



Prediction of parental posttraumatic stress, anxiety and depression after a child's critical hospitalization[☆]

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ABSTRACT

Objective: To study the role of parental resilience, emotions accessed during admission and perceived stress in predicting the degree of parental posttraumatic stress disorder (PTSD), anxiety and depression symptoms after a child's treatment in intensive care.

Methods: This was prospective longitudinal cohort study. A total of 196 parents of pediatric intensive care survivors completed questionnaires assessing resilience, perceived stress, emotions experienced during admission, 48 h post-discharge (T0). Sociodemographic and medical data were also collected. Main outcomes were anxiety, depression and PTSD, three (T1) and six (T2) months later.

Results: At T2, 23% of parents reported clinically significant levels of symptoms of PTSD, 21% reported moderate-severe anxiety, and 9% reported moderate-severe depression. These rates were not statistically different to rates at T1. Path analyses indicated that 47% of the variance in psychopathology symptoms at T2 could be predicted from the variables assessed at T0. Resilience was a strong negative predictor of psychopathology symptoms, but this effect was mostly indirect, mediated by the stress that parents perceive during their child's critical hospitalization.

Conclusions: Mobilizing coping in order to maintain resilience and to decrease their perceived stress levels could improve parents' mental health outcomes following their child's intensive care treatment.

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1. Introduction

In keeping with the principles of family-centered care, it is acknowledged that multidisciplinary teams in intensive care units should include attention to the needs of parents and caretakers [1,2]. Having a child admitted to a pediatric intensive care unit (PICU) is an extremely difficult experience for parents, as these children are, by definition, at increased risk of death. Research examining the psychological impact of having a child on PICU have found that psychopathological reactions are common, with rates of posttraumatic stress disorder (PTSD) around 20–30%, rates of anxiety around 20% and rates of depression around 15% [3–8]. This impairment in parental mental health can have devastating consequences for family structure and functioning, and patient and sibling quality of life [9], which underlines the importance of finding ways to prevent and treat psychopathology symptoms in this population.

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However, as Bronner et al. [4] have pointed out, although many parents experience psychopathological reactions, most of them do not; the majority of parents are resilient and recover without any significant stress symptoms in the long term. As not every individual who is exposed to this potentially traumatic event will develop significant distress, it is important to identify associated risk and protective factors at the time of the child's admission [5].

The main objective of this study was to develop a comprehensive predictive model of parental psychopathology symptoms after a child's PICU admission, from psychological variables assessed at the time of child's discharge. It was hoped that such a model would facilitate the detection of high-risk parents and also potentially suggest elements that might usefully be included in early preventive psychological interventions in the future.

Fig. 1 shows the model that summarizes our main hypotheses. On the basis of relevant findings in the literature, the main study hypotheses were that, as has been found in the parents of children with cancer [9] parental resilience would be associated with lower levels of subsequent psychopathology symptoms. Resilience is defined as positive adaptation or recovery despite experiences of significant adversity [10], and it can be measured as one's perceived ability to cope with stress [11]. As Fig. 1 shows, the relation between resilience and

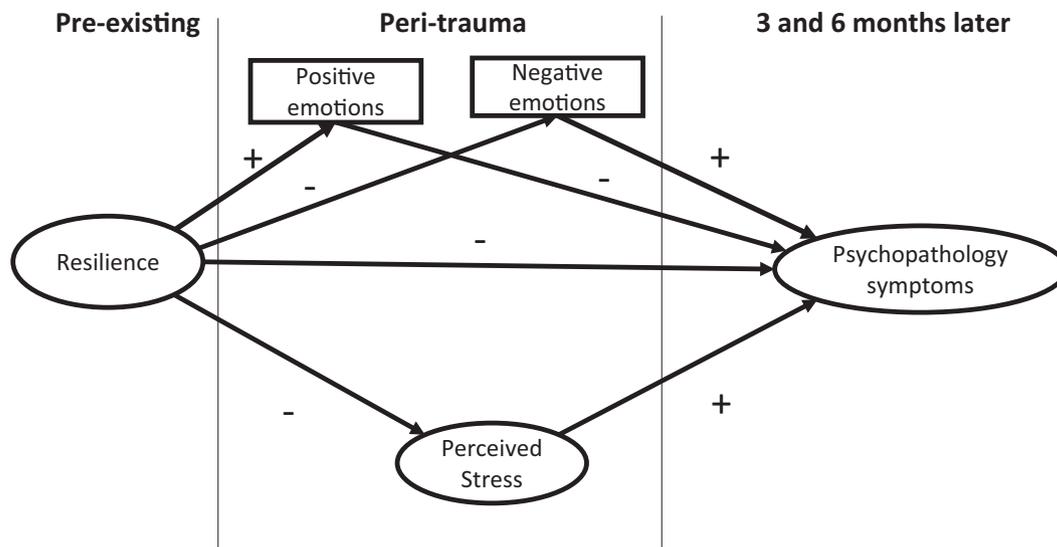


Fig. 1. Hypothesized predictive model of psychopathology symptoms from resilience, perceived stress, positive emotions and negative emotions.

psychopathology was expected to be mediated through the experience of more positive emotions [12] and fewer negative emotions [13] in the peri-trauma period, and lower perceived stress during the admission [6,14]. As for positive emotions, a prospective study conducted on college students by Fredrickson et al. [12], showed that experiencing positive emotions in the aftermath of a traumatic experience (the 9/11 terrorist attacks) fully mediated the relation between pre-event ego resilience, and post-event psychopathology. Additionally, parents with higher resilience use more adaptive coping strategies, such as positive thinking or task-oriented coping [15–17], which is associated to more positive emotions [18], and also with less negative emotions and perceived stress [19]. With regards to the direct effect of perceived stress in psychopathology symptoms, it has been found that acute stress disorder is the best predictor of PTSD in parents of critically ill children [3], thus we expect a positive relation between these variables.

Finally, the contribution of sociodemographic and medical variables (such as parents' age or gender, or child's illness severity) some of which have been shown to be associated with parental adaptation after having a child admitted to a PICU [13,20], was also examined. Unexpected admission [3,7] or subsequent hospital admissions in the time of the following-up have been found associated to higher distress [3]. Additionally, previous studies found that parents belonging to ethnic minorities, and unemployed parents reported higher distress [3,5]. Also, most of literature agrees that mothers report higher distress than fathers [4,5,8]. These variables are not included in the model presented in Fig. 1, but their association to parental psychopathology symptoms will be studied through correlations or mean comparisons.

2. Method

2.1. Participants and procedures

Participants were parents whose child had been recently discharged from a 16-bed PICU, located in a tertiary hospital in Spain. Ethical permission for this prospective longitudinal cohort study was granted by the ethics committee. Exclusion criteria were being admitted for less than 12 h and not speaking Spanish well enough to complete the questionnaires. All parents of consecutive admitted children meeting inclusion criteria were asked for participation in the study. Parents were asked to complete questionnaires at three time-points: within 48 h of the child's discharge from PICU (T0), three months after discharge (T1) and six months after discharge (T2). At T0 parents were asked how they would prefer to be re-contacted (email or post). If the

follow-up questionnaires were not returned after a second mailing or letter, they were given the opportunity either to complete them over the telephone or in person at a time when the child was being reviewed in the outpatient clinic.

In total 273 parents who met the inclusion criteria were approached. Of these, 196 (71.79%) parents of 130 children gave their consent and completed baseline measures (T0). No differences were found between participants and non-participants regarding age or sex of the child, length of the admission, or illness severity score at the time of admission (Supplementary Table 1). At T1 and T2, 158 parents (81%) and 143 parents (73%) respectively, completed the outcome questionnaires. Parents were more likely to complete the full study if they had higher education levels ($p = 0.003$), were of Spanish nationality ($p = 0.006$), reported higher resilience ($p = 0.011$), less perceived stress ($p = 0.021$) or less negative emotions ($p = 0.037$) (Supplementary Table 2).

Most parents who dropped out of the study between T0 and T1 did not give a reason ($N = 25$). Of the remainder, 8 parents decided they did not want to continue, in 4 cases the child died and in one case the mother died. No reasons were given by parents who dropped out of the study between T1 and T2, ($N = 15$). Table 1 shows the sample characteristics of the participants with complete data at all three study timepoints and their children.

2.2. Baseline measures

2.2.1. Demographic questionnaire

Included sex, age, marital status, ethnicity (born in Spain vs. outside Spain), employment status, education level, reported economic difficulties, and whether the parent lived in a different city from where the PICU is located.

2.2.2. Medical variables during the PICU admission

Medical variables during the PICU admission were obtained from patient records and included length of stay, whether the child had been mechanically ventilated, and illness severity as measured by the Pediatric Index of Mortality 2 (PIM2; [21]).

2.2.3. Parental perceived severity of the child's condition

Parents were asked two questions: 1) *How severe did you think your child's condition was during the PICU's admission?* (0 = not serious to 7 = extremely serious), and 2) *Did you think that your child could die at any point in their admission?* (Yes/No).

Table 1
Socio-demographic and medical characteristics for children and parents.

Child (n = 99)	Mean (SD) or n/%	Parent (n = 143)	Mean (SD) or n/%
Socio-demographic data		Socio-demographic data	
Age (months)	59.56 (61.77)	Age (years)	38.24 (6.31)
Male	59/59.6	Male	52/36.4
Female	40/40.4	Female	91/63.6
Medical data		Spanish nationality	134/93.7
Illness severity (PIM2)	5.69 (9.44)	Single	9/6.3
Diagnosis		With a partner	126/88.1
Heart disease	29/29.3	Divorced	8/5.6
Oncological disease	18/18.2	Economic difficulty	2.4 (2.4)
Respiratory condition	8/8.08	Currently employed	98/68.5
Others	44/44.44	Primary education	22/15.4
Reasons for PICU admission		Secondary education	68/47.6
Recovery after planned surgery	68/68.7	University education	53/37.1
Emergency medical treatment	15/15.2	Outside hospital city	53/37.1
Relapse of a chronic disease	4/4	Medical data	
Accidental injury/emergency surgery	12/12.1	Prev. psychological/psychiatric treatment	26/18.2
Healthy prior to admission	26/26.3		
Length of admission (days)	11.23 (13.89)		
Mechanical ventilation	62/62.6		
Unexpected admission	23/23.2		
Previous PICU admissions	43/43.4		
Readmitted to PICU	12/12.1		

Note. PICU = Pediatric Intensive Care Unit. PIM = Pediatric Index of Mortality.

2.2.4. Brief Resilience Scale (BRS; 11)

This is a 6-item self-report scale with a 5-point Likert response scale which assesses a person's self-report of their resilience, defined as the ability to recover from stress. The scores may range from 0 to 30, with higher scores indicating higher resilience. It has shown adequate internal consistency ($\alpha = 0.80$ – 0.90) and test-retest reliability ($r = 0.62$ – 0.69) and has been recommended on the basis of its psychometric properties [22]. The Spanish BRS [23] showed adequate internal consistency ($\alpha = 0.83$) and test-retest reliability ($ICC = 0.69$).

2.2.5. Perceived Stress Scale (PSS; [24])

This is a 14-item questionnaire with a 5-point response scale to evaluate the current level of stress experienced by the subject. Scores may range from 12 to 70, with higher scores indicating higher stress. It has shown adequate internal consistency ($\alpha > 0.70$ in 11 of 12 studies) and test-retest reliability ($r = 0.73$ – 0.85) [25] as well as the Spanish translation ($\alpha = 0.81$, $r = 0.73$) [26].

2.2.6. Modified Differential Emotions Scale (mDES; 12)

The mDES measures the degree to which people report using positive and negative emotions in relation to coping with a particular situation. Includes two 10-item subscales, one assessing positive emotions (amusement, wonder, gratitude, hope, inspiration, interest, happiness, love, proudness, quietness) and the other assessing negative emotions (anger, shame, contempt, disgust, guilt, hate, sadness, fear, stress, embarrassment). In the present study respondents were asked about the frequency of their experience of each emotion during their child's hospitalization in the PICU (0 = "not at all" to 4 = "extremely"). The scores on each subscale range from 0 to 40, with higher scores indicating greater frequency of positive or negative emotions. These scales yielded high

internal consistency, ($\alpha = 0.82$ – 0.94) [27]. We used the Spanish version by Páez, Bobowik, Carrera, and Bosco [28].

2.3. Outcome measures

2.3.1. Davidson Trauma Scale (DTS; [29])

The DTS is a 17-item self-report measure that assesses the 17 DSM-IV symptoms of PTSD included under criteria B: re-experiencing; C: avoidance/numbing and D: hyperarousal. It yields a total score ranging from 0 to 136. A cut-off of 40 is recommended for classification of those with PTSD, with a diagnostic accuracy of 83%. It has adequate internal consistency ($\alpha = 0.97$) and concurrent, convergent and discriminant validity [30]. The Spanish version demonstrated adequate internal consistency ($\alpha = 0.90$) and test-retest reliability ($ICC = 0.87$) [31].

2.3.2. Hospital Anxiety and Depression Scale (HADS; [32])

The HADS is a 14-item, self-report scale including two 7-item Likert subscales, one for anxiety and one for depression. Scores for each subscale range from 0 to 21, with a score of ≥ 11 considered to indicate moderate-severe case status. A literature review [33] reported a mean Cronbach's alpha of 0.83 for anxiety and 0.82 for depression. The Spanish version [34] has shown adequate internal consistency ($\alpha = 0.86$) and concurrent validity.

2.4. Statistical analyses

Descriptive statistics were used to report the degree of perceived stress, resilience, positive/negative emotions and perceived severity of the child's illness at T0, and to establish the prevalence of PTSD, anxiety, and depression at T1 and T2. Additionally, ANOVAs and Pearson correlations were used to examine the associations between socio-demographic and medical variables, with parental outcomes. Finally, path analyses with latent variables (PALV) were conducted to assess the combined effect of resilience, emotions and perceived stress on parental outcomes. Two different models were run, one for each time-point (T1 and T2). In order to assess model fit, absolute fit indexes - χ^2 , χ^2/df , Goodness of Fit Index (GFI)-, relative fit indexes -Incremental Fit Index (IFI)- and non-centrality fit indexes -Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR)- were used, as well as criteria for acceptance or rejection described by Hair, Black, Babin, Anderson, & Tathan [35] (ratio $\chi^2/df < 5$; SRMR < 0.08 ; RMSEA < 0.08 ; GFI, CFI and IFI > 0.90).

3. Results

3.1. Baseline psychological measures

The mean for perceived stress was 23.65 ($SD = 8.65$). Regarding resilience, the mean was 19.28 ($SD = 4.91$). Overall, parents reported experiencing positive emotions, such as gratitude ($M = 23.63$; $SD = 6.88$) significantly more often than negative ones such as guilt ($M = 9.88$; $SD = 6.14$) during admission ($t = 15.74$; $p < 0.001$). Although the objective probability of the risk of death (PIM2) was 6%, 37 parents (26%) believed their child could die during admission.

3.2. Associations between socio-demographic/medical variables and psychological variables at T0

As for the associations between demographic and medical variables and the psychological variables assessed at T0 there were no differences between mothers and fathers, but single parents reported more perceived stress. Parents who lived out of the hospital city reported lower perceived stress and negative emotions. Parents whose child was unexpectedly admitted reported more negative emotions. Economic difficulties were associated with lower resilience and higher perceived stress,

while education level was associated with higher resilience. The correlation between the child's PIM2 score and the parent's subjective rating of the severity of their condition was 0.36 ($p < 0.001$) but was not associated with any of the other psychological variables. Length of admission and younger age of parent and child were related to greater experience of negative emotions (Supplementary Table 3).

3.3. Psychological outcomes at three and six months

- a) *PTSD– Prevalence and evolution.* The sample average score on the DTS fell from 25.61 at T1 to 24.93 at T2 but this difference was not statistically significant ($t = 0.48, p = 0.63$). The same proportion of parents, 33/143 (23%), scored above the cut-off (≥ 40) at both timepoints but there were 10 examples of parents who had scored below the clinical range at T1 who later scored above cut-off, and also 10 examples of parents who did score over the cut-off at T1 but not at T2.
- b) *Anxiety– Prevalence and evolution.* The average score on anxiety was 7.77 ($SD = 3.86$) at T1 and 7.22 ($SD = 4.26$) at T2 ($t = 1.68; p = 0.094$). At both timepoints, 30/143 (41%) parents reported moderate-severe anxiety.
- c) *Depression – Prevalence and evolution.* The average score on depression at T1 was 4.50 ($SD = 3.61$) and at T2 it was 4.52 ($SD = 4.05$) ($t = -0.227; p = 0.828$). The number of parents reporting

moderate-severe depression rose from 10 (7%) ($N = 10$) at T1 to 13 (9%) at T2 but this was not a statistically significant difference ($p = 0.368$).

Finally, we calculated the correlations between PTSD symptoms, anxiety symptoms and depression symptoms at T1 and T2. We found that the correlation between depression and anxiety was 0.70 at T1 and 0.84 at T2; the correlation between PTSD and anxiety was 0.67 at both timepoints, and finally the correlation between PTSD and depression was 0.59 at T1 and 0.68 at T2 ($p < 0.001$ for all correlations).

3.4. Associations between socio-demographic/medical variables and psychological outcomes

Table 2 shows the associations between socio-demographic/medical variables and psychological outcomes. Single parents experienced more anxiety at T1 and more PTSD at T1 and T2. Unemployed parents reported more depression at T1. Parents who lived out of the hospital city reported the lowest depression at T1 and the lowest anxiety at T2. Economic difficulties were related to higher PTSD, anxiety and depression at T1 and T2. Higher education level was related to lower anxiety and depression at T1, and to lower PTSD and depression at T2. Parents who have been in prior psychological/psychiatric treatment reported

Table 2
Associations between socio-demographic/medical variables and main psychological outcomes at 3 months (T1) and 6 months (T2).

	RESULTS FOR T1			RESULTS FOR T2		
	PTSD	Anxiety	Depression	PTSD	Anxiety	Depression
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
ANOVAs for categorical variables						
Men	17.93 (17.27)	6.91 (3.65)	3.70 (2.94)	16.48 (19.53)	6.07 (3.35)	3.70 (3.17)
Women	22.68 (22.80)	7.18 (4.01)	3.84 (3.54)	22.57 (23.50)	7.32 (4.86)	4.39 (4.46)
Married	23.62 (23.81)**	7.44 (3.72)*	4.25 (3.55)	22.78 (24.35)**	7.04 (4.19)	4.44 (4.09)
Single/divorced	40.35 (27.74)	9.71 (4.97)	6.00 (4.41)	40.88 (30.92)	8.59 (4.62)	5.35 (3.76)
Employed	23.26 (23.54)	7.33 (3.67)	3.97 (3.14)*	29.51 (28.48)	7.40 (4.29)	5.31 (4.95)
Unemployed	30.73 (26.92)	8.53 (4.40)	5.53 (4.54)	22.83 (29.30)	7.14 (4.26)	4.16 (3.53)
Living in the hospital city	26.47 (25.47)	8.18 (4.17)	5.02 (3.80)*	24.93 (24.87)	7.79 (4.39)*	4.86 (3.82)
Living in another city	24.15 (23.80)	6.91 (3.39)	3.51 (3.33)	24.92 (27.49)	6.26 (3.87)	3.96 (3.39)
Spanish	25.16 (24.78)	7.58 (3.92)	4.29 (3.47)*	32.67 (29.84)	8.00 (4.00)	6.11 (4.26)
Non-Spanish	32.33 (25.64)	9.56 (4.00)	7.00 (5.87)	24.41 (25.52)	7.17 (4.28)	4.42 (4.03)
Intubated	26.16 (24.62)	7.84 (3.92)	4.35 (3.67)	26.04 (29.30)	7.96 (4.81)	5.08 (4.62)
Not intubated	24.63 (25.33)	7.49 (4.00)	4.65 (3.76)	24.30 (23.68)	6.80 (3.87)	4.21 (3.67)
Elective admission	24.84 (26.11)	7.46 (3.82)	4.38(3.74)	29.81 (23.73)	7.84 (4.20)	4.45 (3.26)
Unexpected admission	28.39 (19.48)	8.58 (4.30)	4.74(3.55)	23.58 (26.75)	7.05 (4.28)	4.54 (4.26)
On previous psych. treatment	42.08 (35.49)**	9.69 (4.76)**	5.58 (3.79)	37.08 (30.65)**	9.19 (4.47)**	5.65 (3.33)
Not on previous psych. treat.	21.95 (20.18)	7.26 (3.61)	4.21 (3.64)	22.23 (23.88)	6.79 (4.10)	4.27 (4.16)
Healthy child prior to admission	26.70 (22.89)	7.64 (4.13)	4.48 (3.95)	23.93 (22.77)	7.38 (4.11)	4.37 (3.77)
Not healthy prior to admission	25.18 (25.60)	7.88(0.346)	4.43 (2.97)	25.32 (26.95)	7.17 (4.33)	4.58 (4.17)
First time in PICU	22.23 (19.57)	7.56 (4.09)	4.21 (3.35)	19.94 (20.86)**	7.06 (4.67)	4.14 (3.85)
Not first time in PICU	30.15 (30.04)	7.90 (3.76)	4.80 (4.11)	31.64 (30.09)	7.44 (3.65)	5.03 (4.28)
Readmitted to PICU	21.38 (16.60)	7.53 (4.89)	4.00 (4.67)	20.23 (21.63)	5.88 (4.01)	3.88 (4.30)
Not readmitted to PICU	26.06 (25.49)	7.72 (3.83)	4.51 (3.60)	25.56 (26.29)	7.40 (4.27)	4.61 (4.03)
Believe child could die	23.73 (25.37)	7.56 (3.80)	4.34 (3.62)	23.91 (25.76)	7.31 (4.21)	4.61 (4.14)
Not believe child could die	30.97 (22.56)	8.08 (4.35)	4.81 (3.91)	27.84 (25.93)	6.97 (4.44)	4.27 (3.79)
Correlations for continuous variables						
Age parent	-0.112	-0.078	-0.106	-0.116	-0.080	-0.045
Age child	0.182*	0.103	0.053	0.129	0.092	0.097
Reported economic difficulty	0.249*	0.303**	0.307**	0.344**	0.267**	0.397**
Education level	-0.118	-0.193*	-0.191*	-0.189*	-0.129	-0.269**
Objective severity (PIM2)	-0.017	0.020	0.014	-0.050	-0.091	-0.084
Perceived severity (0 to 7)	0.205*	0.125	0.095	0.151	-0.055	-0.081
Length of admission	0.051	0.210*	0.072	-0.019	0.053	0.016

Note. PICU = Pediatric Intensive Care Unit. PTSD = Posttraumatic Stress Disorder. Significant associations are indicated in bold. Gender comparisons were restricted to those parents where both mother and father supplied data ($N = 88$).

* $p \leq 0.05$.

** $p \leq 0.01$.

higher PTSD and anxiety at T1 and T2. Also, those whose child had been previously admitted to the PICU reported higher PTSD at T2. Mechanical ventilation, unexpected admission, previous child's health status, child's mortality risk (PIM2) and the occurrence of readmissions did not appear to influence parental outcomes. Parental perceived severity was only related to higher PTSD risk in at T1. The length of the admission only correlated with anxiety at T1.

3.5. Predictive model of PTSD, anxiety and depression

As correlations between the three outcomes measures were high, we decided to test two models (T1 and T2) with a single combined variable, labeled "psychopathology symptoms". The upper part of Fig. 2 shows the standardized estimates and the squared multiple correlations for the predictive model at T2. As this figure shows, 47% of the total variance in psychopathology symptoms is predicted by the baseline psychological variables. The fit statistics showed that the model is well adjusted. Chi-square statistic was significant ($p < 0.001$), probably due to the sample size [35], but the ratio $\chi^2/df (= 1.87 < 5)$ and the remaining adjustment indexes (GFI = 0.945; IFI = 0.967; CFI = 0.967 all of them > 0.90 ; RMSEA = 0.079 and SRMR = 0.044 both < 0.08) were within acceptable limits.

Most of the relationships found were consistent with the study hypotheses. Resilience was significantly and negatively related to negative emotions and perceived stress, and positively related to positive emotions. The positive relation between perceived stress and psychopathology symptoms was also significant and strong, while the relation between positive emotions and psychopathology symptoms was weaker, but also significant and –contrary to our expectations– positive. Negative emotions, however, were unrelated to psychopathology symptoms. Although the total standardized effect of resilience on psychopathology symptoms was very significant (-0.57), the direct relation between resilience at T0 and psychopathology symptoms at T2 (-0.19), was not statistically significant. However, the indirect effect of resilience on psychopathology symptoms (via perceived stress and positive emotions) was strong and significant (-0.42).

The lower part of Fig. 2 shows the predictive model of psychopathology symptoms for the T1 assessment, being the only relevant difference with the T2 model that it predicts a higher percentage of the total variance in psychopathology symptoms (69% versus 47%). For both time points (T1 and T2) we tested two additional models which included as an outcome measure only depression and anxiety (alternative model 1) and only PTSD (alternative model 2). The relations between the variables included in these models were very similar to the relations

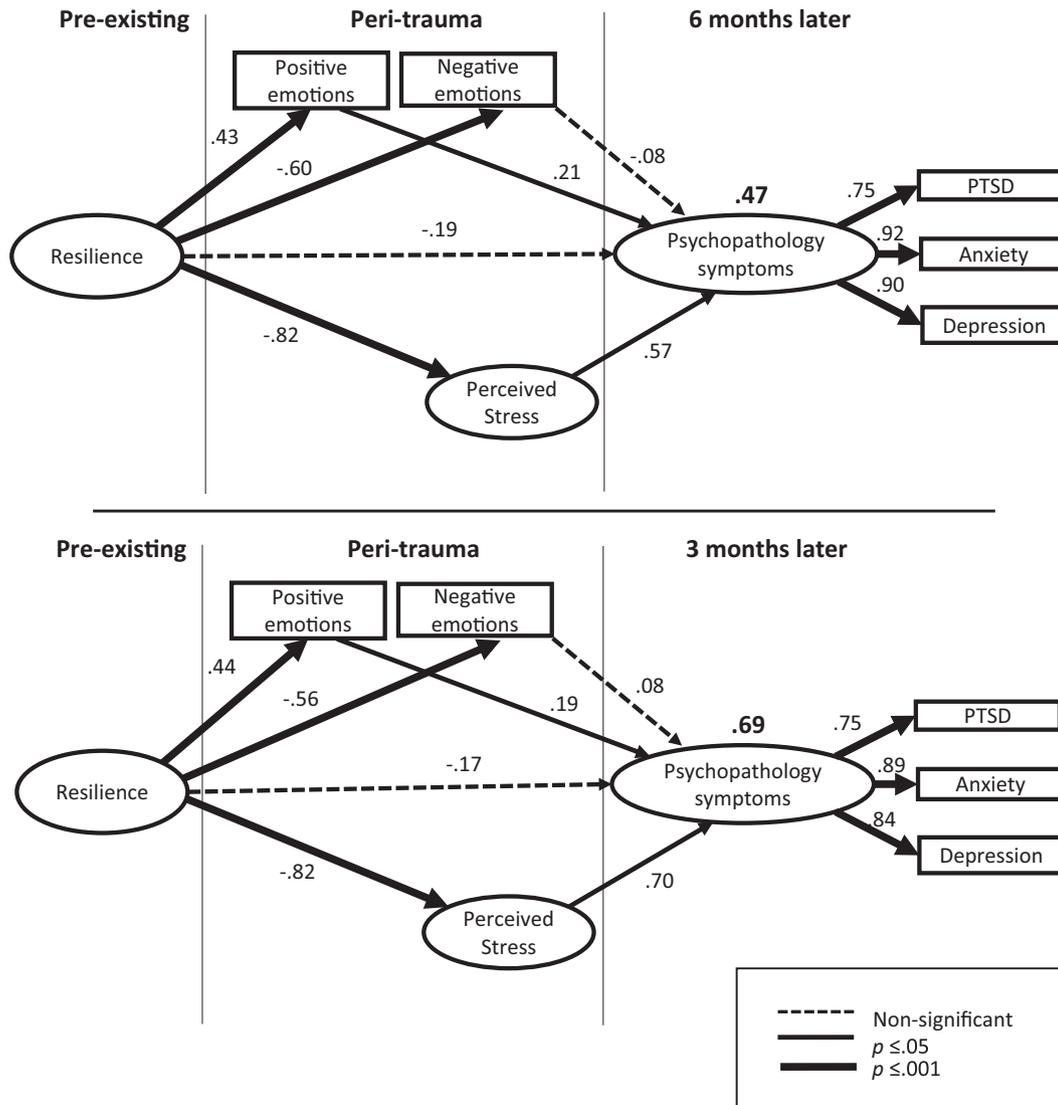


Fig. 2. Predictive models of parental distress six months after the child's discharge from PICU (upper part) and three months after the child's discharge from PICU (lower part). Note. PTSD = Posttraumatic Stress Disorder.

in the model presented in Fig. 2. Also, the fit indices were lower for these alternative models. Thus, in the present article the psychological variables included predict the three outcomes measures (anxiety, depression and PTSD symptoms) in the same direction.

4. Discussion

In life, few experiences can be considered more difficult than that of a parent facing the real possibility that their child could die or become severely disabled. The results of this study confirm that having a child under intensive care treatment can negatively affect parental mental health in the mid-to long-term, and are consistent with previous studies [3,5,7,8].

Data on the evolution of parental psychopathology symptoms showed that rates of PTSD, anxiety and depression did not decline over time, suggesting chronicity. These results are contrary to the findings of some previous longitudinal studies [3,36] but consistent with others [5,7]. Besides, some parents who hadn't reported PTSD at T1, scored above the cutoff at T2, which suggests a pattern of evolving and/or delayed, which is consistent with the findings of Colville and Pierce [7]. These late reactions might be explained by parents' delay in fully appreciating the psychological impact of this experience because of their initial need to focus on their child's physical recovery [37].

In relation to the study hypotheses, whilst the expected direct negative relationship between resilience and psychopathology symptoms was not found, the PALVs showed that a significant proportion of the variance in parental psychopathology symptoms at follow up could be predicted from psychological variables at child's discharge. Resilience was found to be a strong protective factor but, interestingly, its effect on parental psychopathology symptoms was indirect. It was mediated mainly by parents' decreased susceptibility to the stress inherent in this difficult situation. However, contrary to our expectations, and to previous literature [12] the association between positive emotions and psychopathology symptoms was positive. A similar positive association has been found in another study which examined the relationship between parents' post-traumatic stress symptoms and their report of post-traumatic growth after their child's PICU admission [38] suggesting that people may be more likely to reach for positive ways to view their situation as their perceived stress increases.

The finding that those with a history of mental health problems reported more long term psychopathology symptoms and that education appeared to be a protective factor, are consistent with meta-analyses in this field [13,39], however the fact that fathers and mothers reported equivalent distress contradicts such meta-analyses. The elevated risk for single parents has been noted in another recent longitudinal study [20]. This finding that those who lived out of the city were less distressed was unexpected, but given the other associations found with unemployment and ethnicity may reflect social deprivation related factors associated with urban settings.

These results also provided further evidence that parents' perceptions of the severity of their child's illness are more strongly associated with subsequent PTSD symptoms than objective indices of risk [3,5,7]. It may therefore be helpful, where it is established that a parent has unrealistically pessimistic beliefs about prognosis, to challenge these gently. The fact that parents whose child has previous admissions to PICU experience higher PTSD is an interesting data, as professionals may assume that parents who are more familiar with the setting will cope better. These findings are consistent with a qualitative study of parents of chronically ill children admitted to PICU, which point out that they have specific care needs [40].

A number of limitations should be acknowledged. Firstly, although the original recruitment rate was high, at 72%, there was a significant amount of attrition. As drop-outs differed significantly to those who remained in the study in that they had lower resilience, higher negative emotions and higher perceived stress, it is possible that the rates of psychopathology symptoms found are an underestimate. Nevertheless, the

percentage of participants retained was higher than in comparable studies [3,5], indicating relatively good representation of a population that is difficult to recruit and retain. Also, even though special efforts were made to engage and keep fathers in our study, this group constitutes just one third of the sample. Future studies should keep investing efforts in engaging fathers, because there is a dearth of research on the experiences of fathers with critically ill children [41] as well as more generally in pediatric settings [42]. Finally, previous studies including mothers and fathers after pediatric burn injury have found that parents within a couple were similar in terms of their avoidance symptoms [43]. Thus, future studies should explore the inter-relatedness of psychopathology symptoms between mothers and fathers of the same child.

5. Conclusion

This study highlights the need for a trauma-informed care framework in the PICU and suggests that parental risk and protective factors could usefully be assessed at discharge to identify those most likely to require further support. Interventions aiming to decrease parental PTSD, anxiety and depression rates should be focused at mobilizing adaptive coping [14] in order to maintain resilience and to decrease their perceived stress levels during admission [15–17]. These interventions could be complemented by others, such as anticipatory guidance about common experiences in PICU, which has proved to be useful in reducing perceived stress acutely [44]. All these interventions are compatible with Kazak's Pediatric Traumatic Stress model [14] which emphasizes the importance of providing information on normative reactions and mobilizing coping in the acute peri-trauma period. Finally, the finding that a significant number of parents report chronic and/or delayed symptoms suggests that ideally they should be monitored for some time after discharge.

Parental stress has been shown to be associated to children's PTSD [2]. It follows therefore, that by gaining a better understanding of parental distress during and after a child's PICU admission health professionals will also be in a better position to have a positive impact on their children's mental health.

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