1 Maternal Emotion Dysregulation and its Association with Child Internalizing and

2 Externalizing Behaviors and Heart Rate Variability

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8   Abstract

9   Maternal emotion dysregulation, a transdiagnostic feature of psychopathology, may be a

10 potential risk factor for the emergence of psychopathology in children. However, there is

11 less known about child characteristics that might serve as protective factors against this

12 risk. One such characteristic is heart rate variability (HRV) reactivity, where greater

13 decreases in HRV from baseline to a stressor task indicate increased emotion regulation.

14 This study examined whether increased child HRV reactivity served as a protective factor

15 mitigating the transmission of psychopathology from emotionally dysregulated mothers to

16 behavior problems in preschool age children.

17   Mother-preschooler dyads (N=66) were oversampled for maternal emotion

18 dysregulation, measured using maternal self-report on the Difficulties in Emotion

19 Regulation Scale. Mothers reported on child internalizing and externalizing behaviors using

20 the Child Behavioral Checklist. Child baseline HRV was collected, where the child sat

21 quietly for 2 minutes while a book was read to them. Child HRV was also measured during

22 a stressor task, where dyads had 7 minutes to build a complex Lego figure. HRV reactivity

23 was calculated by subtracting child baseline HRV from child HRV during the stressor task.

24   Two hierarchical regression models were conducted, entering maternal emotion

25 dysregulation, child HRV reactivity, and the interaction term of these variables predicting

26 either child internalizing or child externalizing problems (see Table 1). Across these two

27 models, maternal emotion dysregulation, but not child HRV reactivity, significantly

28 predicted child's internalizing and externalizing behaviors. Maternal emotion dysregulation

29 significantly interacted with child HRV reactivity to predict child internalizing behaviors,

30 such that maternal emotion dysregulation had a greater impact on child internalizing

31 behaviors if the child exhibited a greater decrease in HRV from baseline to the stressor task

32 (i.e. exhibited increased self-regulation). There was no significant interaction predicting

33 child externalizing behaviors.

³⁴ These findings suggest that maternal emotion dysregulation more strongly predicts

³⁵ child behavior problems in physiologically regulated children. Interventions that target

³⁶ maternal emotion dysregulation may therefore improve child behavior outcomes even in

³⁷ physiologically regulated children.

³⁸ *Keywords:* emotion regulation, parenting, child outcomes

³⁹ Word count: X

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41 Externalizing Behaviors and Heart Rate Variability

Introduction

43 Emotion dysregulation, a transdiagnostic feature of psychopathology, has been shown

44 to be a significant mediator of mental health symptoms and symptom severity in adults. A

45 parent's own mental health has been known to predict child mental health symptoms and

46 behavioral problems. These two facts together, therefore, may mean a parent's emotion

47 regulation, particularly emotion regulation difficulties, may be an important risk factor for

48 the emergence of psychopathology in children. Investigating the role of parental emotion

49 regulation on childhood health and mental health problems is therfore an important

50 clinical question in need of further investigation.

51 While risk factors are one important area to investigate in the prevention of child

52 mental health symptoms, it is also important to examine protective factors that may help

53 make a child more resilient to developing these symptoms later on. However, there is less

54 known about child characteristics that might serve as protective factors against risk. One

55 such characteristic that has been identified in the literature is heart rate variability (HRV)

56 reactivity, where greater decreases in HRV from baseline to a stressor task indicate

57 increased emotion regulation.

58 This study examined whether increased child HRV reactivity served as a protective

59 factor mitigating the transmission of psychopathology from emotionally dysregulated

60 mothers to behavior problems in preschool age children. The aims of this research is to

61 investigate the relationship between maternal emotion dysregulation and child behaviors in

62 a sample of women with BPD symptoms and there preschool aged children. A second aim

63 is to examine the effects of maternal emotion dysregulation on child HRV reactivity. The

64 final aim is to examine the interaction of maternal emotion dysregulation and child

65 reactivity on child behaviors.

<p style="text-align:center">Methods</p>

Participants

Sixty-eight mothers and their preschool aged children (M = 48, SD = 7.6 months, 46% girls) were recruited from various sources including a developmental database maintained by the university psychology department, craigslist, and community mental health centers. Mothers were recruited based on the presence or absence of borderline personality disorder (BPD) symptoms, a disorder marked by extreme emotion dysregulation, as measured by the McLean screener (Zanarini et al., 2003). Mothers with elevated BPD symptoms were oversampled in order to ensure a range of emotion regulatory capabilities.

Procedure

Families participated in a 2.5-hour assessment in offices on a university campus. Prior to participation, both mother consent and child assent were obtained, per Institutional Review Board approval. While mothers completed questionnaires, children completed assessments in an adjacent room, although child assessment data is not presented here. Mother and children were then reunited for parent-child interaction tasks in which baseline and stressor task HRV was collected on both mothers and children. Only child HRV data is presented here.

Materials

Maternal emotion dysregulation. Maternal emotion dysregulation was measured using the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). The DERS is a 36-item self-report questionnaire designed to assess multiple facets of emotional dysregulation, with scores ranging from 36-180 (M=70.10, SD=22.33). Higher scores suggest greater emotion dysregulation.

90 **Heart rate variability.** Child baseline HRV was collected, where the child sat

91 quietly for 2 minutes while a book was read to them. Child HRV was also measured during

92 a stressor task, where dyads had 7 minutes to build a complex Lego figure. HRV reactivity

93 was calculated by subtracting child baseline HRV from child HRV during the stressor task

94 (M=-1.10, SD=0.65)..

95 **Child behavior problems.** Child behavior problems were assessed using maternal

96 report on the Child Behavior Checklist (CBCL) for both internalizing (i.e., anxious,

97 depressive, and overcontrolled) and externalizing (i.e., aggressive, hyperactive,

98 noncompliant, and undercontrolled) behaviors. Mean scores are presented in Table 2.

Data analysis

100 We used R (Version 3.5.1; R Core Team, 2018) and the R-packages *bindrcpp* (Version

101 0.2.2; Müller, 2018), *dplyr* (Version 0.7.6; Wickham, François, Henry, & Müller, 2018),

102 *forcats* (Version 0.3.0; Wickham, 2018a), *ggplot2* (Version 3.0.0; Wickham, 2016), *here*

103 (Version 0.1; Müller, 2017), *jtools* (Version 1.1.1; Long, 2018), *kableExtra* (Version 0.9.0;

104 Zhu, 2018), *knitr* (Version 1.20; Xie, 2015), *papaja* (Version 0.1.0.9842; Aust & Barth,

105 2018), *purrr* (Version 0.2.5; Henry & Wickham, 2018), *readr* (Version 1.1.1; Wickham,

106 Hester, & Francois, 2017), *rio* (Version 0.5.10; C.-h. Chan, Chan, Leeper, & Becker, 2018),

107 *stringr* (Version 1.3.1; Wickham, 2018b), *tibble* (Version 1.4.2; Müller & Wickham, 2018),

108 *tidyr* (Version 0.8.1; Wickham & Henry, 2018), and *tidyverse* (Version 1.2.1; Wickham,

109 2017) for all our analyses.

Results

111 Means and standard deviations for variables are presented in Table 1. and Table 2.

112 Two hierarchical regression models were conducted, entering maternal emotion

113 dysregulation, child HRV reactivity, and the interaction term of these variables predicting

114 either child internalizing or child externalizing problems (see Table 2.). Across these two

115 models, maternal emotion dysregulation, but not child HRV reactivity, significantly

116 predicted child's internalizing and externalizing behaviors. Maternal emotion dysregulation

117 significantly interacted with child HRV reactivity to predict child internalizing behaviors,

118 such that maternal emotion dysregulation had a greater impact on child internalizing

119 behaviors if the child exhibited a greater decrease in HRV from baseline to the stressor task

120 (i.e. exhibited increased self-regulation). There was no significant interaction predicting

121 child externalizing behaviors.

122 **Discussion**

123 These findings suggest that maternal emotion dysregulation more strongly predicts

124 child behavior problems in physiologically regulated children. Interventions that target

125 maternal emotion dysregulation may therefore improve child behavior outcomes even in

126 physiologically regulated children.

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Table 1

Means and SDs for Maternal Emotion Dysregulation (DERS) and Child Reactivity

DERS_mean	DERS_SD	Reactivity_mean	Reactivity_SD
70.10	22.33	-1.10	0.65

Table 2

Means and SDs for Child Internalizing and Externalizing Behavior

cbcl_subtype	cbcl_mean	cbcl_SD
ext	16.28	9.49
int	11.17	7.54

Table 3

Results of Linear Regression Predicting Child Internalizing Behavior

Predictor	b	95% CI	$t(45)$	p
Intercept	11.00	[9.04, 12.97]	11.27	< .001
Ders c	0.17	[0.08, 0.25]	3.98	< .001
Reactivity c	-1.19	[−4.30, 1.91]	-0.77	.443
Ders c × Reactivity c	-0.18	[−0.34, −0.02]	-2.27	.028

Table 4

Results of Linear Regression Predicting Child Externalizing Behavior

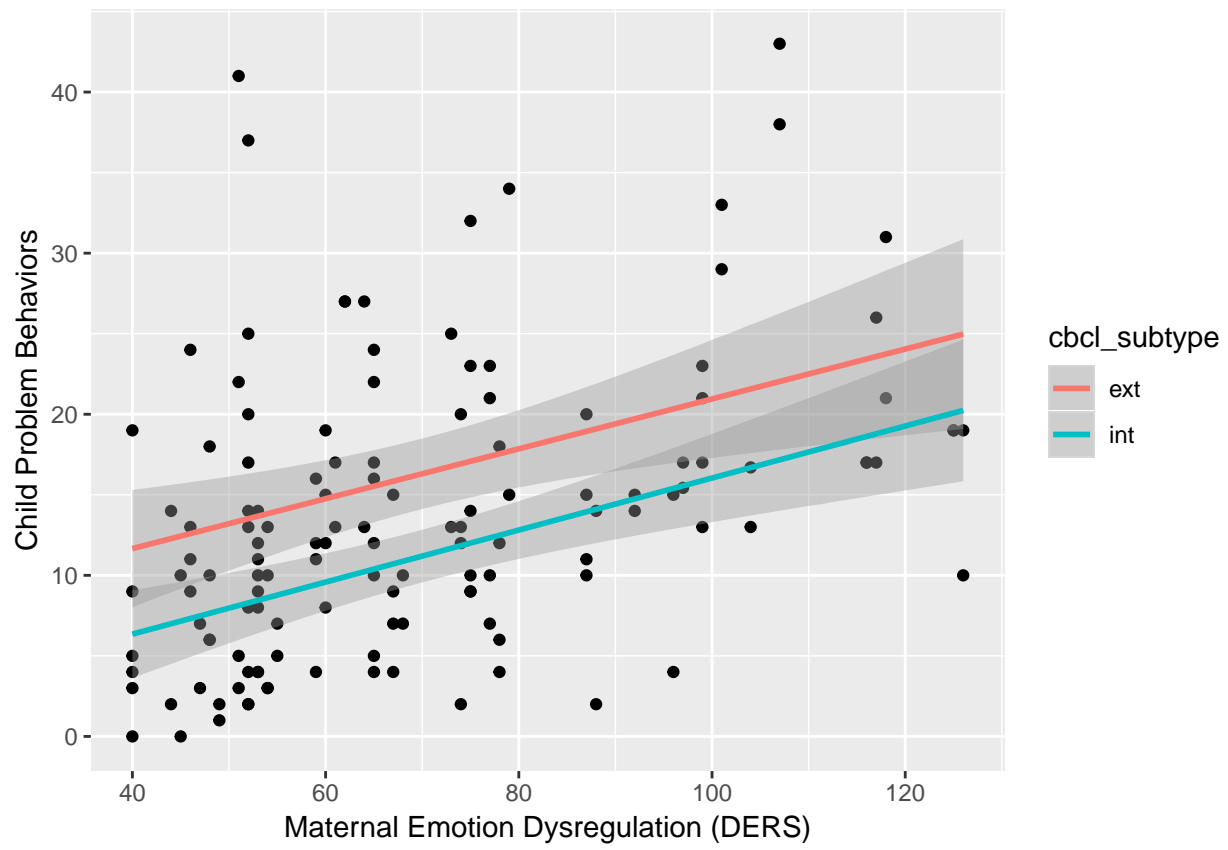| Predictor	b	95% CI	$t(45)$	p
Intercept	16.02	[13.34, 18.69]	12.06	< .001
Ders c	0.16	[0.05, 0.27]	2.84	.007
Reactivity c	1.72	[−2.50, 5.94]	0.82	.415
Ders c × Reactivity c	-0.03	[−0.25, 0.19]	-0.30	.764

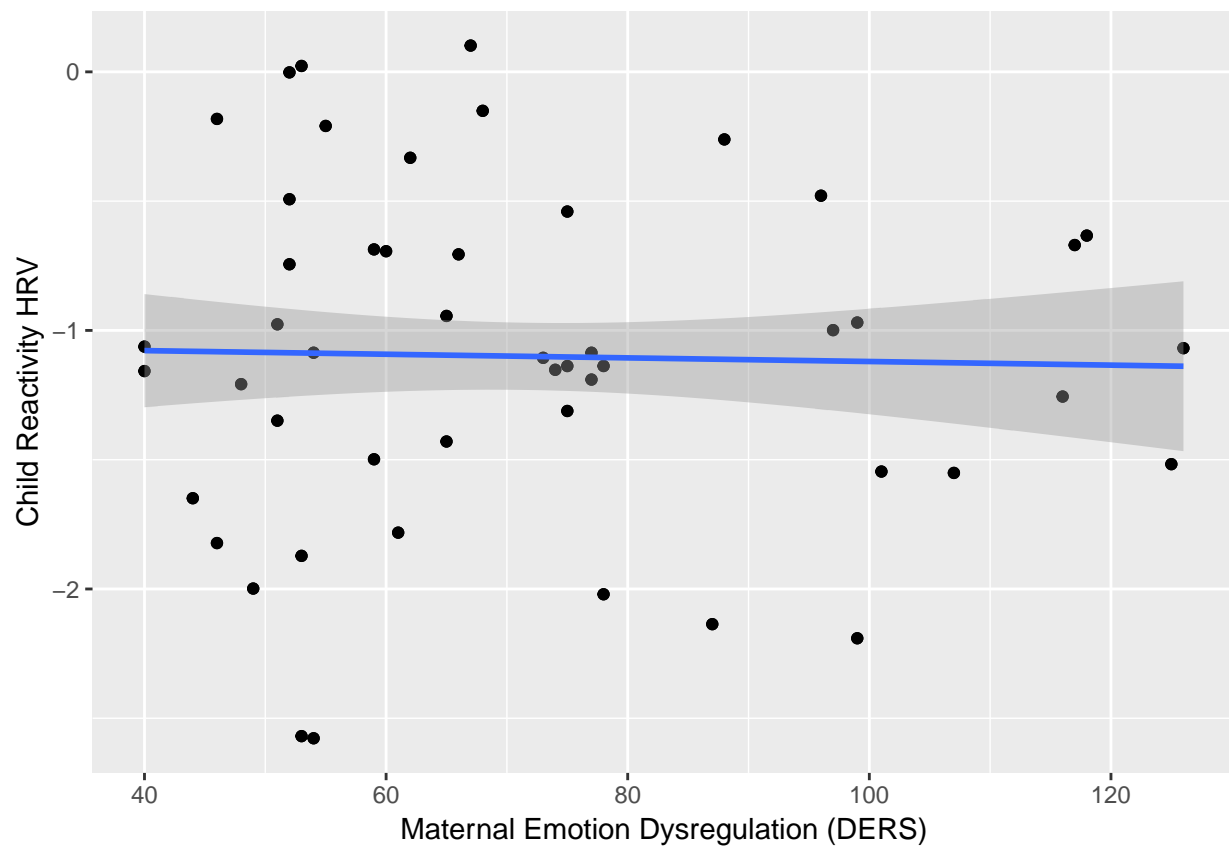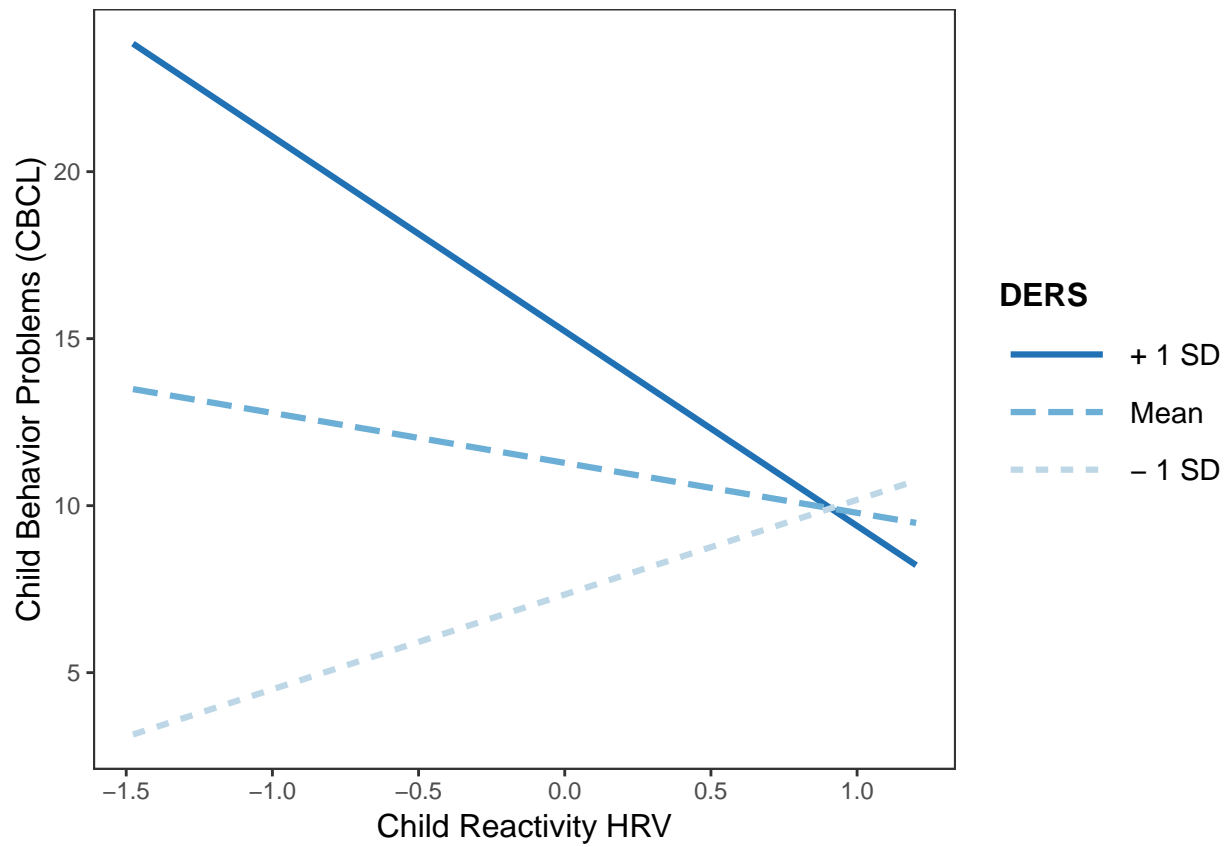*Figure 1*. Maternal Emotion Dysregulation and Child Behaviors

Figure 2. Maternal Emotion Dysregulation and Child HRV Reactivity

Figure 3. Child Reactivity Predicting Child Behavior Problems at Three Different Levels of Maternal Emotion Dysregulation