



The Role of Executive Functions in Facilitating Soothing Behavior During Interactions with a Simulated Distressed Infant

Katie M. Laws^{1*}, Melissa Naso¹, Kate B. Oddi¹, Brittney Keilman-Wyatt^{1*}, Liz Hougland¹, Brittney Wyatt^{1*}, Grant Allen¹,

David Bridgett¹, Helena Rutherford², & Linda Mayes²

Northern Illinois University¹, Yale University School of Medicine²



Introduction

- Executive functions (EF) consist of cognitive processes which include, cognitive flexibility, set shifting, and inhibitory control¹⁻³
- Problems with EF, and self-regulation broadly, have been related to a number of outcomes, including parenting behavior
 - In studies with older children inattention and lower working memory have been implicated in less child involvement and inconsistent discipline^{4,5}.
- Only one study was identified that examined associations between maternal self-regulation and parenting of infants.
 - Effortful control predicted the amount of time mothers spent in various interactive caregiving activities with infants⁸.
- The effects of EF on parenting behavior during stressful parenting situations (e.g., when young children are distressed) have not been investigated despite the importance of parental reactions in these situations for the development of self-regulation in young children^{6,7}.
- Using a novel parenting simulation task, the goal of this study was to examine the role of college student EF on specific behavioral responses to persistently high levels of infant distress.

Hypotheses

- While trying to soothe an inconsolable simulated infant, it was anticipated that participants who exhibited greater EF difficulties (i.e., poor inhibitory control and cognitive inflexibility) would use:
 - Fewer sensitive vocalizations
 - Fewer caretaking efforts
 - Fewer attempts at distraction
 - Less frequent use of soothing touch

Method - Participants

- 77 non-parent college students
- Mean age = 19.36 years (range = 18 – 25 years)
- Most participants self-identified as Caucasian American (59.7%), African American (22.1%), or Hispanic/Latino (11.7%).

Method - Measures

- Covariates: Participant gender and prior infant caregiving experience (PCE).
- Participants completed the computerized version of the Wisconsin Card Sorting Task (WCST)⁹
 - Cognitive inflexibility was assessed by averaging the standardized number of two types of errors (perseverative and non-perseverative) made during the WCST.
- Participants also the Color-Word Interference task, which is a Stroop-like task from the D-KEFS¹⁰, including the Inhibition and Inhibition Switching trials
 - Inhibitory control was calculated as the mean of the standardized values of the number of errors and completion times during the Inhibition and Inhibition Switching trials

Method - Procedure

- Prior to interacting with the simulated distressed infant, participants completed EF and other tasks.
- Infant Simulator Paradigm (ISIM)
 - Participants were given a description of the ISIM followed by a demonstration, using a standard script, showing that the ISIM could be calmed when distressed
- After the demo, an RA located in a separate control room reprogrammed the ISIM to be inconsolable
- During the ISIM procedure, participants interacted with the ISIM for up to 6, 255s cycles of recorded infant cry, with a 10s no-cry period between cycles. Cry intensity varied during each cycle, but generally started at a low level and peaked towards the end of the cycle
- A high chair, rocker glider, and changing table with multiple shelves holding a bottle, diaper, blankets, and various infant toys were available for participants in use during the ISIM
- Gender of the ISIM was counterbalanced within participant gender; all participants were debriefed at the end of the task

Method - Behavioral Coding

- Target behaviors were continuously coded by RAs trained to a Kappa reliability of .80 or higher using Noldus 10.0 software¹¹.
 - Vocalizations – talking or singing to, shushing, or other soothing sounds made toward the ISIM ($\kappa = .74$).
 - Caretaking – efforts to feed, change, or wrap the ISIM in a blanket ($\kappa = .77$).
 - Distracting – use of an auditory toy (e.g., a rattle), a quiet toy (e.g., a stuffed animal), a mirror, or a book ($\kappa = .92$).
 - Touch – patting, rubbing, or stroking, holding/playing with the ISIM's hands or feet, and tickling ($\kappa = .70$).
- The rate per minute at which participants engaged in these behaviors was calculated and utilized to test hypotheses.

Results

Table 1. Hierarchical Multiple Regression Analyses Predicting Soothing Behavior from Executive Function Measures

DV	Predictors	ΔR^2	β
Vocalizations RPM	Gender	.022	.963
	PCE		-.125
Caretaking RPM	Cognitive Inflexibility	.065	-.851*
	Inhibitory Control		-1.010*
Distracting RPM	Gender	.099*	.002
	PCE		-.007*
Touch RPM	Cognitive Inflexibility	.183***	.011+
	Inhibitory Control		-.015+
Touch RPM	Gender	.016	.421*
	PCE		.076+
Touch RPM	Cognitive Inflexibility	.016	-.083
	Inhibitory Control		.087

DV = Dependent variable; RPM = Rate per minute; ⁺ $p < .10$, ^{*} $p < .05$, ^{**} $p < .01$, ^{***} $p < .001$

Conclusion

- Consistent with prior work, in the current study, EF effects on parenting behavior were demonstrated using a novel, stressful, simulated parenting task.
 - Greater difficulties with cognitive flexibility and inhibitory control contributed to fewer soothing vocalizations; a trend was observed such that difficulties with inhibitory control were associated with fewer distraction attempts.
 - This is the first study to demonstrate the importance of adult EF for interactions in the context of high infant distress
 - This study demonstrates the potential usefulness of parenting simulation tasks that could be used in situations normally difficult to observe, such as reactions to inconsolable child distress
- Given links between EF and parenting behavior and the importance of parenting for children's developing regulation, studies should examine the possibility that parenting mediates associations between caregiver EF and children's developing self-regulation.
- Findings may also have implications for intervention work. For example, the efficacy of parenting interventions might be enhanced by considering caregiver EF as those with EF difficulties may need more intensive, practice oriented interventions.

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Corresponding Author

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- Corresponding Author: Kate Oddi (kodd1@niu.edu)
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