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WOMEN'S EXPRESSION OF EMOTION DURING PREGNANCY AND THEIR  
LATER AFFECTIVE BEHAVIOR WITH THEIR INFANTS

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## **ABSTRACT**

Maternal emotional expressiveness measured in various ways has been associated with both positive and negative childhood outcomes. This relationship is believed to be influenced by the relationship between maternal emotional expressiveness and maternal behavior toward their children. This study examined the relation between prenatal maternal emotional expressiveness when discussing perceptions of pregnancy and their later behavior toward their infants. The interviews of 75 pregnant women discussing positive and negative aspects of their pregnancies were audiotaped, transcribed and analyzed using the Linguistic Inquiry and Word Count (LIWC) software. Mothers' positive and negative behaviors and behavioral synchrony with their infants at 6 months of age were observed in the Still-Face Paradigm (SFP). Results indicated that mothers who use more positive words and more affect words during prenatal interviews about their pregnancies displayed more positive affect but lesser synchrony when interacting with their infants at 6 months.

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## **Introduction**

While current research has established a relationship between maternal behavior and childhood outcomes, little is known about how mothers' perceptions of pregnancy may impact postnatal maternal behavior. Though it has not been investigated in great detail, mothers' perceptions of the positive and negative experiences of pregnancy may be related to their later parenting behavior, which in turn may influence child outcomes. Specifically there is a deficit in the literature discussing how prenatal perceptions may be related to the mother-infant relationship after birth. This study investigates the relationship between mothers' verbal expressivity when discussing perceptions of pregnancy and later maternal behavior in order to enhance understanding of the ways in which mothers' prenatal cognitive processes may influence later child development.

### **Emotional Expressiveness and Childhood Outcomes**

Maternal emotional expressivity has been shown to influence various positive and negative outcomes in children. In 1989, Malatesta and colleagues found that mothers who showed a greater range of affect during a structured play interaction tended to have securely attached children (Malatesta, Culver, Tesman & Shepard, 1989). Later, Ritter and colleagues (Ritter, Bucci, Beebe, Jaffe & Maskit, 2007) demonstrated that mother's verbal expression of emotion might contribute uniquely to this relationship. These authors investigated links between maternal emotional expressiveness, measured by spoken language, and child attachment by monitoring analyzing interviews with new mothers. They then analyzed associations between mothers'

language use and infants' attachment styles and discovered that mothers of children classified as avoidantly attached were contained and controlled when having a conversation, whereas mothers of children classified as secure used fuller language and verbalized negative affect more freely (Ritter et al., 2007).

Research has also investigated links between parent's emotional expressiveness and other aspects of children's social-emotional development. One study found that both mothers' and fathers' degree of emotional expressiveness was significantly correlated with child emotional regulation (Ramsden & Hubbard, 2002). The study found that too little positive expressiveness might also be detrimental to child development. Specifically, families with high negative expressiveness and little positive expressiveness were negatively correlated with poorer emotional regulation in the child (Ramsden & Hubbard, 2002). Ramsden and Hubbard theorized that children may learn their emotional expressiveness and emotional regulation by observing the people in their life express their own emotions, and thus it is important to investigate how emotional expressiveness may also be related to parenting behaviors.

Building on these findings, Cummings and Davies (2011) found that recurrent intense parental emotional expressiveness, especially when involving negative emotions, may hinder the development of emotional regulation and be related to decreased emotional security in children (Cummings & Davies, 2011). This study also established that maternal acceptance of their children's emotions had an opposite effect from negative expressiveness and seemed to help with child emotional regulation (Cummings & Davies, 2011).

Acceptance and discussion of emotions between mother and child seems to be a key factor in helping children develop positive social behavior and good emotion regulation. Garner, Dunsmore, and Southam-Gerrow (2008) studied relations between maternal discussion of emotions and prosocial behavior in preschool aged children. They found that maternal explanations of emotions were linked to decreased levels of aggression and increased prosocial

behavior. Another related study found that discussing negative emotions provided the child with a better opportunities to discuss emotional outcomes, contexts, and consequences that can aid in emotional development (Lagattuta & Wellman, 2002).

Together, these findings suggest that maternal emotional expressiveness may contribute to various child outcomes including social behavior, aggression, emotional regulation, and attachment (Cummings & Davies, 2011; Garner, Dunsmore & Southam-Gerrow 2008; Lagattuta & Wellman, 2002; Malatesta et al., 1989). However, this introduces a new question: how do mothers' perceptions and expression of emotion influence child outcomes? One possible explanation is that maternal perceptions and expressions of emotional experiences may influence parenting behavior.

### **Emotions, Perceptions and Maternal Behavior**

A small body of research has examined whether mothers' verbal expression of perceptions of their children and their emotional experiences is related to parenting behavior. Mercer (1985) studied the effect of age, perceptions of the birthing experience, and later maternal behavior using a questionnaire in which mothers rated their perception of different events on a scale of highly positive to highly negative. This study found that the relationship between perceptions of their pregnancy and maternal behavior was significant for younger age groups (teens and 20-year-olds), but not for the age groups above 30. The author proposes that this is because older women may be more prepared for motherhood and may be better at dismissing a negative birthing experience in order to maintain a positive maternal behavior better than younger women. This research suggests that relations between perceptions of pregnancy and maternal behavior differ as a function of mothers' age (Mercer, 1985).

After it was established that perceptions of pregnancy were correlated with mothering behaviors the questions became how the relationship occurs, and in what ways is the relationship is present. A recent study investigated associations between perceptions of pregnancy and maternal behaviors by analyzing mothers' use of positive and negative wording in interviews and later observed maternal sensitivity (Borelli West, Decoste & Suchman, 2012). The researchers predicted that a mother's inability to discuss negative emotional experiences might later demonstrate greater maternal insensitivity (Borelli et al., 2012). This was predicted because investigators believed that greater positivity and few negative remarks was indicative of an unwillingness to discuss negative emotionality, which they believed may also be related to maternal insensitivity to the cues of their children (Borelli et al., 2012). This may be because acceptance of one's own emotions could be related to greater empathy and sensitivity when interacting with others. In accordance with the hypothesis, the authors found that greater frequency of positive words during an interview was correlated with decreased parenting sensitivity in response to child cues, possibly due to an unwillingness to engage with negative emotional affect (Borelli et al., 2012). Corroborating and expanding upon these results, Moore and colleagues (2013) found that mothers who displayed greater amounts of positivity with their 6-month-old infants showed lower dyadic synchrony during a structured interaction with their infants (Moore et al., 2013). These results suggest that maternal emotional expressiveness may be associated with mother-infant interaction.

The research on emotional expressiveness, perceptions and maternal behavior has opened the door for the scientific community to start questioning the directionality of the relationships and what variable may come first. In a recent study investigating the relationship between maternal behavior, perceptions, and infant outcomes, it was found that mothers' behavior toward their children was connected to infants' reciprocating behavior, which in turn shaped mother's perceptions of their child (Rosenblum, McDonough, Muzik, Miller & Sameroff, 2002). These

maternal mental perceptions of their children were associated with infant emotion regulation (Rosenblum et al., 2002). This study suggests multiple steps by which maternal behavior influences infant behavior, which alters maternal perceptions of the child. It has already been discussed that maternal perceptions may influence maternal behavior; therefore the main question that arises from the current research is the relation between maternal perceptions and maternal behavior and how early the relationship occurs.

### **The Role of Depression and Anxiety**

Research suggests that maternal depression and anxiety may influence maternal perceptions, emotional expressiveness, and parenting behavior and are associated with child outcomes, therefore it is necessary to consider whether depression and anxiety influences women's perceptions of their pregnancy (which may in turn influence their parenting behavior). Past research has found that depression may bias a mother's perception and evaluation of her experiences and her child (Fergusson, Lynskey, & Horwood, 1993), and studies have found links between maternal depression and parenting behaviors of acceptance and control among their children (Brennan, Brocque, & Hammen, 2003). Mothers who have depression are more likely than non-depressed mothers to use intrusive or hostile behavior when interacting with their infants (Lyons-Ruth, Zoll, Connell, & Grunebaum, 1986). They are also more likely to display less positive facial emotion and respond less frequently to their infants than non-depressed mothers (e.g., Field et al., 1996). Importantly, parental warmth, acceptance, over involvement and control were found to be better predictors of child resilience than maternal depression alone: If the child perceived the mother's interaction as warm, accepting and without emotional over-involvement, then the child was more likely to have a positive outcome (Brennan et al., 2003).

Maternal anxiety has also been reported as being influential to childhood outcomes. In a 2005 study investigating antenatal maternal anxiety it was discovered that maternal anxiety was positively correlated with various childhood problems including cognitive, behavioral, and emotional regulation problems (Van den Bergh, Mulder, Mennes & Glover, 2005). Therefore, the current study aims to further understanding of the relationships among maternal depression, anxiety, perceptions, and behavior by investigating whether maternal depression and anxiety may be related to mother's verbal expression of emotions and perceptions during pregnancy.

### **Language Use as a Measure of Perception**

The manner in which an individual expresses herself through words may be indicative of her perceptions, personality, and emotionality (Pennebaker, Mehl, & Niederhoffer, 2003). For example, a mother frustrated with the behavior of her child may say, "Would you please stop behaving that way" or she may say, "Stop it!" Both statements convey similar instructional information; however they are stated in two different and unique ways that contain very different emotional information. Pennebaker and colleagues (2003) suggested that the quality of an individual's speech is indicative of his or her personality, disposition, and even health (Pennebaker, Mehl, & Niederhoffer, 2003). Indeed, an individual's general manner of speaking has been demonstrated to be stable and reliable across time and topic (Pennebaker & King, 1999). This stability suggest that word use is a valid means of investigating differences in emotional expressiveness between individuals; the way in which an individual uses language can be indicative of their perception of the topic.

Language word count software has been used previously to show relationships between emotions and age (Pennebaker & Stone, 2003), simplicity of writing, distinction making, and the Big 5 personality measures, as well as the relationship between depression and verb tense usage

(Pennebaker & King, 1999). In a study interested in how emotional word usage impacts health, it was found that the use of positive words was positively correlated with better health, and the use of negative words seemed to follow a U-shaped curve, where too much or too little was negatively correlated with health (Pennebaker, Mayne, & Francis, 1997). It appears that one's language usage is a unique individual factor that is related to many other aspects of one's life, including personality variables, health, and behavioral outcomes.

As discussed above, language use has been successfully utilized to examine maternal perceptions after birth (Borelli et al., 2012). However, little is known about the role of maternal perceptions beginning prior to the child's birth: do the maternal perceptions associated with parenting behavior result from child characteristics, or are they present before birth, indicating a greater role of preexisting mother characteristics? In order to address these questions, the current study employs Pennebaker's concept and method to investigate the relationship between maternal perceptions during pregnancy and maternal behavior at six months postpartum.

### **Current Study**

Previous research has demonstrated the relationship between maternal perceptions of pregnancy and their children, maternal behavior, and childhood outcomes. However, little is understood about when this relationship begins, as most studies only investigate these associations during the postnatal period. Therefore, the current study addresses two key questions. First, are the narrative qualities of women's prenatal perceptions of pregnancy related to maternal behavior, defined as maternal positive and negative affect and dyadic synchrony during a structured parent-infant interaction? Second, are these narrative qualities associated with maternal depression or anxiety? In order to examine these questions, the present study measured narrative qualities of women's perceptions of pregnancy using linguistic word count software

(LIWC; Pennebaker, Chung, Ireland, Gonzales, & Booth, 2001) and observed maternal behavior during a structured mother-infant interaction (FFSFP; Tronick, Als, Adamson, Wise, & Brazelton, 1978).

## **Method**

### **Participants**

This study utilized data from a larger study ( $N = 190$ ) of fetal and postnatal neurobehavioral development (PI DiPietro Grant# 1MD27592-16). Participants in the current study included 75 mothers over the age of 18 and their 6-month-old infants. Participants were non-smoking pregnant women with uncomplicated, singleton pregnancies. Participants were not excluded based on race or ethnicity.

### **Demographics**

The study included 75 pregnant females with a mean age of 32.29 ( $SD = 4.408$ ). The mean years of education were 17.29 ( $SD = 1.915$ ). For 66.7% of the sample they were pregnant with their first child, 25.3% with their second child, and 8% with their third child. The majority (96%) of the women were currently married. In terms of race, 73.3% of the women identified themselves as Caucasian, 12% as African American, and 14.7% as races other than white and black.

### **Procedure**

#### *Mother-Infant Interaction*

Maternal behavior was observed during a structured mother- infant interaction, the Face-to-Face Still Face Paradigm (FFSFP; Tronick et al., 1978) when infants were, on average, 6

months of age. The FFSFP is a 3-episode interaction between mothers and their children involving normal play, still face, and reunion episodes. Each episode lasted approximately 2 minutes, and mothers were given specific instructions on how to behave during the phases. To begin, infants were placed in a secure play seat and mothers were seated opposite the child. Mothers were instructed to play normally with their child for 2 minutes, then to face the child with a neutral expression for 2 minutes without movement or reaction, and finally to play normally again for the final 2 minutes.

This interaction was filmed when mothers' infants were approximately 6 months of age. The video files were coded by a group of trained coders using software to code mothers' behaviors. Mother coders were instructed to code at 1-second intervals for direction of gaze (away or towards infant) and affect (positive, neutral, negative) for the play and reunion episodes only, because the mothers' behavior was constrained during the still-face episode.

Coders were trained to reliability using a larger group of recorded FFSFP interactions. Randomly selecting 15% of the interactions and having a second coder code the interaction verified inter-observer agreement. Agreement for both mother and infant coders was found to be reliable for both gaze and affect ( $k > .70$ ) when using kappa to correct for agreements of chance.

Several maternal behavior variables were computed for each mother: The percentage of time that a mother spent in positive and in negative states during normal play and reunion episodes were computed as the percent of valid time mothers exhibited positive and negative affect in normal play and reunion episodes only because mothers' behaviors were constrained to be neutral during the still-face episode. A 6-point mother-infant positive engagement scale was created by combining mothers' gaze and affect scores (separately for normal play and reunion episodes), such that gaze towards with positive affect would equal 6 and gaze away with negative affect would equal 1. Dyadic synchrony was measured as the Pearson correlation coefficient between mother and infant positive engagement scores, separately for normal play and reunion

episodes. The percentage of time mothers and infants spent in matched positive engagement states were computed, separately for normal play and reunion episodes.

#### *Questionnaires:*

The Edinburgh Postpartum Depression Scale (EPDS; Cox, Chapman, Murray & Jones, 1995) is a self-report scale that includes 10 items. Each item is rated on a scale of 0-3 with a possible total of 0-30 points. This scale was administered to participants at 18, 24, 30, and 36 weeks during pregnancy. For the purposes of the current study, the 36-week administration was used in order to measure depressive symptoms reported at the same time of the pregnancy interview (see below). According to the scale, a score of 13 or higher is indicative of clinical depression.

The State-Trait Anxiety Inventory (STAI; Spielberger, 2013) is a self-report measure that includes two 20-item scales. The STAI was created to differentiate between state based and more generalized trait anxiety symptoms. This measure was administered to the participants at 18, 24, 30, and 36 weeks during pregnancy. For the purposes of the current study, the 36-week administration was used in order to measure anxiety symptoms reported at the time of the pregnancy interview.

#### *Interviews*

At 36 weeks gestational age, a researcher interviewed each participant. The interview was semi-structured and discussed the uplifting and distressing aspects of pregnancy. Women were randomly assigned to discuss uplifting elements first or to discuss distressing elements first. The interview was structured to discuss common topics of pregnancy such as: feeling the baby move, nausea, heartburn, sharing the news with family, and worries about giving birth. Interviews lasted approximately 10 minutes. The audio recordings of the interviews were transcribed by a group of trained research assistants who were naïve to the study hypotheses.

Transcribed text files were then edited to include only the mother's spoken words (i.e., removing interviewer questions), and the text was analyzed using the LIWC software, which is designed to capture emotional valence and key themes in speech (Pennebaker, Mehl, & Niederhoffer, 2003). The LIWC software computes the frequency of several categories of word types (see <http://www.liwc.net/descriptiontable1.php> for a complete list). Relevant categories for the current study included: past, present, future, family, friend, affect (emotion), positive, negative, anxiety, social, time, and work. Emotion-related words (*affect, positive, negative*) and *verb tense* usage have all been previously associated with later behaviors (Borelli et al., 2012; Pennebaker, Mehl, & Niederhoffer, 2003; Pennebaker & Stone, 2003). *Social words* have been previously correlated with mother's openness to discuss emotions (Ritter et al., 2007).

### **Analyses**

To analyze the first question of the study, Pearson correlations coefficients were computed between LIWC variables (past, present, future, social, family, friend, affect, positive emotion, negative emotion, anxiety, anger, sad, time, work, achieve and home) and maternal behavior in the SFP normal play and reunion episodes (Mother percent positive and negative, dyadic synchrony, matched affect). To analyze the second key question of the study, Pearson correlation coefficients were computed between LIWC variables and participant scores on the STAI and the EPDS

## Results

### Relations between verbal expression during pregnancy and postnatal maternal behavior

LIWC positive emotion words (i.e., the frequency with which the mother used positive words during the pregnancy interview) were positively and significantly correlated with mother percent positive during normal play ( $r = 0.241, p = 0.038$ ) and reunion ( $r = 0.320, p = 0.008$ ). LIWC positive emotion words were significantly negatively correlated with dyadic synchrony ( $r = -0.272, p = 0.02$ ). LIWC *affect* words were also significantly negatively correlated with dyadic synchrony ( $r = -0.323, p = 0.005$ ).

There were several significant relationships that did not address specific questions of this study. Other significant relationships included: *past tense* words and mother positivity during normal play ( $r = -0.208, p = 0.075$ ), *family* words and dyadic synchrony ( $r = -0.251, p = 0.032$ ), *family* words and mother infant matched positive emotion during normal play ( $r = -0.304, p = 0.009$ ), *time* words and dyadic synchrony ( $r = 0.335, p = 0.004$ ), and *work* words and mother positivity during normal play ( $r = 0.247, p = 0.034$ ). Frequency of *work* words was also correlated with mother positivity during reunion ( $r = 0.371, p = 0.002$ ) and mother infant matched positive engagement during normal play ( $r = 0.387, p = 0.001$ ). Significant and nearly significant correlations between maternal behavior and LIWC word category frequencies can be found in Table 1.1 for normal play and Table 1.2 for reunion play. The total compilation of results for the LIWC variables and maternal behavior can be found in Appendix A.

**Relations between depression and anxiety scores and verbal expression of pregnancy experiences**

LIWC *social* words were significantly correlated with trait anxiety scores on the STAI ( $r = -0.23, p = 0.047$ ). Though they did not reach traditional significance, there were trending relationships between *anger* words and trait anxiety scores on the STAI ( $r = 0.19, p = 0.102$ ) and *anger* words and depression scores on the EPDS ( $r = 0.217, p = 0.062$ ). These results can be seen in Table 2, which is a compilation of the noteworthy correlations between LIWC variables and anxiety and depression scores. The total compilation of all the data can be found in Appendix B.

Table 1-1. Notable LIWC and Maternal Behavior (Normal Play) Correlations

Variable	% Mother Neg, Normal Play	% Mother Pos, Normal Play	Mother-infant synchrony, Normal Play	% Mother-infant matched Pos state engagement, Normal Play
LIWC <i>past</i>	0.089	-0.208	0.046	0.011
LIWC <i>family</i>	0.015	-0.084	-.251*	-.304**
LIWC <i>affect</i>	-0.07	0.222	-.323**	-0.113
LIWC <i>Positive Emotion</i>	-0.081	.241*	-.272*	-0.093
LIWC <i>anxiety</i>	-0.043	0.196	-0.222	0.042

\* $p < .05$ , \*\* $p < .01$

Table 1-2. Notable LIWC and Maternal Behavior (Reunion) Correlations

Variable	% Mother Neg, Reunion	% Mother Pos, Reunion	Mother- infant synchrony, Reunion	% Mother- infant matched state engagement, Reunion
LIWC <i>past</i>	0.033	-0.136	-0.073	0.028
LIWC <i>family</i>	-0.073	0.04	-0.146	-0.022
LIWC <i>friend</i>	0.029	0.157	-0.225	0.058
LIWC <i>affect</i>	0.097	0.236	-0.025	-0.031
LIWC <i>Positive Emotion</i>	0.075	.320**	-0.025	-0.017
LIWC <i>anxiety</i>	0.089	0.008	-0.03	-0.003

\*p < .05, \*\*p < .01

Table 2-1. Notable LIWC, Anxiety and Depression Correlations

Variable	STAI: Y-1 sum state scores	STAI: Y-2 sum trait scores	EPDS 36 WKS
LIWC <i>social</i>	-0.029	-0.23	-0.172
LIWC <i>positive emotion</i>	0.054	-0.154	-0.008
LIWC <i>anger</i>	0.071	0.19	0.217

\*p < .05

## Discussion

This study produced several notable correlations, both expected and unexpected. Some results were in line with the previous research on the topic of language and maternal behavior, and some contradicted what was expected. With respect to the first research question, analyses revealed that mothers who spoke with more positive emotion at 36 weeks gestational age showed more positive affect during interactions with their 6-month-old infants. However, mothers who used more positive emotion and more general *affect* words had lower dyadic synchrony with their infants during the interactive episodes of the FFSFP.

Previous research has suggested that mothers who emphasize positive emotionality and are unwilling to express negative emotions may exhibit less sensitive parenting behavior (Borelli et al., 2012). This may explain the negative correlation between positive verbal expression during pregnancy interviews and dyadic synchrony during mother-infant interaction. Indeed, results of the current study are consistent with Moore et al.'s (2013) discovery that mothers who display more positive emotion show lower synchrony with their infant. The current study expands on this finding to suggest that higher positive word usage during pregnancy is related to lower synchrony during structured interactions with their infant at six months. While it may appear contradictory that mothers who use greater amounts of positive emotion words and display larger amounts of positive affect while interacting with their infants also show less behavioral synchrony with their infants, this result is consistent with previous research that investigated unwillingness to engage or express negativity and maternal behavior (Borelli et al, 2012). These results are also indicative of Moore et al.'s (2013) finding that mothers who display greater

positivity have lower synchrony, which suggests that it is not enough to simply investigate the degree of positivity and negativity.

The relationship between anxiety and word use when describing experiences of pregnancy also proved to be significant. Participants with greater trait anxiety used fewer social words. Though not reaching traditional significance, it was also found that greater trait anxiety was related to less positive word use and greater usage of anger words. This was previously found in a study that investigated anxiety and written perceptions of events. The study found that more anxious students were more likely to express negative events and use anger words, and they were less likely to focus on positive events (Piolat & Bannour, 2009). Though this may explain the use of anger words and positivity in this study, it still does not explain the deficit in social words. It is possible that the anxiety is related or emphasized by social situations, which could lead to unwillingness to discuss social situations. It is also possible that, similar to Piolat and Bannour's (2009) finding, anxiety leads the participant to dwell on negative topics and avoid positive word use. The participant may not wish to discuss social situations because they view it as being a positive situation and are unwilling to discuss the topic.

One of the relationships that was not expected but proved to be significant was the use of family words and lower mother infant synchrony and lower matched positive behavior state engagement. A possible explanation for this result could be that it is linked to positivity, and that people tend to talk positively when discussing their family and tend to bring up their family when discussing their perception of their pregnancy. In a study looking at personality and word use researchers found that the trait of agreeableness is positively correlated with both positive affect and family words (Yarkoni, 2010). Though it is certainly possible that the relationship between positive affect and family is not the cause of the results, it brings up an interesting question for further research on the topic.

By examining aspects of the relationship between mothers' verbal expressiveness during pregnancy and later parenting behavior, the current study contributes new understanding to processes that may influence maternal behavior and child social-emotional outcomes (Garner, Dunsmore, & Southam-Gerrow, 2008; Lagattuta & Wellman, 2002; Malatesta et al., 1989). This study yielded new insight to two key components of this relationship: the relationship between language use in perceptions of pregnancy and later maternal behavior, and the relationship between anxiety, depression, and language use in women's perceptions of pregnancy. Most notably, findings suggest a relationship between positive word use during pregnancy and dyadic synchrony at six months postpartum.

There are several limitations to this study that lend direction for further research. Primarily, the greatest limitation could be the generalizability of these results. Based on past research by Hart and Risley (1995) it is clear that social class is related to both language use and child development. It may be necessary to replicate these findings with a more representative sample of social economic status. Another possible limitation is the ages of the participants. The mean age of the participants was 32, and as previously discussed the relationship between perceptions of pregnancy and later maternal behavior was more prevalent in younger age groups (Mercer, 1985). The results of this study were significant and derived from mothers with a mean age of 32, which may suggest that perceptions of pregnancy and maternal behavior are more widely distributed than Mercer previously suggested, or that the relationship has been changing over time.

In order to better understand the relationship between maternal language use during pregnancy and later maternal behavior, further statistical analyses are required. This study provided a helpful first step by exploring significant relationships between variables of interest and, in this way, laid the groundwork for further research on the topic. Moving forward, emphasis should be placed on generalizability and age of the participants, as discussed above. Given that

anxiety and depression scores do not appear to fully explain maternal emotional expressivity during pregnancy, it may be beneficial to investigate why so many women express a limited range of emotions.

## Appendix A

### Full LIWC and Maternal Behavior Results

#### Full LIWC and Maternal Behavior Results (Normal Play)

Variable	% Mother Neg, Normal Play	% Mother Pos, Normal Play	Mother-infant synchrony, Normal Play	% Mother-infant matched Pos state engagement, Normal Play
LIWC <i>past</i>	0.089	-0.208	0.046	0.011
LIWC <i>present</i>	-0.031	0.067	0.042	0.02
LIWC <i>future</i>	-0.008	0.063	0.063	-0.071
LIWC <i>social</i>	0.088	0.099	-0.052	-0.005
LIWC <i>family</i>	0.015	-0.084	-.251 *	-.304 **
LIWC <i>friend</i>	-0.088	0.179	0.034	0.023
LIWC <i>affect</i>	-0.07	0.222	-.323 **	-0.113
LIWC <i>Positive</i>	-0.081	.241 *	-.272 *	-0.093
<i>Emotion</i>				
LIWC <i>Negative</i>	0.096	-0.023	-0.125	-0.121
<i>Emotion words</i>				
LIWC <i>anxiety</i>	-0.043	0.196	-0.222	0.042
LIWC <i>anger</i>	0.179	-0.03	0.025	-0.145
LIWC <i>sad</i>	-0.041	0.024	0.05	-0.054

\*p < .05, \*\*p < .01, \*\*\*p < .001

## Full LIWC and Maternal Behavior Results (Reunion)

Variable	% Mother Neg, Reunion	% Mother Pos, Reunion	Mother- infant synchrony, Reunion	% Mother- infant matched state engagement, Reunion
LIWC <i>past</i>	0.033	-0.136	-0.073	0.028
LIWC <i>present</i>	-0.175	0.035	-0.116	-0.101
LIWC <i>future</i>	-0.023	-0.005	-0.04	0.058
LIWC <i>social</i>	0.027	0.129	-0.076	0.115
LIWC <i>family</i>	-0.073	0.04	-0.146	-0.022
LIWC <i>friend</i>	0.029	0.157	-0.225	0.058
LIWC <i>affect</i>	0.097	0.236	-0.025	-0.031
LIWC <i>Positive Emotion</i>	0.075	.320**	-0.025	-0.017
LIWC <i>Negative Emotion</i>	0.072	-0.028	-0.011	-0.042
<i>words</i>				
LIWC <i>anxiety</i>	0.089	0.008	-0.03	-0.003
LIWC <i>anger</i>	0.043	-0.016	-0.127	0.018
LIWC <i>sad</i>	0.008	-0.012	0.009	-0.001

\*p < .05, \*\*p < .01, \*\*\*p < .001

## Appendix B

### LIWC, STAI and EPDS Results

#### Full LIWC, STAI and EPDS Results

Variable	STAI: Sum state Y-1 scores	STAI: Sum trait Y-2 scores	EPDS Total Score 36 WKS
LIWC <i>past</i>	0.051	0.091	0.046
LIWC <i>present</i>	0.192	0.13	0.169
LIWC <i>future</i>	0.049	0.081	-0.007
LIWC <i>social</i>	-0.029	-.230*	-0.172
LIWC <i>family</i>	0.094	0.056	0.103
LIWC <i>friend</i>	-0.088	-0.025	-0.061
LIWC <i>affect</i>	0.031	-0.083	0.051
LIWC <i>Positive</i>	0.054	-0.154	-0.008
<i>Emotion</i>			
LIWC <i>Negative</i>	-0.066	0.068	0.082
<i>Emotion words</i>			
LIWC <i>anxiety</i>	0.121	0.152	0.124
LIWC <i>anger</i>	0.071	0.19	0.217
LIWC <i>sad</i>	-0.194	0.073	0.094
LIWC <i>time</i>	0.036	0.141	0.041
LIWC <i>work</i>	0.111	0	0.065
LIWC <i>achieve</i>	0.148	0.127	0.074
LIWC <i>home</i>	-0.089	-0.031	0.084

\*p < .05, \*\*p < .01

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## Education

- Bellefonte Area High School (2007-2010)
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- The Pennsylvania State University (2010-Current)
- The College of the Liberal Arts
- The Schreyer Honors College
  - Seeking BA in Psychology
  - Seeking BA in Crime, Law and Justice
  - Seeking Spanish Minor

## Honors and Awards

- Dean's List (2010-Current)
- Paterno Fellowship Program (2010-Current)
- Schreyer Honors College (2012-Current)

## Association Memberships/Activities

- National Society of Collegiate Scholars (2011-Current)
- Helping Hands Therapeutic Horseback Riding (2012-Current)

### **Professional Experience**

- Library Assistant, The Pennsylvania State University (2010-Current)
  - Interlibrary Loan Assistant at the Paterno Library
- Ocean City Police Officer (Summer 2013)
  - Seasonal Police Officer

### **Research Experience**

- Research Assistant, The Pennsylvania State University (2012-Current)
- Senior Thesis, The Pennsylvania State University (2013-Current)