of parents continue to experience psychological difficulties in the long run (between 18% and 30%) (Hardy *et al.* 2008; Diseth *et al.* 2011; Ljungman *et al.* 2014). Large differences were also found when exploring frequencies of psychological symptoms in parents. For example, the frequency of clinical anxiety was found to vary across studies from normative levels (Greening & Stoppelbein 2007; Hardy *et al.* 2008; Dunn *et al.* 2012) to more than 37% (Fotiadou *et al.* 2008). Although these differences may result from differences in measurement, they also seem attributable to factors pertaining to the cancer trajectory, individual coping resources, and social environment, to name a few possibilities.

Although previous reviews have described parental distress, they did not include a clear definition of it. For example, mental QoL was not included in the review by Vrijmoet-Wiersma *et al.* (2008), and health was defined very broadly in that of Klassen *et al.* (2007). Moreover, these reviews did not cover the recent literature. Finally, none of the wide-scope reviews on the subject included a precise analysis of bias. Despite a rigorous narrative review process, these reviews may have been influenced by studies with High risk of bias. Only one focused review included a risk of bias assessment in a limited sample of 15 studies (Ljungman *et al.* 2014).

In addition, recent developments plead for an update in the review of factors of parental distress along the cancer trajectory. First, there is ample evidence that medical treatments for childhood cancer have become both more effective and efficient in the past decade (Pui *et al.* 2008). Although it is unclear to what extent this would impact parental distress, we can assume that better prognosis and general outlooks for children have favourable impacts on distress levels in parents. This may also increase contrast between conditions where such treatment may or may not be available. Second, the recent developments in comprehensive care have placed an increased emphasis on including parents and the family as a strong resource for the child's development and future rehabilitation (Meyler *et al.* 2010). Diverse types of supportive care have been available for children and their families, including rehabilitation (e.g. occupational therapy), psychological support and information about cancer, which in turn could provide parents with previously unknown resources and assist in alleviating distress (Pai *et al.* 2006). Parents who received

psychological care have reported lower distress (Bennett Murphy *et al.* 2008). Further, social changes have impacted paediatric care, such that professionals are increasingly giving fathers, as well as mothers, an active role in caring for the ill child. Just as children with diabetes have been shown to benefit from fathers' involvement in disease management (Dashiff *et al.* 2008), this trend may also be evident in paediatric cancer. Finally, the attention given to distress in patients and caregivers has dramatically increased as a result of the recognition of distress as the 6th vital sign in adult oncology in 2007 (Holland & Bultz 2007; Accreditation Canada, 2013). It is thus probable that factors and effects of parental distress have changed in recent years.

Interestingly, although previous reviews underscored the issue of consequences of parental distress, none included a detailed examination of this issue. Beyond the significant impact that paediatric cancer can have on parents themselves, parental distress could also be related to major outcomes for the family and the children themselves. Indeed, results have suggested a detrimental effect on the child's emotional adjustment (Merrill *et al.* 2007) or mental QoL (Roddenberry & Renk 2008; Penn *et al.* 2009; Yagc-Kupeli *et al.* 2012). These hypotheses are consistent with a large body of literature in psychopathology linking parental psychological status with children well-being (Hammen *et al.* 2012). Although much effort has been dedicated to describe levels and the evolution of distress in parents (Vrijmoet-Wiersma *et al.* 2008), no recent systematic review is available on identifying the factors and the consequences of distress.

The present review has two objectives: (1) to synthesise knowledge on factors of emotional distress in parents confronted by the cancer of their child. We will rely on the definition of distress given earlier and focus on studies measuring one or several aspects of emotional distress in conjunction with factors interpreted by authors as antecedents, risk factors or moderators of distress; (2) to synthesise knowledge on the consequences of parental emotional distress. The objective of this review was not to summarise descriptions, frequencies or evolution of distress over time since these aspects have been extensively studied. Given existing syntheses on the literature prior to 2007, we focus on the 2007–2012 period. We systematically examine the quality of information, and during the interpretation process, we prioritise data from high-quality studies.

METHOD

This systematic review was conducted according to the *Preferred Reporting Items for Systematic Reviews and*

Meta-Analyses (PRISMA) (Moher *et al.* 2009) and *A Measurement Tool to Assess Systematic Reviews (AMSTAR)* guidelines (Shea *et al.* 2007). The protocol was registered on Prospero on 20 September 2013, number CRD42013005772.

Search strategy

The literature search was performed in PubMed, PsycINFO, and CINAHL databases. Articles pertaining to parental distress in paediatric cancer were identified by using the following search terms: MeSH terms for parents (parents; mothers; fathers; family; parent-child relations) were combined with MeSH terms for distress (mental health; depression; anxiety; adjustment disorder; adaptation psychological; stress, psychological; stress disorders, post-traumatic; quality of life) and MeSH terms for cancer (neoplasms, brain neoplasms, leukaemia, lymphoma). The review was limited to articles in English published between 1 January 2007 and 31 December 2012.

Inclusion and exclusion criteria

To be selected, studies had to include parents of children that have suffered from cancer during childhood (0–18 years). Studies had to include a valid measure of parental distress, consistent with the definition given in the introduction. As reflected in the search strategy, target studies could include any reference to psychological symptoms (e.g. PTSS), psychiatric conditions (e.g. major depressive disorder), mental health (e.g. mental QoL) or emotional stress and distress (e.g. perceived stress). In the following lines, measures of mixed anxiety/depression symptoms (e.g. HADS total score) or measures integrating various symptoms designed for case identification (e.g. SCL-90) are referred to as 'mixed distress'. Studies also included factors associated with measures of distress. Only quantitative studies published in peer-reviewed journals were included. Studies were excluded if they assessed distress during the end-of-life or palliative period, or if they referred to deceased children, as parental distress within these specialised groups was presumed to be different than that experienced by parents during other stages of the illness or survivorship. Finally, because we wished to focus on quantitative empirical studies that were able to yield association estimates, we excluded commentaries, editorials, abstracts, case reports, qualitative studies, review articles, book chapters and dissertations.

Data extraction

Articles were independently screened and assessed by two separate investigators (TL, ER) by examining titles and abstracts to identify relevant studies. In cases of doubt, the full text was reviewed and discussed with all authors. The full texts of retained abstracts were screened by the investigators for final inclusion and data extraction. Studies included in the review were then independently classified by the investigators as relevant to either factors or effects of distress. Records could be relevant to both aspects. Omissions or discrepancies were resolved by consensus. Next, study characteristics (first author, year, country, number of mothers and fathers, proportion of girls in the child sample, child diagnosis, distress instruments, study design, time since diagnosis) and results were extracted by the investigators. Two independent summary tables were elaborated independently (TL and ER) and discrepancies were discussed with all authors.

Risk of bias

According to the standard guidelines for reporting data in systematic reviews (Cochrane guidelines, Higgins & Green 2011), articles included in the review were assessed for risk of bias. We rated the following domains independently: Selection, Attrition, Reporting and Other. Table 1 summarises criteria used for the present evaluation. In the 'Other' domain, we adapted Cochrane guidelines to behavioural observational research and rated the criteria on the basis of: Sample size, Measurement quality, Response rate maximisation, Research design and Appropriateness of analyses for hypothesis testing. The rating of biases was performed by two investigators independently (TL and ER). Discrepancies were resolved through discussion involving all authors.

Of the 56 articles included, 43 had an overall Low risk of bias, 11 had a High risk of bias and 2 had an Unclear risk of bias (Table S1). Most frequent reasons for rating High or Unclear risk were: convenience samples, insufficient description of children diagnoses or lack of socio-demographic data on participants, recruitment or selection procedure not specified or too vague, small sample size with regard to analyses, unspecified response rate, time since diagnosis not specified or heterogeneous. Most frequent biases domains in the 56 articles were Selection biases (18 High risk and 2 Unclear risk) and Other (18 High risk and 2 Unclear risk). Domains were aggregated into one global rating, using recommendations from the Cochrane guidelines. In case of tie (e.g. two Low risk and two Unclear risk ratings), we adopted a conservative approach by rating the

lowest level (in the example the global rating was Unclear risk). Studies being globally rated as Low risk were retained for further analysis and interpretation. A summary table describing studies rated as Unclear or High risk of bias is available as an online supplement (Table S2).

RESULTS

Study selection

The search initially identified 1212 articles. After screening titles and abstracts, 930 articles were excluded because they did not include data on childhood cancer or parental distress. Two hundred and eighty-two full-text articles were then examined for eligibility, of which 228 were discarded, most of them because they were not quantitative empirical studies (see flow chart in Fig. 1). Fifty-four articles fulfilled the inclusion criteria. Reference lists of all eligible articles were also reviewed. We identified two additional studies meeting our criteria in these reference lists, making up a total of 56 articles reviewed. Among these reports, 43 were rated as bearing a Low risk of bias and are the focus of the present review.

Study characteristics

Between 2007 and 2012, we found 42 studies pertaining to factors of parental distress and 25 studies on consequences of parental distress. The studies are summarised in Table 2. Most studies were cross-sectional ($n = 37$, 66%), the others being prospective follow-ups ($n = 18$, 32%) or retrospective studies ($n = 1$, 2%). Thirteen studies were group comparisons, of which nine were case-control designs. Although overlap was probable in a number of studies, it can be estimated that approximately 7000 parents participated during the review period, from 15 countries. Participants were predominantly mothers (72%). Eleven studies included exclusively mothers, and two studies did not report parent sex. Overall, parents of girls comprised approximately 45% of the total retrieved studies. Most studies (88%) were comprised of parents of children with heterogeneous cancer diagnoses (Leukaemia, CNS tumour or other). Seven studies also included children with other diagnoses than cancer.

When examining instruments used to evaluate distress in parents (Table 3), we found they predominantly assessed mixed distress (32 studies) using instruments evaluating general stress (such as the PSS) or mixed symptoms especially in the anxiety and depression domains (such as the SCL-90-R or its short forms). In this category, a wide variety of instruments were used.

Table 1. Criteria for judging risk of bias of selected studies, adapted from the criteria suggested by the Cochrane Handbook for systematic reviews of interventions

Selection bias of participants	
'Low risk' of bias	Sites <ul style="list-style-type: none"> ● Multicentred ● Bicentred Recruitment <ul style="list-style-type: none"> ● Random selection ● Sequential selection (e.g. first 50 volunteers) ● Patient list from set criteria (e.g. age) Inclusion/Exclusion <ul style="list-style-type: none"> ● Children of parents in the study group have cancer diagnoses ● Homogeneous times since diagnoses
'High risk' of bias	Sites <ul style="list-style-type: none"> ● Monocentred Recruitment <ul style="list-style-type: none"> ● Convenience sample Inclusion/Exclusion <ul style="list-style-type: none"> ● Children of parents in the study group have heterogeneous diagnoses (cancer and other condition) ● Heterogeneous times since diagnoses
'Unclear risk' of bias	Insufficient information to permit judgement of 'Low risk' or 'High risk'
Attribution bias (incomplete outcome data from participants)	
'Low risk' of bias	<ul style="list-style-type: none"> ● Statistical comparisons between participants and non-participants ● High response rate (questionnaires: $\geq 65\%$; interviews: $\geq 75\%$) ● Low attrition (according to number of measures used and length of follow-up) ● Missing data identified and managed for analysis
'High risk' of bias	<ul style="list-style-type: none"> ● Low response rate (questionnaires: 65%; interviews: 75%; Arber, 2001) ● High attrition (according to number of measures used and length of follow-up) ● Missing data identified but not managed for analysis
'Unclear risk' of bias	Insufficient information to permit judgement of 'Low risk' or 'High risk'
Reporting bias (from authors)	due to selective outcome reporting
'Low risk' of bias	Objectives/Hypotheses <ul style="list-style-type: none"> ● Objectives/hypotheses clearly stated ● Objectives/hypotheses addressed accordingly Demographics <ul style="list-style-type: none"> ● Demographic information on participants available Outcome data/confounds <ul style="list-style-type: none"> ● All collected data available in the results section ● All data acknowledged (whether approving or disproving the hypotheses) ● Confound variables acknowledged and controlled for statistically (e.g. as covariate in multivariate analyses) ● Reasons for missing data acknowledged ● Use of multi-informant strategy when collecting data in children ● Consideration of effect sizes (e.g. Cohen's <i>d</i>) Discussion/Conclusions <ul style="list-style-type: none"> ● Conclusions based on results ● Limitations acknowledged ● If preliminary study/pilot: acknowledged ● No conflict of interest (source of funding acknowledged)
'High risk' of bias	Objectives/Hypotheses <ul style="list-style-type: none"> ● Objectives/hypotheses not clearly stated ● Not all of the study's objectives/hypotheses addressed Demographics <ul style="list-style-type: none"> ● Missing demographic information on participants Outcome data/Confounds <ul style="list-style-type: none"> ● Missing collected data in the results section ● Missing data disproving the hypotheses ● Confound variables not acknowledged ● No acknowledgement of reasons for missing data ● No use of multi-informant strategy when collecting data in children ● No consideration of effect sizes (Cohen's <i>d</i>)

Table 1. Continued

	Discussion/Conclusions
	<ul style="list-style-type: none"> ● Conclusions depart from results ● Limitations are not acknowledged ● If preliminary study/pilot: not acknowledged ● Conflict of interest (source of funding not acknowledged)
'Unclear risk' of bias	Insufficient information to permit judgment of 'Low risk' or 'High risk'
	<ul style="list-style-type: none"> ● Confound variables acknowledged but not controlled for statistically
Other bias	
'Low risk' of bias	<p>Participants</p> <ul style="list-style-type: none"> ● Large sample (Ratio of participants to predictors satisfying Tabachnick & Fidell's (2007) guidelines: $N > 50 + 8p$, where p: number of predictors) <p>Measures</p> <ul style="list-style-type: none"> ● Structured clinical interview ● Measures with satisfactory pre-established psychometric properties ● Multimodal assessment (e.g. medical records and self-reports) <p>Procedures</p> <ul style="list-style-type: none"> ● Use of procedures to maximise response rate or limit attrition <p>Design</p> <ul style="list-style-type: none"> ● Longitudinal ● Data analysis strategy appropriate for exploring longitudinal causal effects (e.g. predicted outcome controlled for at baseline)
'High risk' of bias	<p>Participants</p> <ul style="list-style-type: none"> ● Small sample (Ratio of participants to predictors not satisfying Tabachnick & Fidell's (2007) guidelines: $N > 50 + 8p$, where p: number of predictors) <p>Measures</p> <ul style="list-style-type: none"> ● Measures have not been validated or insufficient pre-established psychometric properties (e.g. ad hoc or home-made measures) ● Composite measures (e.g. combining subscales of parental distress and other constructs) <p>Procedures</p> <ul style="list-style-type: none"> ● No procedures used to limit attrition <p>Design</p> <ul style="list-style-type: none"> ● Cross-sectional
'Unclear risk' of bias	Insufficient information to permit judgement of 'Low risk' or 'High risk'

Arber S. (2001) Designing samples. In: *Researching Social Life* (ed. Gilbert N). SAGE Publications, London.

Tabachnick B.G. & Fidell, L.S. (2007) *Using Multivariate Statistics*, 5th edn. Pearson, Boston, MA.

Eight studies also assessed mental QoL. Twenty-one studies assessed post-traumatic stress or PTSD. Half of these used the IES/IES-R, which underscores a higher homogeneity among measures in this domain. Depression and anxiety were explored independently in 15 and 11 studies respectively. We noted a remarkable homogeneity of measures in depression where 12/15 studies used the Beck inventories. Finally, as reflected in Table 3, the vast majority of studies used self-description and only one used a structured interview to diagnose clinical depression and anxiety.

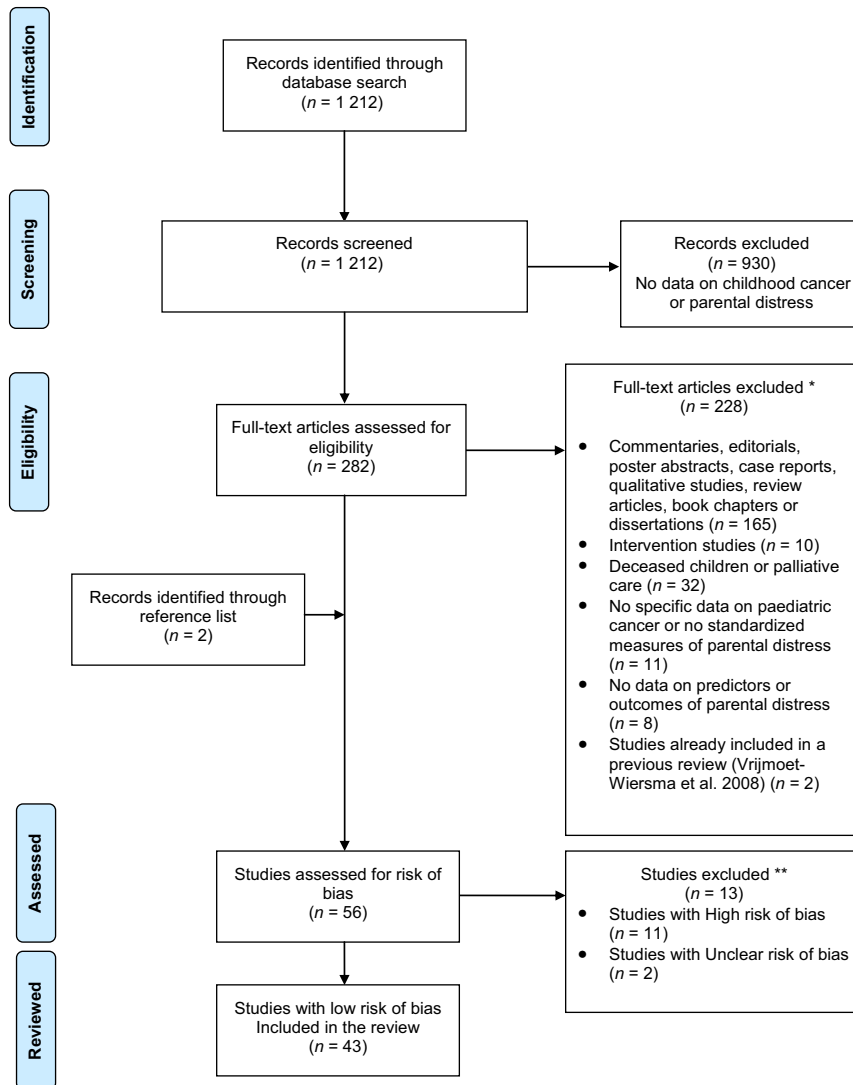
Study findings

Factors of distress

When focusing on studies with a low risk of bias, we found that factors explaining distress could be classified in three groups, those exploring illness/trajectory factors, factors related to individual characteristics, or family factors.

Illness and trajectory

Twelve studies explored how the child's cancer trajectory and treatment may impact parental distress. Coherent with the psychological theory of adaptation, a shorter time since diagnosis was associated with higher general distress and PTSS beyond 5 years post-diagnosis (Ozono *et al.* 2007; Klassen *et al.* 2008), and an active treatment status was associated with higher levels of general distress, depression, anxiety and PTSS (Hutchinson *et al.* 2009; Jurbergs *et al.* 2009) in comparison to off-treatment or survivorship periods. Complicated cancer types (e.g. brain tumours), intense treatments, more hospitalisation days and activity limitations were also related to higher levels of general distress, anxiety, depression and PTSS (Hoven *et al.* 2008; Klassen *et al.* 2008; Robinson *et al.* 2009), as confirmed by prospective studies controlling for baseline distress (McCarthy *et al.* 2012; Tremolada *et al.* 2013). Except for one study (Norberg *et al.* 2012), tumour



* List of excluded articles is available on request; ** Supplementary Table online

Figure 1. Flow of information through the different phases of the systematic review.

relapse was associated with higher PTSS (Jurbergs *et al.* 2009; Bruce *et al.* 2011). The association between parental distress and demanding clinical situations is reflected in the fact that higher levels of caregiving strain (time and effort dedicated to the child) were consistently related to higher levels of mixed distress, anxiety and PTSS over the first year post-diagnosis (Klassen *et al.* 2011; Rodriguez *et al.* 2012). Interestingly, parents of children diagnosed at a young age did not report higher distress in medium length follow-ups (Rodriguez *et al.* 2012; Tremolada *et al.* 2013).

Individual factors

Eighteen studies included demographic predictors of parental distress.

Mothers reported overall higher distress levels (Gerhardt *et al.* 2007; Fotiadou *et al.* 2008) but cross-sectional results suggested that this is the case only at time of diagnosis and during active treatment. Higher levels and rates of PTSS, mixed distress, anxiety and depressive symptoms are noted in mothers when compared to controls during the first year post-diagnosis (Gerhardt *et al.* 2007; Fotiadou *et al.* 2008; Rodriguez *et al.* 2012). Notably, these differences in distress between mothers and fathers tend to even out across the cancer trajectory. The higher rates of significant distress observed in mothers following the completion of treatment decreased to levels similar to those of fathers at 1–5 years post-treatment when comparing parents of the same cancer patient (Maurice-Stam *et al.* 2008b). Levels of distress within parental dyads were alike during the off-treatment and survivorship period

Table 2. Summary table of reviewed articles on factors and outcomes of parental distress in the context of paediatric cancer ($N = 43$, 2007–2012, low risk of bias)

Author (year)	Sample			Child diagnosis (%)				Design			Summary of results
	Parents	Girls (%)	Time post-diagnosis	Country	LK	CNS	Other	Measure (distress)	Type	Times of assessment	
<i>Predictors</i> Dolgin <i>et al.</i> (2007)	212 M	45	–	USA/Israel	43	18	30	POMS BDI-II IES-R	L	T1: 2 months PD T2: 5 months PD T3: 8 months PD	Mixed distress, depression and PTSS not associated with age (child and M), gender, diagnosis, marital status and education over time. General distress and depression associated with neuroticism and poor social problem-solving skills over time. PTSS associated with immigrant status over time No association between mixed distress and social support
Gerhardt <i>et al.</i> (2007)	Cases: 48 M 33 F Controls: 49 M 29 F	37	18 months	USA	51	–	49	SCL-90-R	C	–	
Greening and Stoppelbein (2007)	141 M 9 F	53	4 years	USA	50	–	50	BDI-II PTSD-RI STAI-State	C	–	Depression and PTSD associated with more negative self-blame/affect and substance use. State anxiety associated with more negative self-blame/affect and active coping. Lower state anxiety associated with more religious coping/optimism and social support/advice seeking
Ozono <i>et al.</i> (2007)	87 M 72 F	56	5–10 years (44%) >10 years (56%)	Japan	67	–	33	IES-R STAI	C	–	Severe PTSS associated with higher trait anxiety, poorer family functioning and shorter time since diagnosis in M, and with higher trait anxiety in F
Fortiadou <i>et al.</i> (2008)	Cases: 70 M 30 F Controls: 87 M 30 F	34	n/a	UK	66	8	27	HADS SF-36v2	C	–	Lower anxiety and depression associated with higher levels of optimism in both groups
Hoven <i>et al.</i> (2008)	182 M 139 F	n/a	19 months	Sweden	65	26	9	PPD-C	C	–	Depression associated with more complicated cancer diagnosis
Klassen <i>et al.</i> (2008)	358 M 50 F	43	≤1 year (69%) >1 year (31%)	Canada	61	11	28	SF-36	C	–	Higher mental QoL associated with more exercise, better eating habits, better sleep quality, better child's health, less intense treatment and longer time since diagnosis. Mental QoL not associated with parental age, sex, marital status, education, income and smoking status
Maurice-Stam <i>et al.</i> (2008b)	122 M 109 F	42	14 months	NET	48	5	47	GHQ-30 SSERQ	L	T1: 2 months PT T2: 1 year PT T3: 2 years PT T4: 3 years PT T5: 4 years PT T6: 5 years PT	Lower mixed distress associated with older maternal age, lower perceived intensity of treatments, longer treatments, family cohesion and optimism over time. General distress associated with recent important family events in M and passive and lower palliative (leisure) coping in F over time

Table 2. Continued

Author (year)	Sample			Child diagnosis (%)				Design		Summary of results	
	Parents	Girls (%)	Time post-diagnosis	Country	LK	CNS	Other	Measure (distress)	Type		Times of assessment
Patino-Fernandez et al. (2008)	129 M 72 F	44	1-2 weeks	USA	38	23	39	ASDS STAI-Y	C	-	General anxiety associated with symptoms of acute stress in both M and F
Pöder et al. (2008)	107 M 107 F	47	≤14 days	Sweden	44	12	44	PCL-C	L	T1: 1 week PD T2: 2 months PD T3: 4 months PD	ASD/PTSD associated with unemployment (T1, T2, T3), immigrant status (T2), female child gender, younger parental age, lone child status (T1) and past trauma (T1 and T3)
Han et al. (2009)	200 M	n/a	<6 months (49%)	Korea	45	9	46	PAIS	C	-	Lower mixed distress related with family integration, cooperation, optimistic definition of the situation, social support, self-esteem, psychological stability and understanding the healthcare situation through communication with other parents and with the healthcare team
Hutchinson et al. (2009)	On-treatment: 38 M 19 F Off-treatment: 35 M 8 F	51	12 months	USA	-	100	-	BSI	C	-	Mixed distress, anxiety, depression and PTSD associated with active treatment status. Both groups reported high PTSS
Iobst et al. (2009)	Alone: 87 M Married/partnered: 377 M 119 M 18 F	n/a n/a 43	2-16 weeks 26 months	USA USA	49	13	38	POMS BDI-II IES-R CES-D	C	-	Lower PTSS and better mood associated with positive problem-solving skills
Jurbergs et al. (2009)	On-treatment: 60 M 8 F Off-treatment: 100 M 25 F Controls: 98 M 9 F	41	≤1-6 months (56%) >5 years (41%)	USA	39	17	44	IES-R	C	-	Lower depression moderated the association between family cohesion/expressiveness and child-reported distress
Robinson et al. (2009)	Cases: 53 M 31 F Controls: 60 M 46 F	52	7 years (survivors)	USA	23	25	52	SCL-90-R	L	T1: 18 months PD T2: 7 years PD	PTSS not associated with case/control status. PTSS elevated in the on-treatment group. PTSS associated with longer time since diagnosis and relapse
		35			36	-	64				The association between mixed distress (in M, T1) and survivor-reported depression (T2) moderated by male child gender and lower treatment intensity. The association between general distress (in F, T1) and survivor-reported negative mood (T2) moderated by higher treatment intensity. The association between general distress (in M, T1) and M-reported child internalising symptoms (T2) and survivor-reported negative mood (T2) moderated by more late effects

Table 2. Continued

Author (year)	Sample			Time			Child diagnosis (%)			Measure (distress)	Design		Summary of results
	Parents	Girls (%)	Time post-diagnosis	Country	LK	CNS	Other	Type	Times of assessment				
Ozono <i>et al.</i> (2010)	87 M 72 F	55	10.8 years	Japan	68	-	32	IES-R STAI SDS	C	-	PTSS, depression and state-trait anxiety associated with low family cohesiveness and expressiveness and elevated conflict		
Bruce <i>et al.</i> (2011)	46 M 6 F	n/a	n/a	UK	-	100	-	IES-R	C	-	PTSS associated with higher number of tumour recurrences and lower conflict resolution		
Demirtepe-Saygili and Bozo (2011b)	90 M	n/a	14 months since first symptoms	Turkey	100	-	-	BDI	C	-	Depression associated with lower satisfaction with basic needs and daily activities and more role strain at work. Association between stressors and depression mediated by emotion-focussed coping and social support		
Gudmundsdottir <i>et al.</i> (2011)	114 M 76 F	33	4–18 months	Sweden/Iceland	47*	13*	32*	PPD-C GHQ-12	C	-	Mixed distress associated with lower sense of coherence		
Hoekstra-Weebers <i>et al.</i> (2012)	85 M 79 F	33	-	NET	40–38	12–7	48–55	GHQ	L	T1: 14 days PD T2: 6 months PD T3: 1 year PD T4: 5 years PD	Mixed distress not associated with parent gender, education and number of children (T1, T2, T3, T4), but associated with parent age (T1). In F, mixed distress associated cross-sectionally with palliative (T2), avoidant (T2, T3), passive coping (T2), social support seeking (T2, T3) and expression of emotions (T2, T3). Mixed distress (T2, T3, T4) associated with passive, avoidant coping and expression of emotions (T1); lower general distress (T4) associated with problem-focused coping (T1). In M, general distress (T3) associated with lower social support seeking (T1). General distress (T2, T3, T4) associated with passive coping and social support seeking (T1)		
Klassen <i>et al.</i> (2011)	Cases 1: 245 M 40 F Cases 2: 113 M 13 F	45 39	Case 1: <12 months Case 2: >12 months	Canada	56–72	11–11	33–17	SF-36v2	C	-	Higher mental QoL associated with higher mastery and self-esteem and perceiving more family-centred services for the child in the Case 1 group, and with caregiver strain in both groups		
Norberg <i>et al.</i> (2011)	111 M 109 F	47	From diagnosis	Sweden	39	12	49	PCL-C	L	T1: 8 days PD T2: 61 days PD T3: 120 days PD T4: 13 days PT T5: 374 days PT or child's death	PTSS/PTSD (T5) associated with avoidance coping (T1–T4)		
Miller <i>et al.</i> (2011) [†]	162 M 57 F	n/a	11 months	USA	30	-	70	POMS-Bi	C	-	Mixed distress associated with external influence. This association mediated by decision-making (autonomy) and task-focused coping		

Table 2. Continued

Author (year)	Sample			Child diagnosis (%)				Design		Summary of results	
	Parents	Girls (%)	Time post-diagnosis	Country	LK	CNS	Other	Measure (distress)	Type		Times of assessment
Barrera <i>et al.</i> (2012)†	49 M 35 F	n/a	24 months	Canada	49	-	41	SF-36	L	T1: pre-SCT T2: 1 year post-SCT T3: 2 years post-SCT	Lower mental QoL (T3) associated with child behaviour problems (T1), poor health (T1) and female child gender in M and F as well as treatment severity in F
Klassen <i>et al.</i> (2012)	Two-parent: 237 M 38 F Single-parent: 37 M 3 F	41	0.5 year	Canada	68	12	20	SF-36v2	C	-	Lower mental QoL associated with lower mastery and self-esteem, greater impact on the family and poorer child's mental QoL
Landolt <i>et al.</i> (2012)§	68 M 57 F	39	-	SWI	n/a	n/a	n/a	PDS	L	T1: 5-6 weeks PD/accident T2: 1 year PD/accident	PTSS (T1) associated with more days spent in hospital (T1). Parental PTSS (T1) not associated with child's PTSS (T1)
Norberg <i>et al.</i> (2012)	112 M 112 F	47	-	Sweden	40	12	48	PCL-C	L	T1: 8 days PD T2: 61 days PD T3: 120 days PD T4: 13 days PT T5: 96 days PT T6: 374 days PT	PTSS (T6) associated with Nordic ethnicity, being unemployed at diagnosis, perception of their child's psychological, physical and total symptoms (T3), and death of the child, but not with parent gender, family income, previous trauma, child's prognosis, treatment intensity, non-fatal relapse and satisfaction with the child's care
McCarthy <i>et al.</i> (2012)	135 M 85 F	42	-	Australia	41-44	14-9	45-47	ASDS (T1) PCL-C (T2)	L	T1: diagnosis T2: 6-8 months PD	ASD (T1) associated with being a M, psychosocial risk factors, trait anxiety, poor family functioning and brain tumour diagnosis. PTSS (T2) associated with younger maternal age and trait anxiety (T1), and parent-reported child QoL (T2)
Rodriguez <i>et al.</i> (2012)	191 M 95 F	43	2 months	USA	38	11	51	RSQ PSS IES-R	C	-	PTSS associated with cancer communication stress and caregiving stress, but not with child age and family income
Tremolada <i>et al.</i> (2012)	94 M	48	-	Italy	100	-	-	PTSD-S-C BSI-18	L	T1: 1 week PD T2: 1 month PD T3: 6 months PD T4: 12 months PD	The association between emotional-focused coping and general distress cross-sectionally mediated by memory problems (T1). The association between social support and general distress mediated by current life perception (T1). The association between routine and time reorganisation and PTSS mediated by state anxiety and cognitive problems (T3, T4).
Tremolada <i>et al.</i> (2013)	76 M	50	-	Italy	100	-	-	BSI-18 PTSD-SC	L	T1: 1 week PD T2: 1 month PD T3: 6 months PD T4: 12 months PD T5: 24 months	PTSS (T2, T3, T4) was associated with more days of hospitalisation (T1, T3), mothers' education (T1, T2), stress events (T1), child's age (T5), cognitive functioning (T1, T2, T3, T4, T5)

Table 2. Continued

Author (year)	Sample			Child diagnosis (%)					Measure (distress)	Design		Summary of results
	Parents	Girls (%)	Time post-diagnosis	Country	LK	CNS	Other	Type		Times of assessment		
Outcomes Norberg and Boman (2007)	29 M 22 F	n/a	–	Sweden	20	8	72	STAI-State	L	T1: 1–6 months T2: 12–24 months	Depression (T1) predicted a greater decrease in perceived social support. Anxiety (T1) and gender not associated with change in perceived support	
Barrera et al. (2008)	103 parents	n/a	20 months	Canada	48	–	52	BDI	L	T1: transplant T2: 12 months PT T3: 24 months PT	Depression moderates the effect of time on child verbal IQ. Depression predicted lower perceptual IQ over time, lower verbal IQ (T2 and T3) and lower visual motor scores (T2) and lower verbal IQ (T2 and T3)	
Colletti et al. (2008)	53 M 9 F	45	9 months	USA	52	11	37	PSI-SF	C	–	Parenting stress predicted poor parent-rated behavioural, emotional and social adjustment in children	
Maurice-Stam et al. (2008a)	34 M 19 F	51	15 months	NET	45	–	55	GHQ-30	L	T1: 2 months PT T2: 1 year PT T3: 2 years PT T4: 3 years PT	Longer treatments, poor prognosis and parental mixed distress predicted worse children physical QoL, but not child mental QoL	
Pöder et al. (2008)	107 M 107 F	47	≤14 days	Sweden	44	12	44	PCL-C	L	T1: 1 week PD T2: 2 months PD T3: 4 months PD	ASD (T1) predicted PTSD (T3) in half of the sample	
Barrera et al. (2009)	99 M	66	19 months	Canada	46	–	54	BDI	L	T1: pre-SCT T2: 12 months after SCT T3: 24 months after SCT	Depression predicted child externalising and internalising behaviours (parent-reported) but not competence scores, and problem behaviour and social competence (child-reported)	
Jobe-Shields et al. (2009)	119 M 18 F	43	26 months	USA	67	–	33	CES-D	C	–	Depression predicted child-reported distress	
Robinson et al. (2009)	Cases: 53 M 31 F Controls: 60 M 46 F	35	7 years (survivors)	USA	36	–	64	SCL-90-R	L	T1: 18 months PD	Mixed distress (T1) predicted child internalising symptoms (parent-reported, not child-reported, T2)	
Davis et al. (2010)	160 M 33 F	48	1–18 months (50%) 18 months–5 years (24%) ≥5 years (26%)	USA	30	22	48	BDI POMS IES-R	C	–	PTSS predicted child emotional (self- and parent-reported) and behavioural difficulties (parent-reported). Child anger regulation moderated the association between PTSS and child emotional (parent and child-reported) and behavioural difficulties (parent-reported)	
Norberg (2010)	24 M 20 F	n/a	42 months	Sweden	–	100	–	PSS	C	T1	Stress (T1) predicted burnout symptoms (T2)	
Pöder et al. (2010)	107 M 107 F	47	≤14 days	Sweden	44	12	44	PCL-C	L	T1: 1 week PD T2: 2 months PD T3: 4 months PD	PTSD (T2–T3) is associated with more severe perception of children's symptom burden	
Witt et al. (2010)	Cases: 68 M 6 F	47	≤2 years (50%)	USA	47	36	17	SE-12v2	C	–	Stress mediated the effect of being a parent of a child with cancer on poorer mental QoL	

Table 2. Continued

Author (year)	Sample			Time post-diagnosis			Child diagnosis (%)			Design		Summary of results
	Parents	Girls (%)	Country	LK	CNS	Other	Measure (distress)	Type	Times of assessment			
Wolfe-Christensen et al (2010)	Controls: 113 M 16 F 36 M	52	USA	60	14	26	C-SOSI PSS PSI-SF	C	-	Parenting stress predicted poorer child adjustment (parent-reported problems of internalising, externalising and prosocial behaviour)		
Hoekstra-Webers et al (2012)	85 M 79 F	33	NET	40-38	12-7	48-55	GHQ	L	T1: 14 days PD T2: 6 months PD T3: 1 year PD T4: 5 years PD	Mixed distress (T1) predicted mixed distress at T2 and T3 in M and F		
Landolt et al (2012)§	68 M 57 F	39	SWI	n/a	n/a	n/a	PDS	L	T1: 5-6 weeks PD/accident T2: 1 year PD/accident	Higher PTSS in parents (T1) predicted poorer recovery from PTSS in the child (T2). PTSS change in parents (T1-T2) not associated with PTSS change in children (T1-T2)		
McCarthy et al (2012)	135 M 85 F 94 M	42	Australia	41-44	14-9	45-47	ASDS (T1) PCL-C (T2) PTSD-S-C	L	T1: diagnosis T2: 6-8 months PD T1: 1 week PD T2: 1 month PD T3: 6 months PD T4: 12 months PD	Severity of ASD symptoms (T1) predicted PTSS (T2) Mixed distress (T1) predicted PTSS (T2)		
Tremolada et al (2012)	48	48	Italy	100	-	-	BSI-18	L	-	Severity of ASD symptoms (T1) predicted PTSS (T2)		
Yagci-Kupeli et al (2012)	Cases: 128 M 154 F 99 F Controls: 170 M 99 F	42	Turkey	-	14	86	BSI	C	-	Mixed distress predicted lower school, physical, emotional and social functioning of children in both groups (parent- and child-reported)		

LK, leukaemia; CNS, central nervous system tumours; L, longitudinal; C, cross-sectional; M, mothers; F, fathers; PD, post-diagnosis; PT, post-treatment; SCT, stem cell transplantation; ASD, acute stress disorder; PTSD, post-traumatic stress disorder; PTSS, post-traumatic stress symptoms; QoL, quality of life; USA, United States of America; UK, United Kingdom; NET, the Netherlands; SWI, Switzerland; n/a, not applicable.

* Data missing (8%).
 † Cancer = 84%; Congenital heart disease = 11%; other serious illness = 5%.
 ‡ Cancer = 90%; Blood disorders = 10%.
 § Cancer = 27%; Accident = 48%; Diabetes = 25%.

Table 3. Instruments used to measure emotional distress in 56 studies

Category	Acronym	Instrument	N studies*	
Mixed distress	BSI	Brief Symptom Inventory	5	
	C-SOSI	Calgary Symptoms of Stress Inventory	2	
	GHQ	General Health Questionnaire	5	
	HADS	Hospital Anxiety and Depression Scale	1	
	PAIS	Psychosocial Adjustment to Illness Scale	1	
	POMS	Profile of Mood States	4	
	PPD-C	Parental Psychosocial Distress in Cancer	2	
	PSI-SF	Parenting Stress Inventory-Short Form	3	
	PSS	Perceived Stress Scale	5	
	RSQ	Response to Stress Questionnaire-Paediatric Cancer Version	1	
	SCL-R	Symptom Checklist 35 and 90 Revised	3	
	Mental QoL	SF-12v2	Short-Form 12 Health Survey Version 2	2
		SF-36	Short-Form 36 Health Survey Version 1 and 2	6
	Anxiety	BAI	Beck Anxiety Inventory	3
SBAS		State-based Anxiety Scale	1	
STAI		State-Trait Anxiety Inventory	6	
Depression	SCID I	Structured Clinical Interview for DSM-IV, Axis I disorders	1	
	BDI	Beck Depression Inventory, First and Second Edition	12	
	CES-D	Center for Epidemiologic Studies Depression Scale	1	
	SDS	Zung Self-Rating Depression Scale	1	
Traumatic stress	SCID I	Structured Clinical Interview for DSM-IV, Axis I disorders	1	
	ASDS	Acute Stress Disorder Scale	2	
	IES	Impact of Event Scale, Original and Revised	10	
	PCL-C	PTSD Checklist-Civilian Version	5	
	PDS	Post-traumatic Diagnostic Scale	1	
	PTSD-S-C	PTSD Symptom Checklist	2	

Note (full references available on request): BSI, Brief Symptom Inventory (Derogatis & Spencer, 1982; Derogatis, 1992, 2000); C-SOSI, Calgary Symptoms of Stress Inventory (Carlson & Thomas, 2007); GHQ, General Health Questionnaire (Goldberg & Williams, 1988, 1991; Goldberg, 1992); HADS, Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983); PAIS, Psychosocial Adjustment to Illness Scale (Derogatis, 1986); POMS, Profile of Mood States (McNair *et al.* 1992; Lorr & McNair, 1988); PPD-C, Parental Psychosocial Distress in Cancer (Van Dongen-Melman *et al.* 1995); PSI-SF, Parenting Stress Inventory-Short Form (Abdin, 1990); PSS, Perceived Stress Scale (Cohen & Kamarck, 1983); RSQ, Response to Stress Questionnaire-Paediatric Cancer Version (Miller *et al.* 2009); SCL-R, Symptom Checklist 35 and 90 Revised (Derogatis, 1994, 1983); SF-12v2, Short-Form 12 Health Survey Version 2 (Ware *et al.* 1996); SF-36, Short-Form 36 Health Survey Version 1 and 2 (Ware, Snow & Kosinski, 2000; Ware, Kosinski & Dewey, 2000); BAI, Beck Anxiety Inventory (Beck & Steer, 1990); SBAS, State-based Anxiety Scale (Marteau & Bekker, 1992); STAI, State-Trait Anxiety Inventory (Spielberger *et al.* 1983); SCID I, Structured Clinical Interview for DSM-IV, Axis I disorders (First *et al.* 1997); BDI, Beck Depression Inventory, First and Second Edition (Beck, 1978; Beck & Steer, 1993; Beck *et al.* 1996); CES-D, Center for Epidemiologic Studies Depression Scale (Radloff, 1977; Shrout & Yager, 1989); SDS, Zung Self-Rating Depression Scale (Zung, 1965); ASDS, Acute Stress Disorder Scale (Bryant *et al.* 2000); IES, Impact of Event Scale, Original and Revised (Horowitz *et al.* 1979; Weiss & Marmar, 1997); PCL-C, PTSD Checklist-Civilian Version (Weathers *et al.* 1993); PDS, Post-traumatic Diagnostic Scale (Foa *et al.* 1997); PTSD-RI, Post-traumatic Stress Disorder Reaction Index (Frederick, 1985); PTSD-S-C, PTSD Symptom Checklist (Manne *et al.* 1998).

*References available on request.

(Ozono *et al.* 2007). Consistent with this pattern, mental QoL improved over 2 years in mothers of children who underwent stem cell transplantation, while no such improvement was found for fathers (Barrera *et al.* 2012). Interestingly, only seven studies included formal comparisons of parental dyads from the same family (Ozono *et al.* 2007; Maurice-Stam *et al.* 2008b; Pöder *et al.* 2008; Robinson *et al.* 2009; Witt *et al.* 2010; Barrera *et al.* 2012; McCarthy *et al.* 2012).

Studies suggested that younger parental age, particularly in mothers, predicted higher mixed distress and PTSS up to 5 years post-diagnosis (Maurice-Stam *et al.* 2008b; Pöder *et al.* 2008; Hoekstra-Weebers *et al.* 2012; McCarthy *et al.* 2012) with the exception of (Dolgin *et al.*

2007; Klassen *et al.* 2008). Three of the four studies finding a significant association controlled for initial distress levels. Moreover, having an immigrant status prospectively predicted traumatic stress within the first year post-diagnosis (Dolgin *et al.* 2007; Pöder *et al.* 2008).

Marital status was not associated with mixed distress, depression, anxiety or PTSS (Dolgin *et al.* 2007; Klassen *et al.* 2008; Iobst *et al.* 2009; Hoekstra-Weebers *et al.* 2012). Mixed results were found with regard to parental education. Three studies found no association between parental education and mixed distress, depression and PTSS over the first 5 years post-diagnosis (Dolgin *et al.* 2007; Klassen *et al.* 2008; Hoekstra-Weebers *et al.* 2012). One study found that lower education was associated with

higher depression scores and PTSS up to 1 year post-diagnosis (Demirtepe-Saygili & Bozo 2011a; Tremolada *et al.* 2013). Notably, family income was not associated with distress (Klassen *et al.* 2008; Norberg *et al.* 2012; Rodriguez *et al.* 2012). In a Jordanian study, a greater distance from home to the hospital was related with lower levels of mixed distress for mothers and higher levels for fathers (Masa'Deh *et al.* 2012), perhaps because fathers traditionally drive mothers to the hospital in this country. The literature also suggested that within the first year post-diagnosis, underemployment, lower career achievement and general role strain (e.g. from work) were associated with higher distress, anxiety, depression and PTSS in parents (Fotiadou *et al.* 2008; Demirtepe-Saygili & Bozo 2011b; Norberg *et al.* 2012). On the contrary, having a healthier lifestyle (e.g. exercise, nutrition, sleep, leisure) was cross-sectionally associated with lower parental mixed distress, anxiety and depression (Klassen *et al.* 2008; Demirtepe-Saygili & Bozo 2011b).

Nineteen studies pertained to psychological factors such as coping. Except for one study (Norberg *et al.* 2012), prospective studies suggested that negative affectivity (i.e. neuroticism, trait anxiety), psychosocial risk, cognitive functioning and poor problem-solving were vulnerability factors for later mixed distress, depression and traumatic stress in the first 2 years post-diagnosis (Dolgin *et al.* 2007; McCarthy *et al.* 2012; Tremolada *et al.* 2013). These reports controlled for baseline distress in their analyses. Cross-sectional studies also found these associations (in addition to an association with anxiety) over more than 10 years post-diagnosis (Ozono *et al.* 2007, Iobst *et al.* 2009). They also reported that parents with lower self-esteem and mastery suffered from higher mixed distress within the first year post-diagnosis (Han *et al.* 2009; Klassen *et al.* 2011, 2012). In these studies on psychological factors, it is probable that candidate factors and distress be partly confounded though. An original finding was that in an environment in which much external influence is received (by doctors, family), parents who are more autonomous and task-focused experience elevated mixed distress when taking decisions about treatments (Miller *et al.* 2011).

With regard to coping strategies, prospective studies controlling for baseline distress indicated that avoidant and passive (withdrawal) coping around the time of diagnosis predicted higher mixed distress and PTSS 1–5 years later (Maurice-Stam *et al.* 2008b; Hoekstra-Weebers *et al.* 2012). On the contrary, using more problem-focused coping at diagnosis predicted lower mixed distress 1 year later (Hoekstra-Weebers *et al.* 2012), a result which was also found in a cross-sectional study assessing anxiety and

depression in conjunction with coping (Demirtepe-Saygili & Bozo 2011b). Religious beliefs, optimism and resilience were also associated with lower mixed distress, anxiety, depression and traumatic stress in both prospective (Maurice-Stam *et al.* 2008b; Tremolada *et al.* 2012) and cross-sectional studies (Greening & Stoppelbein 2007; Fotiadou *et al.* 2008; Han *et al.* 2009; Gudmundsdottir *et al.* 2011) up to 5 years post-diagnosis. Palliative coping (leisure) in fathers longitudinally predicted lower distress over 5 years post-diagnosis (Maurice-Stam *et al.* 2008b), but these variables were not significantly associated when measured concurrently (Hoekstra-Weebers *et al.* 2012). A prospective study including a mixed mother/father sample suggested that social support seeking around the time of diagnosis predicted elevated mixed distress 5 years later, particularly in fathers (Hoekstra-Weebers *et al.* 2012) suggesting that looking for support may be a sign of early difficulties in fathers. In these prospective studies, baseline distress levels were controlled. Cross-sectional designs of mostly mother samples found that social support seeking and perceived social support were associated with lower mixed distress, anxiety and depression throughout the first year post-diagnosis (Greening & Stoppelbein 2007; Han *et al.* 2009; Demirtepe-Saygili & Bozo 2011b; Hoekstra-Weebers *et al.* 2012). This is consistent with the observation that increased communication about cancer in the early stages of the illness was associated with lower general distress in mothers (Han *et al.* 2009), and that early stress about this communication was associated with higher PTSS in both parents (Rodriguez *et al.* 2012). Cross-sectional studies reported that emotion-focused coping, substance use, and negative self-blame were associated with higher mixed distress, anxiety, depression and PTSS (Greening & Stoppelbein 2007; Demirtepe-Saygili & Bozo 2011b).

Family factors

Reports suggested that parents' negative perception of their child's adjustment, as well as the child being a girl was associated with elevations or deterioration of general distress and PTSS in the first year post-diagnosis (Klassen *et al.* 2008; Pöder *et al.* 2008; Barrera *et al.* 2012; McCarthy *et al.* 2012; Norberg *et al.* 2012). The literature reviewed, including two reports controlling for distress at baseline, suggested that important stressful family events prior to the diagnosis (e.g. new job, divorce) as well as the perception that cancer has a greater impact on the family, correlated with higher mixed distress and PTSS over the 5 years post-diagnosis (Maurice-Stam *et al.* 2008b; Klassen *et al.* 2012; Tremolada *et al.* 2013). Moreover, poorer

family functioning (i.e. lower cohesiveness, expressiveness and support, and more conflict) was cross-sectionally associated with elevations in general distress and traumatic stress (Maurice-Stam *et al.* 2008b; McCarthy *et al.* 2012). This was also reported in cross-sectional studies more than 10 years post-diagnosis, which also included associations with depression and anxiety (Ozono *et al.* 2007; Han *et al.* 2009, Ozono *et al.* 2010; Bruce *et al.* 2011). One study explored dyadic relations within the parental couple, and found that fathers' instrumental support related favourably with mothers' anxiety over the first year post-diagnosis (Gudmundsdottir *et al.* 2011).

Mixed results were found concerning the association with the number of children in the family within the first year post-diagnosis. One study suggested that having more children was associated with lower parental PTSS and lower maternal general distress (Pöder *et al.* 2008). When considering a longer period of 5 years post-diagnosis and controlling for baseline distress, this relationship was not significant (Hoekstra-Weebers *et al.* 2012). The possible effect of having other children may be moderated by other factors like burden or social support. In fact, cross-sectional studies also indicated that mental QoL was either associated or mediated by caregiver burden and stress levels at various times of assessment, up to 10 years post-diagnosis (Witt *et al.* 2010).

In summary, the recent literature has found some evidence from controls and within-dyad comparison suggesting that mothers experienced higher distress levels than fathers only at diagnosis and during active treatment. Higher levels of distress in parents in the medium-long term were associated with a clinical history of more serious conditions and intense treatment. Such levels were also associated with personal characteristics, including negative affectivity and poorer personal resources (e.g. self-esteem). Finally, emotional or avoidant coping (in mothers and fathers), and support seeking (in fathers) during the early stages also predicted higher distress in the long run. Contrasting with expectations, the literature suggested that having other children is probably not, as such, a vulnerability factor for distress. Notably, education and income did not appear as significant factors either in recent studies.

Consequences of distress

Six studies investigated different consequences of parental distress on the parents themselves. Longitudinal studies suggested that levels of mixed distress and traumatic stress in the early stages predicted future levels from 1 month to 1 year later (Pöder *et al.* 2008; Hoekstra-Wee-

bers *et al.* 2012; McCarthy *et al.* 2012; Tremolada *et al.* 2012). Moreover, depression symptoms at 6 months post-diagnosis predicted lower levels of perceived social support over the first and second year post-diagnosis (Norberg & Boman 2007), and mixed distress 3 years post-diagnosis was associated with burnout symptoms a year later in parents of brain tumour survivors (Norberg 2010). Eleven articles indicated consequences of parental distress on their children, either through parent proxy measures or child-reported measures. With the exception of one study (Maurice-Stam *et al.* 2008a), longitudinal reports found that parental mixed distress, anxiety, depression and traumatic stress within the first year post-diagnosis predicted higher child distress, internalising and externalising symptoms, PTSS, and social competence problems up to 7 years post-diagnosis (Barrera *et al.* 2009; Robinson *et al.* 2009; Pöder *et al.* 2010; Landolt *et al.* 2012). Two of four of these reports controlled for baseline outcomes (Robinson *et al.* 2009; Landolt *et al.* 2012). One original prospective finding was that maternal depression predicted children's verbal, perceptual and motor skills both 1 and 2 years post-diagnosis, but not their educational achievements (Barrera *et al.* 2008). Similar results were found in cross-sectional studies up to 10 years post-diagnosis (Colletti *et al.* 2008; Jobe-Shields *et al.* 2009; Davis *et al.* 2010; Wolfe-Christensen *et al.* 2010; Yagc-Kupeli *et al.* 2012). These also found an association between parental distress and children's school functioning. Yet, this may also reflect the effect of children's limitations on parental distress.

In summary, the current evidence suggests that early intense negative reactions in parents could predict long-term psychological suffering in parents themselves, which is coherent with a certain stability of mood. These might also be associated with psychological suffering of children, but the evidence is weaker on this aspect given the cross-sectional designs used.

DISCUSSION

During the study period 2007–2012, we found 56 studies correlating parental distress with other factors being interpreted as precursors or effects of parental distress. Of these, 43 studies were assessed as bearing Low risk of bias. In this literature, distress referred to mixed anxiety–depression symptoms, undifferentiated mental health issues, mental QoL, depression, anxiety or post-traumatic stress. The most probable factors explaining distress found in this recent literature were severity of the condition and intensity of treatment, being a mother (shortly after diagnosis), negative affectivity and poor personal resources,

family stressors or weaknesses before the diagnosis. As for outcomes of parental distress, we found studies to support the effect of acute short-term distress on long-term parental adjustment. Studies suggested that parental distress may impact the child's adjustment. This overall pattern is fairly consistent with previous literature reviews in this domain (Klassen *et al.* 2007; Rabineau *et al.* (2008); Vrijmoet-Wiersma *et al.* 2008).

Compared to the most comprehensive review to date (Vrijmoet-Wiersma *et al.* 2008), the current review performed on a more recent period of time highlighted a few differences pertaining to sample composition and scope of factors. Although we found a similar number of studies using both mothers and fathers as participants, we also noted that more studies were equally distributed between sexes (12% in the recent period as compared to 6% in Vrijmoet-Wiersma *et al.* 2008). The recent literature was also composed of more homogenous samples in terms of cancer site or trajectory phase. This is pertinent given the growing refinement and standardisation of treatment, which can have unique stressors and late effects (Goldsby *et al.* 2010, 2011; Whelan *et al.* 2010). We found that the recent literature studied predictors which had not been related to parental distress in the past, such as treatment intensity and coping reaction (e.g. palliative coping). Moreover, associations which appeared fairly consistent before were not observed here, specifically as for marital status, education and income levels, perhaps reflecting social trends as new social networks and recent changes in care accessibility for the underserved. Further research will be needed to confirm these hypotheses.

Previous reviews did not analyse distress measurement and thus comparisons are difficult to make. In the present pool of studies, we observed that very few studies used measures other than self-reports (Yalug *et al.* 2008). We also observed that measures were not as homogeneous across distress domains. High homogeneity characterised depression, PTSS and mental QoL, whereas much lower homogeneity was observed in mixed distress or anxiety. This may be important for future meta-analyses.

Original findings regarding sex differences and coping were explored. Findings on distress in mothers and fathers were somewhat mixed, but the general tendency indicated that post-treatment and long-term levels of distress were similar for mothers and fathers (Ozono *et al.* 2007, Maurice-Stam *et al.* 2008b). In the 20 studies in which both parents were equally represented, mothers seemed particularly vulnerable to distress during the first year post-diagnosis. Mothers tended to report higher distress both at diagnosis and during active treatment (except for Hoek-

stra-Weebers *et al.* 2011). In fact, the majority of the studies in this review suggested that mothers experienced greater mixed distress than fathers (Ozono *et al.* 2007; Maurice-Stam *et al.* 2008b, Norberg & Boman 2008; Rein-fjell *et al.* 2009; Barrera *et al.* 2012). Mothers were also more vulnerable to PTSS than fathers (Pöder *et al.* 2008; Landolt *et al.* 2012; McCarthy *et al.* 2012; Rodriguez *et al.* 2012).

Beside parental sex, important stressful family events prior to the child's diagnosis (e.g. divorce, poor family functioning) appeared as vulnerability factors for parental distress (Ozono *et al.* 2007; Maurice-Stam *et al.* 2008b; Han *et al.* 2009; Penn *et al.* 2009; Ozono *et al.* 2010; Bruce *et al.* 2011; Gudmundsdottir *et al.* 2011; Klassen *et al.* 2012, McCarthy *et al.* 2012; Tremolada *et al.* 2013). Tumour relapse was also as a significant predictor for the prevalence of traumatic stress, with traumatic stress nearly doubling following relapse (Jurbergs *et al.* 2009). This exemplifies a vulnerability factor that is also consistent with the traumatic stress literature, whereby relapse was seen as a 'second hit' on the parents and subsequently made them more vulnerable to experiencing clinically significant traumatic distress (Jurbergs *et al.* 2009). Longitudinal studies identified that the initial reaction to the child's cancer (i.e. mixed distress and traumatic stress) predicted long-term parental mental health from 4 months to 5 years post-diagnosis (Pöder *et al.* 2008; Hoekstra-Weebers *et al.* 2012; McCarthy *et al.* 2012).

In the 6-year span of this review, the literature on coping was substantial. Researchers agree that adopting an active (problem-focused) coping style as opposed to a passive/emotional style may be beneficial (for mothers and fathers). Essentially, parents using active coping reported less mixed distress, anxiety and depression in the year following the cancer diagnosis. These observations are consistent with the literature on coping (Zeidner & Endler 1996). Besides having an 'active/fighting spirit', other positive coping mechanisms included religious beliefs, optimism, cancer-related communication, hope regarding the situation (i.e. reframing) and social support. These links found in the recent literature underline the need to articulate coping responses with other moderators from the situation or from social resources. Although the selection of coping strategies can be dependent on the parent's individual characteristics or attributes, it is often quite gender specific. In particular, fathers have been found to use more avoidant/passive and palliative coping (e.g. work, leisure), while mothers use more family and social support coping. This finding corresponds with each parent's traditional role in the cancer experience (Bennett Murphy *et al.* 2008;

Hall 2010). However, it is unclear whether consideration of primary caregiver status would blur this difference. A better understanding of this phenomenon would benefit from a close analysis of both partners' roles and status in future research. Moreover, a subset of longitudinal follow-ups did not control for baseline distress weakening the evidence of a causal relationship between correlates and distress (e.g. Norberg *et al.* 2012).

One comment should be made on the status of predictors or moderators of parental distress. In the recent literature, there has not been any increase in the number of longitudinal designs. In fact, the present review includes a similar proportion of longitudinal studies as the former exhaustive review (i.e. less than a third). The majority of the studies on potential factors and outcomes of parental distress had cross-sectional designs, notably more than half of them. This as well leads to difficulties in interpreting directionality, dissecting confounding effects of inter-related concepts and inferring causality. For example, in one study, PTSS was associated with cancer-related communication stress, but this relationship could be bidirectional (Rodriguez *et al.* 2012). Although it has become almost a tradition at the end of such a review to call for more longitudinal designs, we would like to draw the attention of researchers and practitioners on different status of factors of distress. In our review, it was notable that a large proportion (66%) of studies including both self-reported factors and distress were cross-sectional. These were clearly unable to disentangle the effect of factors on parents' distress. In these cases, longitudinal follow-up and appropriate analysis including the effect of time would be recommended in the future. It should be made clear yet that some factors, although not qualifying for causal risk factors (Kraemer *et al.* 1997), are by nature stronger than others as they are clear antecedents of distress, e.g. sex, treatment history or family structure. To generate causal hypotheses involving these factors, cross-sectional designs may be suitable, as long as the analysis includes appropriate controls (Kazdin 2003).

When considering consequences of distress, we found longitudinal evidence that early intense emotional response could partly explain long-term distress levels in parents. Although this association makes sense, it is also important to recognise that intense emotional reaction is to be expected, especially if the situation is serious and depending on moderating aspects such as the social support available to parents. However, none of the reports systematically explored interactions between initial responses and these moderators to predict long-term adjustment. Factors such as restrictions in social networks, pre-diagnosis psychological distress and adhesion

to traditional masculine roles of coping could either predict or moderate the effects of parental distress. Such refined analyses were seldom available in the literature we reviewed (Litzelman *et al.* 2011; Tremolada *et al.* 2012).

Finally, the limited body of research exploring for the effects of parental distress on the child suggested deleterious effects on children's mental health as well as cognitive performance. Although the former result is a traditional observation in child psychopathology, the latter deserves further discussion. Cognitive status and school achievement may depend on the condition and on the treatment late effects. The dynamics of degradation have not yet been fully understood as they pertain to a wide range of interconnected factors. Therefore, the association observed in the reviewed studies may be due to common factors including risk status, intensity of treatment, etc., which may explain both increased parental distress and deteriorated cognitive status of the child. Given the lack of appropriate longitudinal studies on this topic, it is not possible to conclude on causal links.

We must finally recognise the limitations of this review. First, this is not a meta-analysis. Given the heterogeneity of the illness and treatment variables, the array of factors and the rarity of proposed moderators, a quantitative review would not be meaningful. Second, the classification of correlates as factors or consequences of distress may be questioned given the observational design of studies. For classification purposes, we relied on the aims of studies and interpretations given by authors. We then chose to systematically assess biases to identify the strength of the evidence. Our view is that this classification offers an original description of current attempts to study factors and consequences of parental distress as well as it makes it possible to identify avenues for methodological improvements. Third, in reviewing the evidence, we chose to rely exclusively on low risk of bias studies. Although the results of excluded reports may be subjected to higher bias, they may well be informative. To cope with this issue and remain consistent with common standards on systematic reviews, we included a supplementary table (Table S2) summarising characteristics and findings of these studies. Improvements in research quality could easily be made in future studies especially if appropriate sample selection procedures were systematically implemented (Elkin *et al.* 2007; Bennett Murphy *et al.* 2008; Roddenberry & Renk 2008; Yalug *et al.* 2008; Currier *et al.* 2009; Hall 2010; Liu & Yeh 2010; Demirtepe-Saygili & Bozo 2011a; Litzelman *et al.* 2011; Masa'Deh *et al.* 2012) and reporting was more complete (e.g. response rate, sample description, recruitment procedures, etc.) (Merrill *et al.* 2007; Bayat *et al.* 2008; Bennett Murphy *et al.* 2008;

Penn *et al.* 2009). Finally, this review was performed on quantitative studies correlating parent distress with other factors. It is probable that qualitative studies would bear valuable information on risk factors and effects of distress. Specific methods could be used in the future to articulate qualitative and quantitative findings in the future (Sandelowski *et al.* 2007).

Despite these limitations, the present review underlines the need for more research in the field. For instance, it is still not clear why mothers typically report greater distress than fathers near diagnosis, and why this difference is not significant later in the cancer trajectory. Perhaps, fathers are experiencing just as much distress as mothers near the time of diagnosis but they are masking their concerns and relying on avoidant coping instead of openly expressing their distress. Alternatively, it is also plausible that mothers have heightened reactivity to stress in general as compared to their partners. Future studies could address this by implementing a more routine use of clinical and non-clinical comparison groups and exploring appropriate underlying concepts when examining sex differences. It would also be beneficial if future research provided greater specifications on core elements, which contribute to parental distress (e.g. ask parents to rate a list of potential sources of distress in terms of most to least important factor contributing to their current distress). This avenue could benefit from a large body of qualitative research involving parents. It will require methodological refinements to accurately identify causal relationships. As the idea of 'factor' or 'consequence' of distress implies causality, future research should favour research designs able to bring stronger evidence, including prospective group follow-ups, multiple single-case designs and quasi-experimental studies (Kazdin 2003). Moreover, a focus of researchers on modifiable factors of distress should help identify targets for future intervention (Kraemer *et al.* 1997). A good example of a modifiable factor is social support. Discrepancies between parents' desired support (e.g. social support, instrumental support, informational support) and their actual or perceived support could be partially responsible for their distress levels, because this would constitute an additional source of stress. Future research could empirically examine both of these types of

supports among parents. This is very relevant as promising self-help parent-directed interventions have been developed recently (Cernvall *et al.* 2015). Finally, the research on consequences of parental distress on the family and the child should be expanded. Although it is desirable to evaluate and help the parents who need it, the systematic screening of parental distress is still not common practice (Barrera *et al.* 2014). Weighing precisely the burden of cancer-related distress for the family will be essential to advance our standards of care.

As a conclusion, we systematically updated a previous literature review (Vrijmoet-Wiersma *et al.* 2008) while focusing on factors and effects of parental distress following child cancer. This review was based on an operational definition of distress and included a systematic assessment of biases. We identified the main probable factors in the illness and trajectory, individual and family domains. A lot of the results confirmed previous syntheses. We also found original results pertaining to differences between mothers and fathers and socio-demographic factors. Interestingly, the research on psychosocial factors of parental distress in the recent literature was fairly consistent when compared with the older literature. The recent literature suggested that parental distress may predict further deterioration of adjustment in parents and may have a negative impact on the child. Quality assessment of reviewed studies revealed that widespread biases could easily be dealt with during the research process (e.g. selection and reporting biases). Despite methodological limitations of the literature, the recent literature confirms the need for distress assessment in parents. Following the increasing survival rates in childhood cancer and specific survivorship issues, more research is needed on long-term parental distress as well as long-term effects of heightened distress in parents.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1. Assessment of risk of bias in 56 studies on factors and outcomes of parental distress 2007–2012.

Table S2. Summary of 13 excluded articles on parental distress by category from January 2007 to December 2012.