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Mother, father and child traumatic stress reactions after paediatric burn: Within-family co-occurrence and parent-child discrepancies in appraisals of child stress

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ABSTRACT

Aim: The current study examined occurrence and within-family associations of traumatic stress reactions after child burn injury, while in the same model addressing the role of parents' own symptoms in their reports of child symptoms.

Methods: One-hundred children (8–18 years old), and their mothers (n=90) and fathers (n=74) were assessed within the first month (T1) and three months (T2) after burn. Parents and children rated child traumatic stress reactions on the Children's Responses to Trauma Inventory (CRTI) and parents rated their own reactions on the Impact of Event Scale (IES). Cross-sectional associations at the two occasions were examined using a structural equation model.

Results: Occurrence of traumatic stress symptoms in the clinical range was higher in parents (T1: 24–50%; T2: 14–31%) than children (T1: 0–11%; T2: 3–5%, depending on whether children, mothers or fathers reported on symptoms). Traumatic stress symptoms of mothers at T1 and of both parents at T2 were significantly related to child self-reported symptoms. Moreover, mothers who experienced higher stress symptoms themselves gave higher ratings of their child's symptoms at both time points, while for fathers, this was only found at T2.

Conclusions: The current study demonstrates the impact of pediatric burn injury on the family level, and shows simultaneous existence of within-family interrelatedness of traumatic stress and an influence of parents' own symptoms on their perception of child symptoms. Findings highlight the need for trauma symptom screening in all family members and for considering informants' symptoms to understand the child's functioning in particular.

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1. Introduction

Burn events are potentially traumatizing for children and adolescents. Besides the burn event and injury itself, potential stressors include treatment-related factors such as pain, repeated wound care and skin grafting procedures. Clinically relevant acute stress reactions appear to be present in 25–31% of children [1–3]. Although symptoms after pediatric injury generally tend to decline over time, they persist in a subgroup [4], indicating the necessity to identify children in need of psychological support.

To assess child traumatic stress reactions, both the child and its parents can be a source of information. However, child assessment is complicated because parent and child symptoms may co-occur as both can be affected by the traumatic event and parents' own symptoms may influence their observation of child symptoms [5]. Evidence for the co-existence of these two phenomena was provided by a previous cross-sectional study, showing an association between maternal and child self-reported traumatic stress symptoms after war exposure, as well as a distortion in maternal reports of their child behavior, related to their own traumatic stress symptoms [6]. The current study aims to further unravel the complexity of underlying family systemic influences and to especially examine the role of fathers, thereby enhancing insight into the underlying interdependency and discrepancy between mothers, fathers and children.

The concept of 'relational PTSD' refers to the co-occurrence of parent and (young) children's stress symptoms after a traumatic event [7]. Within this model, it is assumed that the parent's symptoms exacerbate the child's symptoms and vice versa. The interrelatedness of parent and child symptoms is also emphasized within the Integrative (Trajectory) Model of Pediatric Medical Traumatic Stress [8,9]. Indeed, several studies have shown parents' higher initial stress reactions to increase the risk of (later) child traumatic stress symptoms [2,10,11]. However, research has indicated that the strength of the association between child and parent symptoms may depend on the timing of the assessments, as well as on the age of the child; with stronger relationships for younger, compared to older children [12].

Over and above the actual co-occurrence of child- and parent reactions, parents' own traumatic stress symptoms potentially influence the way in which they perceive their child's reactions to the trauma. Several studies have shown that parents with more stress symptoms themselves report higher symptoms in their child, suggesting that parents with higher traumatic stress are more prone to overestimate the child's stress symptoms [5,13–15]. This phenomenon is suggested to be one of the explanations for the observed discrepancy between child self-reports and parental reports of child symptoms, which has been shown in various trauma populations [5,14,16].

To fully understand traumatic stress reactions within the family, assessing both parents is essential. Women have been indicated to be more vulnerable to develop posttraumatic stress disorder (e.g., [17]), which is supported by the observation of higher levels of stress symptoms after burn injury in mothers compared to fathers [18]. Moreover, mothers' traumatic stress symptoms generally have a stronger association with child symptoms, compared to fathers' stress symptoms [19]. This was confirmed in a recent study in preschool children with burns, where maternal symptoms of acute stress were associated with child acute stress, while paternal symptoms were not [20]. However, whether this stronger association for mothers also applies to longer term symptoms and older children with burns is unknown. Also, it is unclear whether a potential influence of parents' own symptoms on reports of child stress symptoms will be different between mothers and fathers, as no previous studies have made comparisons. A previous study in child anxiety showed that mothers' reports of child anxiety were related to mothers' depressive symptoms, while this was not the case for fathers [21]. This suggests that comparing mothers and fathers is relevant and might inform clinical practice regarding the potential consequences of maternal and paternal involvement in assessment of child symptoms.

The main aim of the current study was to examine associations between child (8–18 years old) and parent traumatic stress symptoms and the potential impact of parents' own symptoms on reports of their child's symptoms. Prior to examining these associations in one model, parent–child agreement on child stress symptoms within the first month and three months after the burn event was investigated. It was hypothesized that parent-child agreement regarding child stress symptoms would be low to moderate [5]. In the final model, a significant association between child self-reported stress reactions and parents' stress reactions was expected [9]. In addition, parents with higher levels of traumatic stress were hypothesized to report more stress symptoms in their child, while accounting for the child's self-rated symptoms [5,6,14]. The model was examined for associations within the first month after burn. Next, data collected three months after burn were used to examine whether the model was replicated. Differences between mothers and fathers were examined exploratory. The role of child age was examined by including comparisons between children younger and older than 13 years of age.

2. Methods

2.1. *Participant recruitment and procedures*

Data for this study were collected as part of a larger prospective study on child (age 8–18 years) and parental adjustment following pediatric burn injury. Earlier studies in this cohort examined child health-related quality of life [22], child behavioral problems [23] and parents' traumatic stress reactions [24]. The unique contribution of the current study is the inclusion of child posttraumatic stress reactions and the simultaneous analysis of child and parent stress reactions. From April 2007 to July 2011, data were collected in three Dutch and four Belgian burn centers. Data collected within the first month after burn (T1) and three months after burn (T2) were used for the current study. Families were eligible to participate in the study if the child had been in the hospital for more than 24 h and the percentage total body surface area (TBSA) burned

was more than or equal to 1%. Exclusion criteria included limited Dutch language proficiency, child cognitive impairment, and self-inflicted burns. Researchers at the burn centers contacted eligible families and offered oral and written information. Written informed consent was obtained from the mother and father. Children provided written (≥12 years) or oral (<12 years) assent. The researchers requested to complete the first questionnaires within the first four weeks of admission and follow-up at three months consisted of mail-out questionnaires. The study was approved by two independent ethics committees in the Netherlands and Belgium (NL18008.056.07 and B67020072060).

Of the 202 families eligible for the study, 22 (11%) declined to participate, 15 (7%) children were already discharged before the family could be approached and 19 (9%) families were not invited because the local researcher deemed their participation to be too demanding (e.g., psychiatric background, severely ill family members, involvement of child protection services, or severe financial problems). Twenty families (10%) gave their informed consent to participate, but completed none of the questionnaires. For the purpose of this study, we selected children who completed reports of their own stress symptoms within the first month postburn and for which at least one of their parents completed reports on child symptoms, hereby excluding 26 families. This selection resulted in a sample of 100 families, with reports of 100 children, 90 mothers and 74 fathers. A comparison between the 100 participating families and non-participating families revealed no significant differences in terms of child gender (p=.55), number of days in the hospital (p=.91), percentage TBSA burned (p=.84), and number of surgeries (p=.62). However, children from participating families were younger than children from non-participating families ($M_{participating}$=12.8, SD=3.0, $M_{non\text{-}participating}$=13.8, SD=3.0; t (184) =2.35, p=.02). From T1 to T2, 12 children (12%), 17 mothers (19%) and 10 fathers (14%) dropped out of the study. Comparing the participants that dropped out with the participants that completed measures at T2 revealed no significant differences in terms of self-reported traumatic stress symptoms at T1 (p_{child}=.87, p_{mother}=.14, p_{father}=.33).

2.2. Participants

The sample of 100 children consisted of 69 boys (69%) and 31 girls (31%). Sixty-three percent of the burn events occurred at home. For children under the age of 13 years, the burn event occurred at home significantly more often than for children 13 years and older (p<.001). In the total sample, the incidence of flame burns was highest (54%), followed by scalds (34%). Incidence of scalds was higher in younger (<13 years) than older (≥13 years) children, while older children more often had flame burns (p<.001). Mean TBSA burned was 8.8% (SD=10.3, range 1–72%). Fifty-four (54%) of the children underwent at least one skin grafting procedure (M number of skin grafting procedures=.96, SD=1.95, range 0–16, median=1). Length of hospital stay ranged from one to 218 days (M=18 days, SD=29 days, median=12 days). Mean age of parents was 42.4 years for mothers (SD=6.1, range 28–55 years) and 44.8 years for fathers (SD=6.6, range 32–64 years). The majority of the parents were employed (68% of mothers and 91% of fathers). Eighty-one (81) % of the mothers and 90% of the fathers were married or living with a partner, while 19% of the mothers and 10% of the fathers reported to be single or widowed.

2.3. Measures

2.3.1. Child traumatic stress symptoms

Within the first month after burn and three months after burn, the child, mother and father separately filled out the Children's Responses to Trauma Inventory [CRTI,revised version; 25]. This questionnaire consists of 34 items and assesses the extent to which trauma-related responses were present in the child in the past 7 days. The items included are identical for the child- and parent versions. Items are rated on a 5-point Likert scale ranging from 1 to 5. The measure consists of 4 subscales: intrusion (7 items, e.g., repetitive, intrusive recollections of the trauma), avoidance (11 items, e.g., avoiding conversations about the event), arousal (6 items, e.g., difficulty concentrating), and other child-specific responses (10 items, e.g., feelings of guilt). Clinical relevance of symptoms was derived from clinical norm reference data, with cut-offs based on the 80th percentile [26]. The cut-off value was dependent on the child's age and the informant of the CRTI (Child report, 8–12 years old=91, 13–18 years old=118; parent report, 8–12 years old=100, 13–18 years old=99). As recommended by Alisic et al. [26], clinical relevance was only determined for the total CRTI score, and not for the subscales. Cronbach's alpha's for the total scale were .85 for children, .92 for mothers, and .88 for fathers within the first month after burn and .91, .92, and .93, respectively at three months after burn, indicating adequate reliability.

2.3.2. Parental traumatic stress symptoms

Both parents completed the Impact of Event Scale [IES; 27,28] within the first month after burn and three months after burn. The IES is a valid and psychometrically sound 15-item self-report measure used to assess two dimensions of traumatic stress reactions, namely, symptoms of intrusion and avoidance. Both the mother and father were asked to fill out the Dutch version of the IES [29] by rating the frequency of symptoms they experienced specifically in relation to their child's burn event on a 4-point Likert scale (0-1-3-5). The total possible score could range from 0 to 75, with higher scores representing higher levels of stress. Following Dutch [30] and Australian research [31], scores ≥26 on the Total scale were considered 'clinically relevant stress symptoms.' In our sample, the IES demonstrated adequate reliability, with Cronbach's alpha of .85 and .84 for the total scale within the first month after burn, and .90 and .89 at three months after burn, for mothers and fathers, respectively.

2.3.3. Child- and burn characteristics

Characteristics of the child (i.e., gender and age) and the burn (i.e., percentage TBSA burned, number of skin grafting procedures, and length of stay in the hospital) were acquired from the medical file. Percentage TBSA burned is the estimated percentage body surface area affected by partial- or full-thickness burns. Within the first month after burn, parents provided information on the location of the burn event and the cause of the burn.

2.4. Statistical analyses

Prior to analyses, data were inspected for accuracy of entry and missing values, and the score distributions were examined. First, clinical relevance of stress reactions was established for the child, mother and father reports on the CRTI and the mother and father reports on the IES with the use of above-mentioned cut-off values.

To examine informant agreement, intra-class correlations (ICCs) among child, mother and father reports of child stress symptoms were calculated for the total CRTI scale and the four subscales. ICCs <.40 were interpreted as poor agreement, .40–59 as fair agreement, .60–.74 as good agreement, and ≥.75 as excellent agreement [32]. Moreover, agreement on clinical relevance of the total symptoms score (dichotomous) was evaluated with the κ-statistic [Cohen's Kappa coefficient; 33]. The κ-statistic was interpreted as follows: <0 poor, 0–.20 slight, .21–.40 fair, .41–.60 moderate, .61–.80 substantial, and >.81 almost perfect agreement [34]. Lastly, difference scores were calculated by subtracting the child report score from the parent report score, to capture the size of the potential difference. For mother-father agreement, the mother report score was subtracted from the father report score. Statistical significance of mean differences was tested with paired sample *t*-tests.

Path models were used to examine the associations between traumatic stress reactions of the child, mother, and father, and to examine the relative contribution of parents' own stress symptoms to their reports of child symptoms, accounting for the child's self-reported symptoms. First, a path model with data from the first month after burn was estimated and this model was replicated with data collected three months after burn. Thereafter, the two models were combined and Wald tests were used to test for differences in strength of the coefficients between the two time points. Differences between mothers and fathers within each time point were also examined using Wald tests. A multigroup model was used to examine whether associations differed between the group of children under and above the age of 13 years. A model in which all associations were constrained to be equal across the two age groups (<13 years vs. ≥13 years) was compared to a model without these equality constraints. Models were examined within a structural equation modeling framework, using Mplus 7.4 [35]. As inspection of histograms and values of skewness (ranging from .07 to 1.17) and kurtosis (ranging from −1.06 to 2.93) indicated slight deviations from normality in some variables, a robust maximum likelihood (MLR) estimator was used. Dependency of the data (i.e., children, mothers and fathers are part of the same family) was taken into account in the model by using adjusted standard errors.

In the path model, full information maximum likelihood (FIML) was used to deal with missing data, hereby using all available data. As we examined a saturated model, no fit statistics were calculated. Path coefficients were tested two-sided.

3. Results

3.1. Child and parental stress symptoms: occurrence and correlations

Table 1 presents means, standard deviations, correlations of the measures and the number of family members with stress symptoms in the clinical range. In the first month after burn, the correlation between child self-reported stress symptoms

Table 1 – Pearson correlations (top) and descriptive statistics (bottom) of child and parent traumatic stress symptoms, in different informants at two time points.

	1	2	3	4	5	6	7	8	9	10	11
Child symptoms T1											
1. Child CRTI	–										
2. Mother CRTI	.55**	–									
3. Father CRTI	.40**	.49**	–								
Child symptoms T2											
4. Child CRTI	**.49****	.31**	.25	–							
5. Mother CRTI	.41**	.50**	.37**	.69**	–						
6. Father CRTI	.29*	.29*	.52**	.59**	.75**						
Parent symptoms T1											
7. Mother IES	**.38****	.63**	.40**	.16	.34**	.18	–				
8. Father IES	**.11**	.24	.16	.26	.58**	.39**	.26*				
Parent symptoms T2											
9. Mother IES	.24*	.54**	.22	**.33****	.53**	.37**	**.71****	.37**	–		
10. Father IES	.21	.29*	.46**	**.39****	.54**	.62**	.44**	**.58****	.55**	–	
11. Age	−.21*	−.31**	−.07	−.25*	−.33**	.09	−.27**	−.07	−.21	−.29	–
M	65.30	69.28	62.53	57.22	57.65	55.23	26.69	15.88	18.84	11.22	12.79
SD	15.93	19.69	14.45	17.66	17.80	16.93	14.00	11.63	14.29	11.25	3.04
N	100	90	74	78	74	62	91	72	75	63	100
n (%) with symptoms in clinical range	6 (6)	10 (11)	0 (0)	4 (5)	2 (3)	2 (3)	46 (50)	17 (24)	23 (31)	9 (14)	–

Note. T1 = within first month after burn, T2 = 3 months after burn. CRTI = Children's Responses to Trauma Inventory (range 34–170), IES = Impact of Event Scale (range 0–75). Correlations in bold are addressed in text.

* $p < .05$.

** $p < .01$.

and parents' symptoms was moderate (r=.38) for mothers and weak (r=.11) for fathers. Three months after burn, this correlation was moderate for both mothers (r=.33) and fathers (r=.39). Within-person correlations between traumatic stress symptoms at T1 and T2 were moderate to strong (Child self-reported symptoms r=.49; Mother symptoms r=.71; Father symptoms r=.58), showing an association between symptom levels in the first month and three months after burn for all family members. Child self-reported symptoms and mother-reported child symptoms were significantly higher for younger children at both time points. Also, mothers of younger children reported more symptoms themselves at T1.

At T1 and T2 respectively, 6% and 5% of the children's self-reported stress symptoms were in the clinical range. All of the children with symptoms in the clinical range were under the age of 13. Clinically relevant child stress symptoms were reported by mothers for 11% and 3% of the children, at the two time points, respectively. At T1, 90% of these children were under the age of 13, while at T2, all children were in the younger age group. Fathers reported clinically relevant symptoms in respectively 0% and 3% of the children at T1 and T2. At T2, the children with symptoms in the clinical range as reported by fathers were all younger than 13 years old. Parental reports of their own stress symptoms indicated clinically relevant symptoms in 50% of mothers (child <13 years: 58%; child ≥13 years: 41%) and 24% of fathers (child <13 years: 25%; child ≥13 years: 22%) at T1, and in 31% of mothers (child <13 years: 39%; child ≥13 years: 22%) and 14% of fathers (child <13 years: 19%; child ≥13 years: 9%) at T2.

3.2. *Cross-informant agreement on child stress symptoms*

As displayed in Table 2, ICCs between child- and mother reports of child total stress symptoms as well as the four subscales were poor to fair at T1 (ranging from .38 to .56) and fair to good at T2 (ranging from .55 to .70). Father-child agreement on child symptoms could be classified as poor to fair at T1 (ICCs ranging from .17 to .49), and as poor to good at T2 (ranging from .31 to .67). ICCs between mother and father reports of child symptoms generally reflected fair agreement at T1 and good agreement at T2 (ranging from .24 to .54 and from .59 and.75, respectively).

The κ-statistics displayed in Table 2 reflect the extent of cross-informant agreement regarding scores reflecting clinically relevant stress in the child. Agreement on presence of clinically relevant symptoms varied, with κ ranging from .32 to .79. Mother–child agreement could be regarded fair at T1, and substantial at T2. Father–child agreement at T1 could not be calculated, as no fathers rated their child as experiencing symptoms in the clinical range. At T2, father–child agreement was substantial. Likewise, mother-father agreement was substantial at T2.

As shown in Table 2, difference scores between reports of children, mothers and fathers indicated that mothers generally reported significantly higher levels of child symptoms than children and fathers at T1. There were no significant differences in level of reported child symptoms between children and fathers. At T2, differences between child and mother reports of child symptoms disappeared, as well as differences between mothers and fathers.

3.3. *Path analyses*

Results of the two path models are shown in Fig. 1 and Table 3. At T1, the association between parental symptoms and child self-reported symptoms was significant for mothers, but not for fathers. However, the results of the Wald test showed that the strength of the relationship was not significantly different for mothers and fathers (χ^2 (1)=2.99, p=.08). At T2, both the associations between child self-reported symptoms and mother symptoms, and between child self-reported symptoms and father symptoms were significant. The Wald test

Table 2 – Mean level of child traumatic stress symptoms (left), and cross-informant agreement (right).

	Child traumatic stress symptoms						Cross-informant agreement								
	Child report		Mother report		Father report		Child–mother			Child–father			Mother–father		
	M	*SD*	*M*	*SD*	*M*	*SD*	ICC	κ	Δ	ICC	κ	Δ	ICC	κ	Δ
Within first month after burn															
Total stress symptoms	65.3	15.9	69.3	19.7	62.5	14.4	.54	.32	4.5*	.40	–	−1.9	.48	–	−7.8**
Intrusion	12.9	4.4	14.6	5.2	13.4	4.1	.46		1.7**	.49		.7	.51		−1.3*
Avoidance	21.1	6.0	21.7	7.2	19.4	5.8	.38		.6	.17		−1.7	.54		−3.3**
Arousal	11.3	3.9	12.1	4.3	10.7	3.2	.50		.7	.30		−.1	.24		−1.1
Other child-specific responses	20.1	5.9	21.0	6.2	19.0	5.3	.56		1.1	.41		−.9	.42		−2.2**
Three months after burn															
Total stress symptoms	57.2	17.8	57.6	17.8	55.2	16.9	.69	.65	.7	.59	.79	−1.8	.75	.66	−1.3
Intrusion	10.9	3.9	11.2	4.4	11.6	4.2	.59		.3	.31		.9	.67		.6
Avoidance	18.9	6.7	18.2	6.6	17.5	6.5	.57		−.6	.41		−1.5	.66		−1.0
Arousal	11.0	4.2	11.3	4.5	10.4	3.9	.55		.3	.46		−.5	.59		−.4
Other child-specific responses	16.4	6.1	16.9	5.6	15.8	5.5	.70		.7	.67		−.7	.72		−.5

Note. ICC=intra-class correlation, κ=Cohen's Kappa coefficient for agreement on clinical relevance of symptoms (dichotomous), Δ=mean difference between reports of two informants (child report subtracted from the parent report, and mother report subtracted from the father report, respectively).

* p<.05.

** p<.01.

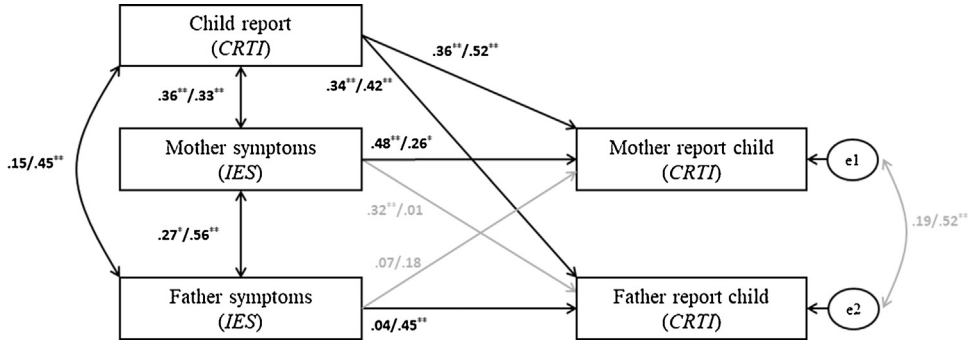

Fig. 1 – Path model representing associations between parent traumatic stress and (parent report of) child traumatic stress. Standardized coefficients are shown, with values for T1 (within first month after burn) on the left and for T2 (three months after burn) on the right. Bold lines represent main associations of interest. CRTI=Children's Responses to Trauma Inventory, IES=Impact of Event Scale.
***p<.05, **p<.01.**

Table 3 – Parameter estimates for the path models.

	Within first month after burn (n=100)					Three months after burn (n=82)				
	B	SE	p_B	CI_B	β	B	SE	p_B	CI_B	β
Child report CRTI										
→ Mother report CRTI	.44	.11	<.001	[.23–.65]	.36	.52	.10	<.001	[.32–.72]	.52
→ Father report CRTI	.31	.11	.004	[.10–.52]	.34	.42	.11	<.001	[.20–.64]	.42
↔ Mother symptoms (IES)	79.06	23.58	.001	[32.85–125.28]	.36	81.00	29.24	.006	[23.70–138.30]	.33
↔ Father symptoms (IES)	27.97	21.09	.190	[−13.36 to 69.31]	.15	89.46	33.53	.008	[23.74–155.19]	.45
Mother symptoms										
→ Mother report CRTI	.66	.12	<.001	[.42–.91]	.48	.32	.13	.015	[.06–.58]	.26
↔ Father symptoms (IES)	44.01	19.59	.025	[5.61–82.41]	.27	89.92	22.41	<.001	[45.99–133.84]	.56
Father symptoms										
→ Father report CRTI	.05	.16	.752	[−.26 to .36]	.04	.69	.18	<.001	[.34–1.03]	.45

Note. CRTI=Children's Responses to Trauma Inventory, IES=Impact of Event Scale. → reflect regression coefficients, ↔ reflect covariance between two constructs. CI=95% confidence interval.

confirmed that this association did not differ in strength for mothers and fathers at T2 (χ^2 (1)=.09, p=.76). For mothers as well as fathers, associations with child self-reported symptoms did not differ between T1 and T2 (Mothers: χ^2 (1)=.20, p=.66; Fathers: χ^2 (1)=3.15, p=.08). The association between mother and father symptoms of traumatic stress was significant at both time points.

Path coefficients indicated that mothers' stress symptoms were independently associated with their reports of child symptoms at both time points. This indicates that mothers experiencing more stress symptoms themselves, observed more symptoms in their child than accounted for by the child's self-report. For fathers, this was only the case at T2. The results of the Wald test showed that these coefficients differed significantly between mothers and fathers at T1, but not at T2 (T1: χ^2 (1)=9.68, p=.002; T2: χ^2 (1)=2.05, p=.15). Also, for fathers, this relationship was stronger at T2 than T1 (χ^2 (1)=10.74, p=.001), while for mothers, the association was stronger at T1 than T2 (χ^2 (1)=4.43, p=.04). Although not an association of main interest, at T1, it was found that fathers reported more stress symptoms in their child in case mothers reported higher stress (p=.002).

An additional multigroup analysis investigated whether the relations in the model between parents and children differed across age groups (<13 years vs. ≥13 years). The results revealed that at both time points the associations between the variables in the model were not different for younger compared to older children (T1: χ^2 (10)=14.49, p=.15; T2: χ^2 (10)=10.91, p=.36); parent and child symptom interrelatedness and the influence of parents' own stress reactions on their report of child symptoms did not depend on child age.

The two models explained 50% of the variance in mother-reported child symptoms at T1 and 59% at T2. For fathers, explained variance was 30% at T1 and 55% at T2.

4. Discussion

This study examined co-occurrence of child, mother, and father traumatic stress reactions after child burn injury. In the same model the potential impact of parents' own stress symptoms on their ratings of child symptoms was examined, while accounting for stress symptoms as reported by the child. The study showed that parent and child traumatic stress reactions were related and that, after having taken into account these associations, parental stress reactions were associated with parents perceiving more stress symptoms in their child.

Depending on the informant of child symptoms, 0-11% of the children were indicated to have traumatic stress symptoms in the clinical range. These rates are in line with findings after child accidental injury [36,37], but low compared to findings after burn injury by Saxe et al. [2], reporting that 31% of the children could be diagnosed with acute stress disorder. Higher mean burn size in the latter sample possibly explains the discrepancy with rates in the present study. Similar to previous studies (e.g., [38]), the present study revealed high occurrence of parental stress symptoms in the clinical range compared to rates in their children, emphasizing the impact pediatric burn injury can have on parents.

The present study indicates that perspectives of mothers, fathers and children on child traumatic stress symptoms differ. Consistent with the study of Kassam-Adams et al. [5], parent–child agreement on presence of stress symptoms in the child was generally low in the first month after the burn event and moderate to good three months after burn. This finding is in line with previous studies [16,39] and suggests that parent and child views on child traumatic stress reactions converge over time. A possible explanation is that all family members initially have to get used to the unfamiliar, stressful and demanding (hospitalization) situation. In this period, physical care for the wounds may dominate, children and parents may need time to recognize child stress reactions and may use different reference situations to judge these reactions. After discharge, old as well as new family routines may characterize daily life, resulting in better opportunities to judge the child's behavior.

Within the first month after burn, mothers in the present study were found to overreport child symptoms relative to the child's report, while this was not found for fathers. This may be explained by a higher prevalence of mothers', compared to fathers', traumatic stress reactions. The findings for mothers contrast two previous studies that found parents to generally underreport child symptoms [16,39]. A potential explanation of these contrasting results is that earlier studies on parent-child agreement have not differentiated between reports of mothers and fathers and have not included information on (potentially different) prevalence rates of mothers' and fathers' own traumatic stress. Findings of the current study imply that reports by mothers and fathers should not be assumed to be interchangeable.

As hypothesized, parental symptoms of traumatic stress were related to child self-rated symptoms, indicating a shared experience of symptoms within the family. Especially mothers' traumatic stress symptoms were associated with child symptoms within the first month after burn, which is in line with findings from a meta-analysis [19], while three months after burn, associations with child symptoms were also found for fathers. Finding no association between paternal and child symptoms shortly after the burn event is consistent with recent findings in young children and their parents [20]. Concurrent associations between child and parent traumatic stress after pediatric (burn) injury have been reported previously [2,36]. The co-occurrence of symptoms within the family that we observed in the longer term fits a relational perspective on PTSD [7]. Although this relational model focuses on trauma reactions in young children and their parents, our study indicated that similar mechanisms may apply to the age group of the current study. Mechanisms explaining co-occurrence of symptoms assumed in the model include dysfunctional parent-child relationship patterns, such as unresponsive, overprotective or reenacting patterns. For example, parents' traumatic stress reactions have been related to more self-reported coaching of avoidant child coping [40]. Alternatively, the association between child and parent symptoms may be explained by a shared genetic vulnerability [41].

After controlling for the co-occurrence of symptoms within the family, the present study also showed that parents with higher stress symptoms themselves perceived more stress in their children independent of the child's own reported stress levels, a finding supported by previous studies [5,6]. This effect was found for mothers at both occasions and for fathers at three months after burn, but not within the first month after burn. However, father reports of child symptoms were related to the mothers' symptoms at this occasion. Overall, our findings indicate that parents with higher stress symptoms are more prone to report elevated stress in their child. Possible explanations are parents with more stress symptoms having difficulty to differentiate their child's reactions from their own [5] or parents' symptoms biasing them to recall more negative information in terms of child problems [42]. In sum, the current findings suggest that parent's own traumatic stress is one of the explaining factors of observed parent-child discrepancies in reports of child symptoms.

The differences between mothers and fathers that were observed for relationships with (parent- and child reported) child traumatic stress may be explained by differential involvement of mothers and fathers in their child's hospital care. Similar to the potential explanation put forward by Haag and Landolt [20], clinical evidence suggests that mothers are generally more often involved in their child's care during hospitalization, for example by being present during child wound care. However, as no data were collected regarding parental involvement during hospitalization and after discharge in the current study, this is a relevant topic to be examined in future studies.

Overall, children below 13 years of age appeared to experience higher levels of traumatic stress than adolescents above 13 years of age. These findings are in line with previous studies reporting more stress symptoms in younger children in the acute aftermath of injury [4,37]. Results of a review suggest that age differences may be most pronounced for immediate symptoms and do not apply to chronic posttraumatic stress [12]. Because the current study did not describe measurements beyond three months after burn, it is unclear whether age differences dissolve by that time. Results further showed that mothers, but not fathers, experienced higher levels of symptoms within the first month after burn when their child was younger. In general, the age differences found support the assumption that the developmental period in which pediatric injury takes place is important to consider when examining psychological responses in families [8,9]. Despite this, the current study found no significant differences between the two age groups in terms of relationships between child and parent symptoms. Also, no age differences were found regarding parents reporting more symptoms in their child when they experienced more symptoms themselves.

Thus, overall, age differences were primarily found in level of child symptoms, while age did not appear to have an effect on associations of posttraumatic stress symptoms within the family.

The findings have to be interpreted in light of the study's limitations. First, with respect to external validity, the results only apply to the first month and three months after burn and do not automatically generalize to later time points. Second, to minimize the burden of the study, no information was obtained from structured diagnostic interviews, which limits generalizations beyond questionnaire scores to clinical diagnosis of PTSD. Moreover, the instrument used to assess parental symptoms only covered two symptom clusters of the updated diagnosis of PTSD. Third, no information on subclinical levels of child stress symptoms could be provided, as appropriate norm data were not available for the CRTI. Fourth, the low rate of clinically relevant child traumatic stress reactions at T2 needs replication in another sample to rule out that the strong parent-child agreement is a chance result. Fifth, because some families were not invited to participate in the study (for example because of severe psychiatric problems in one of the parents) this may have resulted in an underestimation of traumatic stress responses. Finally, non-participation was higher in families of older teenagers, which limits generalizability to this age group.

Results of the present study highlight the co-occurrence of traumatic stress symptoms within families coping with the consequences of child burn injury, while at the same time showing evidence for parents' observation of stress reactions in their child being associated with their own stress reactions. In international guidelines, it is currently recommended to use multiple informants in the assessment of child traumatic stress symptoms. The findings of the present study are in line with these recommendations and emphasize the importance of including the child's self-report when they are capable of providing this. To distinguish between relational influences of traumatic stress in family members and potential overreporting of child traumatic stress by parents who experience stress reactions themselves, professionals should consider the parents' reaction to the injury and include them in a therapeutic plan if wanted and indicated.

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Conflicts of interest

The authors declare there are no conflicts of interest.

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REFERENCES

[1] De Young AC, Kenardy JA, Cobham VE, Kimble R. Prevalence, comorbidity and course of trauma reactions in young burn-injured children. J Child Psychol Psychiatry 2012;53:56–63.
[2] Saxe G, Stoddard F, Chawla N, Lopez CG, Hall E, Sheridan R, et al. Risk factors for acute stress disorder in children with burns. J Trauma Dissociation 2005;6:37–49.
[3] Stoddard FJ, Saxe G, Ronfeldt H, Drake JE, Burns J, Edgren C, et al. Acute stress symptoms in young children with burns. J Am Acad Child Adolesc Psychiatry 2006;45:87–93.
[4] Le Brocque RM, Hendrikz J, Kenardy JA. The course of posttraumatic stress in children: examination of recovery trajectories following traumatic injury. J Pediatr Psychol 2010;35:637–45.
[5] Kassam-Adams N, Garcia-Espana JF, Miller VA, Winston F. Parent-child agreement regarding children's acute stress: the role of parent acute stress reactions. J Am Acad Child Adolesc Psychiatry 2006;45:1485–93.
[6] Smith P, Perrin S, Yule W, Rabe-Hesketh S. War exposure and maternal reactions in the psychological adjustment of children from Bosnia-Hercegovina. J Child Psychol Psychiatry 2001;42:395–404.
[7] Scheeringa MS, Zeanah CH. A relational perspective on PTSD in early childhood. J Trauma Stress 2001;14:799–815.
[8] Kazak AE, Kassam-Adams N, Schneider S, Zelikovsky N, Alderfer MA, Rourke M. An integrative model of pediatric medical traumatic stress. J Pediatr Psychol 2006;31:343–55.
[9] Price J, Kassam-Adams N, Alderfer MA, Christofferson J, Kazak AE. Systematic review: A reevaluation and update of the integrative (trajectory) model of pediatric medical traumatic stress. J Pediatr Psychol 2015;41:86–97.
[10] Landolt MA, Ystrom E, Sennhauser FH, Gnehm HE, Vollrath ME. The mutual prospective influence of child and parental post-traumatic stress symptoms in pediatric patients. J Child Psychol Psychiatry 2012;53:767–74.
[11] Nugent NR, Ostrowski S, Christopher NC, Delahanty DL. Parental posttraumatic stress symptoms as a moderator of child's acute biological response and subsequent posttraumatic stress symptoms in pediatric injury patients. J Pediatr Psychol 2007;32:309–18.
[12] Brosbe MS, Hoefling K, Faust J. Predicting posttraumatic stress following pediatric injury: a systematic review. J Pediatr Psychol 2011;36:718–29.
[13] Ghesquiere A, Fan MY, Berliner L, Rivara FP, Jurkovich GJ, Russo J, et al. Adolescents' and parents' agreement on posttraumatic stress disorder symptoms and functioning after adolescent injury. J Trauma Stress 2008;21:487–91.
[14] Shemesh E, Newcorn JH, Rockmore L, Shneider BL, Emre S, Gelb BD, et al. Comparison of parent and child reports of emotional trauma symptoms in pediatric outpatient settings. Pediatrics 2005;115:e582–9.
[15] Valentino K, Berkowitz S, Stover CS. Parenting behaviors and posttraumatic symptoms in relation to children's symptomatology following a traumatic event. J Trauma Stress 2010;23:403–7.
[16] Meiser-Stedman R, Smith P, Glucksman E, Yule W, Dalgleish T. Parent and child agreement for acute stress disorder, post-traumatic stress disorder and other psychopathology in a prospective study of children and adolescents exposed to single-event trauma. J Abnorm Child Psychol 2007;35:191–201.

[17] Stein MB, Walker JR, Forde DR. Gender differences in susceptibility to posttraumatic stress disorder. Behav Res Ther 2000;38:619–28.
[18] Bakker A, Van der Heijden PG, Van Son MJ, Van Loey NE. Course of traumatic stress reactions in couples after a burn event to their young child. Health Psychol 2013;32:1076–83.
[19] Morris A, Gabert-Quillen C, Delahanty D. The association between parent PTSD/depression symptoms and child PTSD symptoms: a meta-analysis. J Pediatr Psychol 2012;37:1076–88.
[20] Haag A-C, Landolt MA. Young children's acute stress after a burn injury: disentangling the role of injury severity and parental acute stress. J Pediatr Psychol 2017.
[21] Krain AL, Kendall PC. The role of parental emotional distress in parent report of child anxiety. J Clin Child Psychol 2000;29:328–35.
[22] Pan R, Egberts MR, Nascimento LC, Rossi LA, Vandermeulen E, Geenen R, et al. Health-related quality of life in adolescent survivors of burns: agreement on self-reported and mothers' and fathers' perspectives. Burns 2015;41:1107–13.
[23] Egberts MR, van de Schoot R, Boekelaar A, Hendrickx H, Geenen R, Van Loey NE. Child and adolescent internalizing and externalizing problems 12 months postburn: the potential role of preburn functioning, parental posttraumatic stress, and informant bias. Eur Child Adolesc Psychiatry 2016;25:791–803.
[24] Egberts MR, van de Schoot R, Geenen R, Van Loey NE. Parents' posttraumatic stress after burns in their school-aged child: a prospective study. Health Psychol 2017;36:419–28.
[25] Alisic E, Eland J, Huijbregts RAD, Kleber RJ. Children's responses to trauma inventory — revised version. [Schokverwerkingslijst voor Kinderen — herziene versie]. Zaltbommel/Utrecht, the Netherlands: Institute for Psychotrauma in collaboration with Utrecht University and University Medical Center Utrecht; 2006.
[26] Alisic E, Eland J, Huijbregts RAD, Kleber RJ. Manual of the children's responses to trauma inventory — revised version. [Handleiding bij de Schokverwerkingslijst voor Kinderen — herziene versie]. Zaltbommel/Utrecht, the Netherlands: Institute for Psychotrauma in collaboration with Utrecht University and University Medical Center Utrecht; 2011.
[27] Horowitz M, Wilner N, Alvarez W. Impact of event scale: a measure of subjective stress. Psychosom Med 1979;41:209–18.
[28] Sundin EC, Horowitz MJ. Impact of event scale: psychometric properties. Br J Psychiatry 2002;180:205–9.
[29] Brom D, Kleber RJ. De Schok Verwerkings Lijst [The impact of event scale]. Ned Tijdschr Psychol 1985;40:164–8.
[30] Van der Velden P, Van der Burg S, Steinmetz C, Van den Bout J. Slachtoffers van bankovervallen [Victims of bank robberies]. Houten, the Netherlands: Bohn Stafleu Van Loghum; 1992.
[31] Le Brocque RM, Hendrikz J, Kenardy JA. Parental response to child injury: examination of parental posttraumatic stress symptom trajectories following child accidental injury. J Pediatr Psychol 2010;646–55.
[32] Cicchetti DV. Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. Psychol Assess 1994;6:284.
[33] Cohen J. A coefficient of agreement for nominal scales. Educ Psychol Meas 1960;20:37–46.
[34] Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977;33:159–74.
[35] Muthén LK, Muthén BO. Mplus user's guide. 7th ed. Los Angeles, CA: Muthén n; 2012.
[36] Daviss WB, Mooney D, Racusin R, Ford JD, Fleischer A, McHugo GJ. Predicting posttraumatic stress after hospitalization for pediatric injury. J Am Acad Child Adolesc Psychiatry 2000;39:576–83.
[37] Kassam-Adams N, Winston FK. Predicting child PTSD: the relationship between acute stress disorder and PTSD in injured children. J Am Acad Child Adolesc Psychiatry 2004;43:403–11.
[38] Landolt MA, Vollrath M, Ribi K, Gnehm HE, Sennhauser FH. Incidence and associations of parental and child posttraumatic stress symptoms in pediatric patients. J Child Psychol Psychiatry 2003;44:1199–207.
[39] Schreier H, Ladakakos C, Morabito D, Chapman L, Knudson MM. Posttraumatic stress symptoms in children after mild to moderate pediatric trauma: a longitudinal examination of symptom prevalence, correlates, and parent-child symptom reporting. J Trauma 2005;58:353–63.
[40] Kichline T, Kassam-Adams N, Weiss D, Herbers JE, Marsac ML. Parent peri-trauma posttraumatic stress symptoms, appraisals, and coaching of avoidant coping: a multi-method approach. J Child Fam Stud 2017;26:2879–88.
[41] Koenen KC, Nugent NR, Amstadter AB. Gene-environment interaction in posttraumatic stress disorder. Eur Arch Psychiatry Clin Neurosci 2008;258:82–96.
[42] De Los Reyes A, Kazdin AE. Informant discrepancies in the assessment of childhood psychopathology: a critical review, theoretical framework, and recommendations for further study. Psychol Bull 2005;131:483–509.