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Secure Attachment Buffers the Impact of Early Childhood Emergency Room Encounters on Long-Term Emotional Problems

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Abstract

Childhood medical experiences in the emergency room, including pain, injury, and fear of uncertainty, are known as risk factors for later psychological stress. However, there is limited empirical research on protective factors that can mitigate the adverse effects of children's early emergency room experiences on later psychological outcomes. This study employed hierarchal moderated linear regression to examine the moderating role of children's attachment security at age 3 in the association between emergency room visits at age 3 and emotional and behavioral difficulties at age 5. The moderation regression model without covariates indicated emergency room visits (0 = *no*, 1 = *one or more in the past year*) were a significant predictor of long-term emotional and behavioral difficulties (β = .10, p = <.001). Furthermore, attachment security moderated this association (β = -.06, p = .003). For children with low attachment security (M-1SD), emergency room visits predicted greater emotional and behavioral difficulties (β = .10, p = <.001). Meanwhile, this association was not significant for children with average or high (M+1SD) attachment security (β = .04, p = .07; β = -.02, p = .41). This moderation remained significant in the final moderation model with covariates. These results suggest that attachment security may serve as a protective factor that buffers the negative effects of emergency room experiences on later psychological outcomes. Further research should explore contextual mechanisms of emergency room visits and evaluate the efficacy of attachment-based interventions.

Keywords: attachment, emotional and behavioral problems, longitudinal analysis, emergency room, pediatrics, protective factors

Secure Attachment Buffers the Impact of Early Childhood Emergency Room Encounters on Long-Term Emotional Problems

Nearly 1 in 6 children in the United States experience an acute injury or illness requiring medical care in the emergency room (ER)each year (McDermott et al., 2018; Newgard et al., 2023). Existing literature has found up to 65% of children aged 2-18 display psychological symptoms after healthcare experiences (Schauss et al., 2022). For example, 58 % of children aged one to six exhibited post-traumatic stress symptoms one month after sustaining a burn injury (De Young et al., 2012). This study also found that 35% of the participating children met clinical criteria for a psychiatric disorder (De Young et al., 2012). Another study of children admitted to a pediatric hospital following a burn injury found 29% of children aged one to four met criteria for acute stress disorder, with 80% of the overall cohort displaying evidence of re-experiencing the event one-month post-injury (Stoddard et al., 2006).

To date, there has been limited research on children's psychological responses to the emergency department in specific, especially in early childhood. According to Chandler et al., children aged 6-17 were more likely to develop a mental health condition when treated for injury in the ER when compared to children admitted for appendicitis (HR 1.20, $p = .006$), though those discharged from the ER were less likely to develop a mental health condition than those admitted for injury (HR 1.34, $p = <.001$ when compared to appendicitis admits) (Chandler et al., 2022). Martin et al. reported that even after receiving intranasal midazolam to decrease distress, 45% of children aged 2-8 still displayed extreme anxiety during a laceration repair in the ER, with younger age being a significant predictor of anxiety (Martin et al., 2025). A 2003 study surveying children aged 8-19 in the ER for any adverse life events and PTSD found that 25% of children surveyed reported that the most distressing life event was related to chronic medical problems in themselves or loved ones (Shemesh et al., 2003). While most children did not report that the current ER visit was their most distressing life event experienced and instead focused on past trauma exposure, the study uncovered a significant association between children who met diagnostic criteria for PTSD and number of ER visits, and this association remained significant when controlling for number of adverse life events, age, and sex (Shemesh et al., 2003).

Medical experiences, especially ER visits, often have lasting effects on children, contributing to fears of medical treatment as well as emotional and behavioral problems (EBD). Despite this, limited empirical research has examined resilience factors in young children that may mitigate adverse experiences encountered in healthcare settings. The current study aimed to investigate early childhood (age 3) ER visits as a risk factor for developing EBD two years later. Second, we explored whether children's attachment security serves as a moderating factor that can promote resilience in young children.

Application of Risk-Resilience Framework to Early Childhood Emergency Room Visits

Not all children who visit the ER develop adverse psychological outcomes though there may be heterogeneity in the developmental processes through which ER experiences predict longitudinal outcomes. This aligns with the risk-resilience framework, which highlights that children who experience risk may develop unfavorable outcomes, but protective factors may mitigate these adverse effects (Masten, 2021). The risk-resilience framework has been applied in research with various populations, including individuals who experience illness and injury with focus on chronic pain, health-related quality of life, and coping with illness or injury (Cousins et al., 2015; Gartland et al., 2019; Sturgeon & Zautra, 2010).

Risk is an umbrella term for biological, psychosocial, and environmental factors that pose a threat to a child's development and functioning (Masten, 2021). Especially, the American Academy of Pediatrics (AAP) identifies that pediatric medical traumatic stress (PMTS) can pose an adverse childhood experience leading to symptoms such as re- experiencing, avoidance of healthcare, and behavioral changes (Price et al., 2016; De Young et al., 2021). Children who visited ER are likely to experience PMTS; thus, this study examines early childhood ER visits as a risk (Duffee et al., 2021). ER visits pose the opportunity for a pile up of cumulative risks, including pain, needles or painful procedures, unfamiliar staff, separation from caregiver, and uncertainty (Claridge & Powell, 2023; Masten et al., 2021).

In the risk-resilience model, resilience is viewed as a dynamic interaction between the exposure to risk and competing protective factors (Masten et al., 2021). According to Masten et al. (2021), while both promotive and protective factors are considered resilience factors, we were interested in protective factors, which refers to factors that can mitigate the adverse effect of risk in individuals' health or developmental outcomes. These protective factors are observed through the lens of a strengths-based approach, aiding the child in achieving a healthy developmental trajectory despite the presence of risk (Zimmerman, 2013). Evidence suggests protective factors can also serve as buffers against children's adverse experiences in healthcare settings, promoting positive adjustment (e.g., Cuneo et al., 2022). For example, family cohesion and parental coping have been documented as strong predictors of both children's psychological and physical health after burn injury, illness, and (Cuneo et al., 2022; Silverstein et al., 2022; Stoddard et al., 2006). This line of research suggests that parental characteristics and family relationships may serve as a buffer against children's traumatic stressful experiences in the ER.

Children's Attachment Style as Moderator Between Traumatic Stress and Developmental Outcomes

While the family-related factors that may protect children from adverse developmental outcomes following traumatic medical experiences, the quality of the caregiver-child attachment relationship has also received considerable attention. In challenging or threatening situations, children may seek out support or guidance from caregivers (Cushing et al., 2023; Mikulincer et al., 2014). Children with secure attachments have likely learned to expect support from adults, whereas a child with an insecure attachment may not believe that others are there to support them (Cushing et al., 2023). Further evidence suggests that children's attachment styles shape their social and emotional development and that insecure attachment may increase risk for maladjustment and post-traumatic stress symptoms (PTSS) following threatening events (Cushing et al., 2023; Woodhouse et al., 2015). Similarly, attachment is continuously demonstrated to be a buffer for the development of internalizing and externalizing stress behaviors, PTSS, and post-traumatic stress disorder (PTSD), even when exposed to trauma and stress

experienced in inner-city environments or school shootings (Richardson et al., 2019; Turunen et al., 2014).

Experiences in healthcare settings, such as pain, illness, or perceived threat may activate attachment behaviors as one may seek closeness, security, and social support (Donnelly & Jaaniste, 2016). In adults, Meredith et al. propose the attachment-diathesis Model of Chronic Pain (ADMoCP), which recognizes pain as a stressor that triggers attachment-based appraisals and, in turn, influences the cognitive, emotional, and behavioral responses employed (2008). Evidence suggests this phenomenon may be present in children as well. It is known that a child's behavioral response to threat may serve as their way of communicating the symptom of pain to caregivers, and the effectiveness of the distress signals may alter the caregiving response (Donnelly & Jaaniste, 2016). Securely attached children are more likely to have healthy communication with their parents and to discuss their physical symptoms with them (Feeney, 2000). However, further investigation into the activation of attachment behaviors in pediatric healthcare experiences is needed.

The Current Study

While evidence suggests that healthcare experiences may have long-term psychological impact on children (Chau et al., 2024; Meiser-Stedman et al., 2017; Peterson & Whalen, 2001), few studies have examined whether ER visits in early childhood are associated later emotional and behavioral outcomes. Furthermore, research in this area has primarily focused on risk factors, with comparatively little attention given to the protective factors which may buffer children against adverse healthcare experiences from a strength-based approach. Lastly, this literature review revealed that studies of early childhood medical experiences have mostly relied on small, community-based samples, which limit the generalizability of their findings. Few studies have examined these associations among families in the United States within the past two decades. Though it is important to note the differences in healthcare systems and cultural considerations that influence each individual's experience. The current study addressed these gaps by examining 1) the long-term association between early childhood ER visits (at

age 3) and later emotional and behavioral difficulties (at age 5) in a large sample of children across 20 U.S. cities; and 2) the buffering role of caregiver-child secure attachment (at age 3) in this association.

Consistent with literature on attachment theory and the risk-resilience framework, we hypothesize that first, children with ER visits would display higher levels of emotional and behavioral difficulties at age 5. Second, we also hypothesized that having a greater attachment security at age 3 may buffer the long-term impact of ER encounters in early childhood, resulting in lower emotional and behavioral difficulties at age 5. The identification of both risk and resilience factors for children encountering medical-related stress may aid practitioners in identifying children at risk of maladaptation during ER encounters, enabling early intervention.

Method

Participants

Data for the current study are drawn from the Future of Families and Child Wellbeing Study (FFCWS). This longitudinal dataset follows a birth cohort of 4,898 children born between 1998 and 2000 across 20 large US cities. The dataset includes interviews and surveys with mothers, fathers, and the child, primary caregivers, and teachers where appropriate. Additional non-interview data, such as medical records at birth, in-home observations by researchers, or genetic tests, were included across relevant time points. Currently, there are seven published waves from birth to twenty-two years old (at birth and ages 1, 3, 5, 9, 15, and 22). Participants were chosen via a three-step systematic sampling process, where researchers sampled each city, hospitals within the city, and births within each hospital and city to create a cohort that is diverse and representative of the larger population of births in large cities. Data was collected from primary caregivers who completed the scale via phone. Biological mothers were coded as primary caregivers if the mother and father cohabited or if the biological mother had the child more than half of the time. If the biological mother had less than 50% custody of the child, the primary caregiver was coded as the biological father or a non-parental caregiver who raises the child.

Data was excluded by listwise deletion. The dataset was first sampled to include participants with non-missing data on level of attachment security, resulting in n = 2,268 cases. The remaining cases were then sampled to exclude those with missing CBCL scores, indicating children's EBD, at age 5, resulting in a sample of n = 1,757. An additional seven cases were excluded with missing on the ER visits variable (n = 17,50). Lastly, data was sampled to exclude cases with missing covariates, leaving a final subset of 1,624 children included in our analysis (see Table 1 for descriptives). The finalized sample included n = 1,624 children. Biological mothers accounted for 96.9% (n = 1573) of primary caregiver respondents in this survey, with biological fathers (n = 6) and non-parental caregivers (n = 8) identifying as the respondent. Detailed demographic characteristics are presented in Table 1. Approximately half of children were male (n = 843, 51.9%). Children's race was not included in the first nine waves of this study, so we examined maternal demographics reported in wave one. Most mothers (n = 898, 55.4%) identified as Black, non-Hispanic. 20.8% identified as Hispanic, 20.7% were White, non-Hispanic, and 3% responded as "Other." Over half (65%, n = 1,056) of the children included in this sample were covered by Medicaid. 32.9% (n = 534) of mothers had completed some college or technical program at age 3. 349 mothers (21.5%) of our total sample met criteria for depression at age 3.

Measures

ER Visits at Age 3

Primary caregivers reported their child's ER visits at age 3 by answering the following prompt: "*In past 12m, how many times has child been taken to the er?"* Number of ER visits ranged from 0-25 (M= 0.57, SD = 1.24). Distribution of the data was skewed (skewness = 5.97, kurtosis = 70.28) with 11.7% (n = 380) of parents reporting that their child had 2 or more ER visits within the past 12 months. A binary variable was created to reflect childhood ER visits (*0 = no visits, 1 = 1 or more visits*). Of the final sample, 35.5% (n = 576) were coded as having one or more ER visits.

Attachment Security at Age 3

Children's attachment security was assessed via parent-report at age three using the Toddler Attachment Q-Sort 39 (Andreassen & Fletcher, 2007). This scale is a revised version of the Toddler

Attachment Q-sort created by Waters, designed to evaluate the child's attachment behaviors, such as maintaining proximity to caregiver, stress responses, and exploration. It is worth noting that some items within the scale used language geared towards mothers, such as "relaxes when in contact with mother" or "often wants mother's attention." Evaluations of the TAS-39 have found the scale to be consistent with the literature in attachment theory and results of the Strange Situation Test (Andreassen & Fletcher, 2007). Multi-dimensional scaling was used to create a continuous measure of children's attachment security using continuous Q-sort correlation scores. Higher scores reflect more secure attachment behaviors (M = .45, SD = .27).

Child Behavior Checklist

The Child Behavior Checklist (CBCL) is an 112-item measure used to assess children's EBD via either self-report in addition to parent or teacher proxy (Achenbach & Ruffle, 2000). The initial scale was created for children aged six to eighteen, with an adaptive version, only measured by adult proxy, was released for children aged one and a half years old to five. The scale identifies behaviors indicative of behavior or emotional challenges and asks reporters to rate the frequency of the behavior observed in the target child, ranging from "0 = *not true"* to "2 = *very true."* This scale has high internal consistency (α = .90; Waldfogel et al., 2010) and high test-retest reliability *(r* = .85; Achenbach & Rescorla, 2001).

For the current study, this scale was completed by the child's primary caregiver using an in-home workbook assisted by telephone interviewing. Scales were recorded to reflect the scoring used in the CBCL manual. Original scores were coded as "0 = *never true*", "1 = *sometimes true*," and "2 = *very true*." Answers were recoded as (1 = 0, 2 = 1, 3 = 2). Then, the sum of the recoded variables was compiled into a "total CBCL" score for each respondent. Per the FFCWS guidelines, cases were excluded via listwise deletion for any child with missing data on one or more items (Waldfogel et al., 2010). Raw scores were used in accordance with the Achenbach manual, which recommends using raw scores for analysis and T-scores for clinical interpretation (Achenbach & Ruffle, 2000). The current analysis includes this composite variable measured age 5 (α = 0.90, RawM = 23.37 [SD = 13.46], range = 0-78; Waldfogel et al., 2010). Previous studies have found CBCL scores to be skewed in community

samples. Thus, residual distributional assumptions were evaluated in the final model (Bianchi et al., 2017; Thompson et al., 2019).

Covariates

Additional child and family characteristics determined to have empirical importance were included as covariates in the final analysis.

Socioeconomic Status

Socioeconomic status (SES) has been established as a significant predictor of EBD and ER usage (Marçal, 2020; Whitfill et al., 2018). This study accounted for SES using the mother's income-to-needs ratio, a continuous variable constructed by the FFCWS dataset (Waldfogel et al., 2010).

Medicaid

The receipt of Medicaid is significantly associated with limited access to primary care and higher ER utilization, thus was included as a proxy for healthcare access (Cheung et al., 2012). Caregivers reported "are you are the child covered by Medicaid?" and scored (*0 = yes, 1 = no).* Racial discrimination and racially related stress are other significant predictors of EBD (Roach et al., 2023). Additionally, race is associated with increased ER visits and limited access to primary care (Rasooly et al., 2014).

Primary Caregivers' Race/Ethnicity

Primary caregivers; race/ethnicity was included because it is well documented in research that there are large racial disparities in the dismissal of symptoms and proper medication. While information on children's race was not available in the dataset, the current study accounted for maternal race self-reported in the baseline wave (0 = *Black, non-Hispanic, 1 = White, non-Hispanic, 2 = Hispanic, 3 = other*).

Child Gender

Literature reveals gender differences in early childhood EBD (Maguire et al., 2016). The focal child's gender was reported by the primary caregiver as the child's sex at birth in the baseline wave (0 = *male*, 1 = *female*).

Primary Caregivers' Depression

Primary caregivers' depression is associated with children's attachment behaviors and emotional development in early childhood (Badovinac et al., 2018; Cooke et al., 2019). Mothers self-reported on the Composite International Diagnostic Interview – Short Form (CIDI-SF; (Gigantesco & Morosini, 2008). This evaluates psychiatric symptoms in adults and scores participants on how likely they are to meet full diagnostic criteria if given a more in-depth, clinical evaluation. The CIDI-SF is recognized in statistical analysis as a valid measure, including high test-retest reliability (kappa = 0.6-1.0; (Gigantesco & Morosini, 2008). A constructed binary variable was created by scoring if a participant met criteria for depression (0= *does not meet criteria;* 1 = *meets criteria*).

Child Emotional and Behavioral Difficulties (EBD) at Age 3

Baseline EBD was measured using the primary caregiver's responses to the CBCL during the year 3 in-home interview. The current study used the composite CBCL score at age 3($\alpha = 0.90$, RawM = 19.28 [SD = 10.72], range = 0-88; Waldfogel et al., 2010). which was coded and calculated in the same manner as CBCL at age 5 described above. Inclusion of baseline CBCL scores allows for a robust measurement of the interaction effect across the developmental trajectory, highlighting the influence of the predictor on the change of EBD over time (McLaughlin et al., 2020).

Missing Data

Before analysis, the following responses were coded as missing: -1 (refuse), -2 (don't know), - (missing due to technical error), -4 (participant chose multiple answers), -5 (not asked), -6 (logical skip), -7 (not applicable), -8 (out of range), and -9 (not in wave) as suggested by the FFCWS guidebook (Waldfogel et al., 2010). Listwise deletion was used to account for missing data on key variables due to high levels of missingness. 53.7% of participants had missing data for the level of attachment security. 46.6% of participants were missing data for EBD at age 5, and 33.6% for ER visits. Missingness was also examined for covariates: CBCL age 3 (46.5%), Medicaid status (14%), maternal depression (13.8%), and income-to-needs ratio (13.6%). Multiple imputation was not appropriate for this analysis due to the high level of missingness. However, a Little's MCAR test of key variables found no

significant differences. Thus, the mechanism of missingness can be attributed to MCAR or MAR. A priori power analysis using G*power determined a sample size of n = 652 was needed to achieve a power of .95 for detecting a small effect (f^2 = .02, α = .05) (Faul et al., 2009). The final sample of n= 1624 exceeds this requirement and is acceptable to detect a small effect.

Analysis

Prior to the main analysis, frequency and descriptive statistical analyses and correlations were conducted using PROCESS macro version 5.0 for IBM SPSS Statistics (Version 31.0). Hierarchical regression analysis was then conducted to address the research questions, following a three-step procedure using SPSS Process macro 5.0 IBM SPSS Statistics (Version 31.0). Attachment security was mean centered before analysis. For Model 1 (Step 1), ER visits at age 3 and attachment were entered to examine the main effect of ER visits at age 3 and attachment on later EBD (age 5).

Moderations were then tested using an OLS regression with an interaction term using PROCESS version 5.0 on IBM SPSS Statistics (Version 31.0). For Model 2 (Step 2), an interaction term (ER visits at age 3 X attachment) was added to test whether attachment moderated the association between ER visits and child EBD. Lastly (Step 3), a set of covariates (child gender, socioeconomic status, maternal depression, and baseline EBD) was added to provide a more rigorous test of the moderation effect. All continuous variables were centered to avoid multicollinearity.

Our first aim was addressed via linear regression analysis to examine the relationship between ER visits at age 3 and EBD at age 5. Following the hierarchical moderated regression process, a second model was created to include attachment security, interaction effect (ER visits and attachment security), and a set of covariates. To explore the second aim of this study, this model was probed for interaction effects of low (-1SD), mean, and high (+1SD) levels of attachment security using simple slopes analysis. Model fit was examined in both analyses using 95% confidence intervals at the p = <.05 level. Assumptions for the final were examined by linearity, normality of residuals, multicollinearity, and influence diagnostic tests. A Breusch-Pagan analysis displayed concern for homoscedasticity, thus bootstrapping at 5000 samples for the full model was employed. Non-bias corrected confidence intervals

were produced at the 95% level. Results were visualized using the "interactions" package in R (Version 1.2.0, Long, 2024; *R Core Team,* 2024).

Results

Descriptive statistics and correlations are presented in Tables 1 and 2. Overall, children's EBD at age 5 had small to moderate correlations with most demographic variables (r = -.17 to .17, p = <.001 to .003). Children's EBD at age 5 was positively correlated with ER visits and negatively correlated with secure attachment (r = .10, p = <.001, and r = -.25, p = <.001). A relatively high correlation was found between child EBD age 3 and child EBD at 5 (r = .57, p = <.001). This relationship can expected due to mechanisms of repeated measurement. Subsequent variance inflation factor (VIF) analysis indicated no problematic multicollinearity between variables (1.0-.1.7). Normality of residuals was acceptable (skewness = .68, kurtosis = 1.2). Further analysis identified a small number of residuals exceeded conventional cutoffs. However, influence diagnostics did not indicate undue leverage, and values were acceptable based on DFBETAs. Bootstrapping was used to obtain robust inference.

Table 1

Descriptives of Demographics and Study Variables (Final Sample N = 1,624)

Term	Variable	N (%)/mean(SD)
Maternal Race[a]		
	Black, non-Hispanic	898 (55.4%)
	Hispanic	338 (20.8%)
	White, non-Hispanic	336 (20.7%)
	Other	48 (3.0%)
Maternal Education		
	Less than high school	420 (25.9%)
	High school or equivalent	481 (29.6%)
	Some college or technical school	534 (32.9%)
	College or graduate school	189 (11.6%)
ER Visit age 3		
	No ER Visits	1048 (64.5%)
	1 or more ER visits	576 (35.5%)

Attachment Security		0.45(0.27)
EBD at age 5		17.04(9.59)
Gender[a]		
	Male	843 (51.9%)
	Female	781 (48.1%)
Medicaid[b]		1056 (65.0%)
Maternal Depression[c]		1280 (78.6%)
EBD at age 3		22.72(12.42)
Income to Needs Ratio		1.78(1.96)

Note. For continuous variables, the mean and standard deviation of each variable were presented. For categorical variables, the number and the percentage of children/families who reported the particular category. [a] Measured at wave 1/ birth of focal child. All other variables measured at age 3. [b] Reflects the number and percentage of participants answering "yes" to this question [c] Reflects the number and percentage of participants answering "no" to this question.

Table 2

Bivariate Correlations

Variable	1	2	3	4	5	6	7
1. Gender[a]							
2. Maternal Depression[b]	-0.01						
3. Income to Needs Ratio	0.03	-.10***					
4. Medicaid Status[c]	0.02	-.09***	.51***				
5. ER Visit age 3[b]	-0.02	0.03	-.09***	-.12***			
6. Attachment Security	.08**	-.05*	.18***	.18***	-.00		
7. EBD age 3	-.08**	.15***	-.21***	-.21***	.10***	-.35***	
8. EBD age 5	-.08 **	.17***	-.17***	-.16***	.10***	-.25***	.57***

Note. [a] Measured at wave 1/ birth of focal child. All other variables measured at age 3 unless specified. [b] Reflects the number and percentage of participants answering "no" to this question [c] Reflects the number and percentage of participants answering "yes" to this question.

* p < .05, ** p < .01, *** p < .001

Model 1: ER Visits (age 3) and Attachment (age 3) Predict Later EBD (age 5)

A linear moderated regression was used to model the main effects of ER visits (age 3) and attachment (age 3) as predictors of later EBD (age 5), results are shown in Table 3. Model 1 revealed that the experience of ER visits at age 3 (β = .1, p = <.001) and insecure attachment (β = -.25, p = <.001) were significant predictors higher levels of EBD at age 5. Results indicate that the model explains a small, yet significant influence on the outcome (adjusted R^2 = .07). Overall, this model suggests that ER visits and attachment behaviors both serve as predictors of EBD, though additional factors play an important role in this relationship.

Table 3

Moderation of Attachment Security on ER Visits (age 3) and Emotional and Behavioral Difficulties (age 5)

Model	Term	*b*	β	*SE*	*t*	*p*	95% CI
1	(Constant)	20.4	NA	0.48	42.5	<.001***	[19.5, 21.3]
	ER Visit Age 3	1.90	.10	0.48	3.96	<.001***	[0.96, 2.84]
	Attachment security	-8.91	-.25	0.84	-10.5	<.001***	[-10.6, -7.25]
2	(Constant)	16.36	NA	0.28	57.5	<.001***	[15.8, 16.9]
	ER Visit Age 3	1.89	.09	0.48	3.97	<.001***	[0.96, 2.83]
	Attachment security	-6.60	-.19	1.05	-6.28	<.001***	[-8.66, -4.54]
	Interaction	-6.61	-.09	1.77	-3.73	<.001***	[-10.1, -3.13]
3	(Constant)	7.90	NA	0.56	14.1	<.001***	[6.80, 9.00]
	ER visit age 3	0.73	.04	0.41	1.78	.07	[-0.07, 1.53]
	Attachment security	-.43	-.01	0.92	-.461	.645	[-2.25, 1.39]
	Maternal depression	1.85	.08	0.48	3.87	< .001***	[0.91, 2.79]
	Income: needs ratio	-0.19	-.04	0.12	-1.65	.09	[-0.42, 0.04]
	Gender	-0.54	-.03	0.39	-1.39	.16	[-1.30, 0.22]

Model	Term	*b*	β	*SE*	*t*	*p*	95% CI
	EBD age 3	0.40	.52	0.02	23.46	< .001***	[0.37, 0.44]
	Medicaid Status	-0.15	-.01	0.48	-.307	.758	[-1.09, .791]
	Interaction	-4.42	-.06	1.50	-2.96	.003**	[-7.37, -1.50]

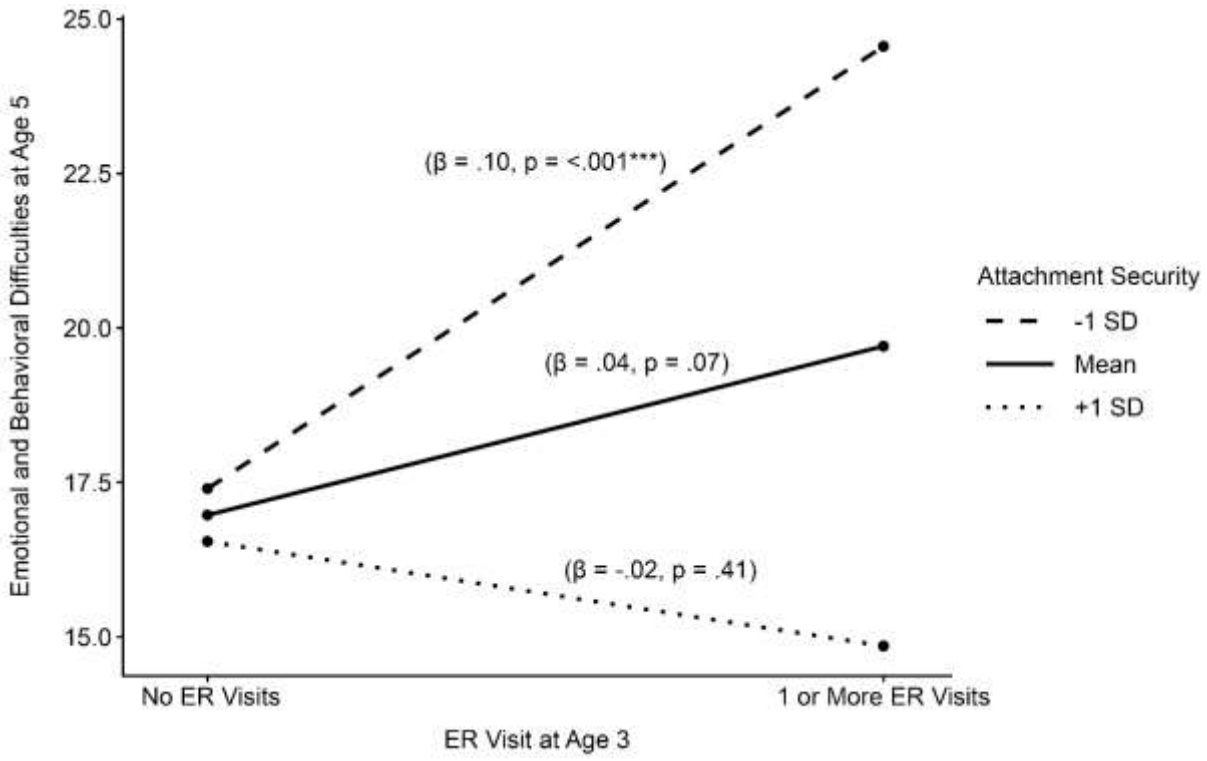
Note. Attachment security was mean centered prior to analysis. ER = emergency room, EBD = emotional and behavioral difficulties.

* p < .05, ** p < .01, *** p < .001

Model 2: The Interaction between ER Visits (age 3) and Attachment Security (age 3) Predicting Later EBD (age 5)

Further analysis examined whether the relationship between ER visits at age 3 and EBD at age 5 changed based on levels of attachment behaviors. Model 2 was a linear moderated regression including an interaction term representing ER visits x Attachment security (see Table 3). We found that 1 or more ER visits at age 3 (β = .09, p = <.001) and attachment security (β = -.19, p = <.001) remained significant predictors of higher levels of EBD at age 5 in this model. Additionally, we found that the interaction between ER visits and attachment was a significant predictor of later EBD (β = -.09, p = <.001). Simple slopes analysis revealed the effect of ER visits at age 3 was a significant predictor of EBD at age 5 for children with low (-1SD; β = .18 , p = <.001) and mean (β = .09, p = <.001) levels of attachment security. However, the interaction was not significant in children with high attachment security (+1SD; β = .01, p = .870). This model showed a slight, yet significant, increase in influence over model 1, though the effect size remains small (adjusted R^2 = .08). Thus, further analysis was conducted to examine the influence of covariates.

Fig. 1 *Simple slopes interaction of attachment security on emergency room visits (age 3) and emotional and behavioral difficulties (age 5)*



Note. . ER = emergency room; ER Visit at age 3 *(0 = no visits, 1 = 1 or more visits).*

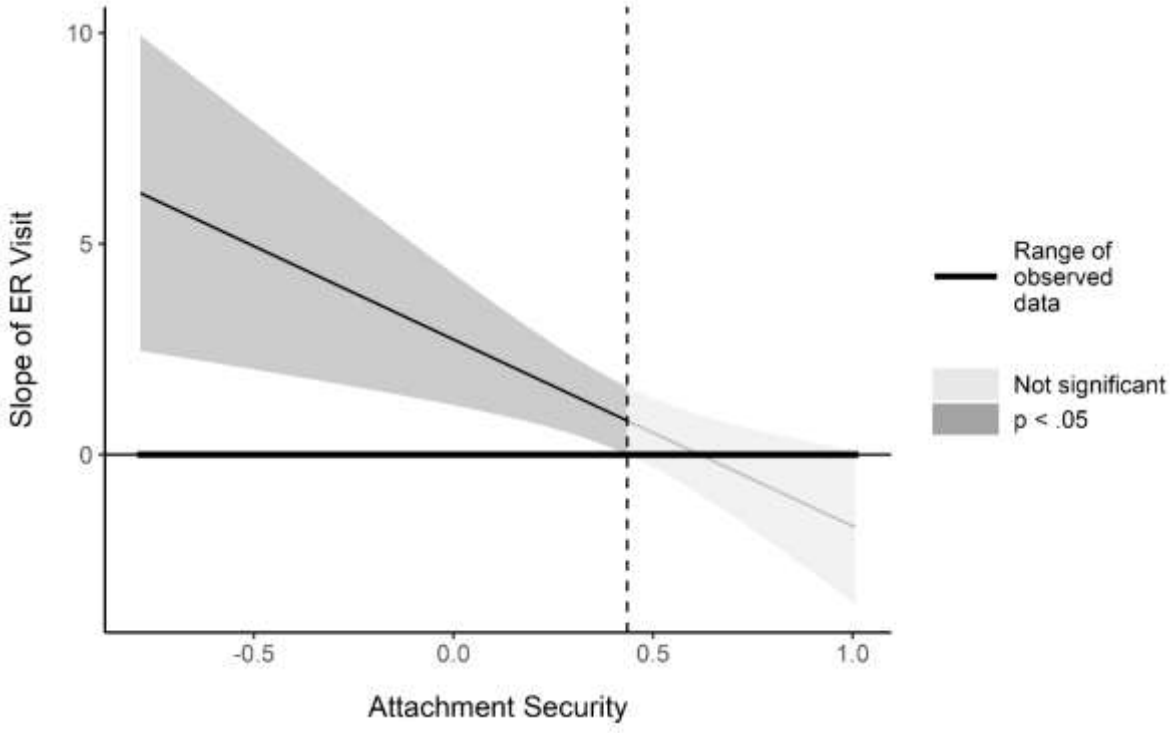
* p < .05, ** p < .01, *** p < .001

Model 3: Interaction between ER Visits (age 3) and Attachment Security Predicting the Later EBD (age 5), with Covariates Added

Model 3 included covariates and attachment behaviors as an interaction term. The initial model included the following covariates: gender, income to needs ratio, maternal depression, maternal race, and EBD at age 3. Results showed that maternal race/ethnicity was not found to be a significant covariate in this model. Analysis revealed little change when including maternal race (adjusted R^2 = .344 vs. adjusted R^2 = .343), thus the model was finalized without race as a covariate (see Table 3). The model was significant and accounted for 34% of variance in children's EBD at age 5 (adjusted R^2 = .34). As expected, baseline EBD was a strong and significant predictor (β = .52, p = <.001), consistent with previous studies that have indicated that the CBCL is a strong predictor of later EBD throughout childhood (Petty et al., 2008). Additionally, maternal depression was found to be a significant predictor (β = .08, p = <.001).

The results in Table 3 indicated that attachment behaviors significantly moderated the relationship between ER visits and child EBD (β = -.06, *p* = .003). To probe the pattern of interaction, simple slopes analysis was used to further investigate the interaction between ER visits and attachment behaviors. As presented in Figure 1, level of attachment security was examined across three moments: low (-1 SD), mean, and high (+1SD). Results showed that ER visits are a significant and positive predictor of EBD in children with low attachment security (β = .10, *p* = <.001). For children with mean levels of attachment security approached statistical significance though did not satisfy the p = .05 level (β = .04, *p* = .075). This relationship was not significant for children with high levels of attachment security (β = -.02, *p* = .408). Figure 2 visualizes the increased EBD in children with low levels of attachment security who had 1 or more ER visits using Johnson-Neyman intervals.

Fig. 2 *Region of significance for of the conditional effects of emergency room visits (age 3) on emotional and behavioral difficulties (age 5) across levels of attachment security using Johnson-Neyman techniques*



Note. ER = emergency room; ER Visit at age 3 *(0 = no visits, 1 = 1 or more visits).*

Discussion

ER visits are an unplanned experience associated with pain, illness, and injury, leading to emotional distress in children and families (Merritt, 2014; Nager et al., 2010). While it is known that children's pain and behavioral distress often go unnoticed and undertreated in the ER (Nager et al., 2010; Zempsky et al., 2004), there has been little investigation into the long-term psychological impacts of ER visits in early childhood. This study answers this need by providing original research investigating children's attachment security as a protective factor on emotional adjustment following ER visits. We found that ER visits at age 3 are a significant predictor of EBD at age 5 and that level of attachment security buffered this association: for children with average or high levels of attachment security, the negative effect of ER on EBD was no longer significant. The moderation effect remained significant after including covariates. Our findings based on large-scale longitudinal data, representative of U.S. children and families in 20 cities, can be generalizable to children who go through unexpected acute medical stress and their caregivers. The attachment-diathesis Model of Chronic Pain (ADMoCP) suggests that pain in adults triggers attachment responses which may influence coping and emotion regulation (Meredith et al., 2008). Our research extend this theory to young children, suggesting that attachment responses may influence coping and psychological outcomes across multiple healthcare contexts and across early and middle childhood. A practical implication of this finding is that assessing a child's attachment behaviors in the ER may help identify children at risk for developing long-term EBD.

Child Emergency Room Visits Predicting Longitudinal Psychological Outcomes

We hypothesized that in Model 1 (a regression model without moderation), children who had been to the ER at age 3 would have higher levels of EBD at age 5 than those who did not have an ER visit. Our findings supported this hypothesis, though the effect size was small. This significant finding is consistent with emergent research on PMTS and children's emotional adjustment following hospital admissions (Price et al., 2016). Children in this age group process information in a concrete and egocentric manner that can lead to frightening thoughts and distorted memories of ER visits (De Young et al., 2021). While the current knowledge indicates that early childhood medical experiences, such as

ER visits or pediatric intensive care unit (PICU) admissions tend to experience lasting symptoms PTSD, such as sleep disturbances, nightmares, and anxiety, or severe stress (e.g., Mesier et al., 2017; Terp & Sjöström-Strand, 2017; De Young et al., 2012), our finding adds to the existing understanding of the longitudinal effect of children's medical experience on their psychological and behavioral health, such that early childhood ER visits may lead to children's EBD.

Child Secure Attachment with the Primary Caregiver as a Moderator

Our second hypothesis was that children's attachment security would buffer the impact of ER encounters on EBD. Specifically, we predicted that a secure attachment security would serve as a protective factor, reducing the emotional impact of the ER visit. Models 2 (a regression model with moderation) and 3 (a regression model with moderation and covariates) confirm this hypothesis, suggesting the importance of early parent-child relationships in shaping children's long-term responses to healthcare encounters. Children with lower levels of attachment security (-1SD) had significant increases in EBD, though this association was not significant in children with higher levels of attachment security (+1 SD). These findings suggest that children with lower levels of attachment security may be at increased risk of developing psychological symptoms after an ER visit whereas children who displayed more attachment security were protected against this risk. This is consistent with previous work suggesting that family cohesion and parental coping are strong predictors of children's psychological outcomes across multiple medical contexts including chronic illness (Cueno et al., 2022), traumatic injuries (Sadeh et al., 2022), and other acute traumas (Silverstein et al., 2022).

The positive child-caregiver relationship plays a critical role in children's psychological outcomes after medical experiences (Burns-Nader & Hernandez-Reif, 2016; Silverstien et al., 2022). Our results align with literature within childhood chronic pain which illustrates that attachment factors are associated with children's methods of emotional expression, cognitive appraisal of threat, and subsequent behavioral responses (Donnelly & Jaaniste, 2016).Research suggests that the child's perception of hospitalization and illness is an important predictor of later EBD and that children's attachment style may moderate the subjective perception of the experience (Donnelly & Jaaniste, 2016;

Meredith et al., 2008). The mechanism in which this occurs may be found in the child's internal working model, largely shaped by the caregiving received in infancy. Having a secure attachment may comfort the child as they perceive that they will receive support and protection from harm from their caregivers within the hospital setting. Conversely, an insecure attachment style can develop from inconsistent caregiving, prompting children to mistrust adults (Doyle & Cicchetti, 2017). This lack of trust in their safety and protection from others may increase a child's fear or perception of threat in the hospital setting, leading to hypervigilance, fear, and long-term EBD.

In our final model with covariates, both children's and mother's pre-existing mental and behavioral health at age 3 were significant predictors of children's EBD at age 5. This final model indicates that ER visits at age 3 were no longer a significant predictor of EBD at age 5 for children with average or greater attachment security, however maternal depression and EBD at age 3 were significantly associated with EBD at age 5. This is consistent with the Integrative-Trajectory model of PMTS which lies on the assumption that pediatric patients and their families psychological functioning influences children's responses to medical experiences (Price et al., 2016). Children's attachment style is associated with their emotional regulation, and a secure attachment may equip children with cognitive tools to better cope with the hospital experience and mitigate long-term outcomes (Cooke et al., 2019; Cushing et al., 2023; Woodhouse et al., 2015). Securely attached children may seek more social support and engage in increased communication with primary caregivers, who reinforce the belief that they will be safe and cared for. Furthermore, children with secure attachments may benefit from watching their caregivers cope with the stress of their child's ER visit (Burns-Nader et al., 2016). While 42.5% of parents of children birth to eighteen years old report clinically significant levels of state anxiety upon their child's ER visit (Martin et al., 2023), caregivers use of coping skills decreases children's anxiety during medical experiences (Burns-Nader et al., 2016).

Implications for Practitioners: Attachment Interventions

The current study highlights the potential contributions to attachment-based interventions during hospital experiences to support the child-caregiver relationship and promote healthy coping and

adaptation after the event. Including children's attachment behaviors in a psychosocial assessment may identify children at risk for developing EBD and to provide early psychosocial intervention. One common psychosocial intervention in the hospital, Certified Child Life Specialists (CCLS) effectively support parent-child interactions through therapeutic play (Burns-Nader & Hernandez-Reif, 2016; Romito et al., 2021). CCLSs are experts in promoting coping and patient-family centered care in healthcare settings in addition to significantly reducing children's distress and pain during ER visits (Romito et al, 2021). Further research should investigate the use of child life interventions on attachment-based coping used by children and caregivers.

Strengths, Limitations, and Future Directions

This model achieves rigor by controlling for baseline EBD, which allows interpretation of the influence of the predictor and interaction while accounting for rank order stability. Additionally, our study is unique in both its sample size and its longitudinal follow-up, extending to 2 years after the ER encounter. Similar studies, including longitudinal follow-up, often explore outcomes up to 18 months after the initial event. The current findings suggest that the emotional impact of hospital experience may persist for years after the initial occurrence.

One limitation of this study was the limited information available about the context of each ER visit. Contextual factors such as the severity of the illness or injury, pain, and experiences with medical procedures are needed to gather a complete picture of the child's ER experience. To better understand the way each subgroup manifests in relation to ER visits. A second limitation was the insufficient data to investigate subgrouping within insecure attachment styles, including avoidant and anxious attachment. Further research is needed to explore the internal working model and attachment behaviors of avoidant and anxious attachment styles to better understand the way each subgroup manifests in relation to ER visits.

Future research should examine the context of the ER encounter (e.g., illness severity, pain level, procedures required) that may play an additional role in children's adjustment. Further studies are needed to explore the moderation of attachment style and internal working model on children's

perception of ER visits as a predictor of behavioral responses and EBD. This study provides a foundational depiction of attachment security as a protective factor for later EBD. Future research should explore attachment-based interventions to support parent-child relationships during ER encounters to promote children's coping and mitigate negative emotional and behavioral outcomes.

Conclusion

This study examined emotional and behavioral outcomes at age 5 of children who had one or more ER visits at age 3. A hierarchal moderated linear regression found a small yet significant association between ER visits and later EBD. Children's level of attachment security strongly moderated this association. These findings indicate that the child-caregiver relationship is a protective factor against negative long-term outcomes of childhood ER visits. The present work suggests attachment-based psychosocial interventions may promote resilience in children. One limitation of this study is that the mechanisms and contextual factors contributing to this association are unknown. Further research should examine these mechanisms and evaluate the effectiveness of attachment-based interventions as a protective factor for children in the ER.

Statements and Declarations

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Competing Interests

The authors have no relevant competing interests to disclose.

Ethics Approval

This study was approved by the Institutional Review Board (IRB) at the first author's institution.

Data Availability Statement

No new data were generated or analyzed in support of this research.

Data Citation

This secondary data analysis was conducted using the Future of Families and Child Wellbeing Study.

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Author Contributions

This study was conceptualized by R.G. and S.K. All authors contributed to data analysis. The first draft of the manuscript was written by R.G. The method and results were critically reviewed by Y.S. Multiple rounds of additional revisions were conducted by S.K. and R.G.

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