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Effects of the INSIGHT obesity preventive intervention on reported and observed infant temperament

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Abstract

Objective—Infants higher on negative reactivity and lower on regulation, aspects of temperament, have increased obesity risk. Responsive parenting (RP) has been shown to impact the expression of temperament, including the developing ability to regulate negative emotions. The aim of this analysis was to test the effects of the INSIGHT Study's RP intervention designed for the primary prevention of obesity on reported and observed infant negativity and regulation.

Method—The sample included 240 mother-infant dyads randomized 2 weeks after birth to the RP intervention or a safety control intervention. Both groups received 4 home visits during the infant's first year. In the RP group, nurses delivered RP guidance in domains of sleep, feeding, soothing, and interactive play. At 1 year, mother-reported temperament was measured via survey, and a frustration task was used to observe temperament in the laboratory. Effects of the RP intervention were tested using general linear models.

Results—The RP intervention reduced overall reported infant negativity, driven by lower distress to limitations ($p<.05$) and faster recovery from distress ($p<.01$) in the RP group versus controls. There were no intervention effects on reported regulation or observed negativity. The intervention did increase observed regulation, particularly the use of self-comforting strategies ($p<.05$) during the frustration task.

Discussion—A RP intervention designed for early obesity prevention affected reported infant negativity and observed regulation, outcomes that have been linked with subsequent healthy

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development. Interventions grounded in a RP framework have the potential for widespread effects on child health and well-being.

Keywords

responsive parenting; negative reactivity; regulation; infancy

INTRODUCTION

Temperament refers to individual differences in behavioral styles. Specifically, temperament consists of individual differences in reactivity, including how quickly or intensely an individual reacts to his or her environment, and regulation, or the extent to which an individual can modulate his or her reactivity.¹ Myriad child outcomes have been linked to early temperament. For example, high negative reactivity and low capacities to regulate one's emotions and behavior are predictive of school readiness, academic achievement, and behavior problems.^{2, 3} Additionally, high negative reactivity, particularly distress to limitations, and low levels of regulation in early life have been linked to subsequent obesity risk.^{4, 5} Modifying parents' perceptions of and/or infants' expression of their temperament may promote healthier weight trajectories as well as positive outcomes in other developmental domains.

Both perceptions and expression of temperament are important to consider as they provide insights on different facets of children's behavioral styles. A parent's report about their child's temperament can provide a global assessment of the child's typical behavior across time and contexts. As with other questionnaires, reports of temperament may be plagued by some social desirability bias; yet they have demonstrated predictive validity, such as via links between reported temperament and later behavior problems.³ In contrast, observations of temperament during standard laboratory tasks avoid social desirability bias and provide an objective way to compare behavioral styles across participants, but are limited in their scope, assessing behavior in one particular situation on one particular day. Given these differences, it is not surprising that parent reports and laboratory observations do not always converge.⁶ Yet together, these two modes of assessment offer complementary strengths and provide a comprehensive indicator of temperament.⁷

Although temperament is biologically based, expression and perceptions of it can change over time based on experiences in the environment, such as responsive parenting (RP). For example, an intervention aiming to enhance maternal responsiveness among mothers of irritable infants increased observed infant sociability, exploration, and self-soothing and decreased crying.⁸ RP includes parental responses that are prompt, developmentally-appropriate, and contingent on child cues.⁹ Such parenting responses may enhance child self-regulation through the scaffolding of self-soothing behaviors, while unresponsive parenting can spur infant distress, creating increased parenting challenges and negative child outcomes, such as behavior problems.¹⁰ RP is a promising target for interventions during infancy, given its causal and longitudinal links with many positive developmental outcomes over time. For example, in a RP intervention involving 10 home visits between infant ages ~6 and ~11 months, target RP behaviors, such as contingently responding to infant signals,

were reviewed and practiced with feedback, and intervention group infants demonstrated greater increases in early communication, problem-solving, and social cooperation than controls through age ~13 months¹¹. While RP interventions have typically been implemented to affect such cognitive and socio-emotional outcomes,^{8, 11, 12} research exploring intersections between RP and infant feeding and growth has emerged,^{13, 14} highlighting the relevance of RP for children's physical health.

Our team showed that an obesity preventive intervention, in which home-visiting nurses delivered RP guidance in the domains of sleep, feeding, soothing, and interactive play, prevented rapid weight gain between birth and age 28 weeks, with decreased overweight prevalence in the RP intervention group at age 1 year.¹⁵ In addition, RP group infants in this study were more likely to self-soothe to sleep and slept longer at night.¹⁶ To further the understanding of how RP interventions might affect child health and development by modifying perceptions or expression of early temperament, we tested the effects of our RP intervention on reported and observed infant negative reactivity and regulation, focusing first on overall negativity and regulation and probing further into specific dimensions of these factors in the case of significant overall effects. Covariates were selected based on relevant relationships previously described in the literature, including sex differences in infant temperament and inverse relationships between negativity and regulation¹⁷. Based on the nature of the present intervention, which promoted contingent and appropriate responses to infant behavior and distress, we anticipated that RP group infants would demonstrate lower negativity, particularly being more likely to calm quickly from distress, and higher regulation, particularly self-comforting behaviors that are indicative of the emergence of self-soothing. As mentioned, reported and observed indicators of these attributes can together provide a comprehensive view of temperament; further, parent perceptions of temperament are relevant in studies of RP, as RP involves interpreting and responding to sources of infant distress and thus will be influenced by parent perceptions of the child's behavior.

METHODS

Participants and Design

Mothers and their newborns were recruited in-person by research staff shortly after delivery from one maternity ward in Central Pennsylvania into the Intervention Nurses Start Infants Growing on Healthy Trajectories (INSIGHT) Study. This study was approved by the Human Subjects Protection Office of the Penn State College of Medicine and was registered at <http://www.clinicaltrials.gov> prior to participant enrollment. The study design, inclusion criteria, and CONSORT diagram have been published previously.¹⁸ Briefly, eligibility criteria included full-term (> 37 weeks' gestation), singleton newborns weighing > 2500g delivered to English-speaking, primiparous mothers > 20 years of age. Participants were told that the study purpose was "to see if nurse visits to your home during your baby's infancy can improve your ability to either respond to your child's cues related to feeding and fussiness or improve your ability to provide safe environment for your child and prevent injuries." Of 707 eligible dyads, 316 enrolled, and 291 were randomized two weeks after birth to the RP intervention or safety control group, stratified on birthweight for gestational

age (<50th or 50th percentile) and intended feeding mode (breastfeeding or formula feeding). Research nurses were trained in administering both RP and control interventions. Home visits were conducted at infant ages 3–4, 16, 28, and 40 weeks, and a research center visit occurred at age 1 year. 279 mother-infant dyads completed the first home visit and are considered as the study cohort. At age 1 year, 253 (90.7%) of dyads remained in the study, with primary reasons for drop out including loss to follow-up (41%), willingly terminating because of personal constraints (28%), no longer being interested (14%), and moving out of the area (14%). Participants with 1-year temperament data were included in the present analyses: n=240 for analyses of parent perceptions of temperament, n=230 for analyses of observed temperament. We repeated all analyses in the full study cohort using multiple imputation, and results were consistent, suggesting that missing data did not affect the results reported herein.

Intervention

The RP intervention targeted behaviors linked with obesity risk (sleep, feeding, soothing, and interactive play), with messages grounded in a unifying RP framework that involved responding contingently and appropriately to infant signals, including the incorporation of developmentally-appropriate structure and routines as development progressed.¹⁸ Lessons included but were not limited to: a) recognizing infant hunger and satiety cues, b) using alternatives to feeding to soothe a fussy but non-hungry infant, c) allowing the infant chances to self-soothe back to sleep during night wakings, d) providing appropriate portions of healthy foods and allowing children to determine the amount consumed, and e) actively engaging infants in play time. The control group received an intervention designed around safety that was not grounded in RP but addressed similar domains: e.g., safe sleep, including crib safety, and food safety.

Measures

Data were collected and managed using REDCap (Research Electronic Data Capture). If the mother lacked internet access, paper versions of online surveys were mailed. A detailed listing of all measures collected in INSIGHT has been published previously.¹⁸

Background Characteristics—Family demographic information collected at enrollment included maternal and child ethnicity and race and maternal education and marital status. Maternal age, child sex, and gestational age were recorded from medical charts. Infant feeding mode was collected at age 16 weeks using a question from the Infant Feeding Practices Study;¹⁹ infants fed breast milk at 80% of feeds were categorized as predominantly breastfed.

Reported Temperament—To assess the outcome of parent-reported temperament, mothers completed the Infant Behavior Questionnaire-Revised (IBQ-R) at infant age 1 year.¹⁷ This reliable, valid, and widely-used parent-report measure uses 191 items to assess fine-grained aspects of infant temperament across 14 subscales. Parents indicate on a scale of 1 (never) to 7 (always) the extent to which items are characteristic of their infant's recent behavior. The measure's subscales can be collapsed into three overarching superfactors, two of which are of interest in this study. The Negative Affectivity factor (called negativity

herein) assesses negative reactivity and includes four subscales: distress to limitations (anger/frustration), sadness, fear, and falling reactivity (rate of recovery from distress, reverse scored). An example negativity item is: “How often during the last week did the baby protest being placed in a confining place (infant seat, play pen, car seat, etc.)?” This item captures the infant’s distress to limitations. Given the RP intervention’s promotion of contingent and appropriate responses to infant distress, and the idea that such efforts can support the development of self-soothing in the face of distress, distress to limitations and falling reactivity were anticipated to be the most relevant negativity subscales in this study. Study group differences in sadness and fear were not anticipated.

The Orienting/Regulation factor (called regulation herein) assesses modulation of infant reactivity and includes four subscales: soothability, duration of orienting (attention), cuddliness (enjoyment in being held), and low intensity pleasure (enjoyment of low stimulus intensity). An example regulation item is: “When rocking your baby [during the past two weeks], how often did s/he soothe immediately?” This item captures the infant’s soothability. Based on the RP intervention’s focus, soothability was anticipated to be the most relevant of the regulation subscales in the present study.

The very short form of the Infant Behavior Questionnaire-Revised²⁰ was also administered to mothers at infant age 16 weeks, yielding negativity and regulation factors. This measure was utilized as an indicator of earlier temperament although it is important to note that one of the four intervention visits occurred at age 3–4 weeks, prior to the administration of this measure, and this first home visit included strategies to soothe fussy/crying infants.

Observed Temperament—The outcome of observed temperament was measured during a standard frustration task administered during the 1-year clinic visit. This task was video recorded for later coding and consists of multiple episodes: first, the infant plays with an interesting toy with his/her mother. Then the toy is removed, and both the toy and the mother move out of the infant’s reach but within sight (the toy removal episode). After a minute, the mother returns the toy to the infant and leaves again, so the infant is now alone with the toy (the toy return episode). Finally, the mother returns and plays with the infant. Teams of trained researchers, blinded to study group, coded infant negativity and regulation in five-second intervals during the toy removal and toy return episodes. These episodes were expected to elicit individual differences in negative reactivity and regulation. The toy removal was expected to be frustrating and upsetting, and infants would likely be in the process of calming down from this distress during the toy return episode, during which the mother continues to be unavailable and is thus unable to assist with soothing. In coding negative reactivity during these episodes, coders identified the peak level of negativity (none, mild, moderate, or high) displayed during each interval.

For regulation, four regulatory strategies were coded. Coders recorded whether or not each of two “self-soothing strategies” were observed during each interval: self-comforting (e.g., thumb sucking, hair twirling) and orienting (fixing gaze on an aspect of the environment). These strategies were of primary interest given the hypothesis that the RP intervention would promote the emergence of infants’ self-soothing. In addition, coders recorded whether or not each of two “other regulatory strategies” were observed during each interval: looking

at the toy and looking to the mother. These were two additional strategies infants could use during this task but were not considered indicative of self-soothing.

For both the negativity and regulation coding teams, 20% of the videos were randomly selected to be coded by both coders to continually assess reliability. For coded negativity variables, reliability was calculated using intraclass correlations, which were 0.91. For coded regulation variables, reliability was calculated using Cohen's kappa and ranged from 0.69–0.85 for all codes, with percent agreements consistently 90%.

Negativity data were summarized as proportion scores representing the percent of coded intervals in which the infant's peak distress level consisted of mild, moderate, or high intensity negativity or no negativity. Weighted intensity scores were calculated from these data to represent overall negativity during the toy removal and toy return episodes, respectively: $[(0 \times \text{proportion of intervals coded as non-negative}) + (1 \times \text{mild negativity proportion score}) + (2 \times \text{moderate negativity proportion score}) + (3 \times \text{high negativity proportion score})]$. Proportion scores for individual regulation strategies (e.g., self-comforting, orienting), as well as those capturing the percentage of intervals in which any self-soothing strategies were used and the percentage in which any other regulatory strategies were used, were also calculated.

Statistical Analysis

Descriptive statistics were generated for all variables of interest, including demographics. Chi-square and independent samples t-tests were used to test for study group differences among categorical and continuous demographic variables, respectively. Inter-relationships between composite temperament variables at 1 year, as well as relationships between these indicators and covariates of interest were explored.

To test key study aims, general linear models assessed RP intervention effects on composite temperament variables of interest at age 1 year: negativity and regulation superfactors from the IBQ-R (parent-reported temperament); overall negativity intensity scores during the toy removal and toy return episodes (observed negativity); and the percentage of toy removal and toy return intervals spent exhibiting self-soothing and other regulation strategies (observed regulation). In the case of a significant effect, results were probed further by examining effects on corresponding fine-grained aspects of temperament: e.g., for reported regulation, the fine-grained aspects are the corresponding IBQ-R subscales, such as soothability, and for observed regulation, the fine-grained aspects are the specific regulation strategies corresponding to self-soothing and other strategies, such as self-comforting as a self-soothing strategy.

Analyses were repeated with covariate adjustments (sex and feeding mode at 16 weeks, plus negativity when regulation was an outcome) and with frequency outcomes instead of proportion scores. All findings were similar, so the simpler models are reported herein. Additional models exploring the roles of covariates as potential moderators were examined in the case of significant relationships between aforementioned demographic factors and temperament variables at 1 year. In each case in which a demographic factor demonstrated a significant relationship with a temperament variable, this factor was added into the model.

examining study group effects on the temperament variable, as was the interaction between the demographic factor and study group. Finally, we also tested for study group differences in mother-reported negativity and regulation from the Infant Behavior Questionnaire-Revised Very Short Form at age 16 weeks to provide insights into whether temperament differences existed between the study groups at this earlier time point. Statistical significance was defined as $p < .05$.

RESULTS

Descriptive Statistics and Associations between Temperament and Covariates of Interest

Demographic characteristics of the sample are shown in Table 1. There were no study group differences on any of these demographic characteristics. Reported and observed indicators of infant temperament at age 1 year were interrelated overall, with positive associations between reported negativity and negativity scores during the toy removal ($r = 0.23$, $p < .001$) and toy return episodes ($r = 0.17$, $p < .05$) of the frustration task, and positive associations between reported regulation and use of self-soothing regulatory strategies during the toy return episode ($r = .16$, $p < .05$) (but not during the toy removal, $p = .21$). Some indicators of negativity and regulation were also related to one another, with a significant inverse association between reported negativity and observed self-soothing strategies during the toy return episode ($r = -.17$, $p < .05$) (but not toy removal, $p = 0.13$). Reported regulation was not significantly related to reported or observed negativity.

In examining associations between these key temperament variables and covariates of interest, some relationships with sex and feeding mode emerged: girls displayed less negativity ($t(226) = 3.3$, $p < .01$), more self-soothing strategies ($t(228) = 3.0$, $p < .01$), and fewer of the other regulatory strategies ($t(228) = 3.2$, $p < .01$) than boys during the toy return episode. Breastfed infants used more of the other regulatory strategies ($t(224) = 3.6$, $p < .001$) during the toy removal episode. Neither sex nor feeding mode significantly moderated effects of the RP intervention on key temperament indicators at 1 year described herein.

RP Intervention Effects on Reported Infant Negativity and Regulation at Age 1 Year

RP group mothers reported that their infants were lower on negativity compared to the control group ($F(238,1) = 3.99$, $p < .05$; Table 2). Follow-up analyses revealed that these differences were driven by significantly lower mother-reported distress to limitations ($F(238,1) = 6.33$, $p < .05$) and significantly faster rates of recovery from distress (i.e. falling reactivity; $F(238,1) = 7.60$, $p < .01$) in the RP group, with no study group differences on the negativity subscales of sadness ($p = .29$) or fear ($p = .86$). RP group mothers did not report any differences in regulation compared to the control group ($p = .39$).

RP Intervention Effects on Observed Infant Negative Reactivity and Regulation at Age 1 Year

There were no study group differences in observed negativity during the toy removal ($p = .99$) or toy return ($p = .96$) episodes, and there were no differences in observed regulation during the toy removal ($p = 1.0$ for self-soothing strategies and $p = .36$ for other strategies). Yet group differences in regulation were revealed during the toy return, the episode during which

infants are still calming down from the distress caused by the removal of the toy and are also still without their mothers. During this episode, RP group infants used self-soothing strategies more than control group infants ($F(228,1)=5.18, p<.05$; Table 2). Specifically, these infants used self-comforting strategies such as thumb-sucking and hair twirling more often than controls ($F(228,1)=4.71, p<.05$). There were no group differences in the use of orienting ($p=.39$) or other regulatory strategies ($p=.22$) during the toy return.

Study Group Differences in Temperament at Age 16 Weeks

An examination of the temperament data available before age 1 year revealed a trend-level difference in reported negativity by study group, with lower negativity in the intervention group at age 16 weeks, after administration of some but not all intervention sessions. There were no group differences in reported regulation at 16 weeks (Table 2).

DISCUSSION

Results from this analysis from the INSIGHT Study provide evidence that a RP intervention designed for the primary prevention of early obesity affected maternal perceptions and observed expression of infant temperament at age 1 year. Specifically, compared to controls, mothers' perceptions of infant negativity were lower in the RP group, and observations of self-soothing strategies were higher. Given the aforementioned links between negativity, regulation, and positive developmental outcomes across cognitive, socio-emotional, and physical health domains, these effects highlight the potential for interventions like INSIGHT's to have widespread effects on health and well-being.

These findings are consistent with previous studies focused on socio-emotional development, which have shown effects of RP interventions on aspects of infant negativity and regulation. For example, in their RP intervention targeting parents of infants, Landry et al.¹¹ found that intervention group infants demonstrated increased regulation, such as in regulating their affect when interacting with a new adult. These effects were especially pronounced among infants born at very low birth weight, who were considered a high-risk group in the study. Results from the same study demonstrated effects of RP on infants' social-emotional competence, communication, and cognitive outcomes. These effects, combined with findings from the present study, support the idea that RP interventions offer the potential for simultaneous and perhaps lasting benefits across developmental domains.

The observed regulation findings we report are also largely consistent with effects previously detected in our pilot research²¹ and with the predicted effects of the RP intervention and nature of the intervention content. The INSIGHT curriculum is designed to provide parents with strategies they can use to appropriately respond to infant behaviors, including responding to non-hunger-related distress with soothing techniques that do not involve feeding and giving infants chances to self-soothe before intervening during night wakings. Scaffolding infants' soothing and calming in this manner offers the potential to facilitate the development of self-regulation, including infants' self-soothing of their own distress. To test this idea, we examined whether RP group infants were more likely to apply self-soothing strategies like self-comforting in the context of a distressing "Toy Removal" task at age 1 year and found that this was the case during the toy return episode, during

which infants are continuing to calm down from the distress of the toy's removal and continue to have their mothers unavailable. The similar effects of the pilot²¹ and larger INSIGHT RP interventions on the use of self-soothing strategies during this frustration task increase our confidence in the robustness of the RP intervention's effects on observed regulation.

In addition to examining observed temperament in a standard laboratory task, we also examined RP intervention effects on parents' perceptions of their infants' temperaments. As mentioned, in the temperament literature, results from such assessments do not always converge, as observations reflect objective assessments of infant temperament in a particular context on a particular day, and parents' perceptions reflect a more global (but perhaps less objective) indication of their infants' temperaments.⁷ In this case, we argue that examining both aspects of temperament is important, as parents' perceptions of their infants' behavioral styles can affect their future interactions with and expectations of their infants, further shaping developmental outcomes. The present results showed that the RP intervention affected mother-reported negativity and observed regulation (but not observed negativity and reported regulation). Looking more closely at the dimensions of reported negativity that drove these findings, intervention group mothers perceived their infants as lower on distress to limitations and higher on rate of recovery from distress, expected effects given the nature of the intervention. Intervention effects on these two temperament subscales reflect an infant who is better able to regulate his or her distress and quickly and successfully self-soothe. Therefore, across the reported and observed temperament measures, results consistently reflect a link between the RP intervention and increased self-soothing among infants.

Overall, the RP intervention's effects on the use of self-soothing strategies in a distressing situation, as well as parents' perceptions of their infants' distress and falling reactivity, are encouraging, suggesting the potential for effects on continued self-regulation development and associated cognitive, socio-emotional, and physical health outcomes during childhood and beyond.^{22, 23} For example, in their school readiness intervention research with low-income children, Raver and colleagues²⁴ found that effects on self-regulation mediated intervention effects on school readiness. Taken together, such findings underscore that a RP approach to early obesity prevention may not only be promising for this target outcome¹⁵ but also may have collateral benefits on children's health and well-being more broadly, making such interventions a worthy investment for future study along longer timelines and in additional populations.

A limitation of the current study is that the sample is relatively homogeneous, including being predominantly White and well-educated, reflecting the demographics of the geographic area in which this first large-scale obesity prevention trial using RP techniques was conducted. The aforementioned extant research applying RP interventions to more diverse and higher-risk populations suggests the potential for RP obesity interventions to be effective beyond the population studied here, but additional research is needed to test this assumption. Additionally, while the absence of study group differences on demographics and the change from trend-level to statistically significant group differences in reported negativity from 16 weeks to 1 year are consistent with the idea that the observed group differences in temperament at 1 year resulted from this randomized RP intervention, the lack

of a baseline measure of infant temperament prior to the administration of any interventions is a limitation of this study. Finally, our observed regulation measure, while a well-established measure from the temperament literature,²⁵ represents infant behavior in one laboratory situation on one particular day, and effect sizes corresponding to significant findings ranged from 0.26–0.36, which can be considered small to medium effects, with the possibility that some findings were significant due to chance. Consistent results demonstrating RP infants' increased self-soothing across observed regulation (e.g., effects on self-comforting) and parent-reported temperament data (e.g., effects on falling reactivity) increase our confidence in these results, but future research testing effects of this RP intervention on additional measures of child temperament and self-regulation over time would bolster the current findings.

Taken together, the present results highlight the promise of early obesity preventive interventions grounded in a RP framework to not only prevent obesity but also promote the early development of adaptive regulatory behaviors among infants, behaviors with the potential for benefits for whole child health and well-being. Continued testing of such interventions' effects on physical health, as well as cognitive and socio-emotional outcomes over time, can continue to reveal the potential of RP strategies, including their sustainability and generalizability. In the context of the ongoing childhood obesity epidemic, as well as other developmental challenges such as behavior problems, early RP offers the potential for widespread payoff of a single intervention and warrants continued investigation.

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Table 1Demographic characteristics of the study sample (N=240)^a

	RP intervention group n=123 Frequency or M (SD)	Control group n=117 Frequency or M (SD)
<i>Infant</i>		
Male sex	54.5%	50.4%
Gestational age, weeks	39.2 (1.3)	39.2 (1.2)
Predominantly breastfed at 16 weeks	51.7%	49.1%
<i>Mother</i>		
Age	29.2 (4.5)	28.8 (4.6)
Ethnicity		
Hispanic/Latino	5.7%	5.1%
Race		
Black	3.3%	3.4%
White	91.1%	94.0%
Asian	3.3%	2.6%
Other race	2.4%	0.0%
Marital status		
Married	77.2%	80.3%
Living with partner	17.1%	12.8%
Single	4.9%	6.8%
Divorced/separated	0.8%	0.0%
Education		
High school or some college	32.5%	32.5%
College graduate	38.2%	41.9%
Post-college	29.3%	25.6%

^aThe above analyses were conducted on the sample of 240 mother-infant dyads with reported temperament data at age 1 year. Demographics are very similar in the N=230 participants with observed temperament data.

In some cases, totals across subcategories differ slightly from 100% due to rounding.

There were no statistically significant study group differences on any of these demographic characteristics.

Table 2

Reported and observed indicators of infant negativity and regulation by study group

	RP intervention group Mean (SD)	Control group Mean (SD)
<i>Mother-reported temperament</i>		
Negativity at 16 weeks ^a	3.25 (0.85) [#]	3.46 (0.90) [#]
Regulation at 16 weeks ^a	5.42 (0.62)	5.37 (0.74)
Negativity at 1 year ^b	3.16 (0.53) [*]	3.30 (0.55) [*]
Distress to limitations ^c	3.85 (0.69) [*]	4.08 (0.72) [*]
Falling reactivity (reverse-scored) ^c	2.60 (0.64) ^{**}	2.85 (0.76) ^{**}
Sadness ^c	3.22 (0.74)	3.32 (0.76)
Fear ^c	2.97 (0.90)	2.95 (0.93)
Regulation at 1 year ^b	4.73 (0.51)	4.79 (0.55)
<i>Observed temperament</i>		
Negativity score during toy removal	0.67 (0.62)	0.67 (0.64)
Negativity score during toy return	0.41 (0.57)	0.41 (0.55)
Self-soothing during toy removal ^d	41.9% (18.0)	41.9% (20.1)
Self-soothing during toy return ^d	18.8% (16.9) [*]	13.9% (15.7) [*]
Self-comforting	12.0% (15.3) [*]	7.8% (14.5) [*]
Orienting	8.0% (9.2)	7.4% (7.6)
Other regulation during toy removal ^d	64.7% (17.3)	66.8% (16.6)
Other regulation during toy return ^d	89.7% (13.7)	92.3% (17.2)

The table depicts unadjusted analyses; findings from adjusted models were similar as discussed in the text.

^aFrom Infant Behavior Questionnaire-Revised (IBQ-R) Very Short Form²⁰

^bFrom IBQ-R¹⁷, possible range for IBQ-R items = 1–7

^cSubscales were tested in the event of significant study group differences in the overarching composite

^dPercentage of coded intervals with self-soothing or other regulatory strategies observed, respectively

[#]p<.10,

^{*}p<.05,

^{**}p<.01

Effect sizes corresponding to significant intervention effects on reported temperament range from d=0.26–0.36.

Effect sizes corresponding to significant intervention effects on observed temperament range from d=0.27–0.30.