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Temperament and Early Communication in Premature Children

A thesis

presented to

the faculty of the Department of Communicative Disorders

East Tennessee State University

In partial fulfillment

of the requirements for the degree

Master of Science in Speech-Language Pathology

by

Nina King

May 2007

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Keywords: Temperament, Prematurity, Language Acquisition

ABSTRACT

Temperament and Early Communication in Premature Children

by

Nina King

Premature children are at greater risk for developing communication delays than full-term children, although it is not inevitable. Recent research links specific temperament characteristics to early language development. Thus, temperament may provide a way to identify premature children who are at increased risk. The first purpose of this study was to determine if temperament characteristics of premature children are the same as full-term children when measured by the *Infant Behavior Questionnaire-Revised*. The second purpose was to determine if temperament and language acquisition, as measured by the *MacArthur Communicative Development Inventory: Words and Gestures*, are linked in premature infants and, if so, are the relationships similar to those of full-term populations. Participants included 19 children 8-12 months, chronological age. Results indicated that they exhibited similar temperament characteristics to full-term children. Additionally, temperament was linked to vocabulary comprehension and, unlike findings for full-term children, to expressive communication as well.

DEDICATION

I would like to express my sincere love to my husband, Ryan. Your support and devotion throughout my graduate program inspired me to do my best. I would have never been able to accomplish what I have without your help. I would also like to express thanks to my son, Myles. You are the joy of my life. Your smile and laughter brighten my days. Special thanks are extended to my in-laws, Carolyn and Steve, and my grandparents, Betty and Jack.

ACKNOWLEDGMENTS

I would like to thank the chair of my thesis committee, Dr. Kerry Proctor-Williams, and express to her my sincere appreciation for her guidance, encouragement, time, and effort throughout this research project. She has truly been an inspirational mentor. Special thanks are extended to Dr. Nancy Scherer and Dr. Wallace Dixon for their support and for their service on my thesis committee. In addition to my committee, I would like to express my gratitude to the East Tennessee State University School of Graduate Studies and Graduate Council Research Grant for partial support of the current research.

TABLE OF CONTENTS

	Page
ABSTRACT.....	2
DEDICATION.....	3
ACKNOWLEDGMENTS.....	4
Chapter	
1. NATURE AND PURPOSE OF THE STUDY.....	8
Need for the Study.....	9
Research Hypotheses.....	9
Overview.....	10
2. REVIEW OF THE LITERATURE.....	11
Prematurity.....	11
Prematurity and Language Development.....	12
Risk Factors for Delayed Communication.....	12
Effects of Prematurity on Language Development.....	13
Temperament.....	16
Assessment of Temperament.....	17
Stability of Temperament.....	18
Temperament and Prematurity.....	19
The Relationship Between Communication and Temperament.....	23
Conclusion.....	26
3. METHOD.....	29

Chapter	Page
Participants.....	29
Procedure.....	32
Variables.....	33
4. RESULTS.....	34
Temperament Characteristics of Premature Children.....	34
Temperament and Language Characteristics of Premature Children.....	42
5. DISCUSSION.....	45
Temperament of Premature Children.....	45
Higher Risk Children.....	47
Adjusted and Chronological Age.....	48
Stability of Temperament.....	49
Sample Size.....	50
Temperament and Language of Premature Children.....	50
Limitations of the Study.....	52
Directions for Further Research.....	53
Conclusion.....	53
REFERENCES.....	56
APPENDICES.....	61
Appendix A: HIPPA Authorization Form.....	61
Appendix B: Informed Consent.....	63
VITA.....	66

LIST OF TABLES

Tables	Page
1. Participants' Demographic and Health Information.....	31
2. Means and Standard Deviations of the Scores on the <i>IBQ-R</i>	35
3. Differences Between Mean Scores on the <i>IBQ-R</i> in the Largest Two Premature Groups and Age Equivalent Full-Term Groups.....	37
4. Correlations (<i>r</i>) Among the Temperament Scales of the <i>IBQ-R</i> for Premature Children	38
5. Comparison of Reliable Correlations Among the Temperament Scales in Premature and Full-Term Children.....	41
6. Correlations Between Temperament and Vocabulary Comprehension.....	43
7. Significant Correlations Between Temperament and Expressive Communication.....	44

CHAPTER 1

NATURE AND PURPOSE OF THE STUDY

Language delays in children cause great concern for their caregivers because there is an increased likelihood of negative academic, social, and vocational outcomes. Premature infants with low birthweight are at greater risk for developing language delays compared to infants born full-term (Aram, Hack, Hawkins, Weissman, & Borawski-Clark, 1991; Hedrick, Prather, & Tobin, 1975). Identifying precursors to language delays can help caregivers and professionals distinguish those children who are at particular risk. Those who are identified at risk can then begin early intervention. Unfortunately, identification of communication delays in children under 2 years of age is difficult because of the general lack of recognition of intentional non-speech vocalizations and gesture use as necessary precursors to spoken communication, the wide range of normal variability in emergence of first words, and the limited number of standardized pre-linguistic assessment tools available for very young children.

Temperament characteristics associated with language delays may be one key to unlocking the much-needed early identification of communication delays. Temperament can be identified earlier than spoken communication delays and temperament has been shown to remain stable during childhood (Riese, 1987) barring significant physical or psychological events (Goldsmith et al., 1987). Therefore, temperament characteristics of children may help identify increased risk for future communication difficulties and enable advocates for those children to seek out preventative or early intervention.

This study has two primary purposes. The first purpose of this study is to determine whether the temperament characteristics of premature children are the same as those of typically developing children as measured by the *Infant Behavior Questionnaire-Revised (IBQ-R)*. The

second purpose of the current study is to determine if temperament predicts language acquisition in premature infants and, if so, are the relationships between temperament and language the same among premature populations as those in typically developing populations.

Need for the Study

Communication delays associated with premature birth may have effects on early academic performance if the delays are not resolved prior to the child attending school (Aram et al., 1991). Temperament has been shown to be identifiable in infants as early as 1 month (Medoff-Cooper, Carey, & McDevitt, 1993) and is considered stable at approximately 4 months of age (Goldsmith et al., 1987). Furthermore, there is a growing body of research that suggests certain temperament characteristics are associated with slower language development in typically developing children (Dixon & Smith, 2000). If a similar link can be established between temperament characteristics and communication development in premature children, we will be able to identify with greater assurance those who are at high risk for developing language delays. The earlier that identification occurs, the earlier intervention can take place; the earlier that intervention takes place, the greater the likelihood that treatment can resolve or ameliorate the child's communication delay (Jacoby, Lee, Kummer, Levin, & Creaghead, 2002).

Research Hypotheses

The current study will test the following hypotheses.

1. The mean scores and patterns of correlation between temperament characteristics of premature children will be similar to those of typically developing children when measured by the *IBQ-R*.

2. Children, who are born prematurely, will demonstrate the same linkages between temperament characteristics and language acquisition as those in typically developing, full-term children.

Overview

The overall nature and purposes of the investigation have been presented in this chapter. Chapter 2 reviews the literature and examines prematurity, communication development, temperament, and the relationships between these topics. A presentation of the study's methodology appears in Chapter 3. Chapter 4 includes the data analyses and results. A discussion of the results with reference to the literature appears in Chapter 5.

CHAPTER 2

REVIEW OF THE LITERATURE

Prematurity

A premature infant is defined as any child born before 37 weeks' gestation (Clark, 1989). When a child is born prior to term, that child's central nervous system is not fully organized for sustaining itself outside the uterus (Cherkes-Julkowski, 1998). Early problems, such as birth asphyxia, intracranial hemorrhage, high levels of bilirubin, and consequent exposure to ototoxic drugs, may lead to neurological sequelae and, through association, may lead to future communication delays (Clark).

Two distinct sub-groups appear to emerge among premature infants. These include children born prematurely but of adequate weight for their gestational age and infants born very preterm or of very low birthweight. Low birthweight can result from a shorter gestational period, a slower than expected rate of intrauterine growth, or a combination of these two factors (Gallagher & Watkin, 1998). Infants born prior to week 32 of gestation are called very preterm, and infants weighing less than 1,500 grams are considered to be of very low birthweight (Veen et al., 1991). There can be significant developmental differences within these subcategories. One such difference is the presence of severe health-related problems seen frequently in those born prior to 32 weeks gestation or those born of low birthweight.

Regardless of severity of health conditions, studies tend to base comparisons of the preterm child's development to that of the full-term child using adjusted age (Briscoe, Gathercole, & Marlow, 1998). Adjusted age refers to the projected age of a child if he or she had been born full-term (Cherkes-Julkowski, 1998). Some evidence shows that looking at a premature child's chronological age gives a more accurate account of the child's development in

relationship to their peers (Riese, 1988). Others argue that a comparison of both adjusted and chronological age to full-term peers may give an even more accurate portrayal of language development in premature infants (Menyuk, Liebergott, Schultz, Chesnick & Ferrier, 1991). This is the approach that will be taken in this study when possible. Whether a study identifies premature infants according to their adjusted age or to their chronological age, there are several risk factors for communication delays that are prevalent among premature infants. To understand the likelihood of the development of communication delays among preterm populations, an understanding of these risk factors is essential.

Prematurity and Language Development

Risk Factors for Delayed Communication

Gallagher and Watkin (1998) recognize several conditions associated with later language difficulties that are frequently seen in premature infants. Respiratory distress syndrome, intraventricular hemorrhage, and bronchopulmonary dysplasia may affect intellectual outcomes and, thus, communication (Gallagher & Watkin). Communication delays among premature children may also result from an increased risk for hearing loss. Precursors to hearing loss in preterm infants include: asphyxia; congenital and neonatal infection; recurrent otitis media; gestational age of 26 to 30 weeks; birthweight less than 1000 grams; Apgar scores at 1 and 5 minutes below 5 and 6; post-natal blood pH below 7.25; neurological status; respiratory distress syndrome with 11 or more days on ventilation; and congenital malformations (Gerber, 1990; Knobloch & Kanoy, 1982). Fortunately, with increased implementation of universal hearing screenings for newborns, early identification of and intervention for hearing loss is improving (Karzon & Lieu, 2006). Because premature infants are at an increased risk for communication

delays, they may miss language milestones. If early language milestones are missed, future delays in communication development may occur (Capone & McGregor, 2004).

Effects of Prematurity on Language Development

Feldman, Janosky, Scher, and Wareham (1994) stated that prematurity may be an underlying factor for developmental disorders, but these disorders may not include future language impairment. They reviewed a potential subject pool of 66 premature infants with neural imaging evidence of non-progressive brain injury. The birthweight for the participants ranged between 750-2,890 grams. Study criteria included: (1) gestational age less than 36 weeks; (2) chronological age of 36 and 39 months at the time of the study; (3) male; (4) no active seizure disorders or seizure disorders that were controlled through anticonvulsant medications; (5) scores greater than 80 on the *General Cognitive Index of the McCarthy Scales of Children's Abilities* (McCarthy, 1972); and (6) no moderate to severe hearing loss. Eighteen children met these criteria and were then equally subdivided into three groups of six: (1) children with spastic cerebral palsy from periventricular leukomalacia; (2) children with periventricular brain injury without cerebral palsy; and (3) preterm controls without brain injury or cerebral palsy. The authors found that language disabilities, as measured by various language measures, were not directly associated with cerebral palsy, periventricular brain injury, or prematurity at age 3 (Feldman et al., 1994). Based on Feldman et al., prematurity appears to slow language development but does not necessarily result in future language impairments.

In a separate study, Menyuk et al. (1991) found that premature birth alone is not a risk factor for early language delay, but low birthweight may increase the risk for communication delays. Menyuk et al. compared patterns of linguistic and cognitive development of 26 premature infants to those of 27 full-term infants using naturalistic data and test measures at 12,

22, and 29 months. The premature infants were compared based on their adjusted age and chronological age. Twelve of the premature infants were of very low birthweight, weighing between 794-1,530 grams. Children were classified as at-risk for language problems if they exhibited signs of hyperbilirubinemia, respiratory distress or intraventricular hemorrhage or had incidents of otitis media. They found that patterns of language development in premature infants and children born full-term were similar whether language development was compared using chronological or adjusted ages. When they made comparisons based on chronological age, there were no differences between premature infants and full-term infants in their language comprehension and production skills or in the rates at which new words were acquired. Based on adjusted age, the premature infants were noted to be significantly ahead of their full-term peers. However, the subgroup of children with very low birthweights tended to comprehend words approximately 1 1/2 months later than their full-term peers.

Although Menyuk et al. (1991) found very low birthweight infants were at increased risk for language impairment, other research does not consistently report connections between low birthweight and future language difficulties. Aram et al. (1991) studied 249 children born prematurely and of very low birthweight (< 1,500 grams), 24 of whom were identified as having major neurosensory abnormalities. The authors tested the very low birthweight participants' communication development at 8 years of age and compared it to that of 363 full-term children born of normal birthweight. Expressive and receptive language assessments were given to each participant using a variety of standardized tests of language comprehension and production. The authors found that when very low birthweight children, including those with neurological impairment, were compared to controls, the mean in all instances fell more than 3 standard deviations below the mean (Aram et al., p. 1175). They also found that low birthweight children

had significantly lower IQ scores, which put them at additional risk for poorer language comprehension, language production, and speech abilities. Despite their poorer performances, however, the low birthweight infants were not found to be at greater risk for developing specific language impairment compared to their full-term peers. Aram et al. did not find consistent links between low birthweight and future language impairment.

Cherkes-Julkowski (1998) came to a similar conclusion. Premature participants were born prior to 38 weeks gestation, weighed less than 5 pounds, and had no evidence of congenital disorder or retrolental fibroplasia and were discharged prior to 42 weeks conceptional age. The author examined engaged time and episodes among 28 preterm and 20 full-term children at 13 and 15 months of age. There were no known differences between the groups except for the classification of prematurity. At follow-up, school records through grade 5 were gathered for 28 preterm and 14 full-term children. Of these 42 total participants, one premature child was classified as language impaired (LI). Cherkes-Julkowski found that the LI child became increasingly non-engaged between 13 and 15 months.

Generally, the assertion of Feldman et al. (1994) is supported. Prematurity may be an underlying factor for developmental disorders, but it does not invariably lead to language impairment. It appears that children born with very low birthweight tend to perform more poorly on language measures than their full-term counterparts, though not necessarily in the disordered range (Aram et al., 1991; Menyuk et al., 1991). Interestingly, neurological difficulties among preterm children did not consistently result in early language delays (Aram et al.). Only Cherkes-Julkowski (1998) showed any predictive relationship between a prelinguistic behavior in premature children and later language impairment.

Temperament

“Temperament patterns are discernable quite early in life and persist over time and across situations” (Prior, 1992, p. 249). Therefore, if an association can be made between temperament and communication delays, increased likelihood for earlier identification of future delays in children may be established based on their temperament characteristics. Though researchers have not yet settled on a common and clear definition of temperament, there is agreement that temperament is biologically based (Goldsmith et al., 1987; Prior). Thomas and Chess (1977) stated that temperament is biological in nature but is affected by different environmental experiences. In a 1987 roundtable discussion, four approaches to temperament were discussed and a general consensus among researchers was that temperament can be defined as consisting of “dimensions or dispositions that underlie behavior and influence how one person would respond differently than another person to the same environmental situation” (Goldsmith et al., 1987, p. 525). They proposed the following definition of temperament: “temperament consists of relatively consistent, basic dispositions inherent in the person that underlie and modulate the expression of activity, reactivity, emotionality, and sociability” (p. 524). Activity includes intensity, vigor, pace of movement, speech, and thought. Reactivity involves approach or withdrawal from stimulation, thresholds for response to stimuli, attention and interest in stimuli, and persistence. Emotionality is expressed as anger, sadness, fear, joy, pleasure, disgust, surprise, smiling, laughing, frustration, crying, and soothability. Finally, sociability includes the preference to be around other people during shared activities (Goldsmith et al.). Intelligence is not a part of temperament in any of the theories and is only a subset of personality and sociability. The panel agreed that temperament underlies behavior and influences how a person

reacts in certain situations. Furthermore, there was consensus that, overall, temperament is relatively stable, although certain dimensions may be unstable (Goldsmith et al.).

Assessment of Temperament

Temperament may be directly measured through behavioral observation at home, at school, or at a laboratory where particular stimuli are presented to a child and responses are recorded. Temperament can also be indirectly measured through parent interviews or questionnaires. Questionnaires are the most common method of measuring temperament because they can be used for large samples and are inexpensive to administer (Anderson, Pellowski, Conture, & Kelly, 2003; Prior, 1992). Furthermore, research indicates that indirect approaches to measuring temperament are largely valid (Carey, 1985). This validity is attributed to the large number of opportunities and wide range of daily situations in which parents may observe their children that would be impossible to recreate in a laboratory environment (Putnam, Ellis, & Rothbart, 2001). Although there are several tools available for measuring temperament, the measurement series that relates directly to the current study includes the *Infant Behavior Questionnaire-Revised (IBQ-R)*; Gartstein & Rothbart, 2003).

To establish the reliability and validity of the *IBQ-R*, 360 primary caregivers of infants between 3 and 12 months of age were asked to complete the questionnaire (Gartstein & Rothbart, 2003). One hundred twenty questionnaires were obtained for three age groups within the 3 month to 12 month age range (group 1 consisted of 3-6 month olds, group 2 consisted of 6-9 month olds, and group 3 consisted of 9-12 month olds). Parents were asked to describe their baby's behavior, during the previous week, using a 7-point scale: never, very rarely, less than half the time, half the time, more than half the time, almost always, and always. There are 14 sub-dimensions on the *IBQ-R*, including: approach, vocal reactivity, high intensity pleasure,

smiling and laughter, activity level, perceptual sensitivity, sadness, distress to limitations, fear, recovery from distress, low intensity pleasure, cuddliness, duration of orienting, and soothability (Gartstein & Rothbart). Their normative information (120 full-term children for each of the 3 age groups) provides the comparison sample for the current study.

Stability of Temperament

Several researchers have found temperament to be stable over time (Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Riese, 1987). To demonstrate this stability, Kagan et al. looked at behavioral inhibition or lack of inhibition. Out of 43 participants, 22 were classified as inhibited and 21 classified as uninhibited at 21 months of age. Those who were formerly classified as inhibited and uninhibited continued to display these behaviors at 4 years of age. By age 4, five inhibited children were considered less inhibited and one uninhibited child was moderately inhibited (Kagan et al.).

Additional evidence of temperament stability is seen in a study conducted by Riese (1987). In this study, the temperament stability of 67 full-term infants from 28 pairs of same-sex twins and 7 pairs of opposite-sex twins were assessed (3 children were eliminated from the original 35 twin dyads because of incomplete data). The participants did not have prenatal or perinatal complications as assessed between 1 and 4 days of age. Five categories of behavior were observed in the infants between 1 and 4 days of age, including: irritability, resistance to soothing, reactivity, reinforcement value, and activity. The infants were observed again at 9, 12, 18, and 24 months and the behaviors that were measured included emotional tone, attentiveness, activity, and social orientation to staff (Riese). Riese noted that irritable neonates were later rated as more upset, less attentive to stimuli, less responsive to staff, and more changeable to activity level at 24 months of age. This research indicates that while there are predictable

relationships between neonate behaviors and later temperament, there can also be temperamental variability during early infancy.

Temperament and Prematurity

Riese (1988) also examined temperament stability between preterm and full-term infants at 6 months of age (109 full-term and 81 preterm infants), 9 months of age (99 full-term and 75 preterm infants), 12 months of age (95 full-term and 74 preterm infants), 18 months of age (87 full-term and 69 preterm infants), and 24 months of age (81 full-term and 63 preterm infants). For all participants, chronological age was used. The researcher videotaped each child during age-appropriate activities and later rated them on their emotional tone, attentiveness, activity, and social orientation to staff (Riese). Riese found that at 6 months of age, the preterm infants were less positive toward staff than full-term infants. At 12 months of age, the full-term infants were more upset and less attentive to stimuli than preterm infants; however, these same behaviors were seen later in the 18-month-old preterm infants. At the youngest ages, full-term infants demonstrated stronger age-to-age stability than preterm infants; however, at later ages, the premature infants did demonstrate stability.

In contrast to Riese (1988), other studies have shown that the temperamental characteristics of premature children do not differ from those who are full-term, unless they were born very premature, of low birth weight, or with perinatal complications. In a study conducted by Oberklaid, Prior, Nolan, Smith, and Flavell (1985), caregivers of 110 premature infants were surveyed using a revised *Infant Temperament Questionnaire (ITQ; Carey & McDevitt, 1978)* that was adapted for use with Australian populations. The premature infants, ages 4 to 8 months adjusted age, were compared to 240 full-term infants of the same age. Mean scores from the nine temperament dimensions of the *ITQ* showed that temperament characteristics of premature

infants did not differ from those of full-term infants. A later study conducted by Oberklaid, Prior, and Sanson (1986) adds further support to these findings. In this study, 126 premature infants were again found to have similar temperament characteristics to those of full-term infants. Oberklaid et al. (1986) cautioned that their findings should not be extended to extremely premature infants, however. They suggest that children with low birth weight or developmental complications may differ in temperament from children born full-term.

Spungen and Farran (1986) found exactly this. In their study, 44 low birth weight infants were more likely to have a negative mood, judged to be less persistent, and were less distractible when compared to 24 low-risk, healthy preterm infants and 24 full-term infants (Spungen & Farran). Children with perinatal problems (Ross, 1987) and those born very premature (Larroque, Tich, Guedeney, Marchand, & Burguet, 2005) have also been found to exhibit unique temperament characteristics when compared to their full-term peers.

In Ross' (1987) study, parents of 98 preterm and 89 full-term infants completed the *Toddler Temperament Scale (TTS)* (Fullard, Carey, & McDevitt, 1984) that measures the caregiver's global impression of the child on each of nine temperament dimensions. Ross also considered perinatal risk factors that may be related to temperament, including: (1) birth weight, (2) gestational age, (3) Apgar scores at 1 and 5 minutes, (4) seizures, (5) presence of intraventricular hemorrhage, (6) need for assisted ventilation, (7) hypoxia, and (8) maximum amount of oxygen required while on a respirator (Ross). Preterm infants at 1 year did not differ significantly from full-term infants on temperament type (Easy, Difficult, Slow-to-warm-up, Intermediate high, and Intermediate low) or on nine dimensions of temperament. Children who experienced greater respiratory problems, however, were more likely to be classified as having lower adaptability and lower activity level, and they displayed less approach behavior. Also,

children with central nervous system dysfunction were significantly more likely to be identified as difficult than children who were neurologically intact. This study indicates that preterm and full-term temperament may be similar over time unless the preterm infant experienced considerable respiratory or neurological perinatal complications.

In a recent study, Larroque et al. (2005) compared the temperament of 266 very preterm children born at less than 29 weeks of gestation to that of 456 full-term infants. The authors examined whether differences in temperament associated with very premature children could be the result of medical complications associated with this population rather than prematurity in itself. They suggested that this might account for an increased prevalence of difficult temperaments in premature infant populations (Larroque et al.). The authors sent the *Infant Characteristics Questionnaire (ICQ)*; Bates, Freeland, & Lounsbury, 1979) to the infant's mother when the child turned 9 months adjusted age. The items on the *ICQ* are distributed across four independent scales including: Difficult, Unadaptable, Unpredictable, and Dull (Larroque et al.). Results indicated that the very preterm infants scored higher on the Dull scale regardless of their gestational age at birth. Infants born with grade 3 or 4 intraventricular hemorrhage were also rated higher on the Dull scale. The Dull scale reflects the child's ability to deal with social responsiveness (Larroque et al.). Each infant was also ranked according to four behavioral characteristics. Of these characteristics, very premature infants had more difficulty falling asleep, were more likely to wake up at night, were difficult to feed, and were hard to soothe during crying (Larroque et al.).

Together, these research studies show that premature children who were born of extreme prematurity or low birth weight or who demonstrated perinatal complications have unique

temperament characteristics when compared to full-term children. However, other research shows that eventually premature children will exhibit similar temperaments to full-term children.

Hughes, Shults, McGrath, and Medoff-Cooper (2002) suggested that there may be differences in temperament during early months, but over time preterm and full-term children begin to have similar temperament characteristics. Hughes et al. compared the temperamental characteristics of 76 preterm infants to standardized norms of full-term infants at 6 weeks, and then re-examined their temperament development at 6 months and 12 months. The infants received the *Early Infancy Temperament Questionnaire (EITQ)*; Medoff-Cooper et al., 1993) at 6 weeks of age, the *Revised Infant Temperament Questionnaire (RITQ)*; Carey & McDevitt, 1978) at 6 months of age, and the *Toddler Temperament Scale (TTS)*; Fullard et al., 1984) at 12 months of age. Only the 19 preterm infants whose parents returned the surveys at 6 weeks and 6 months or 6 weeks and 12 months were included in the study. Hughes et al. found that at 6 weeks of age, the preterm group differed from the full-term infants in that the premature infants were less rhythmic, more distractible, less intense, and less approaching. At 6 months of age, this subgroup grew to be less adaptable than full-term peers but did not differ in rhythmicity, approach, intensity, or distractibility. This indicated that the preterm infants became more attentive during those first 6 months and could be classified as similar to their full-term peers. At 12-months, the preterm infants were less persistent than full-term peers but similar on all other dimensions. They were also less likely to pursue an activity when faced with an obstacle (Hughes et al.).

In summary, seemingly contradictory evidence has been presented regarding temperament and premature infants. Riese (1988) found that premature children have distinct temperament characteristics when compared to children born full-term. However, some studies

indicate preterm and full-term infants have analogous temperament characteristics (Oberklaid et al., 1985; Oberklaid et al., 1986). Further review suggests, however, that when the degree of prematurity, presence of complications, and timing of measurement are considered, temperament differences between preterm and full-term infants cease to exist (Hughes et al., 2002).

Interestingly, researchers who reported that temperament is dissimilar among premature and full-term infants found differences only among those premature children who were born of very low birth weight or very preterm or who exhibited medical complications (Larroque et al., 2005; Ross, 1987; Spungen & Farran, 1986).

The Relationship Between Communication and Temperament

There is increasing evidence that temperament is associated with the acquisition of language in full-term, typically developing children (Dixon & Shore, 1997; Dixon & Smith, 2000; Spere, Schmidt, Theall-Honey, & Martin-Chang, 2004). In the earliest study, Dixon and Shore explored whether early temperament characteristics are associated with later linguistic style. Twenty-nine parents and their infants at ages 13, 14, 20, and 21 months participated in the study. The *Infant Behavior Questionnaire (IBQ)* was administered when the child was 13-months-old and a standardized parent interview was used to obtain examples of the child's linguistic productions at 20 and 21 months of age. Their results indicated that the children who produced more multi-word utterances at 21 months paid attention for longer periods of time, smiled and laughed a lot, and were easily soothed at younger ages (Dixon & Shore).

Further evidence supports the link between temperament and language. Dixon and Smith's (2000) study investigated: (1) whether temperament-language relationships of their earlier study could be replicated; (2) if correspondences between temperament and language could be observed for language comprehension; and (3) whether temperament predicts language

acquisition. To answer these questions, the study was conducted in two parts over the course of 2 years.

First, the researchers gave the *TTS* to the parents of 13-month-olds (43 participants) and 20-month-olds (42 participants). To assess language production, parents completed *The MacArthur Communicative Development Inventory (MCDI): Words and Gestures* (Fenson et al., 1991) for their 13-month olds and the *MCDI: Words and Sentences* (Fenson et al.) for their 20-month olds. Dixon and Smith (2000) found that "advanced language productivity at age 20 months was generally predicted by greater adaptability, more positive mood, and greater persistence at 13 months" (p. 435).

In the second part of their study, Dixon and Smith (2000) used the *IBQ* to measure temperament in infants at 7 months, 10 months, and 13 months. The *MCDI: Words and Gestures* was used to measure linguistic comprehension. Of the temperament dimensions measured by the *IBQ*, Dixon and Smith hypothesized that smiling and laughter, duration of orientation, and soothability would be associated with linguistic comprehension. The authors found that positive characteristics seen in 7-month-olds did lead to advanced language comprehension at 7 and 10 months. In addition, advanced language production at 20 months was associated with increased duration of orientation from 7 to 10 months, increased soothability from 10 to 13 months, and decreased distress to limitation from 10 to 13 months. Furthermore, Dixon and Smith found that greater persistence, greater adaptability, and more positive mood predicted advanced language production at 20 months.

Recent work by Dixon and his colleagues, (Dixon, Salley, & Clements, 2006; Dixon & Salley, in press) examines the role that attention may play in mediating the relationship between temperament and language development. Because the children with longer attention spans

tended to perform better on language measures, Dixon et al. (2006) sought to find whether environmental distractions would negatively impact learning of nonlinguistic environmental events and whether differences in executive control would influence the effect of environmental distractions on learning of linguistic and nonlinguistic tasks. To do this, the Early Childhood Behavior Questionnaire (ECBQ; Putnam, Gartstein, & Rothbart, 2006) was sent to the parents of 39, full-term, 21-month-olds to determine whether the children tended to be low (19 participants) or high (20 participants) in attentional focus. As well as conducting several non-word attentional tasks, novel words were taught to the children. Dixon et al. (2006) found that environmental distractions inhibited word learning, but that children high in attentional focus were less affected by social environmental distractions during word learning than children low in attentional focus. The researchers also found that environmental distractions impacted the participants' ability to perform nonlinguistic tasks. Dixon et al. (2006) concluded that children with high attention spans exhibit better receptive vocabularies, in part, because of their ability to be less susceptible to the impact of distractions within their environment.

In a separate study, Dixon and Smith (in press) examined attentional focus, habituation, and the relationship these have to language development among 43 children at 13-months and 42 children at 20-months (only 40 children were the same ones tested at both 13 and 20-months). Vocabulary measures were obtained using the MCDI-Words and Gestures at 13-months and the MCDI-Words and Sentences at 20 months. Temperament was measured using the TTS and habituation measures were gathered by showing patterns of red geometric shapes to the participants at both 13 and 20-months of age and were also collected for the 42 children at 20-months. They found that children with low attentional focus and fast habituation during infancy exhibited larger vocabularies production when reaching toddlerhood. For those children who

had high attentional focus, slow habituation early in life led to larger vocabularies during the toddler years.

In summary, initial research indicated predictive links between “easy baby” temperament characteristics such as positive affect, soothability, and adaptability and language development in typically developing children (Dixon & Shore, 1997; Dixon & Smith, 2000). As well, characteristics such as attention and persistence were strongly and positively correlated to later language development. Dixon and his colleagues (Dixon et al., 2006; Dixon & Smith, in press) offer further evidence that attention may be the key mediator in this link between temperament and language development. The research suggests that children who display more positive temperament characteristics and greater attentional focus during early childhood exhibit advantages in later language production.

Conclusion

The literature shows that premature infants are at greater risk than full-term infants for developmental delays that often, but not invariably, include communication delays (Feldman et al., 1994; Gallagher & Watkin, 1998; Gerber, 1990; Knobloch & Kanoy, 1982; Menyuk et al., 1991). The challenge is to distinguish between these infants. We can meet this challenge if we can identify very early in a child’s development those characteristics that are reliably linked to later language impairment. For example, infants who are born with low birthweights are at greater risk for specific delays in language acquisition (Aram et al., 1991; Menyuk et al.). Temperament may be another predictor of language delays. Temperament characteristics of children can be identified in early infancy, they are stable over time after 4-6 months of age, and certain temperament characteristics have been shown to have links to language acquisition (Dixon et al., 2006; Hughes et al., 2002; Kagan et al., 1984; Riese, 1987).

Currently, there is no direct research about the relationships between prematurity, language, and temperament. This study is unique in its exploration of these areas. The first question addressed in this exploratory study is:

Are the temperament characteristics of premature children the same as those of typically developing children as measured by the *IBQ-R*?

Temperament of premature children was compared to that of full-term children using information from Gartstein and Rothbart (2003). Temperament has not yet been directly measured in the premature population using the *IBQ-R*. While several instruments have been used to assess temperament with this population, (i.e., the *TTS*, *ICQ*, *ITQ*, and *EITQ*) (cf.; Farran, 1986; Hughes et al., 2002; Langkamp, Kim, & Pascoe, 1998; Larroque et al., 2005 Oberklaid et al., 1985; Oberklaid et al., 1986; Spungen & Farran, 1986; Ross, 1987), it is the temperament measures of *IBQ-R* that have linked temperament with language outcomes. Research indicates that premature children have similar temperament characteristics to those of full-term children (Ross; Oberklaid et al., 1985) once the period of temperamental stability is entered (Hughes et al., 2002; Riese, 1988) unless those children experience considerable perinatal complications (Ross). Thus, it is predicted that, generally, the temperament characteristics of children who are born prematurely will exhibit similar patterns of correlation to typically developing children when measured by the *IBQ-R*.

The second question that this study addresses is:

Is temperament and language acquisition linked in premature infants and, if so, are the relationships between temperament and language the same in this premature population as in a full-term typically developing population?

The temperament of premature children was compared to full-term children using the data of Dixon and Smith (2000). Temperament has been found to be a contributing factor in the acquisition of language in full-term, typically developing children (Dixon & Shore, 1997; Dixon & Smith; Spere et al., 2004). Specifically, Dixon et al. (2006) found stronger receptive and expressive vocabulary skills in children who were temperamentally more positive in mood, more adaptable, more soothable, and had longer attention spans. The prediction is that children, who are born prematurely will demonstrate the same temperament characteristics that have been linked to language acquisition in typically developing, full-term children.

CHAPTER 3

METHOD

This study was designed to identify the temperament and communication characteristics of premature children and to determine whether a relationship existed between the two. This chapter presents a discussion of the participants, procedures, and statistical analysis.

Participants

The participants included 19 children (7 boys and 12 girls) born prior to 38 weeks gestation at Johnson City Medical Center (JCMC) or who were transported to the neonatal intensive care unit of JCMC from regional hospitals. Participants and their caregivers (15 mothers, 3 fathers, and 1 grandmother) attended the high-risk follow-up clinic at ETSU Physicians and Associates. The clinic offers an array of specialists including: a speech-language pathologist, audiologist, nutritionist, developmental specialist, nurse, and neonatologist. To qualify for the study, participants had to be at least 8 months chronological age ($M = 10.90$ months, $SD = 2.60$ months; M adjusted age = 8.26 months, $SD = 2.79$ months). No child was excluded on the basis of race, gender, or ethnicity.

To obtain gestational age at birth, birthweight, and medical history of the participants, information was gathered from the children's medical chart. In order to have access to the medical history, a HIPPA release form was signed by the caregiver who completed the questionnaires (see Appendix A). Table 1 provides a description of individual demographic and health characteristics. The average gestational age for the participants at delivery was 29.84 weeks (Range = 24 to 36 weeks). The mean birthweight for participants at time of delivery was 1,200.95 grams (Range = 521 to 2,540 grams). The mean age of the participant's mothers at the time of delivery was 27.90 (Range = 18 to 47 years). If available, the biological mothers' habits

of smoking, alcohol, and drug use were noted. Of those habits that were noted, one mother smoked during pregnancy and one mother admitted to smoking and drinking during pregnancy. No child was diagnosed with a genetic condition; however, one child did have vision problems. Finally, because of the increase in medical complications that are seen in this population, a detailed description of any respiratory, neurological, and cardiovascular problems at the time of birth was gathered. Out of the 19 participants, 16 had respiratory conditions, 7 had neurological conditions, and 8 had cardiac conditions. Only one child did not exhibit any medical complications at birth.

Table 1

Participants' Demographic and Health Information

Child	Gestation in Weeks	Gender	Adjusted Age in Months	Chronological Age in Months	Birthweight in Grams	Apgar 1 Minute	Apgar 5 Minutes	Days in NICU	Respiratory Difficulties	Neurological Conditions	Cardiac Conditions
1	36	Male	7	8	1630	2	2	10	Yes	No	No
2	29	Female	15	18	991	7	8	56	Yes	Yes	No
3	27	Female	8	11	1040	7	8	48	Yes	No	Yes
4	30	Male	6	9	1305	8	9	38	Yes	Yes	No
5	30	Male	6	9	1330	6	9	21	Yes	No	Yes
6	37	Male	9	10	2540	8	9	10	No	Yes	Yes
7	36	Female	14	15	1600			17	Yes	Yes	No
8	26	Female	6	9	521			61	Yes	No	No
9	24	Female	10	14	545	4	7	94	Yes	Yes	No
10	26	Female	8	12	930	9	9	94	Yes	No	Yes
11	36	Female	12	13	1210			75	Yes	Yes	No
12	26	Female	7	11	870			61	Yes	No	No
13	28	Male	9	12	1010	7	8	80	Yes	No	Yes
14	32	Female	8	10	1270	9	10	26	No	No	No
15	28	Female	7	10	915	4	6	52	Yes	No	Yes
16	33	Male	7	9	2140	1	9	15	Yes	No	Yes
17	24	Male	4	8	640	4	6	89	Yes	Yes	No
18	27	Female	7	10	835	2	8	58	Yes	No	Yes
19	32	Female	7	9	1496			23	No	No	No

Procedure

On the day of the child's scheduled appointment, an explanation of the study was provided to the infant's caregiver. Those who chose to participate signed an informed consent (see Appendix B). Confidentiality of the participants was protected according to the protocols approved by the Institutional Review Board of East Tennessee State University. Two questionnaires were given to each caregiver and were completed before leaving the facility.

Temperament was measured using the *IBQ-R*. Parents answered questions by ranking their child based on a 7-point scale that included: never, very rarely, less than half the time, about half the time, more than half the time, almost always, or always. Rankings were then converted to numbers for scoring purposes. Certain questions were reversed scored (i.e., if parents ranked their child a seven, that particular item was scored and reported as a number one). Each question and its ranked score corresponded to temperament scales. These scales included: activity level, distress to limitations, fear, duration of orienting, smiling and laughter, high pleasure, low pleasure, soothability, recovery from distress, cuddliness, perceptual sensitivity, sadness, approach, and vocal reactivity. To determine whether the *IBQ-R* was as reliable a measure of temperament for premature children as for full-term children, Cronbach's alpha was calculated for each dimension. It showed that for 12 of 14 dimensions, Cronbach's alpha was $\leq .80$ ($\alpha = .80$ to $.94$). Items within vocal reactivity ($\alpha = .74$) and activity level ($\alpha = .63$) showed less internal consistency, suggesting these items may not be as representative of these dimensions for premature children as they are for full-term children. Therefore, results involving vocal reactivity and activity level should be interpreted with some caution.

Language development was analyzed using the *MCDI: Words and Gestures*. The vocabulary items were divided into three categories based on the study by Dixon and Smith

(2000) and included: nouns, predicates, and function words. In their study, nouns included all *MCDI* noun categories except people and outside things. The predicate category was comprised of action words and descriptive words. Finally, pronouns, question words, and prepositions and locations made the closed function word category. In addition to the subcategories listed by Dixon and Smith, the current study also calculated words produced and gestures produced, as identified in the *MCDI*, for each premature child.

Variables. Caregivers of the participants completed the *IBQ-R* and *MCDI-Words and Gestures*. The children's scores on these measures provided the variables for statistical analyses. Additionally, to determine if differences existed between premature and full-term children on the *IBQ-R*, the current study divided the participants into age groups of less than 7 months adjusted age, and 7-9 months and 10-12 months adjusted and chronological ages. Premature age groups approximated those of the full-term age classifications of Gartstein and Rothbart (2003). In their study, participants were divided into three age groups: 3-6 months, 6-9 months, and 9-12 months. The group age assignments used in the current study did not exactly replicate those of Gartstein and Rothbart in order to avoid the ambiguity of overlapping age assignments at 6 and 9 months.

CHAPTER 4

RESULTS

The current research had two primary objectives. The first purpose of the study was to determine whether the temperament characteristics of premature children were the same as those of full-term, typically developing children as measured by the *IBQ-R*. The second purpose of the study was to determine if temperament predicts language acquisition in premature infants and, if so, were the relationships between temperament and language the same among premature populations as those reported in typically developing populations. These hypotheses were evaluated using descriptive and correlational statistical methodologies. The *p*-level was set at .10 for all statistical calculations in an effort to minimize Type II error given the small sample. At this level, the likelihood that an effect will be found when it is in fact real increases. Because this is the first experiment to specifically look at temperament characteristics among premature populations using the *IBQ-R* and their relationships to language development, identification of all a potential real effects was a priority (cf. Proctor-Williams & Fey, in press).

Temperament Characteristics of Premature Children

To address the first purpose, the average scores of premature children on 10 scales of the *IBQ-R* were compared to those of the full-term children using the results established by Gartstein and Rothbart (2003). Gartstein and Rothbart reported the means and standard deviations for only the 10 scales that yielded significant age effects: activity level, distress to limitations, fear, duration of orienting, high pleasure, low pleasure, cuddliness, perceptual sensitivity, and approach. Simple mathematical calculations were made to determine whether the means of premature children were within one standard deviation of full-term children as reported by Gartstein and Rothbart. Of the 50 comparisons, based on 10 temperament scales for each of the

five age groups, only five means exhibited greater than one standard deviation difference from their full-term counterparts (see Table 2).

Table 2

Means and Standard Deviations of the Scores on the IBQ-R

Temperament Scales	< 7 mo AA		7-9 mo AA		7-9 mo CA		10-12 mo AA		10-12 mo CA	
	N = 4		N = 11		N = 7		N = 2		N = 8	
	M	SD	M	SD	M	SD	M	SD	M	SD
Activity level	5.00*	0.09	4.79	0.77	4.99	0.46	3.38*	0.88	4.72	0.08
Distress to limitations	3.62	0.94	3.79	1.16	3.68	1.03	3.28	0.67	3.80	1.18
Fear	1.75	0.52	2.92	1.01	2.31	0.84	2.62	1.16	2.86	1.17
Duration of orienting	5.63	0.97	4.31	1.15	5.36*	0.96	3.50	0.11	4.05	1.14
High pleasure	6.41	0.76	6.35	0.68	6.50	0.59	5.50*	0.07	6.24	0.77
Low pleasure	5.87	1.47	5.43	0.89	5.98	1.05	5.62	0.76	5.17	0.91
Cuddliness	5.63	0.68	5.35	0.85	5.58	0.88	6.25*	0.76	5.29	0.75
Perceptual sensitivity	4.63	0.75	4.11	1.08	4.66	0.88	3.80	1.00	3.89	1.02
Approach	5.57	1.69	5.77	0.59	5.74	1.21	4.98	0.85	5.70	0.69
Vocal reactivity	4.91	1.07	4.92	1.25	5.04	0.95	4.55	0.07	4.81	1.39
Smiling and laughter [▪]	5.00	0.25	5.15	0.92	4.96	0.94	4.26	0.21	5.25	0.67
Soothability [▪]	5.11	1.15	5.00	0.68	5.30	0.91	4.61	0.31	4.79	0.62
Recovery from distress [▪]	4.66	1.23	4.87	1.21	4.96	1.10	5.04	0.16	4.68	1.29
Sadness [▪]	2.88	0.33	3.39	1.02	3.19	0.63	2.24	0.06	3.31	1.14

Note. Means of adjusted age (AA) and chronological age (CA) identified with * are greater than 1 standard deviation different than the means of Gartstein and Rothbart (2003).

▪ Scales not included in their descriptive statistics.

In a more rigorous test to determine if similarities existed, inferential statistics were used to make comparisons of differences between means, taking standard deviation and sample size into consideration, for the two largest premature groups and their full-term equivalents. These results indicated that children in the 7-9 month adjusted age group differed ($p \geq 0.10$) from their full-term peers on 5 of 10 means, though children in the 10-12 month chronological age group differed from their full-term peers on only 1 of 10 means (see Table 3). It may be that if the sample size of premature participants was large enough for inferential comparisons to be made, there may have been greater variation than the simple descriptive comparison suggests. Alternatively, because there appears to be more differences when adjusted age is used these results suggest using chronological age comparisons when similarity to full-term peers is important.

Table 3

Differences Between Mean Scores on the IBQ-R in the Largest Two Premature Groups and Age Equivalent Full-Term Groups

Temperament Scales	7-9 mo AA	10-12 mo CA
	<i>N</i> = 11	<i>N</i> = 8
	<i>p</i> value	<i>p</i> value
Activity level	0.07	0.39
Distress to limitations	0.42	0.58
Fear	0.14	0.85
Duration of orienting	0.05	0.10
High pleasure	0.09	0.67
Low pleasure	0.23	0.31
Cuddliness	0.07	0.67
Perceptual sensitivity	0.93	0.39
Approach	0.10	0.48
Vocal reactivity	0.35	0.39

In addition to comparisons based on means, Pearson's Product Moment correlation coefficients were calculated to examine the relationships among temperament variables for premature children. Of the 91 correlations conducted among the 14 dimensions of the *IBQ-R*, 37 reached statistical reliability at *p* levels of $< .10$ (see Table 4). Ideally, with a larger sample, a factor analysis could be conducted to detect clusters of variables.

Table 4

Correlations (r) among the Temperament Scales of the IBQ-R for Premature Children

Temperament Scales	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Activity level	–	.52**	.33	.32	.22	.33	-.02	.02	-.44*	-.57**	.59***	.56**	.37	.13
2. Distress of limitations	–	–	.53**	-.12	-.35	-.16	-.55**	-.56**	-.88***	-.68***	.14	.85***	-.27	-.49*
3. Fear	–	–	–	-.19	.22	-.15	-.39*	-.35	-.46**	-.42*	.13	.60***	.13	.02
4. Duration of orienting	–	–	–	–	.29	.51**	.66***	.22	.05	.12	.37	-.15	.15	.46**
5. Smiling and laughter	–	–	–	–	–	.13	.13	.26	.17	.03	.04	-.22	.32	.55**
6. High pleasure	–	–	–	–	–	–	.63***	.27	.15	.29	.47**	.07	.49**	.57**
7. Low pleasure	–	–	–	–	–	–	–	.38	.49**	.57**	.27	-.39*	.29	.51**
8. Soothability	–	–	–	–	–	–	–	–	.65***	.12	.24	-.34	.67***	.55**
9. Recovery from distress	–	–	–	–	–	–	–	–	–	.48**	-.07	-.67***	.35	.33
10. Cuddliness	–	–	–	–	–	–	–	–	–	–	-.02	-.59***	.05	.27
11. Perceptual sensitivity	–	–	–	–	–	–	–	–	–	–	–	.24	.60***	.40*
12. Sadness	–	–	–	–	–	–	–	–	–	–	–	–	.04	-.36
13. Approach	–	–	–	–	–	–	–	–	–	–	–	–	–	.64***
14. Vocal reactivity	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Note. * $p \leq .10$. ** $p \leq .05$. *** $p \leq .01$.

Although a factor analysis could not be performed on the current study because of the limited number of participants, trends emerged based on significant correlations among the scales. Furthermore, these associations were consistent with factors identified by Gartstein and Rothbart (2003). In their study, the researchers conducted a three-factor solution that yielded three broad dimensions of temperament including: Surgency and Extraversion, Negative Affectivity, and Cuddliness and Affiliation. Under the broad dimension of Surgency and Extraversion, general dimensions that exhibited significant positive correlations in premature children included those among: approach, vocal reactivity, high pleasure, activity level, and perceptual sensitivity, with r -values that ranged from .47 to .60. Under Gartstein and Rothbart's broad dimension of Negative Affectivity, premature children displayed significant positive correlations among sadness, distress to limitations, fear and negative correlations with recovery from distress, with r -values that ranged from .46 to .88. Finally, premature children exhibited significant positive correlations that fell within Gartstein and Rothbart's broad dimension of Orienting/Regulation for the dimensions of low pleasure, cuddliness, and duration of orienting, with r -values that ranged from .57 to .66.

Differences were also evident, however. In addition to the dimensions that fell within the broad dimensions of Gartstein and Rothbart (2003), premature infants who exhibited higher levels of duration of orienting also demonstrated pleasure to both high and low stimulus events and higher levels of vocal reactivity ($r = .46$ to $.66$). Vocal reactivity was also positively correlated with smiling and laughter, soothability, and approach ($r = .55$ to $.64$). In contrast to their findings, smiling and laughter (falling under Surgency and Extraversion and Orienting and Regulation) and soothability (falling under Orienting and Regulation) were not found to be

significantly correlated with other dimensions within the three broad dimensions of Gartstein and Rothbart.

Finally, Gartstein and Rothbart (2003) found 65 of the possible 91 (59.15%) correlations among temperament variables to be statistically significant in either boys or girls. In the premature population, 37 (40.66%) of the correlations were found to be statistically significant. Of the correlations seen in the premature population, 89.12% exhibited the same pattern of correlations as full-term children, but 10.82% fell outside of the full-term pattern of correlations (see Table 5).

The study did not reveal as many strong relationships among temperament dimensions in premature children as were reported in full-term children. Those that demonstrated reliable correlations, however, were highly similar to those of full-term children. Interestingly, fear appeared to be more broadly related with other temperament dimensions in the premature population than was found in the normative sample. Of the five reliable correlations unique to the premature population, three involved fear. Increased fear was correlated with decreased pleasure reaction to low stimulus events, decreased cuddliness, and decreased recovery from distress in premature populations. In addition, reliable positive correlations between distress to limitations and sadness were also apparent in the full-term population.

Table 5

Comparison of Reliable Correlations Among the Temperament Scales in Premature and Full-Term Children

Temperament Scales	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Activity level	■							●	■	●	■		
2. Distress to limitations		●				■	■	■	■		■		●
3. Fear						●		●	●		■		
4. Duration of orienting					●	■							■
5. Smiling and laughter													■
6. High pleasure						■				■		■	■
7. Low pleasure								■	■		●		■
8. Soothability								■				■	■
9. Recovery from distress									■		■		
10. Cuddliness											●		
11. Perceptual sensitivity												■	●
12. Sadness													
13. Approach													■
14. Vocal reactivity													

Note. Gray boxes are the statistical reliable correlations that Gartstein & Rothbart (2003) found

for typically developing children. Premature children who exhibit statistically reliable

correlations are marked as ● $\leq .10$; ■ $\leq .05$.

Temperament and Language Characteristics of Premature Children

To address the second purpose, the words understood, as reported on the *MCDI-Words and Gestures*, were divided into three categories: nouns, predicates, and function words, as in Dixon and Smith (2000). The total number of words in each category was correlated with the scores of each of the *IBQ-R* temperament scales to determine if statistically significant relationships existed (see Table 6). In premature children duration of orienting, smiling and laughter, perceptual sensitivity, and vocal reactivity were positively and significantly correlated with vocabulary comprehension. As in the present study, Dixon and Smith also found that the dimensions of duration of orienting and smiling and laughter were reliably and positively correlated with vocabulary comprehension in full-term children. In addition, the present study found significant positive correlations between vocal reactivity and noun comprehension and perceptual sensitivity and predicate comprehension. Generally, premature children with higher duration of orienting, greater sensitivity to their environments, and greater vocal reactivity and those who smiled and laughed a lot tended to demonstrate better vocabulary comprehension. In contrast, full-term children showed reliable negative correlations between vocabulary comprehension and distress to limitations and fear. Reliable positive correlations for full-term children were found between vocabulary comprehension and soothability scales. However, premature children did not show the same reliable correlations with distress to limitations, fear, or soothability (Dixon & Smith).

Table 6

Correlations Between Temperament and Vocabulary Comprehension

Temperament Scales	Vocabulary Comprehension		
	Nouns	Predicates	Closed class
Duration of orienting	.38	.50**	.67**
Smiling and laughter	.50**	.25	.28
Perceptual sensitivity	.42	.53**	.17
Vocal reactivity	.43*	.35	.22

Note. * $p \leq .10$. ** $p \leq .05$. ($N = 19$)

Interestingly, there were several correlations between temperament and production of words and gestures as reported on the *MCDI* (see Table 7). Distress to limitations was negatively correlated with production and total gestures in premature children. Positive correlations existed between production of premature children and duration of orienting, smiling and laughter, low pleasure, perceptual sensitivity, and vocal reactivity. In addition, premature children demonstrated positive relationships between gesture use and the temperament dimensions of duration of orienting, smiling and laughter, perceptual sensitivity, approach, and vocal reactivity. Dixon and Smith (2000), however, did not report that there were reliable age-concurrent correlations between temperament characteristics and communicative productivity either at a preverbal level, as measured by gestures, or verbal level, as measured by words

produced, and temperament characteristics. Thus, the present findings appear to be new to the literature.

Table 7

Significant Correlations Between Temperament and Expressive Communication

Temperament Scale	Expressive Communication	
	Produced	Total Gestures
Distress to limitations	-.44*	-.36
Duration of orienting	.39*	.46**
Smile and laughter	.67***	.52**
Low pleasure	.39*	.37
Perceptual sensitivity	.39*	.55**
Approach	.33	.43*
Vocal reactivity	.58***	.57**

Note. * $p \leq .10$. ** $p \leq .05$. *** $p \leq .01$. ($N=19$)

CHAPTER 5

DISCUSSION

The current study examined the temperament characteristics and their relationships with the language characteristics of premature children. Two primary objectives were addressed. First, this study explored whether the temperament characteristics of premature children were the same as those of typically developing children as measured by the *IBQ-R* and reported by Gartstein and Rothbart (2003). Second, it investigated whether temperament and language acquisition were linked in premature infants and, if so, were the relationships between temperament and language the same among this premature population as those reported in full-term, typically developing populations (Dixon & Smith, 2000).

Temperament of Premature Children

This study examined the temperament characteristics of preterm children in two ways. First, it provided a simple comparison of the mean scores, as reported by caregivers, of the premature children and those of full-term children on 10 scales of the *IBQ-R* as reported by Gartstein and Rothbart (2003). The premature children generally demonstrated similar temperament characteristics to those of the full-term children. Out of 50 comparisons (10 scales, across five age groups), only five mean scores in the premature population differed by greater than one standard deviation from the mean scores of the full-term children.

A more rigorous analysis, however, based on inferential statistics, for the two largest premature age groups (i.e., 7-9 months adjusted age, and 10-12 months chronological age) revealed that children in the 7 to 9 month adjusted age group differed ($p \leq 0.10$) from their full-term peers on 5 of 10 means, and children in the 10 to 12 month chronological age group differed from their full-term peers on 1 of 10 means. Based on adjusted age, the premature

children displayed differences on the temperament scales of activity level, duration of orienting, high pleasure, cuddliness, and approach. The chronological age group differed only in their duration of orienting. Thus, temperament results based on chronological age were more consistent with those of the full-term children.

Second, the correlational relationships between the 14 temperament scales for the premature children were compared to those of the full-term children as reported by Gartstein and Rothbart (2003). While fewer relationships reached statistical significance in the premature group (40.66%) than in the full-term group (71.43%), the majority of reliable correlations displayed by the premature group (89.12%) were also displayed by the full-term group. Furthermore, all correlations that were common to both groups were in the same direction, positive or negative. This is not to say there were no differences. Five reliable correlations appeared in the premature population that were not evident in the full-term population. Interestingly, the temperament variable of fear was more prevalent among significant correlations in premature children than in full-term children.

Overall, the results of the descriptive correlation analyses suggest that the temperament characteristics of premature children, and those who were full-term, were more alike than different. This is consistent with the literature (Oberklaid et al., 1985; Oberklaid et al., 1986). Oberklaid et al. (1985) found premature infants, ages 4 to 8 adjusted months, did not differ from full-term infants when the mean scores from the nine temperament dimensions of the *ITQ* were compared. Oberklaid et al. (1986) also found that premature infants had similar temperament characteristics to those of full-term infants unless the premature child was born of low birthweight or exhibited developmental complications.

The disparities that were seen among premature children, however, were interesting and possible reasons for the differences should be addressed. There are four potential explanations for discrepancies in temperament characteristics between the premature and full-term groups. These reasons include: inclusion of high-risk children in the sample, use of adjusted versus chronological age, stability of temperament, and sample size.

Higher Risk Children

The current study did not separate children based on birthweight, gestational age at delivery, or medical complications. However, 16 of the 19 participants did have at least one medical complication (see Table 1). The premature children were classified as having medical complications if they suffered from respiratory, cardiac, or neurological conditions after delivery. Because the majority of the premature children exhibited difficult medical histories, it is suspected that this may be a cause of the higher number of correlations involving fear among the premature children. Temperament researchers (Goldsmith et al., 1987) state that the dimension of fear is an inherent dimension, but it may be affected by experience. Other theorists view fear as a learned behavior in young children (cf. Watson & Rayner, 1920). Watson and Rayner tested this viewpoint in their now classic experiment. In their study, an 11-month-old boy was conditioned to be afraid of rats through the use of a loud noise. However, not only did the child fear rats, but he generalized his fear to other items that were white and fuzzy. Furthermore, his fear was resistant to attempts to extinguish it. Whether fear is learned or an inherent characteristic, the premature children in the current study may have had their fear responsiveness altered by their early experiences. It is likely that the premature children were faced with more invasive life-saving procedures at birth such as needle pricks, use of nasal cannula, or intubation for breathing and intubation for feeding.

Additionally, there is literature that suggests that difficult temperament is more common in premature children than in their full-term peers (Larroque et al., 2005; Oberklaid et al., 1986; Riese, 1988; Ross, 1988; Spungen & Farran, 1986). Difficult temperaments have been found to be more prevalent among premature children who were born very premature, suffered from medical complications (Larroque et al.; Ross), or were born of low birthweight (Spungen & Farran). Although fear is not specifically mentioned in this stated literature, it is presumed that this characteristic could also be considered a difficult temperament characteristics and, thus, be the result of low birthweight, early gestational age, and medical complications. Although inclusion of higher risk children may be one explanation for the disparity seen among premature age groups, a second explanation may be the use of adjusted and chronological age.

Adjusted and Chronological Age

An empirical comparison, based on inferential statistics, found that greater similarity in temperament characteristics existed between the premature children and their full-term counterparts when chronological age was used. This supports the findings of Riese (1988). Riese found that when chronological age was used, results of *t*-tests indicated the mean scores for emotional tone, attentiveness, activity, and social orientation to staff were similar for premature and full-term children based on play activities and interactions during laboratory visits.

However, other evidence supports the need to look at adjusted age (Briscoe et al., 1998) or both adjusted and chronological age (Menyuk et al., 1991) for premature children when comparisons to full-term children are made, at least when language measures are involved. In their 1998 study, Briscoe et al. compared premature and full-term children on short-term memory and language measures. When adjusted age was used, the premature group performed

more poorly on measures of short-term memory for non-words and digit sequences, expressive language, and receptive and expressive vocabulary.

Menyuk et al. (1991) suggest that both adjusted and chronological ages should be considered in comparisons of premature children to full-term children. In their study, Menyuk et al. found that when premature children were compared to full-term children for language development using chronological age, the groups performed similarly, as in this study. However, when adjusted age of premature children was used, the preterm participants scored significantly higher than their full-term peers (Menyuk et al.). The premature children in this study also performed differently from the full-term population when adjusted age was employed. A third explanation for the differences among premature and full-term children involves the relationship of age to the stabilization of temperament throughout infancy may provide another possible explanation.

Stability of Temperament

Temperament is generally considered stable at approximately 4 months of age (Goldsmith et al., 1987). Because the participants in the current study were at least 8 months chronological age and 4-months adjusted age, it was anticipated that temperament stabilization had occurred. However, there is also evidence that temperamental stability increases sporadically from infancy until approximately 2 years of age (Riese, 1987; Riese, 1988). Based on adjusted age, 15 of the premature children in this sample were less than 10 months and 4 of these were less than 7 months of age. If adjusted age is proven to be a truer reflection of very early development, in particular, these children may have contributed additional variability because of the instability of their temperament. Because there were small numbers involved, it is

difficult to interpret these results definitively. This leads to the final explanation for the empirical differences between premature and full-term children: sample size.

Sample Size

The two largest premature groups consisted of children ages 7 to 9 adjusted months ($N = 11$) and ages 10 to 12 chronological months ($N = 8$). Both adjusted and chronological age groups were compared to groups of 120 full-term children. Therefore, the differences between temperament of premature and full-term children that were observed in the current study may be a result of a lack of statistical power resulting from a small sample size. Even with the adjustment of the significance level to .10 to increase power, the results should be considered exploratory and interpreted cautiously.

Temperament and Language of Premature Children

The premature children in this study exhibited generally similar relationships between temperament and vocabulary comprehension when compared to full-term children, as reported in Dixon and Smith (2000). In premature children, duration of orienting and smiling and laughter were positively and significantly correlated with vocabulary comprehension. Dixon and Smith also found the dimensions of duration of orienting and smiling and laughter to be reliably and positively correlated with vocabulary comprehension in full-term children. However, the premature children also demonstrated statistically reliable correlations between perceptual sensitivity and vocal reactivity and vocabulary comprehension.

Although relationships between perceptual sensitivity and vocal reactivity and vocabulary comprehension are weak in full-term children (Dixon & Smith, 2000), it is not surprising that positive characteristics such as these have linkages to linguistic acquisition. Perceptual sensitivity and vocal reactivity both fall within Gartstein and Rothbart's (2003) broad

dimension of surgency and extraversion. Furthermore, it appears that both surgency and extraversion and orienting and regulation are composed of more positive temperament characteristics and even share some common dimensions such as smiling and laughter and duration of orienting (Gartstein & Rothbart). Duration of orienting and smiling and laughter were reliably and positively correlated with vocabulary comprehension in both premature and full-term children (Dixon & Smith). Consistent with the research of Dixon and his colleagues, the premature children demonstrated that better linguistic comprehension is associated with positive temperament characteristics (Dixon & Shore, 1997; Dixon & Smith, 2000) and better attention (Dixon et al., 2006; Dixon & Salley, in press; Dixon & Smith, in press). Generally, premature children exhibited similar relationships to temperament and vocabulary comprehension when compared to full-term children; however, a new finding in the current study was the numerous significant correlations between temperament and expressive verbal and nonverbal communication in the premature children.

Dixon and Smith (2000) did not report reliable age-concurrent correlations between temperament characteristics and communicative productivity in their full-term participants. However, the premature children demonstrated 10 significant positive correlations and 1 significant negative correlation between the temperament scales and production of words and gestures as reported on the *MCDI*. Word production was reliably correlated with five temperament scales, duration of orienting, smiling and laughter, low pleasure, perceptual sensitivity, and vocal reactivity, in a positive direction, and distress to limitations in a negative direction. Gesture use was significantly and positively correlated with duration of orienting, smiling and laughter, approach, perceptual sensitivity, and vocal reactivity. Although significant correlations were not apparent between temperament and production at earlier ages for full-term

children (Dixon & Smith), the current study shows that for premature populations, a relationship does exist among more positive temperaments, better attention, and linguistic production.

Limitations of the Study

The primary limitation of this study is the small sample size of only 19 participants. This restricted the statistical power and the types of analyses that could be conducted. Thus, generalization to the premature population at large must be considered preliminary.

Additionally, the temperament and language skills of the participants were only examined during one office visit, using a parent questionnaire. Although use of parent questionnaires is the most common method of measuring temperament (Anderson et al., 2003; Prior, 1992) and are largely valid (Carey, 1985; Putnam et al., 2001), concerns about parent bias must be considered. Langkamp et al. (1998) conducted a study using the maternal ratings portion of the *EITQ* to determine if mothers of premature children rated the temperament of their children differently from the way they described their children. The study found that mothers of preterm infants perceived their infants to be more difficult than the ratings of the *EITQ* indicated. Langkamp et al. suggested several reasons for the mothers' perceived differences in temperament of their premature children including: parental inexperience, psychosocial or emotional factors that interfere with the mother's ability to recognize her child as having a normal infant temperament, and maternal misperceptions that may be caused from prolonged separation from her child during early hospitalization. The current study did not take into account any possible perceived differences that caregivers might make about their premature child.

Finally, the current study did not take into account low birthweight, gestational age at delivery, or medical complications of the premature children because of the small numbers involved. These factors have been shown to negatively impact language development (Aram et

al., 1991; Gallagher & Watkin, 1998; Menyuk et al., 1991) and may have influenced the results of this study through added variability. The added variability of premature children who suffered from low birthweight, early gestational age at delivery, or medical complication may have affected the reliability and generalizability of the findings.

Directions for Further Research

This study should be considered a pilot study. Though the results suggest that premature children demonstrate similar relationships between temperament characteristics and vocabulary comprehension as their full-term peers, unique to this population was the significant correlations of temperament to expressive communication. These findings suggest further research is needed in the field of temperament and language development of premature children. Future studies in this field should also include more participants to increase the reliability and validity of the results. In addition, a longitudinal study, like that of Dixon and Smith (2000), has advantages of revealing predictive relationships between temperament and language over the course of time.

Finally, future studies should examine the effects of low birthweight, gestational age, and medical complications on temperament and language characteristics in premature populations. Some research suggests these variables negatively influence temperament in premature populations (Larroque et al., 2005; Oberklaid et al., 1986; Riese, 1988; Ross, 1988; Spungen & Farran, 1986) yet other studies indicate no negative influences (Aram et al., 1991; Feldman et al., 1994). A large-scale longitudinal study may resolve these discrepancies.

Conclusion

Research shows that certain temperament characteristics are associated with slower language development in typically developing children (Dixon & Smith, 2000). Because temperament can be reliably measured earlier than language skills and is considered stable at

approximately 4 months of age (Goldsmith et al., 1987), it can provide a reliable indicator of increased risk for delayed language acquisition. However, temperament characteristics are predictive only if similar links between temperament and language can be demonstrated in high-risk populations such as premature children. The current study took the first steps at identification of links between temperament characteristics and communication development in premature children. To do this, two primary objectives were addressed.

First, this study explored whether the temperament characteristics of premature children were the same as those of typically developing children as measured by the *IBQ-R*. Overall, premature children generally demonstrated similar temperament characteristics to those of the full-term children. However, inferential statistics yielded some differences between the means of premature children (adjusted and chronological ages) and full-term peers. In addition, the results of the descriptive correlation analyses suggest that the temperament characteristics of children who were premature and those born full-term were more alike than different, except for the increased prevalence of correlations between fear and other temperament characteristics among premature children.

The second purpose of the current study was to investigate whether temperament and language acquisition were linked in premature infants and, if so, were the relationships between temperament and language the same among premature populations as those reported in full-term, typically developing populations. The premature children in this study exhibited generally similar relationships between temperament and vocabulary comprehension when compared to full-term children as reported in Dixon and Smith (2000). Positive temperaments and better attention were linked to advance linguistic comprehension. However, unique to this premature population was the relationship between temperament and production of words and gestures.

With further research, we may be able to identify, with greater specificity and assurance, those premature children who are at highest risk for developing language delays based on their temperament characteristics. Once identified, early preventive intervention can be initiated. It is well established (cf. Jacoby et al., 2002) that the earlier that intervention begins, the greater the likelihood that treatment can resolve or ameliorate a child's communication delay.

REFERENCES

- Anderson, J., Pellowski, M., Conture, E., & Kelly, E. (2003). Temperamental characteristics of young children who stutter. *Journal of Speech Language and Hearing Research, 46*, 1221-1233.
- Aram, D., Hack, M., Hawkins, S., Weissman, B., & Borawski-Clark, E. (1991). Very-low-birthweight children and speech and language development. *Journal of Speech and Hearing Research, 34*, 1169-1179.
- Bates, J., Freeland, C., & Lounsbury, M. (1979). Measurement of infant difficulties. *Child Development, 50*, 794-803.
- Briscoe, J., Gathercole, S., & Marlow, N. (1998). Short-term memory and language outcomes after extreme prematurity at birth. *Journal of Speech, Language, and Hearing Research, 41*, 654-666.
- Capone, N., & McGregor, K. (2004). Gesture development: A review for clinical and research practices. *Journal of Speech, Language, and Hearing Research, 47*, 173-186.
- Carey, W., & McDevitt, S. (1978). Revision of the infant temperament questionnaire. *Pediatrics, 61*, 735-739.
- Carey, W. (1985). Clinical use of temperament data in pediatrics. *Developmental and Behavioral Pediatrics, 6*(3), 137-142.
- Cherkes-Julkowski, M. (1998). Learning disability, attention-deficit disorder, and language impairment as outcomes of prematurity: A longitudinal descriptive study. *Journal of Learning Disabilities, 31*(3), 294-306.
- Clark, D. (1989). Neonates and infants at risk for hearing and speech-language disorders. *Topics in Language Disorders, 10* (1), 1-12.

- Dixon, W., Salley, B., & Clements, A. (2006). Temperament, distraction, and learning in toddlerhood. *Infant Behavior and Development, 29*, 342-357.
- Dixon, W., & Salley, B. (in press). "Shhh! we're trying' to concentrate": Attention and environmental distracters in novel word learning.
- Dixon, W., & Shore, C. (1997). Temperamental predictors of linguistic style during multiword acquisition. *Infant Behavior and Development, 20*, 99-103.
- Dixon, W., & Smith, P. (2000). Links between early temperament and language acquisition. *Merrill-Palmer Quarterly, 46*, 417-440.
- Dixon, W., & Smith, P. (in press). Attentional focus moderates habituation-language relationships: Slow habituation may be a good thing. *Infant and Child Development*.
- Feldman, H., Janosky, J., Scher, M., & Wareham, N. (1994). Language abilities following prematurity, periventricular brain injury, and cerebral palsy. *Journal of Communicative Disorders, 27*, 71-90.
- Fenson, L., Dale, P.S., Reznick, J.S., Thal, D., Bates, E., Hartung, J.P., et al. (1991). *Technical manual for the MacArthur communicative development inventories*. San Diego, CA: San Diego State University.
- Fullard, W., Carey, W.B., & McDevitt, S.C. (1984). Assessing temperament in one- to three-year-old children. *Journal of Pediatric Psychology, 9*, 205-217.
- Gallagher, T., & Watkin, K. (1998). Prematurity and language developmental risk: Too young or too small? *Topics in Language Disorders, May*, 15-25.
- Gartstein, M., & Rothbart, M. (2003). Studying infant temperament via the revised infant behavior questionnaire. *Infant Behavior and Development, 26*, 64-86.
- Gerber, S. (1990). *Prevention: The etiology of communicative disorders in children*.

- Engelwood Cliffs, NJ: Prentice-Hall.
- Goldsmith, H., Buss, A., Plomin, R., Rothbart, M., Thomas, A., Chess, S., et al. (1987).
Roundtable: What is temperament? Four approaches. *Child Development*, 58, 505-529.
- Hedrick, D., Prather, E., & Tobin, A. (1975). *Sequenced inventory of communication development*. Seattle: University of Washington Press.
- Hughes, M., Shults, J., McGrath, J., & Medoff-Cooper, B. (2002). Temperament characteristics of premature infants in the first year of life. *Developmental and Behavioral Pediatrics*, 23, 430-435.
- Jacoby, G., Lee, L., Kummer, A., Levin, L., & Craghead, N. (2002). The number of individual treatment units necessary to facilitate functional communication improvements in the speech and language of young children. *American Journal of Speech-Language Pathology*, 11, 370-380.
- Kagan, J., Reznick, S., Clarke, C., Snidman, N., & Garcia-Coll, C. (1984). Behavioral inhibition to the unfamiliar. *Child Development*, 55, 2212-2225.
- Knobeloch, C., & Kanoy, R. (1982). Hearing and language development in high risk and normal infants. *Applied Research in Mental Retardation*, 3, 293-301.
- Karzon, R., & Lieu, J. (2006). Initial audiologic assessment of infants referred from well baby, special care, and neonatal intensive care unit nurseries. *American Journal of Audiology*, 15, 14-24.
- Langkamp, D., Kim, Y., & Pascoe, J. (1998). Temperament of preterm infants at 4 months of age: maternal ratings and perceptions. *Developmental and Behavioral Pediatrics*, 19, 391-396.

- Larroque, B., Tich, S., Guedeney, A., Marchand, L., & Burguet, A. (2005). Temperament at 9 months of very preterm infants born less than 29 weeks' gestation: The epipage study. *Developmental and Behavioral Pediatrics, 26*(1), 48-55.
- McCarthy, D. (1972). *McCarthy scales of children's ability*. New York: Psychological.
- Medoff-Cooper, B., Carey, W., & McDevitt, S. (1993). The early infancy temperament questionnaire. *Developmental and Behavioral Pediatrics, 14*, 230-235.
- Menyuk, P., Liebergott, J., Schultz, M., Chesnick, M., & Ferrier, L. (1991). Patterns of early lexical and cognitive development in premature and full-term infants. *Journal of Speech and Hearing Research, 34*, 88-94.
- Oberklaid, F., Prior, M., Nolan, T., Smith, P., & Flavell, H. (1985). Temperament in infants born prematurely. *Developmental and Behavioral Pediatrics, 6*(2), 57-61.
- Oberklaid, F., Prior, M., & Sanson, A. (1986). Temperament of preterm versus full-term infants. *Developmental and Behavioral Pediatrics, 7*, 159-162.
- Prior, M. (1992). Childhood Temperament. *Journal of Child Psychology and Psychiatry, 33*, 249-279.
- Proctor-Williams, K., & Fey, M. (in press). Recast density and acquisition of irregular past tense verbs. *Journal of Speech-Language-Hearing Research*.
- Putnam, S., Ellis, K., & Rothbart, M. (2001). Advances in research on temperament. Elias, A., & Angleitner, A. *The structure of temperament from infancy through adolescence*, (pp. 166-182). Lengerich, Germany: Pabst.
- Putnam, S., Gartstein, M., & Rothbart, M. (2006). Measurement of fine-grained aspects of toddler temperament: The early childhood behavior questionnaire. *Infant Behavior and Development, 29*, 386-401.

- Riese, M. (1987). Temperament stability between the neonatal period and 24 months. *Developmental Psychology*, 23, 216-222.
- Riese, M. (1988). Temperament in full-term and preterm infants: Stability over ages 6-24 months. *Developmental and Behavioral Pediatrics*, 9, 6-11.
- Ross, G. (1987). Temperament of preterm infants: its relationship to perinatal factors and one-year outcome. *Developmental and Behavioral Pediatrics*, 8, 106-110.
- Spere, K., Schmidt, L., Theall-Honey, L., & Martin-Chang, S. (2004). Expressive and receptive language skills of temperamentally shy preschoolers. *Infant and Child Development*, 13, 123-133.
- Spungen, L., & Farran, A. (1986). Effect of intensive care unit exposure on temperament in low birth weight preterm infants. *Developmental and Behavioral Pediatrics*, 7, 288-292.
- Thomas, A., & Chess, S. (1977). *Temperament and development*. New York: Brunner/Mazel.
- Veen, S., Ens-Dokkum, M., Schreuder, A., Verloove-Vanhorick, S., Brand, R., & Ruys, J. (1991). Impairments, disabilities, and handicaps of very preterm and very-low-birthweight infants at five years of age. *The Lancet*, 338, 33-37.
- Watson, J., & Rayner, R. (1920). Conditioned emotional reactions. *Journal of Experimental Psychology*, 3, 1-14. Retrieved March 10, 2007, from <http://psychclassics.yorku.ca/Watson/emotion.htm>

APPENDICES

APPENDIX A

HIPPA Authorization Form

AUTHORIZATION TO USE AND DISCLOSE PROTECTED HEALTH INFORMATION FOR RESEARCH PURPOSES

The privacy law, Health Insurance Portability & Accountability Act (HIPAA), protects my individually identifiable health information (protected health information). The privacy law requires me to sign an authorization (or agreement) in order for researchers to be able to use or disclose my protected health information for research purposes in the study entitled *Temperament and Early Communication in Premature Children*.

I authorize *Nina King* and her research staff to use and disclose my protected health information for the purposes described below. I also permit my doctors and other health care providers to disclose my protected health information for the purposes described below.

My protected health information that may be utilized and disclosed includes:

- We will collect information regarding your child's birth history, including: week of gestation at delivery, birthweight, any pre-natal or perinatal complications, and length of time spent in the neonatal intensive care unit. Demographic information will include: child's gender and age of mother at the time of delivery.

The Investigator, *Nina King* may use and share my health information with:

- The East Tennessee State University Human Research Protections Program (HRPP) Institutional Review Board Administration when the researcher or the research site is undergoing *Quality Improvement Program (QIP)* auditing.
- The James H. Quillen Veterans Affairs Medical Center Office of Research & Development when the researcher or the research site is undergoing *Quality Improvement Program (QIP)* auditing.
- Government representatives, when required by law

Once my health information has been disclosed to anyone outside of this study, the information may no longer be protected under this authorization.

The investigator(s) *Nina King* and *Kerry Proctor-Williams* agree to protect my health information by using and disclosing it only as permitted by me in this Authorization and as directed by state and federal law.

I do not have to sign this Authorization. If I decide not to sign the Authorization:

- It will not affect my treatment, payment or enrollment in any health plans nor affect my eligibility for benefits.
- I may not be allowed to participate in this research study.

After signing the Authorization, I can change my mind and:

- Not let the researcher disclose or use my protected health information (revoke the Authorization).
- If I revoke the Authorization, I will send a written letter to: Nina King to inform her of my decision.
- If I revoke this Authorization, researchers may only use and disclose the protected health information already collected for this research study.
- If I revoke this Authorization my protected health information may still be utilized and disclosed should I have an adverse event (a bad effect, or experience something unanticipated).
- If I change my mind and withdraw the authorization, I may not be allowed to continue to participate in the study.

This Authorization does not have an expiration date

If I have not already received a copy of the Privacy Notice, I may request one by contacting the Privacy Officer. If I have any questions or concerns about my privacy rights, I should contact the East Tennessee State University, James H. Quillen College of Medicine Privacy Officer, Paula Wright, at (423) 433-6074 or the Compliance Manager at Phone: (423) 439-5651.

I am the subject or am authorized to act on behalf of the subject. I have read this information, and I will receive a copy of this form after it is signed.

Signature of research subject or *research
subject's legal representative

Date

Printed name of research subject or
*research subject's legal representative

Representative's relationship
to research subject

*Please explain Representative's relationship to patient/subject and include a description of Representative's Authority to act on behalf of Patient:

The representative must be the primary caregiver/caregivers of the child.

ETSU/VAre93005

APPENDIX B

Informed Consent

INFORMED CONSENT

This Informed Consent will explain about being a research participant in an experiment. It is important that you read this material carefully and then decide if you wish to be a volunteer.

PURPOSE

The first purpose of this study is to determine whether the temperament characteristics of premature children are the same as typically developing children as measured by the Infant Behavior Questionnaire-Revised and the Early Childhood Behavior Questionnaire. The second purpose of the current study is to determine if temperament predicts language acquisition in premature infants and if so, are the relationships between temperament and language the same among premature populations as in typically developing populations.

DURATION

Two questionnaires will be given to you. The first asks you about your child's temperament and will take about 20 minutes to complete. The second questionnaire asks you how your child's communicates with you. The time it takes to finish this questionnaire depends on your child's communication skills; but should not take more than 25 minutes to complete. Both questionnaires should be finished during your time at the clinic.

PROCEDURES

Demographic information and your child's birth and medical history will be gathered from the medical chart available at this follow-up clinic. You will complete two questionnaires. The principle investigator will explain how to fill out the each questionnaire.

To describe your child's communication you will fill out the MacArthur-Bates Communicative Development Inventory. If your child's adjusted age is 16 months or under, you will do the Words and Gestures form. If your child's adjusted age is 17 months or older you will do the Words and Sentences form. To describe your child's temperament you will complete the Infant Behavior Questionnaire-Revised if your child is 16 months adjusted age or younger. If your child's adjusted age is 17 months or older, you will complete the Early Childhood Behavior Questionnaire. The principal investigator will collect the questionnaires before you leave the clinic.

There are circumstances under which your participation will be terminated by the investigator without regard to your consent. These circumstances include failure to complete one or both of the two questionnaires given to you.

ALTERNATIVE PROCEDURES/TREATMENTS

If you elect not to participate in this study you will still receive all services provided by the neonatal follow-up clinic.

POSSIBLE RISKS/DISCOMFORTS

There are no known or anticipated risks or hazards associated with this project.

POSSIBLE BENEFITS

There is no direct benefit to your child from participating in this study. The knowledge gained from this study may lead to a better understanding of how temperament affects communication development in premature children.

COMPENSATION FOR MEDICAL TREATMENT

East Tennessee State University (ETSU) will pay the cost of emergency first aid for any injury that may happen as a result of your being in this study. ETSU makes no commitment to pay for any other medical treatment. Claims against ETSU or any of its agents or employees may be submitted to the Tennessee Claims Commission. These claims will be settled to the extent allowable as provided under TCA Section 9-8-307. For more information about claims call the Chairman of the Institutional Review Board of ETSU at 423/439-6054.

COMPENSATION IN THE FORM OF PAYMENTS TO RESEARCH PARTICIPANTS

You understand that you will *not* be paid for your participation in this study.

VOLUNTARY PARTICIPATION

Participation in this research experiment is voluntary. You may refuse to participate. You can quit at any time. If you quit or refuse to participate, the benefits or treatment to which you are otherwise entitled will not be affected. You may quit by calling Nina King, whose phone number is 423/833-xxxx (cell). You will be told immediately if any of the results of the study should reasonably be expected to make you change your mind about staying in the study.

CONTACT FOR QUESTIONS

If you have any questions, problems or research-related medical problems at any time, you may call Nina King at 423/833-xxxx (cell), or Kerry Proctor-Williams at 423/439-7187 (work) or 423/753-xxxx (home). You may call the Chairman of the Institutional Review Board at 423/439-6054 for any questions you may have about your rights as a research subject. If you have any questions or concerns about the research and want to talk to someone independent of the research team or you can't reach the study staff, you may call an IRB Coordinator at 423/439-6055 or 423/439/6002.

CONFIDENTIALITY

Every attempt will be made to see that your study results are kept confidential. A copy of the records from this study will be stored in Room 203 Lamb Hall, ETSU for at least 10 years after the end of this research. The results of this study may be published and/or presented at meetings without naming you as a subject. Although your rights and privacy will be maintained, the Secretary of the Department of Health and Human Services, the ETSU/VA IRB for medical research, and personnel particular to this research (Nina King and Kerry Proctor-Williams) have access to the study records. Your child’s medical records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law, or as noted above.

By signing below, you confirm that you have read or had this document read to you. You will be given a signed copy of this informed consent document. You have been given the chance to ask questions and to discuss your participation with the investigator. You freely and voluntarily choose to be in this research project.

SIGNATURE OF PARENT OR GUARDIAN DATE

SIGNATURE OF PARENT OR GUARDIAN DATE

PRINTED NAME OF PARTICIPANT DATE

SIGNATURE OF INVESTIGATOR DATE

SIGNATURE OF WITNESS (if applicable) DATE

