



Associations between Parenting and Error Monitoring Functions



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Introduction

Parenting plays important role in children's cognitive development and emotional wellbeing

- Negative parenting impacts cognitive functioning [1], and emotion regulation [2]

To measure cognitive functioning, two event-related potentials (ERPs), the error-related negativity (ERN) and error positivity (Pe), are neural markers of cognitive control [3]

- ERN is negative deflection in ERP peaking between 0-100ms after a mistake, reflects automatic error detection [4]
- The early Pe (ePe), peaking 150-350 ms after an error, reflects automatic error processing like the ERN [5, 6]
- The late Pe (LPe), peaking 350-750 ms after an error, reflects error awareness and mechanisms to prevent subsequent errors [5, 6]

Past research has examined parenting in relation to the ERN, but not the Pe yet

- Past research shows negative parenting relates to a larger youth ERN [e.g. 7, 8, 9]
- Important to additionally examine how negative parenting impacts Pe

Aims & Hypothesis

Question: How does parenting behavior impact children's cognitive development, as measured with the ERN and early and late Pe.

Hypothesis: Negative parenting will predict a larger ERN and Pe

Methods

Participants

- $n = 143$
- Age: 8.00 - 13.99 ($M = 10.59$; $SD = 1.68$)
- Recruitment: laboratory database and online community advertising

Materials

- Parenting Behavior: Child report Parent Perception Inventory (PPI; [10])
- Child friendly Flankers task [11]



Results

Analysis: Regressed outcome variables (Δ ERN, Δ ePe, Δ LPe) to predictors (positive maternal parenting, negative maternal parenting, positive paternal parenting, negative paternal parenting)

Δ Late Pe: Significant individual predictors for the Δ late Pe

- Negative maternal parenting was associated with a smaller Δ LPe ($\beta = -0.244$, $p < 0.05$)
- Positive maternal parenting was associated with a larger, more positive Δ LPe ($\beta = 0.231$, $p < 0.05$)

Δ Early Pe: Overall model was significant but individual predictors did not predict Δ ePe

Δ ERN: Overall model was significant but individual predictors did not predict Δ ERN

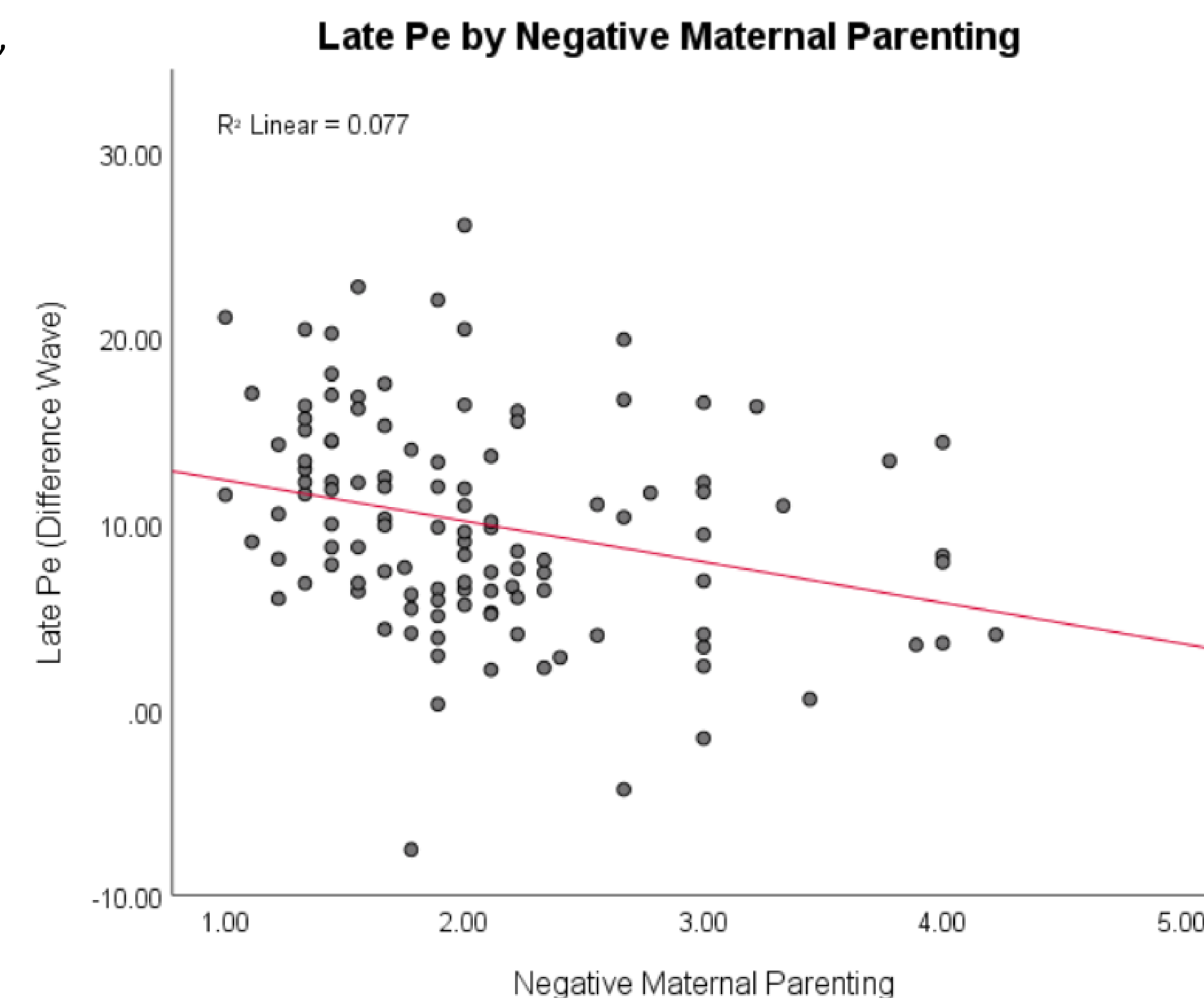


Table 1 Bivariate correlations between parenting and ERPs

Variable	1	2	3	4	5	6	7
1. Δ ERN FCz	--						
2. Δ ePe CPz	0.069	--					
3. Δ LPe CPz	0.234**	0.658**	--				
4. Pos Mom	0.009	0.168	0.207*	--			
5. Neg Mom	0.234*	-0.257**	-0.278**	-0.204*	--		
6. Pos Dad	-0.137	0.103	-0.016	0.477**	-0.093	--	
7. Neg Dad	0.214*	-0.233*	-0.121	-0.032	0.531**	-0.078	--
M	-1.817	15.624	10.265	3.877	2.048	3.593	2.064
SD	6.107	8.557	5.911	0.703	0.725	0.857	0.695

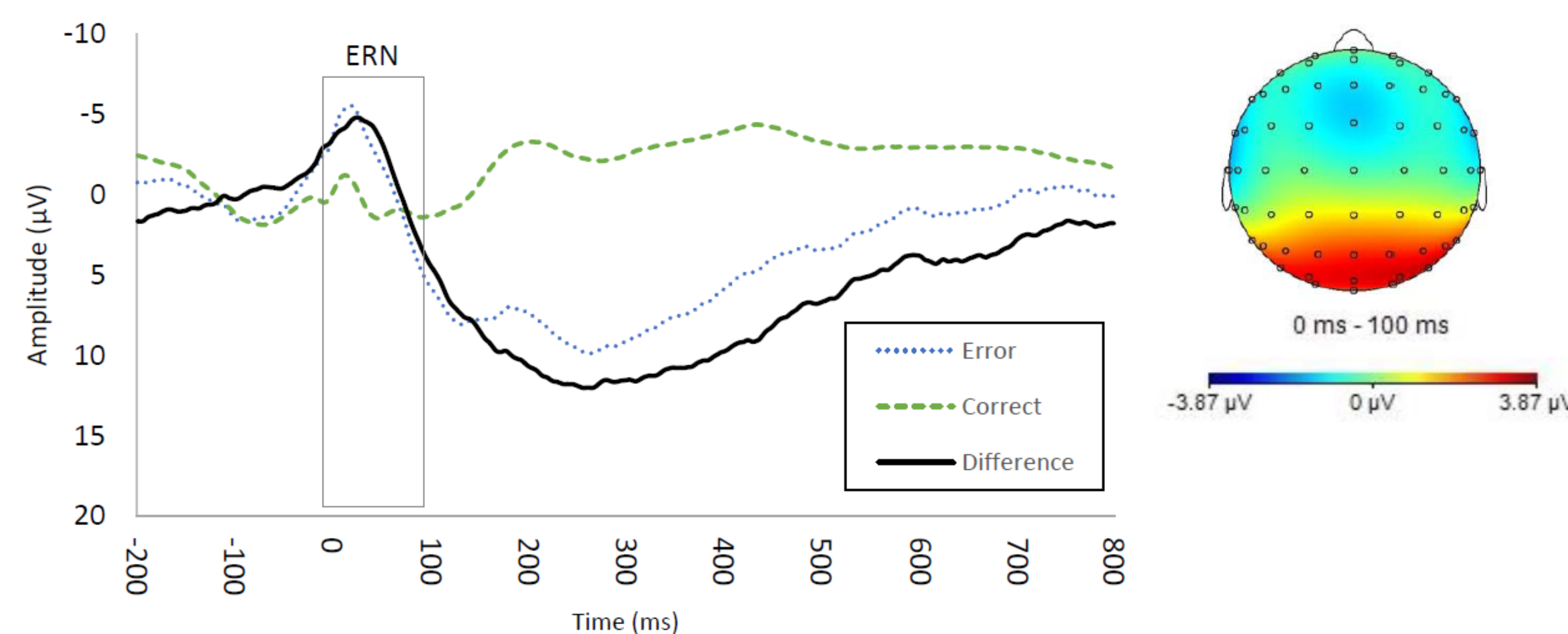
Note. Δ ERN FCz ERN-CRN difference wave at site FCz, Δ ePe CPz Error-Correct difference wave at site CPz, Δ LPe CPz Error-Correct difference wave at site CPz, Pos Mom child report positive maternal parenting behavior, Neg Mom child report negative maternal parenting behavior, Pos Dad child report positive paternal parenting behavior, Neg Dad child report negative paternal parenting behavior

* $p \leq 0.05$

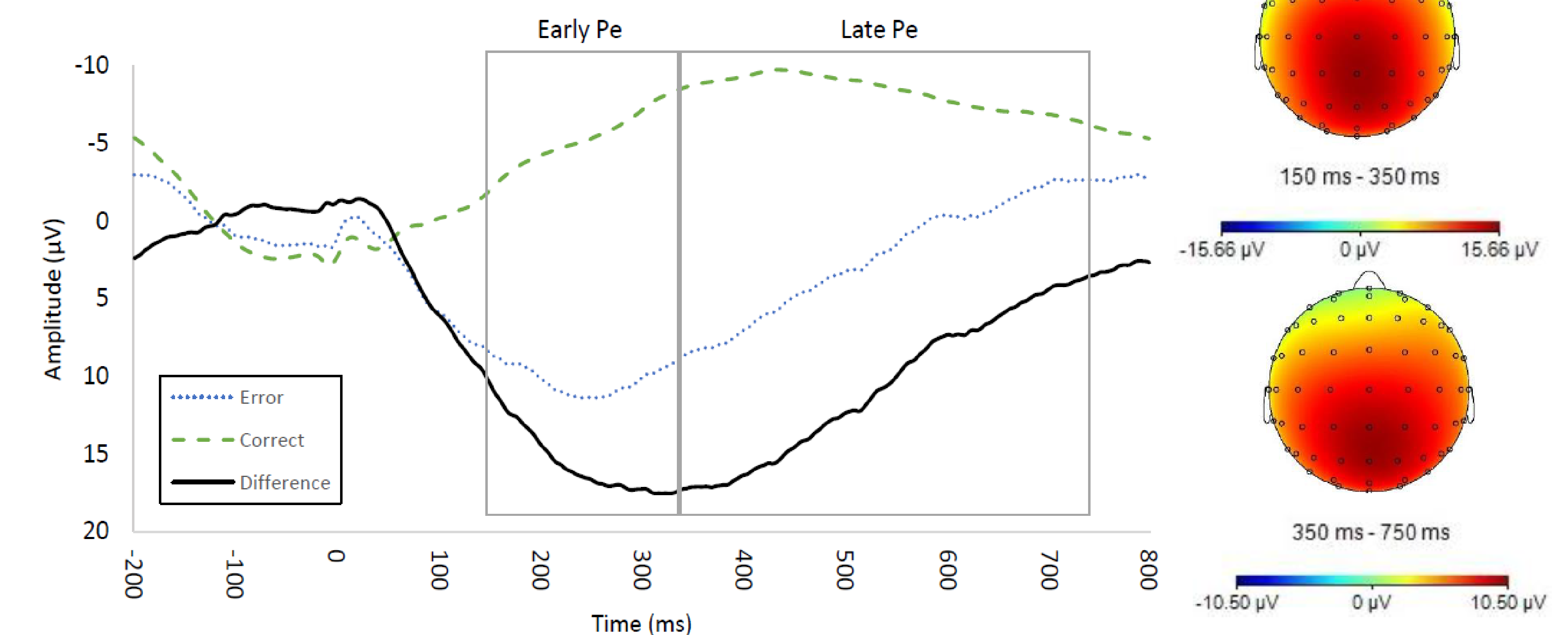
** $p \leq 0.01$

- Positive maternal parenting related to Δ LPe ($r = .207$, $p = .026$)
- Negative maternal parenting related to Δ ERN ($r = .234$, $p = .012$)
- Negative maternal parenting negatively related to Δ ePe ($r = -.257$, $p = .006$)
- Negative maternal parenting negatively related to Δ LPe ($r = -.278$, $p = .003$)
- Negative paternal parenting negatively related to Δ ePe ($r = -.233$, $p = .013$)

FCz Error-Related Negativity (ERN)



CPz Error Positivity (Pe)



Discussion

Negative Maternal Parenting negatively predicts Δ late Pe

- Contrary to hypothesis, more negative maternal parenting may dampen child's ability to recognize and prevent mistakes (reflected as Δ LPe)

Positive Maternal Parenting predicts Δ late Pe

- Having a more supportive parental environment may strengthen children's ability to recognize and prevent mistakes (reflected as Δ LPe)

Parenting does not predict Δ ERN nor Δ early Pe

- Both early Pe and ERN are thought to reflect similar automatic error processes. Notably, neither ERN nor early Pe relate to parenting
- Parenting may not have as much of an impact on early error processes

Limitation

- PPI may not accurately assess parenting behavior
- Children reported low negative and positive paternal parenting scores
- Possible developmental influences in ERPs across time

Conclusion

- Findings suggest negative maternal parenting may have greater negative impact on development of children's error awareness mechanisms
- Results further emphasize need to study late Pe when examining impact of parenting practices on children's cognitive development

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