



# Impact of Parental Acute Psychological Distress on Young Child Pain-Related Behavior Through Differences in Parenting Behavior During Pediatric Burn Wound Care

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## Abstract

Pediatric burn injuries and subsequent wound care can be painful and distressing for children and their parents. This study tested parenting behavior as a mediator for the relationship between parental acute psychological distress and child behavior during burn wound care. Eighty-seven parents of children (1–6-years-old) self-reported accident-related posttraumatic stress symptoms (PTSS), pre-procedural anxiety, general anxiety/depression symptoms, and guilt before the first dressing change. Parent–child behavior was observed during the first dressing change. Mediation analyses identified three indirect effects. Parental PTSS predicted more child distress, mediated through parental distress-promoting behavior. Parental guilt predicted more child distress, mediated through parental distress-promoting behavior. Parental general anxiety/depression symptoms predicted less child coping, mediated through less parental coping-promoting behavior. Parents with accident-related psychological distress have difficulty supporting their child through subsequent medical care. Nature of parental symptomology differentially influenced behavior. Increased acute psychological support for parents may reduce young child procedural pain-related distress.

**Keywords** Accidents and injuries · Pain · Anxiety · Coping · Distress

Parents have been identified as one of the single most important predictors of young child procedural distress (Pillai Riddell, Gennis, Taddio, & Racine, 2016; Pillai Riddell & Racine, 2009; Racine et al., 2016). As young children are reliant on their parents for emotion co-regulation (Ainsworth, Blehar, Waters, & Wall, 1978), it is likely that young children are particularly attentive to their parents' reactions during stressful events such as medical procedures (Brown, De Young, Kimble, & Kenardy, 2018a; Hornik & Gunnar, 1988; van der Kolk, 1987). During pediatric medical procedures, parenting behavior has been found to influence child

behavior and pain intensity (Blount et al., 1989; Chambers, Craig, & Bennett, 2002; Cohen, Manimala, & Blount, 2000; MacLaren Chorney et al., 2009; Manimala, Blount, & Cohen, 2000; Sweet & McGrath, 1998). Specifically, parenting behavior that encourages child coping includes engaging the child in distracting tasks or deep breathing exercises, while parenting behavior that increases child procedural distress includes excessive reassurance, empathy, and giving control to the child (Blount et al., 1997). Procedural distress is generally linked to pain (see von Baeyer & Spagrud, 2007, for a review), and is thought to contribute to long-term consequences such as chronic pain (Kehlet, Jensen, & Woolf, 2006; Perkins, Frederick, & Kehlet, 2000), increased pain sensitivity (Buskila et al., 2003; Taddio, Katz, Ilersich, & Koren, 1997; Weisman, Bernstein, & Schechter, 1998), and anticipatory fear (Pate, Blount, Cohen, & Smith, 1996; Rennick, Johnston, Dougherty, Platt, & Ritchie, 2002). Therefore, minimizing pediatric procedural distress is of benefit, and understanding the role parents play in their child's distress during procedures has significant value.

While much of the research has been conducted in immunization cohorts (i.e., Cohen, Bernard, McClelland,

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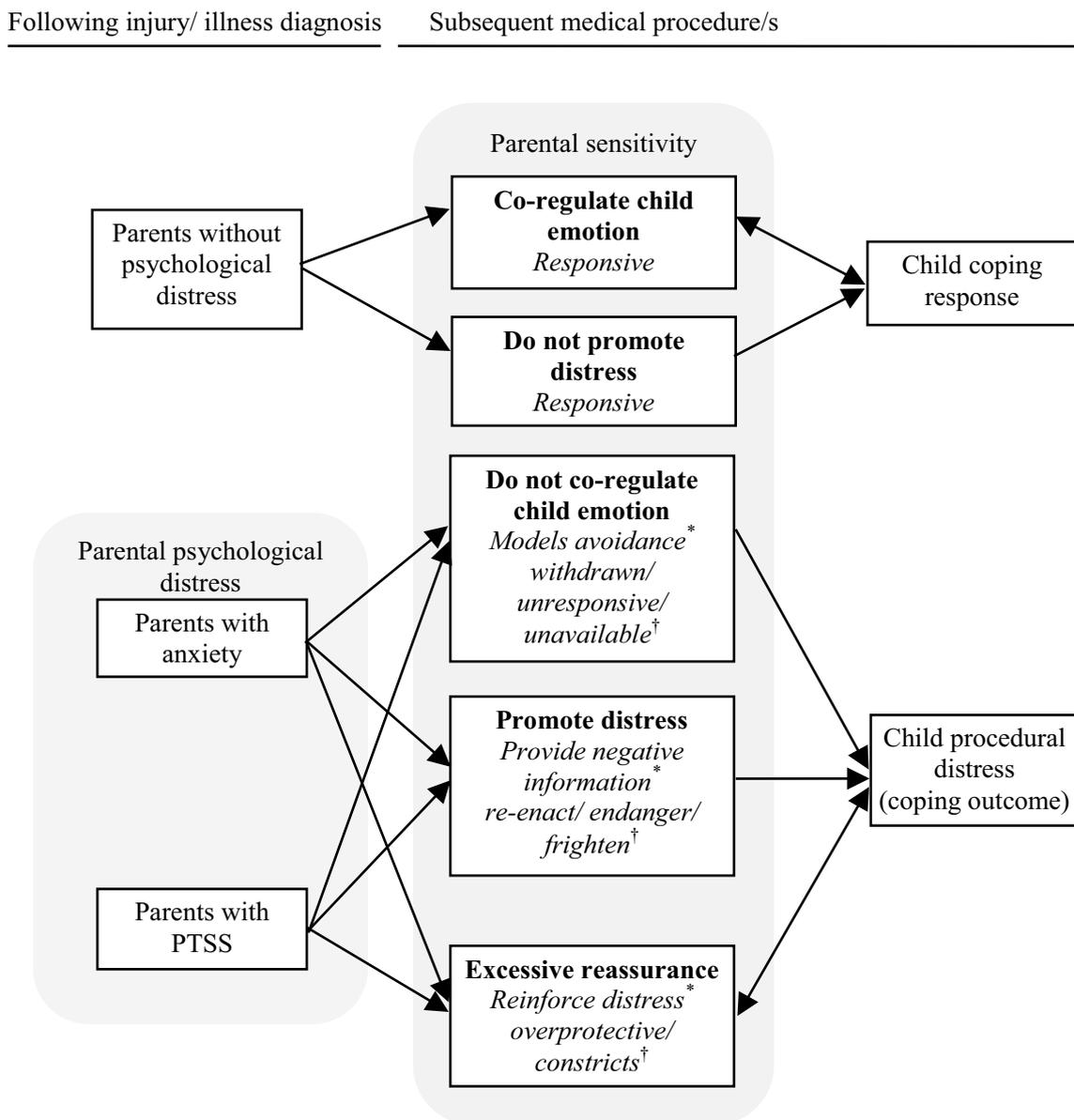
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& MacLaren, 2005), further consideration is needed of the hospitalized medical procedures that children undergo following an injury or illness diagnosis. The onset of a pediatric injury or illness can be highly distressing for the child and the parents. A recent review of the literature identified that in the wake of a child’s injury/illness diagnosis, a proportion of parents report psychological distress, which may affect how they interact with their child during subsequent medical procedures (Brown et al., 2018a). The proposed mechanism is that parents with psychological distress are thought to be less able to respond to their child’s needs (Slade, 2007). Specifically, Brown et al. proposed a conceptual model,

suggesting differences in parental procedural behavior mediated a relationship between parental psychological distress (anxiety, posttraumatic stress) and child procedural distress. The model is presented in Fig. 1.

Research testing the mechanism between parent distress and child distress during medical procedures is limited. One study has investigated the role of parental distress on child behavior during immunizations, mediated through parenting behavior (Bernard, 2001). The authors did not find an effect, although methodological differences compared to the current investigation may have contributed. Firstly, routine immunization is not usually associated with the same



**Fig. 1** Model of parental psychological stress and behaviors as relating to child coping response and outcomes during pediatric medical procedures. \*Parental behaviors previously theorized as pertaining to

parental anxiety. †Parental behaviors previously theorized as pertaining to parental PTSS

level of psychological distress as procedures relating to a child's hospitalized injury or illness. Therefore, the measure of parental distress ["How distressed were you (during the procedure)?"] is a state measure rather than attempting to identify psychological distress (i.e., excessive worrying, avoidance, intrusive thoughts, depressed affect, etc.) stemming from the accident or diagnosis. Secondly, evidence suggests that the impact of parenting behavior on procedural distress does not develop until the child is approximately 1-year-old (Pillai Riddell et al., 2011). Children in the study by Bernard and colleagues were 0–2-years-old; therefore, we would not expect the effect to be present for approximately half of the cohort. Finally, a newer method for mediation analysis has been developed to test indirect effects (Hayes, 2013). This paper attempts to address these limitations and test Brown's model.

Burn wound care is an under-researched area with a high prevalence of procedural pain and psychological distress (Stoddard et al., 2002). Children under 5-years-old are at high risk of sustaining a burn injury (Duke et al., 2011), and subsequently make up the majority (62%) of pediatric burn injury admissions (Stockton, Harvey, & Kimble, 2015). The burn injury and required wound care (debriding and cleaning before redressing the wound) cumulatively contribute to the pain experience (Connor-Ballard, 2009; Weinberg et al., 2000). Providing adequate burn wound care analgesia is difficult due to changes in physiology that increase pain sensitivity (Connor-Ballard, 2009; Sharar et al., 2008), and reduce the effectiveness of pharmacologic intervention (because it is processed more quickly by the metabolism) (Cooper & Pavlin, 1990). Additionally, clinicians are at risk of under-treating child pain during burn wound care because of wariness of medication side-effects (i.e., nausea, respiratory failure, etc.) and potential opioid addiction (Connor-Ballard, 2009; Melzack, 1990). Of further concern, young children are unable to self-report and clinicians can interpret distress behavior as anxiety rather than pain (McGrath & Frager, 1996).

To date no known study has investigated parenting behavior during pediatric burn wound care. Parents prefer to be present during pediatric burn wound care (Egberts, de Jong, Hofland, Geenen, & Van Loey, 2018; Morley, Holman, & Murray, 2017), but concerns have been raised previously regarding the parent's own acute psychological distress inhibiting providing effective support (Stoddard et al., 2002). Following a pediatric burn injury, children and their parents can each have acute psychological distress reactions (Bakker, Maertens, Van Son, & Van Loey, 2013; De Young, Hendrikz, Kenardy, Cobham, & Kimble, 2014; McGarry et al., 2014; McGarry et al., 2013). Up to 50% of parents report clinically significant acute traumatic stress (Bakker, Van Loey, Van der Heijden, & Van Son, 2012), and 6% of parents experience chronic posttraumatic stress symptoms

(PTSS) (De Young et al., 2014). Parents commonly report strong guilt (Bakker, Van Loey, Van Son, & Van der Heijden, 2010), which is likely related to perceived failure to protect their child (during the accident and subsequent treatment), and the constant visual reminder of the wound/scar (Mason, 1993). Up to 23% of parents also report acute general anxiety/depression symptoms (De Young et al., 2014). Parental state anxiety has only been qualitatively assessed in pediatric burn populations (McGarry et al., 2015), but has been found to influence child pain/anxiety in other procedures (Bearden, Feinstein, & Cohen, 2012). When encouraging parents to be present throughout burn wound care, it is important to understand how parental acute psychological distress might influence their child's procedural behavior.

The aim of this study is to test Brown's conceptual model by observing the first burn dressing change for young children (1–6-years-old). Focusing on the first dressing change will isolate the impact of the parent's acute psychological distress relating to the accident itself (rather than the cumulative distress of witnessing the child's dressing change/s). It is hypothesized that parental acute psychological distress (PTSS, pre-procedural anxiety, general anxiety/depression symptoms, and guilt) will indirectly (1) reduce child coping through less parental coping-promoting behavior; and (2) increase child distress through more parental distress-promoting behavior.

## Method

### Setting

The Pegg Leditschke Children's Burn Centre at the Queensland Children's Hospital, Brisbane, Australia, is a tertiary-level pediatric burns center. The center receives approximately 1000 new burn referrals per year. When a child presents to a general practitioner, a different hospital's emergency department, or this hospital's emergency department, the referral center will be contacted prior to application of the initial dressing. The center uses and recommends silver-impregnated dressings that remain in place for approximately 3 days, as supported by the literature (that is, more cost-effective, quickens healing, and reduces pain during dressing changes compared to using daily silver-based ointment dressings) (Gee Kee, Kimble, Cuttle, Khan, & Stockton, 2015; Gee Kee, Stockton, Kimble, Cuttle, & McPhail, 2017). The center requests most children to present at the outpatients' clinic for the first dressing change.

The center does not employ child life therapists or psychologists; therefore, there is no professional support role for minimizing procedural distress. Occupational therapists can step in to provide procedural support for extreme cases. In two cases, volunteer clown doctors were present for part

of the dressing change. There are a small number of toys in each treatment room, although these are not used during the procedure. The center does use the Ditto™ electronic distraction device (Diversiary Therapy Technologies, Queensland, Australia), which a multi-modal preparation and distraction device validated for use with children 4–12-years-old undergoing burn wound care. Pediatric burn centers across the UK, USA, and Australia currently use the Ditto™ device. Additionally, televisions are in each treatment room. The Ditto™ device and television is used at the discretion of the treating nurse (and the Ditto™ was only developmentally appropriate for the older children in the current study). Therefore, as an observational study, a proportion of children were exposed to some coping strategies throughout their treatment. Parents were not given any information regarding what to expect (such as procedural information, expectations, likelihood of immediate surgery, or approximate appointment time) prior to the dressing change.

### Participants and Design

Parents of children aged 1–6 years who presented to the center following an unintentional burn injury were recruited at the first dressing change. In this sample, the first dressing change consisted of the removal of the first dressing (applied on day of injury), debridement and washing of the wound, and the application of a second dressing. Clinically, the first dressing change is considered the most painful burn wound care appointment. It was important to recruit only families about to undergo the first dressing change, because they will not have pre-existing negative expectations that exacerbate procedural distress or a previously developed pattern of behavior during the procedure.

Per standard procedure, all children were given a combination of oral and/or nasal premedication (oxycodone, paracetamol, ibuprofen, midazolam, and/or fentanyl) prior to first dressing change and debridement. The range of premedication was based on the treating nurse's clinical judgement of anticipated pain based on previous photos and descriptions of the wound. Weight-appropriate quantities of the premedication were approved by a doctor. Participants were excluded if (1) the child had a developmental disorder (e.g., autistic spectrum disorder) or; (2) comorbid head injury (Glasgow Coma Scale < 12); (3) the child's injury was suspected to be due to abuse or neglect; (4) the primary caregiver was not present for the child's dressing change; (5) the parent spoke insufficient English for completing questionnaires and verbal coding; or (6) the child was taken to the operating theatre and therefore the dressing was changed under general anesthetic. In cases where both parents were present for the dressing change, one parent self-nominated to take part in the study. All participating parents provided written informed consent. All children were under the age

of 7-years-old and therefore not required to give assent. The University of Queensland Human Research Ethics (approval no. 2015000623) and the Children's Health Queensland Hospital and Health Service Human Research Ethics Committee (approval no. HREC/15/QRCH/27) approved this study.

### Measures

Parents reported sample characteristics and their psychological distress symptoms. The researcher coded parent and child behavior during the dressing change.

### Sample Characteristics

Parents completed a questionnaire regarding family demographic information and the child's medical background. Family sample characteristic information included parent and child genders, ages, ethnic backgrounds, and annual household income. Information regarding the injury and the first dressing change was collected through medical records. These data included injury mechanism, wound depth, percentage of total body surface area burned (%TBSA), number of pharmacological interventions utilized at the first dressing change, and number of days following the injury when the first dressing change occurred. The sample characteristics have been previously reported (Brown, De Young, Kimble, & Kenardy, 2018b).

### Parental Psychological Distress

**Posttraumatic Stress Symptoms** The Primary Care-Post-Traumatic Stress Disorder screen (PC-PTSD; Prins et al., 2003) consists of four items that correspond with the four symptom clusters that underlie the Diagnostic and Statistical Manual for Mental Disorders, 4th Edition (DSM-IV) criteria for PTSD (American Psychiatric Association, 1994). Respondents indicated yes or no about symptoms experienced "since your child's accident." The PC-PTSD has a high test-retest reliability, and good sensitivity and specificity rates with a cut-off score of 3 (Spoont et al., 2013). The PC-PTSD screen has also been analyzed as a symptom count (Jaycox et al., 2009), which the current study used.

**General Anxiety/Depression Symptoms** The Patient Health Questionnaire for Depression and Anxiety-4 (PHQ-4) is a four-item screen for general anxiety/depression symptoms (Kroenke, Spitzer, Williams, & Lowe, 2009). Participants are asked to report the frequency of symptoms during the past 2 weeks, on a 4-point scale from 0 (*not at all*) to 3 (*nearly every day*). Scores can be summed to indicate none (0–2) mild (3–5), moderate (6–8), or severe (9–12) levels of general anxiety/depression symptoms. The PHQ-4 has been

tested for reliability ( $\alpha > .80$ ), construct validity ( $\alpha = .85$ ), and factorial validity (factor loadings  $> .82$ ) (Kroenke et al., 2009). In the current study, this measure was used as a symptom count. Cronbach’s  $\alpha$  was .86 in the present study.

**Pre-procedural Anxiety** The Visual Analogue Scale for Anxiety (VAS-A; Choiniere, Melzack, Rondeau, Girard, & Paquin, 1989) is a single-item measure of pre-procedural anxiety. A continuous line of 10 cm in length is anchored by *no anxiety or fear* on the left and *worst possible anxiety or fear* on the right, and participants are asked to mark where on the line reflects their current level of anxiety. The VAS-A has been validated as an accurate self-report of anxiety in adult populations (Choiniere et al., 1989).

**Guilt** The Global Guilt Scale (GGs; Kubany et al., 1996) is a four-item subscale of the Trauma-Related Guilt Inventory that assesses intensity of guilt feelings. The Trauma-Related Guilt Inventory has high internal consistency, and the subscales have been validated in other traumatized populations through correlations to other guilt, PTSD, and depression measures (Kubany et al., 1996). Participants were asked to respond to the GGS in relation to their child’s accident. In this study, Cronbach’s  $\alpha$  was excellent: .94.

**Behavioral Coding**

The Burns-Child Adult Medical Procedure Interaction Scale (B-CAMPIS) was specifically developed to assess parent–child interactions during pediatric burn wound care

(Brown et al., 2018b). The B-CAMPIS has been validated in young children (1–6-years-old). In summary, the B-CAMPIS was developed from a combination of previously identified observational behavioral schemes (Blount, Bunke, Cohen, & Forbes, 2001; Blount et al., 1997; Caldwell-Andrews, Blount, Mayes, & Kain, 2005; Cohen et al., 2005), informal conversations with medical staff, and observations of a large number of pediatric burn wound care procedures. The B-CAMPIS measures verbal and nonverbal behaviors specific to burns dressing changes. The B-CAMPIS coding scheme was validated using a combination of live coding nonverbal behavior with audio recording to subsequently code verbal behavior. Additionally identified behaviors were included in the measure if they significantly correlated to existing CAMPIS-Revised behaviors. Coded parent and child behaviors are listed in Table 1.

Proportions of child coping and distress behavior, and parental coping-promoting and distress-promoting behavior, are calculated by the total frequency divided by procedure duration (commencement of dressing removal until 2 min after debridement). Further description of the development of the B-CAMPIS has been reported (Brown et al., 2018b). The primary rater coded all dressing changes ( $n = 87$ ), and a secondary rater coded 18 (20%) transcripts, and a further 15 (17%) nonverbal observations to limit coder drift (Brown et al., 2018b). Two raters established inter-coder reliability in a separate sample of 15 [Intraclass correlations (ICCs) ranged .52–1.00]. Reliability was maintained in the main sample, with ratings of agreement for individual codes ranging from good to excellent (average child distress ICC = .89,

**Table 1** B-CAMPIS behaviors for child and parent

Behavior	Child		Parent	
	Coping	Distress	Coping- promoting	Distress-promoting
Verbal	Making a coping statement	Cry Scream	Humor directed to the child	Criticism Verbal reassurance
	Non-procedure related talk by child	Verbal resistance Seek emotional support	Non-procedure related talk to child	Giving child control
	Audible deep breathing	Verbal fear Verbal pain Verbal emotion Information seeking	Command child to engage in coping strategy	Apology Empathy Prompt disclosure of pain Negative evaluation of the wound Threat to remove coping strategy
Nonverbal	Play	Flail	Point to distract	Reassuring contact
	Point to décor	Requires restraint	Distract (play, action example, offer)	Parent cry
	Self-soothing	Aggression		Unengaged distress
	Gaze to parent			
	Gaze to injury			
	Using the Ditto™ device			
Watch television				

average child coping  $ICC = .88$ , average parent distress-promoting  $ICC = .84$ , average parent coping-promoting  $ICC = .89$ , calculations derived from the current sample). Convergent and incremental validity were also established for the B-CAMPIS (Brown et al., 2018b).

## Procedure

A researcher screened potential participants for eligibility and approached them on arrival to the outpatient's clinic to obtain informed consent. Recruitment occurred from September 2015 to June 2016. Of 1864 presentations, 152 families were eligible for recruitment. Fifty families were not approached because the procedure began prior to recruitment, seven families were missed because they were enrolled in a conflicting research project, and one family was considered too distressed to approach. Therefore, 94 families were approached, and 92 families (98%) agreed to participate. Written consent was obtained, and the parent completed the demographic and mental health questionnaires in the waiting room. A researcher observed the dressing change for verbal (audio recorded) and nonverbal behavior (coded live), from commencement of the dressing removal, until approximately 2 min after the wound was debrided (blisters and dead skin removed using gauze) and washed with unless the child left the treatment room earlier. This part of a dressing change is clinically considered to have the greatest potential for distress and/or pain. Depending on the location of the wound, the child was positioned either on a hospital bed or on the parent's lap. Following washing, it is typical procedure to place plastic wrap over the wound for the consultant to assess the wound. After the consultant's assessment, nursing staff will most likely re-dress the wound. Dressing reapplication was not coded because time between debridement and reapplication can vary greatly due to the nature of a busy multidisciplinary clinic. For example, other specialists (occupational therapists, physiotherapists, social workers, researchers, etc.) may also visit the family during the appointment.

## Statistical Analyses

Descriptive statistics were presented using medians and interquartile ranges (IQR) for non-normally distributed behavioral data. Analyses were restricted to parents who completed the questionnaires. The current study limited analyses to models of (a) parental coping-promoting behavior related to child coping behavior, and (b) parental distress-promoting behavior related to child distress behavior. Because these groupings have the strongest associations, this parameter limited Type 1 error. Therefore, eight mediation analyses were conducted, to individually compare the effects of each predictor (parental

PTSS, guilt, general anxiety/depression symptoms, pre-procedural anxiety), on each mediator (parental coping-promoting behavior, distress-promoting behavior), and corresponding outcome (child coping behavior, distress behavior). Analyses were conducted using Model 4 in the PROCESS SPSS macro developed by Hayes (2013). Bias-corrected bootstrapping of 10,000 samples were utilized to estimate the indirect effects. Correlational analyses were undertaken with SPSS 24 for Windows to identify possible sample characteristic covariates for significant mediation models. Potential covariates were individually tested for significant relationships with outcomes at  $p < .05$ . All covariates with significance at below  $p = .05$  were included, and best fit was tested using backwards elimination (Tabachnick, Fidell, & Osterlind, 2001). Power for the mediational analyses was computed using Webpower (Schoemann, Boulton, & Short, 2017; Zhang & Yuan, 2018). For power of .08, a sample size of 66 families was estimated, based on path  $a$  and path  $b$  at .5, and an  $\alpha$  of .05.

## Results

### Sample Characteristics

The final sample consisted of 87 parent–child dyads. Five families were retrospectively excluded according to exclusion criteria (speaking a language other than English during the procedure, burn injury was superficial in depth, and wound mechanism was retrospectively attributed to an infection rather than burn). Children were predominantly male ( $n = 50$ , 57%), Anglo/European ( $n = 60$ , 69%), and had a mean age of 2.95 years old ( $SD = 1.72$ , range 1.00–6.90). Participating parents were predominantly mothers ( $n = 73$ , 84%), Anglo/European ( $n = 60$ , 79%) and had a mean age of 32.37 years old ( $SD = 5.31$ , range 22.00–43.00). The depths of burn injuries were classified as superficial-partial thickness ( $n = 63$ , 72%), deep-partial thickness ( $n = 21$ , 24%) or full thickness ( $n = 3$ , 4%). The %TBSA ranged from 0.5 to 12% ( $M = 1.87\%$ ,  $SD = 2.14\%$ ). Four children (5%) subsequently required grafting and another ten children (11%) subsequently required scar management. Therefore, the sample represents an injury group with relatively minor burn injuries, compared to previous research studies (De Young et al., 2014). Burn mechanism was most commonly scald ( $n = 42$ , 48%) or contact ( $n = 42$ , 48%), then friction ( $n = 2$ , 3%), and sunburn ( $n = 1$ , 1%). All participants were outpatients. The first dressing change occurred an average of 3.24 days following the injury ( $SD = 0.99$ , range 1–6). The observed procedures were an average of 12:28 min:sec ( $SD = 3:33$ , range 5:57–23:25) in duration, and conducted by 1–2 of 9 specialist wound care nurses.

## Preliminary Analyses

Pearson's and Spearman's correlation matrices were generated to identify relationships between parent and child behaviors, and sample characteristic (demographic and injury-related) variables. Child coping behavior was correlated to child age ( $r = .43, p < .001$ ), and parent gender (mothers,  $r_s = -.40, p < .001$ ). Child distress behavior was correlated to parent gender (mothers,  $r_s = .29, p = .006$ ). Parental coping-promoting behavior was correlated to parent ethnicity (Anglo/European,  $r_s = -.31, p = .006$ ), and child ethnicity (Anglo/European,  $r_s = -.37, p = .001$ ). Parental distress-promoting behavior was not correlated to

any sample characteristic variables. There was no difference between nurses and parent behavior or child behavior and therefore was not controlled for in the subsequent analyses.

Descriptive information and the correlation matrix for the variables of interest are presented in Tables 2 and 3, respectively. A minority of missing data was observed in the parental self-reported psychological distress measures. Two participants (2%) had responded to 3 of the 4 items on the PC-PTSD. In these cases, the participant mean was substituted for the fourth item. In addition, a minority of participants did not respond on any of the psychological distress measures: Nine (10%) parents did not respond on the PHQ, 6 (7%) parents did not respond on the VAS-A, 6 (7%)

**Table 2** Means and standard deviations of variables of interest

Variable	<i>N</i>	<i>M</i> ( <i>SD</i> )	Range	Above clinical cut-off, <i>n</i> (%)
<b>Parent</b>				
PTSS	83	0.94 (1.14)	0–4	
No symptoms				41 (49)
1 Symptom				19 (23)
2 Symptoms				12 (14)
3 Symptoms (clinical cut-off)				9 (11)
4 Symptoms				2 (2)
General anxiety/depression symptoms	78	1.44 (2.30)	0–11	
Mild				9 (12)
Moderate				5 (6)
Severe				1 (1)
Pre-procedural anxiety	81	2.58 (2.52)	0–9	
Guilt	81	6.54 (4.24)	0–16	
Coping-promoting behavior <sup>a</sup>	87	1.72 (1.49)	0–7	
Distress-promoting behavior <sup>a</sup>	87	2.32 (2.58)	0–15	
<b>Child</b>				
Coping behavior <sup>a</sup>	87	2.53 (1.87)	0–9	
Distress behavior <sup>a</sup>	87	4.02 (3.98)	0–20	

<sup>a</sup>Proportion of behavior per minute during wound care

**Table 3** Inter-correlations for variables of interest

	1.	2.	3.	4.	5.	6.	7.	8.
<b>Parent</b>								
1. PTSS	–	.57***	.40***	.44***	.24 <sup>^</sup>	–.14	.10	–.25*
2. Guilt		–	.31**	.30**	.22*	–.05	.20 <sup>^</sup>	–.35**
3. General anxiety/depression symptoms			–	.45***	–.05	–.31**	.02	–.14
4. Pre-procedural anxiety				–	–.03	–.20 <sup>^</sup>	.16	–.26*
5. Distress-promoting behavior					–	.15	.46***	–.25*
6. Coping-promoting behavior						–	–.08	.33**
<b>Child</b>								
7. Distress behavior							–	–.50***
8. Coping behavior								–

\*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$ , <sup>^</sup> $p < .1$

parents did not respond on the GGS, and 4 (5%) parents did not respond on the PC-PTSD screen. Missing values analysis revealed no significant differences between rates of parental coping-promoting or distress-promoting behavior and missingness on psychological distress measures. Therefore, the data were likely missing at random, and listwise deletion was employed if more than one item on each measure was

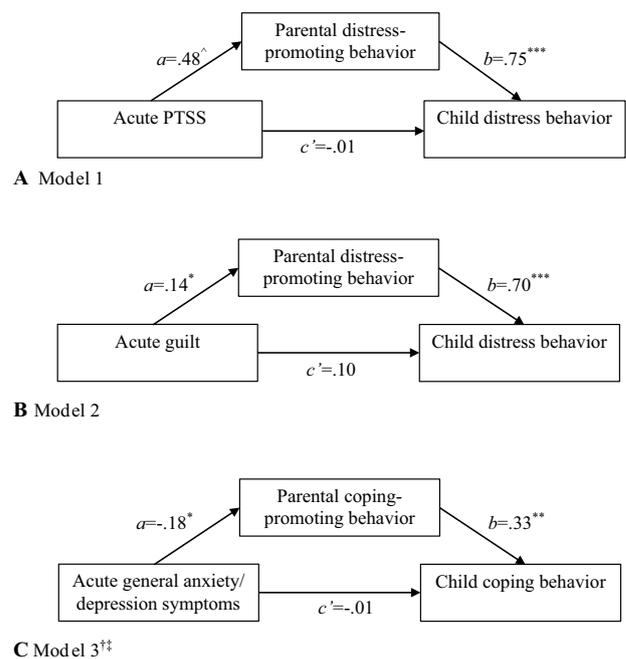
missing. The final sample sizes for each associated mediation analysis are reported in Table 2. Specific behavioral frequencies within the B-CAMPIS categories are reported in Table 4. Frequencies by age group can be found elsewhere (Brown et al., 2018b).

### Mediation analyses

Analyses confirmed three significant mediations. Figure 2 presents the significant models with covariates. In Model 1, child distress behavior was predicted by parental acute PTSS, mediated via parental distress-promoting behavior. In Model 2, child distress behavior was predicted by parental acute guilt, mediated via parental distress-promoting behavior. In Model 3, child coping behavior was predicted by parental acute general anxiety/depression symptoms, mediated via parental coping-promoting behavior. Sample characteristic variables identified in the preliminary analyses were tested as covariates in the significant mediation models. Model fit for Models 1 and 2 were not significantly improved by the inclusion of covariates and therefore not retained in the final models. Model fit for Model 3 was significantly improved with the inclusion of two covariates (child age, parent gender) and was therefore retained in the analyses. Table 5 presents the standardized indirect estimates for all analyses.

**Table 4** Behavioral frequencies and interquartile range

Behavior (N=87)	Median	IQR
<b>Child coping behavior</b>		
Making a coping statement	0	0–0
Non-procedural talk by child	0	0–3
Breathing	0	0–0
Self soothe	0	0–2
Watch television	0	0–1
Gaze to injury	6	1–9
Play	0	0–2
Point	0	0–0
Gaze to parent	1	0–2
Using the Ditto™ device	0	0–0
<b>Child distress behavior</b>		
Cry	10	1–23
Scream	0	0–1
Verbal resistance	0	0–0
Emotional support	0	0–2
Verbal fear	0	0–0
Verbal pain	1	0–4
Verbal emotion	0	0–0
Information seeking	0	0–0
Requires restraint	1	0–3
Flail	1	0–3
Aggression	0	0–0
<b>Parental coping-promoting behavior</b>		
Point to décor	0	0–0
Humor to child	0	0–0
Non-procedural talk to child	4	1–9
Command to engage in coping strategy	2	0–6
Distract (play, action example, offer)	1	1–3
<b>Parental distress-promoting behavior</b>		
Criticism	0	0–0
Verbal reassurance	3	0–8
Giving child control	0	0–0
Apology	0	0–0
Empathy	0	0–1
Reassuring contact	4	1–6
Prompt disclosure of pain	0	0–1
Threat to remove coping strategy	0	0–0
Negative evaluation of the wound	0	0–1
Parent cry	0	0–0
Unengaged distress	0	0–0



**Fig. 2** Significant Mediation models with direct effects. Covariates added to models: †child age, ‡parent gender. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ , ^  $p < .1$

**Table 5** Indirect effect of parental acute psychological distress on child behavior as mediated by parent behavior

Parental acute psychological distress (predictor)	Parenting behavior (mediator)	Child behavior (outcome)	Indirect effect <i>ab</i> ( <i>SE</i> )	Bootstrap 95% CIs lower, upper	Model
PTSS	Distress-promoting	Distress	.36 (.23)	0.01, 0.95*	1
Guilt	Distress-promoting	Distress	.09 (.06)	0.01, 0.26*	2
General anxiety/depression symptoms	Distress-promoting	Distress	– .03 (.08)	– 0.17, 0.15	
Pre-procedural anxiety	Distress-promoting	Distress	– .02 (.06)	– 0.13, 0.12	
PTSS	Coping-promoting	Coping	– .07 (.07)	– 0.26, 0.01	
Guilt	Coping-promoting	Coping	– .01 (.02)	– 0.06, 0.02	
General anxiety/depression symptoms	Coping-promoting	Coping <sup>†,‡</sup>	– .06 (.03)	– 0.14, – 0.02*	3
Pre-procedural anxiety	Coping-promoting	Coping	– .04 (.03)	– 0.13, 0.001	

Confidence intervals have been corrected for bias. Bootstrapping of 10,000 samples has been conducted

Covariates added to models: <sup>†</sup>child age, <sup>‡</sup>parent gender

*SE* standard estimate, *CI* confidence interval

\*Significant mediation

## Discussion

As hypothesized, the relationship between parent and child distress was mediated through parenting behavior. While the literature supports that parents experiencing PTSS/anxiety to respond in a similar fashion, differences emerged. Parental PTSS/guilt was related to more frequent child distress behavior (i.e., crying, flailing) through more frequent distress-promoting behavior (i.e., excessive reassurance, empathy). The effect of PTSS/guilt on parenting behavior has not been researched previously. It is possible that the parent's accident-related guilt, hyper-arousal, and re-experiencing symptoms are activated through re-exposure to their child's distress during the related wound care procedures, and trigger the parent to provide more comfort (excessive reassurance, empathy) as a way to amend for failing to protect their child from the accident. However, their own emotional distress may be implicitly communicated to the child at the same time (i.e., crying, negative evaluation of the wound). As Slade (2007) theorized, it may be that parental psychiatric symptoms impair the parent's ability perceive and accurately interpret their child's signals, and respond appropriately (Ainsworth et al., 1978).

In comparison, parental experience of general anxiety/depression but not state anxiety was related to less frequent child coping behavior (i.e., playing, non-procedural talk) through less frequent coping-promoting behavior (i.e., distraction). Reductions in positive parenting behavior have been found previously (Lovejoy, Graczyk, O'Hare, & Neuman, 2000), although not consistently (Hudson & Rapee, 2001; Lovejoy et al., 2000). Further research is required to replicate and investigate why a child's burn dressing change prompted this particular parenting behavior. Interestingly, parental pre-procedural anxiety trended but did not

significantly reduce child coping behavior through reduced coping-promoting behavior. Null effects of parental state anxiety have been found previously (Dahlquist, Power, Cox, & Fernbach, 1994; Frank, Blount, Smith, Manimala, & Martin, 1995), although this is in contrast to the wider literature (Bearden et al., 2012; Bernard & Cohen, 2006; Jacobsen et al., 1990; Jay, Ozolins, Elliott, & Caldwell, 1983). A key difference between research designs may be that our study limited data collection to observing the *first* dressing change. A recent study found procedural distress predicted later procedural coping through parental worry (Campbell, DiLorenzo, Atkinson, & Pillai Riddell, 2017), indicating that parents can learn anticipatory procedural anxiety. In the current study, it is possible parents did not know what to expect, and therefore pre-procedural anxiety did not drive behavior during this dressing change. An updated version of Brown's model pertaining to burn wound care is presented in Fig. 3.

This study possesses a number of strengths. The research tested a theoretical model and was the first to investigate the effect of parental acute psychological distress and parenting behavior on child behavior during burn wound care. The study took a unique trauma-focused approach by assessing the influence of parental psychological distress from the burn injury, on the child's behavior during the first burn dressing change. Moreover, the study sampled young children including 1–2-year-olds who are typically omitted from research because they are preverbal (Blount et al., 1997), yet are recognized as being at greatest risk for both burn injury (Stockton et al., 2015) and procedural distress (Young, 2005). Previous research has validated the use of the B-CAMPIS as representative of child procedural pain/anxiety during burn wound care using parent- and nurse-reports (Brown et al., 2018b). Therefore, associations can be



explicit encouragement for parents to use distraction techniques to support their child would be valuable.

It is a limitation that child traumatic stress was not analyzed, as it is indicated by behavioral changes after a trauma (Scheeringa & Haslett, 2010), and the re-exposure to the burn pain is likely to contribute to behavioral distress during dressing changes. In addition, the current analysis did not take into account behavior of additional present family members or healthcare professionals. Healthcare professional behavior mirrors parent behavior (Cohen et al., 2005), although it is not as influential as parent behavior for predicting child distress (Racine et al., 2016). It must also be noted that the models produced small effects. Small effects indicate that there are other factors that may be impacting child behavior, such as injury severity or adequacy of pharmacological intervention. Finally, parent and child behavior was not sequentially analyzed to provide evidence of directional influence. While parent and child behavior is likely bidirectional in nature (Brown et al., 2018), it is important to note that identifying the unique influence of parental psychological distress gives some evidence of direction from parent to child, rather than child to parent. That is, an alternative mediation model of parental psychological distress influencing parental behavior through changes in child behavior is not logical. Further research may consider the impact of parental psychological distress on the sequential nature of parent–child behavior.

The results of this study provide directions for future research. Findings should be replicated, ideally at an alternate site, in order to further understand the interactions between psychological distress and behavior in this population. Research should consider the potential long-term consequences of parental acute psychological distress and procedural behavior on a child's recovery following a burn injury. The current findings indicate an early targeted intervention to address parental acute psychological distress and parenting behavior can be of benefit to reduce child procedural distress during burn wound care. Supporting parents with additional psychological and behavioral instruction may reduce the likelihood of burn wound care becoming additional traumatic events for the children and their parents. Research has not attempted to coach parenting behavior during young child burn wound care before. Future research will need to evaluate the effect of a targeted intervention on pediatric procedural distress during burn wound care.

The results of the study have direct application for pediatric burn centers. In general, the study demonstrates the potential value of involving parents in pediatric wound care for managing child distress. However, the study does indicate that parents who are distressed will require additional support for their presence to be beneficial. Guidelines for pediatric burn wound care recommend parents be present (European Burns Association, 2017; National Health

Service England, 2013), and research indicates parents prefer to be present (Egberts et al. 2018). Therefore, the authors suggest that it is important to consider how to best equip parents, especially those showing signs of distress, so that they can use positive coping strategies to support their child during wound care. Another application is that clinicians can be aware that even parents presenting for a “small” burn can potentially have quite strong acute distress reactions. When a parent does display distress, clinicians can be sensitive to them (i.e., normalize their reactions), as well as prompt the parent to engage in coping-promoting behaviors, as appropriate.

In summary, this study is the first to test the relationship between parental acute psychological distress and young child behavior during the first burn dressing change. Findings indicate psychological distress in parents reduces child coping and increases child distress, through negative differences in parenting behavior.

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## Compliance with Ethical Standards

**Conflict of interest** The authors Erin A. Brown, Alexandra De Young, Roy Kimble, and Justin Kenardy declare that they have no conflict of interest.

**Human and Animal Rights and Informed Consent** All procedures were in accordance with the ethical standards of the institutional research committees and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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