


## BRIEF REPORT

# The emotional tone of child descriptions during pregnancy is associated with later parenting

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## Abstract

**Introduction:** How parents think and feel about their young children has implications for the parent–child relationship. We examined prospective associations between prenatal descriptions of the unborn child’s personality and later parenting behavior.

**Methods:** Pregnant women ( $N = 120$ ; mean age = 26.16,  $SD = 5.71$ ) were recruited in their third trimester for a longitudinal study. The sample is demographically diverse and predominantly economically disadvantaged. During prenatal interviews, women described their unborn child’s personality, from which positive and negative emotion words were coded. Parenting behavior was coded 12 months postpartum ( $n = 105$  for longitudinal analyses).

**Results:** Use of positive and negative words was negatively correlated ( $r = -.34$ ,  $p < .001$ ). Greater use of positive words to describe the unborn child’s personality was associated with higher observed sensitivity, warmth, and engagement during mother–infant interactions, whereas negative words were associated with higher interference and lower levels of sensitivity. Mothers who used anxiety- and/or anger-related words to describe their unborn child, relative to mothers who did not, demonstrated higher interference and lower warmth and sensitivity.

**Conclusion:** Descriptions of a child’s personality before the child is born were associated with postnatal parenting behavior. Prenatal interventions that address negative thoughts and feelings regarding the child may be beneficial for promoting positive parenting postnatally.

## KEYWORDS

parenting behavior, prenatal, representations, risk identification

## 1 | INTRODUCTION

Caregiving relationships are central to child functioning and are associated with later developmental outcomes across several domains, including cognitive, social, and behavioral functioning (Madigan et al., 2013; Schneider et al., 2001; van IJzendoorn et al., 1995). Although caregiving interventions can effectively promote positive devel-

opmental outcomes, they are often introduced after challenges in the relationship or child functioning arise. However, there is evidence that risk for suboptimal caregiving can be identified much earlier, sometimes even before a child is born (Crawford & Benoit, 2009; Dayton et al., 2010; Guyon-Harris et al., 2020). From the standpoint of prevention, identification during pregnancy, when many mothers (and fathers) begin to experience thoughts and feelings

about who their baby will be, who they will be as a parent, and the relationship they will have with their baby (i.e., representations of the child; Slade & Sadler, 2019), may signify a uniquely important time for intervention. Prenatal representations of the child are, indeed, early indicators of the health of the developing parent–child relationship.

Parental representations of the child serve as an important predictor of postnatal attachment relationships and parenting behavior (Benoit et al., 1997; Bowlby, 1983; Huth-Bocks et al., 2004). Representations can vary on dimensions from more positive, coherent, and healthy to negative, incoherent, and problematic. Prenatal representations of the child rated as more coherent, flexible, and/or joyful are associated with mother–infant attachment security and positive parenting behaviors including sensitivity, warmth, and engagement. Representations rated as detached, inconsistent, and/or preoccupied are associated with insecure mother–infant attachment and hostile and controlling parenting behaviors (Benoit et al., 1997; Dayton et al., 2010; Huth-Bocks et al., 2004; Huth-Bocks et al., 2011).

In addition to more global representations of the child coded from longer attachment-oriented narratives (i.e., used in the studies described above), some research has shown that specific descriptions or attributions of the child are also associated with important parenting outcomes. For example, a hostile attribution bias (i.e., tendency to infer hostile intent from benign stimuli in others; Nasby et al., 1980) is considered a risk for child maltreatment (Bugental et al., 2002; Mammen et al., 2003; Milner, 2003).

Social Information Processing Theory posits that pre-existing schemas about the self and others influence individuals' interpretations of present events and others' intentions, which then guide behavior (Milner, 1993). In caregiving contexts, incorrectly interpreting a child's mindset and intentions can, therefore, negatively impact caregiver responsiveness (Burkhart et al., 2017; Fonagy et al., 2018). For example, if a caregiver perceives a child's intentions as hostile, they may be more likely to respond in defensive or hostile ways (Ziv & Arbel, 2020). Hostile attributions of child behavior have also been retrospectively linked to caregiver decisions to engage in harsh or abusive discipline of children (Rodriguez et al., 2016).

Findings from a study investigating risks for infant abuse revealed that infants between 7 and 12 months of age were at greater risk for physical abuse by parents who described their personalities using negative or developmentally inappropriate words (e.g., “needy” and “drama queen”) (Young et al., 2018). In another study, the tendency to label novel, ambiguous infant facial expressions with negative emotion words was associated with reduced sensitive parenting behavior with their own child (Dayton et al., 2016). Thus, attention to the emotional tone of the words caregivers use

### KEY FINDINGS AND THEIR IMPLICATIONS FOR PRACTICE/POLICY

**Key finding 1:** A pregnant mother's conceptualization of what her unborn child's personality will be like was associated with postpartum parenting behavior.

**Key finding 2:** Descriptions of the unborn child's future personality that are marked by anger and/or anxiety were associated with higher interference and lower warmth and sensitivity during interactions with the child 12 months postpartum.

**Key finding 3:** Negative emotional descriptions of a child's personality before they are born could indicate risk for suboptimal postnatal parenting behavior.

### STATEMENT OF RELEVANCE TO THE FIELD OF INFANT AND EARLY CHILDHOOD MENTAL HEALTH

This study examines prenatal risk for postnatal parenting behavior, constructs with high relevance to the field of Infant and Early Childhood Mental Health (IECMH), and offers discussion about the relevance of findings to clinical practice in IECMH.

to describe their own (Young et al., 2018) or even other infants (Dayton et al., 2016) may reveal risk for poor parenting outcomes. Based on past research, the emotional tone of words used in “prenatal” caregiver descriptions of the child could be early indicators of risk for poor caregiving before the child is born.

The present study investigated associations between the emotional tone of prenatal maternal descriptions of their fetus's (hereafter, the unborn child's) personality and later maternal parenting behavior observed 12 months postpartum. We hypothesized that the use of words/phrases with positive emotional tone to describe the unborn child's personality would be prospectively associated with more positive parenting behaviors displayed during interactions with the infant including greater sensitivity, warmth, enthusiasm, and engagement. We hypothesized that the use of words/phrases with more negative emotional tone to describe the unborn child would be associated with later negative parenting behaviors including greater hostility, interference, anxiety, and flat affect.

## 2 | METHOD

### 2.1 | Participants

Participants included a community sample of 120 mother-child dyads oversampled for economic adversity from a larger investigation. Mothers were 26.16 ( $SD = 5.71$ ) years of age on average (range: 18–42) at baseline (third trimester of pregnancy), 64% identified as racial/ethnic minorities, 64% had less than a college degree, median monthly family income was \$1500, and 53% of infants were male. Women were 31.43 weeks pregnant on average ( $SD = 3.77$ ) at baseline (pregnancy interview). Eligibility requirements included: being pregnant, at least 18 years of age, and having the ability to speak fluent English. Participants were recruited through the posting of fliers in public locations, as well as local community organizations and agencies serving low-income families. The strategic distribution of fliers allowed for the recruitment of economically disadvantaged pregnant women, a specific focus of the overall larger, longitudinal study. Data for the present study were drawn from the first (third trimester of pregnancy) and the third (12 months postpartum) assessment waves. Data were available on 105 participants for longitudinal analyses. The present study was approved by the institutional review board of the institution at which the research occurred.

### 2.2 | Procedures

The pregnancy interviews were primarily conducted in the participant's home (22% in a research office). Consent was obtained from parents after describing the purpose of the study (i.e., to better understand the experiences women have as they transition to parenthood) and all tasks that would be completed. Participants described their perceptions of their unborn child's personality during a longer attachment interview (see details below). Families were given a \$25 gift card for their participation.

The 12 months postpartum visit was also mainly conducted in the participant's home (7% in a research office). Consent for participation was obtained from parents and on behalf of their children after a review of the study purpose and tasks to be completed. Participants engaged in a 12-min video-recorded interaction with their baby (10 min of free play, 2 min of cleanup) using a standard set of toys<sup>1</sup> supplied by the research team. Participants were instructed to “play with your child as you normally would.” Families

received \$50 in cash and a small baby gift for their participation.

Both interviews were conducted by teams consisting of graduate and undergraduate students in psychology. All interviewers underwent extensive training and received both in vivo and weekly didactic group supervision with the principal investigator and larger study team.

### 2.3 | Measures

#### 2.3.1 | Personality descriptors

The mother's perceptions of her unborn child's future personality were recorded from the Working Model of the Child Interview (WMCI; Zeanah et al., 1996; Zeanah et al., 1994), which was administered during the third trimester of pregnancy. The WMCI is a semistructured interview that assesses a caregiver's perception and subjective experience of her infant, including the infant's personality. The personality question asks women to describe what their infant's personality will be like once they are born in up to five words or phrases, which were extracted for use in the present study. The WMCI can be administered prenatally or postnatally, and is a valid, often-used measure of maternal representations of the child (see Vreeswijk et al., 2012 for a review).

#### 2.3.2 | Emotional Tone Coding

The five words or phrases provided about the child's personality were used to conduct sentiment analysis using The Linguistic Inquiry and Word Count (LIWC) program. This software program analyzes text and classifies each word into various categories using LIWC's dictionary file, which contains over 80 dictionaries (Pennebaker et al., 2015). Mothers' words/phrases to describe their unborn child are analyzed by the program as either positive or negative emotion words, with negative emotion words broken down further into anger, anxiety, or sadness; there are no subcodes for the positive affect domain. Each word/phrase provided by the participant was entered into the program separately,<sup>2</sup> which returned a code of positive or negative. We then used the participant's total number of words/phrases provided to derive proportions of the total number of positive and negative words provided.

<sup>1</sup> The set of toys included items such as a shape sorter, stacking boxes, books, stuffed animals, toy telephone, and pull toys.

<sup>2</sup> In reviewing the coding, entering each word separately resulted in a few errors ( $n = 6$ ) that we corrected as a team through consensus. Examples included “not needy” being coded by LIWC as negative, which we changed to positive, and “stress-free” being coded by LIWC as half positive and half negative, which we changed to all positive.

### 2.3.3 | Maternal parenting behavior

Maternal parenting behavior was coded from video-recorded mother–infant interactions that comprised a 10-min free play and 2-min cleanup, which were coded separately. Codes for sensitivity, engagement, interference, covert hostility, warmth, anxiety, enthusiasm, flat affect, and overt hostility were used in the present study. Each was coded on a global 5-point scale from 1 = *none* to 5 = *very much*. The coding system was adapted from previously established systems (Ainsworth et al., 1978; Crittenden, 1981; Lyons-Ruth et al. 1999; Zoll & Lyons-Ruth, 1983). Interrater reliability was established on 20% ( $n = 22$  interactions) of the sample and intraclass correlation coefficients were acceptable to excellent for all scales (range: .73–.95).

## 2.4 | Data analysis plan

Prior to analyses, variables were evaluated for issues with skew.<sup>3</sup> Associations between proportions of word categories and the following demographic characteristics were explored on the full sample ( $N = 120$ ): maternal age, education, race, relationship status, income-to-needs ratio, weeks gestation, and parity. In the first set of analyses, associations between the proportion of positive and negative affect words and maternal parenting behavior at 12 months postpartum during free-play and clean up episodes were examined using bivariate correlations within the reduced sample with available data longitudinally ( $n = 105$ ). Next, the subcodes within the negative affect domain (anxiety, anger, and sadness) were explored in relation to maternal parenting behavior. Only one participant used a word coded as sad; thus, no further analyses were completed with the sad code. The anxiety and anger domains were dichotomized based on whether an anxiety or anger word was used to describe the child's personality (0 = no negative emotion word used, 1 = one or more negative emotion words used). Mean differences in maternal parenting behavior at 12 months postpartum between those who did and did not use anxiety and anger words were examined. Then, the use of anxiety and anger words was combined into a single group to examine differences in parenting behavior between those who used anxiety and/or anger words and those who did not. Mean

differences were examined using independent samples  $t$ -test; effect sizes (Cohen's  $d$ ) with 95% confidence intervals were provided. The statistical significance of all presented analyses was weighed against a Benjamini–Hochberg correction with a 25% false discovery rate (FDR) to protect against type I error. An FDR of 25% was chosen to balance sensitivity and specificity given our small sample size.

## 3 | RESULTS

The proportion of positive words used to describe the child's personality during pregnancy ranged from 0 to 100 ( $M = 54.98$ ,  $SD = 28.82$ ). Of the five words or phrases used to describe the child, 11 women (9%) provided no positive words or phrases, 21 (18%) provided one positive word/phrase, 27 (23%) provided two, 38 (32%) provided three, 17 (14%) provided four, and six (5%) provided five. The proportion of negative words ranged from 0 to 50 ( $M = 4.11$ ,  $SD = 10.21$ ). Of the five words or phrases, 101 (84%) provided no negative words or phrases, 16 (13%) provided one negative word/phrase, and three (3%) provided two. Six participants used at least one anxiety word and eight participants used at least one anger word. One participant used both an anxiety and an anger word. Examples from the words/phrases mothers provided that were coded as anger include grouchy, aggressive, mean, and won't like to be touched, agitator; examples that were coded as anxiety include anxious, shy, scared, restless, and shocked. None of the associations between use of positive and negative words and demographic characteristics were statistically significant (Table 1).<sup>4</sup>

Data on parenting observations were unavailable for 15 women; associations with parenting behavior were based on 105 women. Greater use of positive words was associated with higher maternal engagement ( $r = .22$ ,  $p = .025$ ) and lower flat affect ( $r = -.21$ ,  $p = .029$ ) during free play as well as higher warmth ( $r = .20$ ,  $p = .045$ ) and sensitivity ( $r = .21$ ,  $p = .036$ ) during cleanup (see Table S1). Greater use of negative words was associated with lower sensitivity during free play ( $r = -.21$ ,  $p = .035$ ) and cleanup ( $r = -.23$ ,  $p = .018$ ) and higher interference ( $r = .20$ ,  $p = .043$ ) during cleanup.

Next, mean differences in parenting behavior were explored based on use of anxiety or anger words; however, given the small number of women who used each type of emotion word, we focused our results on a combined risk group of women who used an anxiety and/or anger word (see Table 2). Tables displaying mean differences

<sup>3</sup> Unacceptable skew values were found for the covert and overt hostility parenting codes in both the free-play and cleanup segments. Skew for the covert hostility variable in both segments was somewhat reduced by applying a square root transformation, though skew values remained elevated and results involving this variable should be interpreted with caution. Skew values for the overt hostility variable in both segments were not correctable and the variables were dropped from future analyses.

<sup>4</sup> Results were consistent when education and race were explored as binary variables (High school diploma or less vs. higher education; Black, Biracial, and Other vs. White).

**TABLE 1** Demographic information for the positive and negative emotion word categories

	Positive emotion words <i>M</i> ( <i>SD</i> )			Negative emotion words <i>M</i> ( <i>SD</i> )		
	None	At least one	<i>t</i> ( <i>df</i> )	None	At least one	<i>t</i> ( <i>df</i> )
Age	26.45 (5.39)	26.13 (5.76)	0.18 (116)	26.55 (5.97)	24.11 (3.48)	2.45 (41.43)
Income-to-needs ratio	1.13 (1.43)	1.63 (1.66)	−0.96 (116)	1.62 (1.73)	1.44 (1.06)	0.38 (117)
Gestational week	30.87 (2.77)	31.45 (3.86)	−0.58 (117)	31.36 (3.73)	31.81 (4.07)	−0.48 (118)
	<i>n</i> (%)		$\chi^2$ ( <i>df</i> )	<i>n</i> (%)		$\chi^2$ ( <i>df</i> )
Education			6.49 (4)			3.66 (4)
Did not complete HS	1 (9)	4 (4)		5 (5)	0 (0)	
HS diploma or GED	1 (9)	18 (17)		15 (15)	4 (21)	
Some college	8 (73)	44 (41)		43 (43)	9 (47)	
Associates or Bachelor's degree	0 (0)	31 (30)		26 (26)	6 (32)	
In progress/earned graduate degree	1 (9)	10 (9)		11 (11)	0 (0)	
Race			3.28 (3)			4.93 (3)
Black	5 (46)	50 (46)		43 (43)	13 (68)	
White	6 (55)	37 (34)		38 (38)	5 (26)	
Biracial	0 (0)	15 (14)		14 (14)	1 (5)	
Other	0 (0)	6 (6)		6 (6)	0 (0)	
Currently in a relationship			0.21 (1)			0.29 (1)
Yes	8 (73)	85 (79)		80 (79)	14 (74)	
No	3 (27)	23 (21)		21 (21)	5 (26)	
First time mother			1.14 (1)			0.00 (1)
Yes	7 (64)	50 (46)		48 (48)	9 (47)	
No	4 (36)	57 (54)		52 (52)	10 (53)	
Child sex						
Male	6 (55)	57 (53)	0.01 (1)	56 (56)	8 (42)	1.24 (1)
Female	5 (45)	50 (47)		44 (44)	11 (58)	

Note: None of the chi-square values reached statistical significance. The column percentages for some variables may add up to greater than 100% due to rounding. Results were consistent when education and race were explored as binary variables (High school diploma or less vs. higher education; Black, Biracial, and Other vs. White).

for anxiety and anger separately are available for review (Tables S2 and S3). Eleven women used either an anxiety and/or anger word. Statistically significant mean differences were found for sensitivity during free play and sensitivity, interference, and warmth during cleanup (Table 2). These associations remained significant after applying the *p*-value correction. There were large effect size differences for covert hostility and interference during free play and anxiety during cleanup, despite not reaching traditional statistical significance.

A post hoc exploratory examination of associations between demographic characteristics and maternal parenting behavior at 12 months postpartum revealed that lower education (high school or less), identifying as a racial minority (perhaps in part due to exposure to racism and discrimination rather than race itself), not being in a relationship, lower maternal age, and lower income-to-needs

ratio were associated with less optimal parenting behavior outcomes. Parity and gestational age were not associated with parenting behavior. To consolidate this large set of findings and explore these associations more parsimoniously, we created a demographic risk index where a point was given for (1) High school education or less, (2) Identification as a racial minority, (3) Not currently in a relationship, (4) Maternal age at or below the 25th percentile (22 years of age), and (5) Income-to-needs ratio less than 1. Associations between the 5-level demographic risk index and parenting behavior were analyzed using Spearman's rank-order correlation (Spearman's Rho). Higher demographic risk was associated with lower sensitivity ( $r = -.38$ ,  $p < .001$ ), engagement ( $r = -.21$ ,  $p = .032$ ), warmth ( $r = -.27$ ,  $p = .005$ ), and enthusiasm ( $r = -.38$ ,  $p < .001$ ) and higher interference ( $r = .29$ ,  $p = .004$ ) during the free play. During the cleanup, higher demographic risk was

TABLE 2 Mean differences between mothers who did and did not use anger and/or anxiety words

	Anger/anxiety words used			No anger/anxiety words used			<i>t</i> ( <i>df</i> )	Cohen's <i>d</i>	95% CI	
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>			LL	UL
Free play										
<b>Sensitivity</b>	2.45	0.69	11	3.44	0.80	94	3.91 (103)***	1.25	0.60	1.89
Engagement	3.72	0.79	11	3.86	0.70	94	0.60 (103)	0.19	−0.44	0.82
Interference	2.91	1.22	11	2.35	0.98	94	−1.74 (103)	−0.55	−1.18	0.08
Covert hostility	1.21	0.31	11	1.09	0.20	94	−1.28 (11.06)	−0.56	−1.19	0.07
Warmth	2.27	0.47	11	2.60	0.74	94	2.02 (16.54)	0.45	−0.18	1.08
Anxiety	2.18	1.08	11	1.84	0.74	94	−1.38 (103)	−0.44	−1.07	0.19
Enthusiasm	2.64	0.81	11	2.50	0.79	94	−0.54 (103)	−0.17	−0.80	0.45
Flat affect	2.91	1.22	11	2.60	0.86	94	−0.83 (11.19)	−0.35	−0.97	0.28
Cleanup										
<b>Sensitivity</b>	2.27	0.65	11	3.12	0.83	94	3.26 (103)**	1.04	0.40	1.68
Engagement	3.18	0.75	11	3.44	0.81	94	0.99 (103)	0.32	−0.31	0.94
<b>Interference</b>	3.09	1.03	11	2.15	0.82	94	−3.52 (103)**	−1.11	−1.76	−0.48
Covert hostility	1.07	0.22	11	1.03	0.11	94	−0.90 (103)	−0.29	−0.91	0.34
<b>Warmth</b>	1.64	0.67	11	2.12	0.72	94	2.12 (103)*	0.68	0.04	1.31
Anxiety	2.09	0.94	11	1.74	0.62	94	−1.65 (103)	−0.53	−1.15	0.11
Enthusiasm	1.73	0.79	11	1.94	0.75	94	0.88 (103)	0.28	−0.35	0.90
Flat affect	3.00	1.00	11	2.79	1.03	94	−0.65 (103)	−0.21	−0.83	0.42

Note: Maternal behaviors in boldface reached traditional statistical significance and remained significant following a Benjamini–Hochberg *p*-value correction to protect against Type I error. A square root transformation was applied to the covert hostility variable for the free play and cleanup due to high skew values. The transformation reduced but did not eliminate the issue of skew, thus results with the covert hostility variable should be interpreted with caution.

\**p* < .05;

\*\**p* < .01;

\*\*\**p* < .001.

associated with lower sensitivity ( $r = -.46, p < .001$ ), warmth ( $r = -.31, p = .001$ ), and enthusiasm ( $r = -.25, p = .011$ ) and higher interference ( $r = .27, p = .005$ ) and flat affect ( $r = .29, p = .003$ ). Demographic risk was not associated with prenatal descriptions of the child's personality.

Given the associations between demographic risk and parenting behavior, we explored whether main study analyses held when covarying for the demographic risk index. Correlational analyses between the proportion of positive and negative emotion words and parenting behavior presented in the text above and in Table S1 held when covarying for demographic risk and after applying a Benjamini–Hochberg correction with 25% FDR. Statistically significant mean differences in sensitivity during the free play and cleanup and interference during the cleanup between women who did and did not use an anxiety and/or anger word held when covarying for demographic risk and after applying a Benjamini–Hochberg correction with 25% FDR. Differences in warmth during the cleanup were not statistically significant when covarying for demographic risk.

## 4 | DISCUSSION

We explored whether the emotional tone of the words a mother used to describe her unborn child's future personality is related to postnatal parenting behavior during interactions with that child. As expected, the use of positive emotion words was associated with more optimal parenting behaviors 12 months postpartum; however, the associations found between the use of negative words and parenting behavior were more robust. In particular, mothers who used child descriptions that depicted anxiety and/or anger (i.e., anxious and angry attributions) were more likely to engage in less positive and more negative parenting behavior compared to mothers who did not use such words. This work suggests that the emotional tone of how caregivers describe their unborn child's personality can indicate risk for later difficulties with important aspects of parenting behavior. These findings have important implications for interventions to promote healthy parenting behavior and point to an important future direction of this work.

Associations between negative descriptors of the child and poor outcomes were also found by Young and colleagues (2018) who demonstrated that negative descriptions of a child postnatally are associated with risk for child maltreatment. Our work builds upon these findings by demonstrating that negative descriptions of the child's future personality can indicate risk for poor parent-child interaction before the child is born. To our knowledge, there is no previous work on prenatal descriptions of a child's personality and later parenting behavior. However, our work is similar to past work showing that how women think and feel about their baby during pregnancy more broadly (i.e., prenatal representations of the child) can have implications for postpartum parenting behavior and parent-infant attachment quality (Dayton et al., 2010; Guyon-Harris et al., 2021; Huth-Bocks et al., 2004; Tambelli et al., 2014).

There is much work to be done in this area including what might influence negative prenatal descriptions of a child's personality and the implications for intervention that may flow from this line of research. Representations of the child are constructed from caregivers' own past relationship experiences and attachment histories from their own childhood (Bowlby, 1983; Main & Goldwyn, 1984). For some caregivers, histories of abuse and neglect in their own childhood may affect their ability to accurately infer their child's mindset or understand situations from their child's point of view (Dayton et al., 2010; Fonagy et al., 2018). Preliminary evidence finds that a history of sexual abuse, physical neglect, and exposure to intimate partner violence during childhood are each associated with more distorted or disrupted prenatal representations (Ahlf-Dunn et al., 2021; Malone et al., 2010; Roth et al., 2020). Understanding the factors that influence prenatal descriptions of a child's personality may be helpful in identifying those most at risk for suboptimal parenting behavior.

In terms of what interventions may be useful following the identification of those most in need of support, it is presently unclear to what degree prenatal views of the child can be improved through intervention. There is evidence suggesting interventions delivered postnatally can affect the mother's postnatal representations of the child. One study found that mothers' representations of their child improved after a relatively brief (i.e., 13-session) intervention specifically targeting representations among mothers in low-income communities (Rosenblum et al., 2018). Another found that after a 20-week intervention aimed at improving caregiver-child attachment security, caregivers had more positive and less negative representations of their children (Huber et al., 2015). Despite evidence that postnatal interventions can change postnatal representations, there is no known literature on whether "pre-

natal" representations can be changed through prenatal interventions including whether change in prenatal representations leads to change in postnatal parenting behavior. Importantly, our findings revealed associations between prenatal descriptions of the child marked by anger and/or anxiety and maternal sensitivity and interference across both free-play and cleanup interactions 12 months after birth. Thus, these two domains of parenting behavior in particular may be an important focus of postnatal interventions with women holding negative attributions of their child.

It is important to note that demographic risk, although not associated with prenatal descriptions of the child, was associated with numerous aspects of parenting behavior, which echoes past work on demographic/cumulative risk and parenting behavior (Gach et al., 2018; Suchman & Luthar, 2000; Trentacosta et al., 2008). Our primary study analyses largely held when covarying for demographic risk, which suggests that both prenatal descriptions of the child's personality and demographic risk are each associated with parenting behavior and represent potential targets for intervention to promote and support healthy parenting behavior. Maternal mental health is another important potential area to explore. We were unfortunately underpowered in the current study to examine more complex models. Exploring potential mediators and moderators of the association between prenatal descriptions of the child and postnatal parenting in larger samples is an important next step to further understand the association and, perhaps, identify additional potential targets for intervention.

The present study is not without limitations. First, the overall sample size was small with very low rates of the use of anger and anxiety words, which made it difficult to use and interpret traditional inferential statistics. Thus, replication is needed in larger samples. Another limitation may be the use of LIWC to classify personality descriptors. LIWC is typically used to analyze longer texts and our selection of emotional tone specifically is only one of many potential metrics LIWC provides. Future work could explore other methods for analyzing and classifying descriptors of the child.

How caregivers think and feel about their unborn child has implications for the parent-child relationship. In this study, we provide evidence that mothers' use of both positive and negative emotions when describing their unborn child's personality is meaningfully linked to parenting behavior more than a year following the initial assessment. Further work is needed to support and extend the findings of this study. Understanding the predictors, stability, and sequelae of positive and negative descriptions of the unborn child has the potential to inform

interventions, including the critical window of opportunity prior to birth, to support caregivers in developing healthy relationships with their infants as early as possible.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## HUMAN RESEARCH APPROVAL

This research was approved by the Institutional Review Board at Eastern Michigan University (PI: Huth-Bocks), where the study was conducted.

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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