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Communicative behaviors of toddlers with very low birth weight in social contexts

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COMMUNICATIVE BEHAVIORS OF TODDLERS WITH VERY LOW BIRTH WEIGHT IN SOCIAL CONTEXTS

by

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Dedication

To the memory of my mother

Acknowledgments

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CHAPTER I

REVIEW OF THE LITERATURE AND STATEMENT OF THE PROBLEM

Advances in medical technology over the past fifteen years have resulted in lower mortality rates of infants born with very low birth weight (VLBW). Very low birth weight is defined by birth weight less than 1500 grams (Avery, 1989). Although low birth weight alone predisposes a child to developmental impairment, a number of medical complications associated with low birth weight contribute to the risk for impairment. Morbidity rates are as high as 10% for severe developmental disability and 60% for some degree of functional impairment in academic areas (McCormick, 1989).

Developmental research has focused on the linguistic, cognitive, social and behavioral outcomes for children with VLBW at various ages. Outcome studies span the age range from birth to school age. Children born with VLBW are at a high risk for some degree of learning impairment by school age (Breslau, DelDotto, Brown, Kumar, Ezhuthachan, Hufnagle, & Peterson, 1994; Hack, Taylor, Klein, Eiben, Schatschneider, & Mercuri-Minich, 1994). Evidence of impairment is often not apparent until school age (Stewart, Costello, Hamilton, Baudin, Townsend, Bradford, & Reynolds, 1989). Research is needed in which the early indicators of impairment can be identified which are present at one to two years of age. It may be possible to identify subtle deficits in early language behaviors which will provide clues to functional impairment of academic areas, such as reading and writing at later ages. Early identification of impairment may lead to intervention which may alleviate later deficits and prevent secondary disabilities which sometimes accompany language impairment (e.g., behavioral and emotional disturbances)

(Achenbach, Howell, Aoki, & Rauh, 1993).

Comprehensive studies of the early communicative behaviors exhibited by children with VLBW are rare. Toddlers with VLBW reach early language milestones at the same rate as their peers with normal birth weight (NBW) (Menyuk, Liebergott, Schultz, Chesnick, & Ferrier, 1991; Stevenson,Roach, Leavitt, Miller, & Chapman, 1988). However, studies have not utilized measures of early communication which are sensitive to the precursors of language development, such as intentional communicative behaviors. The development of communication and language involves a complex interplay of emerging abilities in social, affective, cognitive, and linguistic domains (Bates, 1979). The clues to later impairment in communicative skills may be evident in one or all of the domains. Past studies which have focused soley on the linguistic domains may not be sufficient to detect early impairment. This study includes measures of the social, affective, cognitive and linguistic domains of early communication in toddlers with VLBW who are free of major developmental disability.

Development of communication can be understood by consideration of the interactive context between the child and adult, not simply by focusing on one participant. The quality and nature of the interactive context within which a child participates may determine whether or not opportunities for language learning will be available (Hoff-Ginsberg, 1991). Communicative temptation provides a socially interactive context to elicit a variety of communicative functions and acts from children who are developing normally (Wetherby & Rodriguez, 1992). The temptations are activities or events initiated by an adult which are expected to entice the child to communicate intentions related to the reenactment, termination or modification of the activity or event. A child who successfully signals intentions to achieve communicative goals learns to influence the

behaviors and attitudes of others and gradually learns to use more sophisticated and conventional means to communicate (Wetherby & Prizant, 1993). This study utilizes contexts of communicative temptation to compare the children with VLBW to controls with normal birth weight.

The review of the literature will focus on the developmental areas relevant to communication which have been previously studied in children with VLBW: (a) neurocognitive outcomes of children with VLBW, (b) language outcomes of children with VLBW, and (c) behavioral characteristics of infants with VLBW in the neonatal period.

Review of the Literature

Neurocognitive Outcome of Very Low Birth Weight Children

Neurocognitive areas of development include intelligence, reading, mathematics, spelling, visual and fine motor abilities and behavior. The research in these areas is important to consider because of the influence of neurocognitive ability and language skills on children's academic performance. Impairment in either area contributes to language-learning deficits in the child with VLBW.

Birth to three years. Significant differences with respect to cognitive development are generally not found when children with VLBW are compared to their peers with NBW during this period (Sternqvist & Svenningsen, 1993). Some researchers have speculated that the outcome measures used to study cognitive areas during infancy [e.g., The Bayley Mental Development Inventory (Bayley, 1969), The Griffiths' Mental Development Scale (Griffiths, 1954)] may not have been sensitive enough to identify underlying problems in cognition (Jacobson & Jacobson, 1991;Stewart, et al., 1989). Similarily, the number of observable behaviors which tap specific domains of functioning (e.g., inform-

ation processing) are limited before three years of age. By school age, children are beginning to read, write, participate in various types of oral discourse and learn mathematics. Consequently, there may be an opportunity to identify specific impairment in one or more neurocognitive areas before a child enters school. For example, poor visuomotor ability or difficulty attending may be easily overlooked until a child is presented with tasks which elicit those skills, such as those presented in the classroom or on standardized tests of achievement at school age.

Results of longitudinal studies which extend from birth to school age have revealed that the rate of impairment in neurocognitive ability increases with age for children with VLBW. In a study by Stewart, et al. (1989), 10% of children with VLBW were classified as having major impairment and 8% had minor impairments on neuromotor and cognitive measures at one year of age. However, by 4 years of age, the number of children with impairments increased to 15% with major symptoms and 15% with minor symptoms. In another long-term outcome investigation, Achenbach, et al. (1993) studied academic and behavioral areas, such as attentional and activity levels, of children with VLBW from birth to nine years of age. Half of the children with VLBW were placed in a neonatal developmental intervention group. The effect of intervention was not apparent during the birth to three-year period. However, a divergence in performance between the intervention and control groups became apparent after three years of age. In addition, the gap in performance became progressively larger through the nine-year assessments. Underlying cognitive and behavioral problems in the group with VLBW may be masked during infancy so that the functional effects of neonatal intervention were not apparent until school age.

Further evidence for underlying cognitive deficits which are undetected in infants

with VLBW comes from studies which use sociodemographic variables to explain the poor developmental outcome of lower-class children with VLBW (Pfeiffer & Aylward, 1990; Stevenson, et al., 1988). The significance of perinatal risk factors may have been underestimated in studies focused on social class variables. Middle-class children with VLBW present with some form of functional impairment by school age although not to the extent of lower-class children with VLBW (Breslau, et al., 1994). The reason why outcome studies conducted before three years of age do not report class differences in cognitive skills may be that the assessments were not sensitive enough to identify potential deficit in the middle-class children with VLBW. As a result, lower social class groups appear to be the only ones presenting with deficits. For example, Pfeiffer and Aylward (1990) studied the effect of social and perinatal risk factors on cognitive, language and temperamental outcome measures. Their results suggest favorable outcomes for children with VLBW raised in stimulating environments only. However, the outcome measures were based on stage-related behaviors which looked primarily at major developmental milestones. An underlying problem of lesser severity may have existed in the middle-class group but it was not identified as easily as in the lower class group.

Researchers who have studied specific domains of functioning such as novelty preference and visual recognition memory have found differences between children at risk and those without risk which were not found on standardized tests of achievement, such as the Bayley (Jacobson, Fein, Jacobson, Schwartz, & Dowler, 1985; Rose, Feldman, McCarton, & Wolfson, 1988). Smith, Ulvund, and Lindemann (1994) studied lower and middle-class infants with VLBW at 29 and 39 weeks and 13 months of age using the Fagan Test of Infant Intelligence, a paired comparison test of visual novelty preference. Significant differences were found between the children with NBW and those with

VLBW at all three assessment stages, regardless of socioeconomic status. The group with VLBW and the control group were not discriminated by their Bayley scores until two years of age. Furthermore, class differences were not identified until that age. The lower-class children with VLBW performed significantly worse than the middle-class children with VLBW. The latter group scored similiarily to both groups of children with NBW at two years of age. However, the Bayley may not have been sensitive to underlying deficits in the middle-class group, since their problems tend to be of lesser severity as mentioned above. In summary, during infancy and toddlerhood, children with VLBW may have deficits in neurocognitive development which remain undected until after three years of age.

Preschool/Kindergarten. The developmental profile of children with VLBW at preschool to kindergarten age differs from the profile at earlier ages (Hoy, Bill, & Sykes, 1988). By kindergarten, children with VLBW tend to have normal-low I.Q. levels, low verbal scores and minor impairment in fine motor skills. In addition, children with VLBW during this age span have higher activity levels and coordination problems than children with NBW (Herrgard, Luoma, Tuppurainen, Karjalainen, & Martikainen, 1993; Portnoy, Callias, Wolke, & Gamsu, 1988). Minor deficits in verbal, visuomotor, and fine motor skills and behavior may have no functional significance before the age of three years (Achenbach, et al., 1993). However, these deficits become increasingly apparent in comprehensive assessment during the preschool-kindergarten period (Rickards, Ford, Kitchen, Doyle, Lissenden, & Keith, 1987). Msall, Buck, Rogers and Catanzaro (1992) studied children with VLBW for kindergarten readiness. Kindergarten readiness was defined as the preparedness of the child for regular public school kindergarten, given the

presence or absence of major or minor neurodevelopmental impairments. The McCarthy Scales of Children's Abilities (McCarthy, 1972) were administered to assess verbal, perceptual, quantitative, memory and motor skills. For children free of major developmental disability, up to 63% exhibited one or more minor neurodevelopmental impairments, defined by a McCarthy score greater than one standard deviation below the mean on a subscale. In summary, the research conducted on children with VLBW during the preschool to kindergarten period shows that low birthweight is an important biological risk factor for a least minor neurocognitive deficits.

Academic/School-age. Descriptions of the academic performance of children with VLBW has only recently begun to surface. Prior to the mid-1980's, the majority of children with VLBW did not survive neonatal intensive care and those who did were generally left with major developmental disabilities. Researchers have found that the majority of children with VLBW without known neurological impairment exhibit subtle, underlying deficits in several areas of academic functioning, although their I.Q. is within normal limits (Hack, Breslau, Aram, Weissman, Klein, & Borawski-Clark, 1992; Jarvenpaa, Vlrtanen, & Pohjavuori, 1991). The deficits observed at school age are similar to those found in the preschool-kindergarten years which include memory, fine and visuomotor skills and measures of hyperactivity (Michaelsson, Lindahl, Parre, & Helenius, 1984). School-age children with VLBW have poorer social skills and adaptive behavior with more behavioral and attention problems compared to their peers with NBW at seven years of age (Hack, et al., 1994).

Low birth weight in combination with certain social class variables contribute to the deficits observed at school age (Largo, Graf, Kundu, Hunziker, & Molinari, 1990; Robertson, Etches, & Kyle, 1990). However, middle-class children with VLBW also

perform inferiorly when compared to their same-class cohorts with NBW. Breslau, et al. (1994) administered The Weschler Intelligence Scale for Children-Revised (WISC-R) to three groups of children with different classifications of low birth weight in two social classes. Low birth weight was associated with an increased risk for I.Q. below 85 in the urban population and below 100 in the suburban population. The greatest deficits were found in children who were below1500 grams at birth, an intermediate deficit in those between 1501 grams and 2000 grams, and the mildest deficits in children who weighed 2001 to 2500 grams. The trend for increasing morbidity with decreasing birthweight has been noted in an earlier study on developmental outcome (Scott & Spiker, 1989). In summary, the findings of studies conducted during the school-age period suggest that children with VLBW present with deficits in developmental areas which ultimately affect academic skills, such as behavioral and attentional problems and minor deficits in developmental areas such as fine and visuomotor skills and coordination.

Language Outcomes of Very Low Birth Weight Children

Birth to three. More research has been conducted in the area of language development during infancy and toddlerhood than later ages because children with VLBW who survived neonatal intervention have only recently matured to school age. Consequently, children with VLBW have been accessible to study at earlier ages for a longer period of time than those who are only now reaching school age.

The majority of research focused on language development has been conducted on infants with low (2500-1500 grams) versus very low birth weight (<1500 grams). Infants with low birth weight studied during the first year of life tend to reach early language milestones at or near the same rate as controls with NBW (Eilers, Oller, Levine,

Basinger, Lynch, & Urbano, 1993; Stevenson, et al., 1988). In a 3-year study with preterm infants with LBW and VLBW, the only difference in performance between the full-term and preterm children was found when the preterm children with VLBW (11%) were compared to the full-term, NBW controls on one measure of language comprehension and production (Menyuk, et al., 1991). Differences were not found when the preterm infants with LBW were compared to the full-term group on comprehension and expressive language measured with standardized assessment tools such as the Sequenced Inventory of Communication Development (Hendrick, Prather, & Tobin, 1975), the Peabody Picture Vocabulary Test (Dunn, 1965), and the Reynell Developmental Language Scales (Reynell, 1969). In addition, significant differences were not found for informal language measures such as the ages and rates at which early language milestones were reached.

Although children with LBW may acquire early language milestones at the same rate as children with NBW (Eilers, et al., 1993), they may not use their skills as frequently (Jensen, Bogglid-Andersen, Schmidt, Ankerhus, & Hansen, 1988; Oller, Eilers, Steffen, Lynch, & Urbano, 1994). For example, Oller, et al. (1994) found that infants with LBW were not delayed in acquisition of vocalization patterns. However, they used them less frequently than the infants with NBW.

Children with VLBW present with more chronic medical conditions than children with LBW. The effect of VLBW in combination with one or more medical conditions on language development has been investigated. For example, Hubatch, Johnson, Kistler, Burns, and Moneka (1985) studied the receptive vocabulary and expressive verbosity of children with VLBW who suffered from Respiratory Distress Syndrome (RDS). They compared the subjects with VLBW and RDS to controls with VLBW without RDS and

NBW controls. At the time of single-word use, the corrected ages of the children with VLBW and RDS exceeded the ages of both control groups by four months. However, the control groups performed superiorly to the experimental subjects on both language measures, despite their younger age.

In a similar study looking at the effect of a specific medical condition associated with VLBW on language development, Vohr, Coll, and Oh (1988) studied two groups of children with VLBW, 1) those who were appropriate size for gestational age (AGA) and, 2) those who were small for gestational age (SGA). Only the children with VLBW and SGA were delayed in language milestones at 2 years of age. In summary, these results indicate that VLBW may not be the only risk factor for language delay. Medical conditions associated with low birth weight, such as RDS, should be considered when studying this population.

Preschool/Kindergarten. The studies of language development in the population with VLBW during the preschool to school-age period have shown that this group performs inferiorly to most control groups on standardized assessments and less formal measures of speech and language (e.g., speech samples, behavioral descriptions). Generally, at preschool age, children with VLBW exhibit minor deficits in articulation (McAllister, Masel, Tudehope, O'Callaghan, Mohay, & Rogers, 1993b), mild and often transient expressive language delays (Jensen, Bogglid-Andersen, Schmidt, Ankerhus, & Hansen, 1988; Largo, Molinari, Comenale-Pinto, Weber, & Duc, 1986), and low-average performance on stage-related assessments of communication such as the Preschool Language Scale (Zimmerman, O'Callaghan, Mohay, & Rogers, 1993a; Rickards, et al., 1987).

By school age, children with VLBW experience greater difficulty in one or more areas of language-learning, such as reading and writing, than same-age peers with NBW

(Als, 1986; Aram, et al., 1991). A mild speech or language deficit in the preschool-kindergarten years appears to become increasingly functionally significant with age (McAllister, et al., 1993b). Rickards, et al. (1987) administered the Preschool Language Scale (Zimmerman, 1979) to 60 children with VLBW at two and five years of age. They did not find any identifiable speech defects at two years of age. However, by five years of age, 14% had a mild speech deficit and approximately 5% required some speech therapy. The investigators suggested that by school age, a mild articulation deficit may have greater functional significance than in kindergarten because it interferes with oral and/or written skills.

Another study of language development in children with VLBW during the preschool period was conducted by McAllister, et al., (1993a). They followed three groups of high-risk children: 1) >1500 grams with mechanical ventilation >18 hrs., 2) <1500 grams with mechanical ventilation >18 hrs., and 3) <1500 grams without ventilation. For all three risk groups, performance on language measures did not differ significantly from controls with NBW who did not require mechanical ventilation. However, 19% of the risk children presented with mild-severe articulation problems at three years of age. A follow-up study was conducted at five years of age (McAllister, et al., 1993b). The percentage of major communication problems rose from 13% at age three years to 17% at five years. Articulation errors noted in the preschool years, commonly found in the LBW population, are often the first sign of a learning disability (Wiig & Semel, 1984).

Academic/School-Age. Most of what is known about language outcomes at school age is found in comprehensive studies of academic performance using a battery of assessment tools (Hack, et al., 1992; Hack, et al., 1994). Breslau, et al. (1994) found a 6-point discrepancy in Verbal I.Q. scores on the Wechsler Intelligence Scale for Children-

Revised (WISC-R) (Wechsler, 1974) when both urban and suburban groups of children with VLBW were compared to controls with NBW. In addition, Jarvenpaa, et al. (1990) found a language delay in 13% of six-year-old children with VLBW on the Griffith's Scale and Denver Developmental Scales.

Considering the higher incidence of speech and language problems found for children with VLBW compared to same-age peers with NBW, it is not surprising that the latter require speech and language services by school age at higher rates than the former. Michelsson, et al. (1984) found that 28% of the group of children with VLBW studied required speech and language therapy at nine years of age compared to 4% of controls.

The research is limited in comprehensive studies which have focused exclusively on the linguistic profiles of school-age children with VLBW. Children with VLBW perform inferiorly to children with NBW on standardized speech and language assessments (Aram, Hack, Hawkins, Weissman, & Borawski-Clark, 1991; Kenworthy, Bess, Stahlman, & Lindstrom, 1987). Several speech and language measures were utilized in a study by Hack, et al. (1992) to assess syntactic comprehension and production, word retrieval, speech production and oral motor diadochokinesis of school-age children with VLBW. At eight years of age, the total group of children with VLBW had significantly poorer scores on all measures with the exception of the speech domain when compared to the group of controls with NBW. Hack, et al. (1994) administered a similar speech and language battery to a group of seven-year-old children with VLBW and found significantly poorer scores of the study group than the controls.

The variation in some findings among outcome studies conducted at different ages may be due to differences in methodology used by investigators. For example, some

researchers combine children with VLBW together with children with LBW in one study group (Menyuk, et al., 1991). Landry, Chapieski, Fletcher, and Denson (1988) recommend studying high-risk groups with stringent criteria for the control groups, to account for the varied medical histories of the children. In addition, there is not agreed-upon standard for comparison to corrected-age or chronological age peers in studies conducted at earlier ages (Siegel, 1983). The risk in using corrected-ages to study preterms is that it gives them an unfair advantage in performance on developmental tests which may mask early deficits. Considering that many studies show minimal to no differences in early language skills when children with VLBW are compared to their peers with NBW, it is possible that subtle problems exist although these are overlooked when corrected-age is used. Another problem with corrected-age is that suddenly, a child may fall below normal once correction is no longer used. This performance is evident when the child is more than two years old. Finally, socioeconomic status (SES) is often not controlled for or considered in matching study groups. The importance of SES in studies on language development has been well documented (Field, 1980; Hoff-Ginsberg, 1991; Secules & Neisser, 1993; Snow, Arlman-Rupp, Hassing, Jobse, Joosten, & Vorster, 1974). For example, the subjects in the Stevenson, et al. (1988) study were from middle-class homes. The investigators suggest that the nonsignificant findings may be attributed to the SES levels of their subjects.

Communicative Profile of Infants with VLBW during the Neonatal Period

Infants with VLBW have unique communicative characteristics in the first few months of life. The communicative profile of premature infants is relevant to this review in order to extend the description of language development of children with VLBW to

include early patterns of communication. The majority of research on preterm infant communication is descriptive accounts of observable behaviors versus performance on standardized assessments, due in part to the unreliability of infant tests of achievement (Brazelton, 1990).

The communicative behaviors of infants with VLBW are different from those exhibited by infants with NBW. The behaviors which are most characteristic of infants with VLBW include hyporesponsivity, low tolerance for stimulation, limited self-regulatory skills and fleeting attention (Als, 1986). Infants with low birth weight are often incapable of or limited in their ability to respond to communicative input as a result of an overloaded sensory system (Field, 1979; Goldberg, Brachfeld, & Divitto, 1980). In addition, infants with VLBW are less clear in how they signal distress or contentment than the infants with NBW. Studies have not yet focused on the longer-term consequences (i.e., beyond infancy) that early behaviors may have on verbal and nonverbal communication. The child with VLBW might be expected to continue to have difficulty in their ability to signal communicative intentions.

Statement of the Problem

Very low birth weight (VLBW) children are at high risk for later cognitive and linguistic deficits (McAllister, et al., 1993a; Michelsson, et al., 1984; Smith, et al., 1994). The factors which contribute to the poor developmental outcome of children with VLBW are unknown. Previous research has focused on parental interactive behaviors (Cohen & Beckwith, 1979) and infant state (Eckerman, Oehler, Medvin, & Hannan, 1994). In addition, social class variables have been studied, such as the home environment (Bradley, Whiteside, Mundrom, Casey, Kelleher, & Pope, 1994), parental I.Q. level (Pfeiffer &

Aylward, 1990) and parental age (Field, 1980). The results of these studies suggest that no one factor accounts for the relatively poorer outcome of children with VLBW.

The majority of research with children characterized by VLBW has focused only on receptive and expressive language milestones and has neglected early communication development (Eilers, et al., 1993; Kenworthy, et al., 1987; Menyuk, et al., 1991; Stevenson, et al., 1988). The development of age-appropriate receptive and expressive language skills depends on the successful acquisition of early communicative precursors (Bruner, 1975). Children must have a reason to communicate before a means for expressing those reasons is developed. The subtle communicative behaviors exhibited by toddlers with VLBW which are the precursors to later language development have not been studied.

The present investigation is designed to measure social-affective signalling, communicative means, reciprocity and communicative intentions using the Communication and Symbolic Behavior Scales (CSBS) (Wetherby & Prizant, 1993) in two groups; children with VLBW and NBW. This information is needed since these behaviors might account for differences in language outcome which have been documented in these two groups. In previous work, environmental and/or parental factors were credited for language delay in high-risk children, with less consideration for the unique characteristics of the child with VLBW that influence communication. Specifically, this study was designed to address the following research questions:

1. Are there significant differences in the type and frequency of communicative functions (i.e., behavioral regulation, social interaction, joint attention) exhibited by toddlers with VLBW compared to toddlers with NBW?

2. Are there significant differences in the type and frequency of communicative

means (a.k.a. acts) (i.e., gestures, vocalizations, verbalizations) between toddlers with VLBW and NBW?

3. Do toddlers with VLBW and NBW differ significantly in measures of reciprocity?

4. Do toddlers with VLBW and NBW differ significantly in social-affective signaling?

5. Is there a significant difference in social-communicative behaviors between subjects with VLBW and NBW on standardized scores developed with the CSBS norming sample?

This study is expected to provide information that will contribute to the developmental profile of this unique population. Children with VLBW present unique patterns of behavior and learning skills compared to children with NBW due to differences in neonatal brain development (Als, 1986). The brain of the preterm infant with VLBW appears to be overly sensitive and too immature to readily register and process sensory information. The inability of the preterm brain to inhibit excessive sensory input may be connected to the poorer differentiation of higher association cortical areas in children with VLBW compared to children with NBW. This pattern of cortical development might explain the unique neonatal behavioral characteristics observed in preterm infants (Coll, 1990; Duffy, Als, & McAnulty, 1990; Tronick, Scanlon, & Scanlon, 1990). In addition, research that has been conducted beyond infancy to study the effects of VLBW on language and learning development (i.e., outcome literature) provides further evidence for a unique developmental profile of children with VLBW compared to children with NBW (Herrgard, et al., 1993; Hoy, et al., 1988; Largo, et al., 1986). Therefore, it is predicted that the study group with VLBW will exhibit significantly fewer communicative functions with less overt behavioral acts than the comparison group. In addition,

the children with VLBW will exhibit qualitatively different patterns of social interaction and reciprocity than the children with NBW.

CHAPTER II

Method

Subject Characteristics

The 38 subjects included in this study were required to meet a number of criteria for participation. These requirements included: 1) age range of 15 – 20 months; 2) African-American ethnicity, 3) absence of neurological impairment or significant medical problems (i.e., conditions requiring chronic hospitalization), 4) absence of history of emotional and/or physical abuse, 5) Bayley Scales of Infant Development (BSID) (Bayley, 1993) Mental Developmental Index (MDI) score of 70 or greater. Two subject groups were used; toddlers with Very Low Birth Weight (VLBW) had birthweights ≤1500 grams. Subjects in the group with Normal Birthweight (NBW) had birthweights within the 10th and 90th percentile and were full-term infants (i.e., 38-42 weeks gestation).

The subjects from the group with VLBW were matched to the subjects with NBW on the following variables:

1) Age level: The corrected ages of the subjects with VLBW were used to match, within 2 months, to subjects with NBW. An equal number of subjects were included in the three age ranges; 15-16 months, 17-18 months and 19-20 months.

2) Maternal Age: Subjects were matched grossly, on maternal age; younger mothers were ≤ 28 years and older mothers were >29 years.

3) Maternal Verbal I.Q. Scores: Subjects with VLBW were matched to those with NBW on Peabody Picture Vocabulary Test (PPVT) (Dunn & Dunn, 1981) scores, within one of three standard score ranges; low (≤79), middle (80-89), and high (≥90).

Subject characteristics and group comparison of matching and inclusion criterion measures are presented in Table 2.1 and 2.2. All subjects were lower-middle class as determined by the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975). African American subjects were selected for this investigation because of the higher incidence of low birth weight among African American children compared to Caucasions (12% and 5.9%, respectively) (Avery, 1989) and the former make up the largest minority population in the United States (U.S. Bureau of the Census, 1992). The mean chronological age of the subjects with NBW was 17.95 months. The mean corrected age of the subjects with VLBW was 17.68 months and their chronological age was 20.42 months. The group of subjects with NBW consisted of 11 (57.9%) males and 8 (42.1%) females. Thirteen males (68.4%) and six (31.6%) females participated in the group of subjects with VLBW. The mean birthweight for the group with VLBW was 1148 grams and the mean gestational age was 28.53 postconceptual weeks. Significant differences on the BSID (MDI) were not obtained.

Procedure

The following procedure was used to identify subjects who met all eligibility requirements.

1. The subjects in the group of children with VLBW were identified through the

Table 2.1. Subject Characteristics of Toddlers with Normal Birth Weight and Very Low Birth Weight.

	Normal Birth Weight		Very Low Birth Weight	
	Total N	Number (%)	Total N	Number (%)
Gender				
Male	11	57.9	13	68.4
Female	8	42.1	6	31.6
Mothers' Education				
Part High School	3	15.8	3	15.8
High School Graduate	8	42.1	3	15.8
Part College	3	15.8	9	47.4
College Graduate	4	21.1	3	15.8
Graduate Degree	1	5.2	1	5.2
Fathers' Education				
Fathers Not Involved	4	21.0	4	21.0
Part High School	1	5.3	1	5.3
High School Graduate	8	42.1	6	31.6
Part College	5	26.3	5	26.3
College Graduate	0	0	2	10.5
Graduate Degree	1	5.3	1	5.3
Fathers' Age (involved only)	30.1	5.5	35.1	9.0
Marital Status				
Married	11	57.9	11	57.8
Divoriced	3	15.8	4	21.1
Never Married	5	26.3	4	21.1
SES Level				
1	1	5.3	1	5.3
2	2	10.5	7	36.8
3	12	63.2	8	42.1
4	2	10.5	1	5.3
5	2	10.5	2	10.5

Table 2.1. Subject Characteristics of Toddlers with Normal Birth Weight and Very Low Birth Weight.

	Normal Birth Weight		Very Low Birth Weight	
	Total N	Number (%)	Total N	Number (%)
Number of Siblings				
0	6	31.6	4	21.0
1	5	26.3	6	31.6
2	6	31.6	3	15.8
3	2	10.5	4	21.0
4	0	0	1	5.3
6	0	0	1	5.3
Birth Order				
Only Child	7	36.8	4	21.1
Last Child	12	63.2	13	68.4
First Child	0	0	2	10.5
Number in Home				
3	6	31.6	2	10.5
4	7	36.8	4	21.1
5	5	26.3	7	36.8
6	1	5.3	2	10.5
7	0	0	2	10.5
Rooms in Home				
3	0	0	1	5.3
4	7	36.8	6	31.6
5	2	10.5	3	15.7
6	7	36.9	4	21.1
7	4	21.0	5	26.3
8	4	21.0	4	21.1
9	1	5.3	2	10.5

Table 2.1. Subject Characteristics of Toddlers with Normal Birth Weight and Very Low Birth Weight.

	Normal Birth Weight		Very Low Birth Weight	
	Total N	Number (%)	Total N	Number (%)
Household Density+	1.71	.5	1.4	.5
Days of Book Reading per Week				
0	1	5.3	3	15.8
1	1	5.3	2	10.5
2	5	26.3	4	21.0
3	5	26.3	3	15.8
4	1	5.3	1	5.3
7	6	31.5	6	31.6

+Number of persons in the home/number of rooms

Table 2.2. Group Comparison of Criterion Measures for Toddlers with Normal Birth Weight and Very Low Birth Weight.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Corrected Age at CSBS (months)	17.95	1.43	17.68	1.49	.55
Chronological Age at CSBS	17.95	1.43	20.42	1.43	-5.33*
Mothers' Age (years)	28.05	4.61	28.63	5.80	-.34
Mothers' PPVT Score	79.79	18.41	79.16	15.27	.12
SES Score	33.63	9.29	37.79	11.75	-1.21
Bayley MDI	102.53	11.99	95.58	13.77	1.66

*$p < .05$

Henry Ford Hospital Developmental Assessment Clinic (DAC) which is a developmental follow-up clinic for infants who have been discharged from the Neonatal Intensive Care Unit (NICU). Children are generally followed on a once every 3-6 months period upon discharge from the NICU. Subjects in the group with NBW were identified through the Henry Ford Hospital pediatric clinic.

2. Medical records of potential subjects identified through the databases of the developmental and pediatric clinics were reviewed for medical eligibility requirments (e.g., birth weight , prenatal history, in-hospital course) and race.

3. The parents or legal guardians of subjects meeting eligibility requirements in the previous step were contacted by phone to collect socioeconomic information (see Appendix A). If parents could not be reached by phone, a questionaire was sent to the home which was designed to collect the same socioeconomic information. The socioeconomic information was used to complete the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975).

4. Control subjects were matched to same corrected-age subjects in the group of VLBW children on maternal age (identified via subjects' medical record or the socio-economic questionaire), and maternal I.Q. scores (based on scores obtained on the PPVT).

Consent to participate in the study was obtained from parents or legal guardians of subjects meeting all medical and social eligibility requirements (see Appendix B). Financial incentive for NBW subjects to participate was a $50.00 reimbursement check sent to the parents after both the BSID and the Communication and Symbolic Behavioral Scales (CSBS) (Wetherby & Prizant, 1993) testing were completed. Subjects in the VLBW group were reimbursed a smaller amount, $25.00 since BSID testing is part of routine developmental follow-up in the Developmental Assessment Clinic. Data collection was initiated when consents were received and eligibility was determined. The study consisted of three parts: 1) assessment of the mothers' verbal I.Q., 2) assessment of the child's cognitive function unless BSID scores were available within six months of the current study, and 3) the communication assessment.

Subjects falling at or below 70 on the BSID (MDI) were eliminated from the study. Testing was conducted in similar environments for all subjects. The BSID was admin-

istered by a certified Occupational Therapist trained in BSID administration and scoring. The PPVT and the CSBS were administered by a certified Speech-Language Pathologist.

Measures

The Communication and Symbolic Behavior Scales, (Wetherby & Prizant, 1993) is a comprehensive assessment of socio-communicative behaviors elicited within a context of communicative temptation. Sociocommunicative behaviors are communicative acts intended to achieve socially related goals. The CSBS is a standardized assessment tool which is based on a norming sample of 282 children between the ages of eight and 24 months of age. The scales have high internal consistency coefficients, test-retest and interrater reliability. The CSBS has adequate criterion-related and construct validity. Concurrent validity studies of the CSBS are limited because few measures exist which are designed to measure the communicative behavior of children younger than 24 months of age. However, predictive validity was determined using the CSBS scores obtained from the standardization sample and two other groups of children previously classified as having Pervasive Developmental Disorder (PDD) or Specific Language Impairment (SLI). The classification of children into one of the three groups based on CSBS cluster standard scores was 98% accurate. The statistical evidence for adequate construct validity is in the form of interpretable quantitative relationships between the test scores and other variables known to be related to the construct such as a child's age and language stage. The scaled raw scores for the standardization sample show that scores increase with age and language stage on all 22 scales, which is consistent with known patterns of improvement in communication across linguistic stages during this period of early development.

The CSBS was administered following a 10-minute warm-up session with the examiner. The entire CSBS administration was videotaped. Scoring was completed after the assessment.

The CSBS was administered in two separate sections. First, the child was presented with eight communicative temptations which were: 1) a wind-up toy, 2) balloons, 3) bubbles, 4) peek-a-boo, 5) walk-mouse-creep-mouse, 6) blocks in a box, 7) closed jar, and 8) toys in a bag. The temptations are structured as nonverbal situations designed to entice child-initiated communicative acts. For example, most young children have difficulty operating the wind-up toy. Consequently, the child is tempted to communicate the need for assistance from the examiner. Opportunities for using repair strategies were incorporated into four of the eight temptations. If the child was hesitant to interact with the examiner, the warm-up period was extended until the child was willing to participate. Temptations were presented in the order listed above. One to two minutes were spent on each temptation.

When presenting each temptation, the examiner waited and looked expectantly at the child. If the child did not readily initiate a communicative act, the child was encouraged with the following prompts:

1. The examiner said, "Need help?" with a rising intonation.
2. The examiner extended an open hand on the table, 12 inches from the object and said, "Need help?" again.
3. The examiner opened his/her hand to within three inches of the object, without touching it and said, "Need help?" again.
4. The examiner repeated step one of the temptation.

The examiner waited seven seconds after each prompt before presenting the next one. If the child fussed, protested, or showed no interest in a temptation, the examiner proceeded to the next one and returned to the failed temptation if time allowed. If the child's behavior precluded administration of this portion of the testing, the child was eliminated from the study. No subjects were eliminated from this study as a result of behavior problems.

The second section of the communication assessment was "Sharing Books." The purpose of this section was to provide the child with natural opportunities for initiating interaction through labelling, questioning, and for respondent acts. The child was presented with three books and encouraged to select one. The child was allowed to examine the book while the examiner showed an interest in it. The examiner responded naturally to the child's communicative behaviors by acknowledging, commenting on, or expanding on what the child was looking at, pointing at or communicating about in the book. The examiner avoided giving the child commands or asking the child questions except to request clarification or further information. The child was presented with another book using the same procedure. A final book was offered only if the child did not show an interest in the first two books.

Data Coding

All data coding for the CSBS was completed by a certified Speech-Language Pathologist blind to subject group. Identification numbers were assigned to transcriptions and classification information (i.e., language ability and age) and subject names were removed. The following behaviors were analyzed using the CSBS scoring protocol.

Communicative functions. Communicative functions represent the purposes of com-

munication. The Behavioral Regulation category consists of acts which are used to control the behavior of another person to obtain a specific result. The child's goal is to get the adult to do something or to stop doing something. The Social Interaction category consists of acts which are used to attract or maintain another's attention to oneself. The child's goal is to get the adult to look at or notice him or her. Joint Attention represents acts used to direct another's attention to an object, event, or topic of a communicative act. The child's goal is to get the adult to look at or notice an entity or event. Examples of functions are presented in Appendix C.

Communicative means (acts). Communicative acts represent behaviors used to express communicative functions. These behaviors may be verbal, nonverbal or both. Nonverbal Acts include conventional gesturing, pointing, use of contact and/or distal gestures. Verbal Acts include vocalizations and verbalizations (i.e., words, pseudowords, word combinations and simple sentences). Examples are provided in Appendix C.

Reciprocity. Social communicative behavior occurs in the context of reciprocal interactions. Reciprocity was coded for three categories of behaviors. In a Respondent Act, the child maintains the focus of attention or topic by responding to the adult's act. The Rate of Communicative Acts is the second category for coding Reciprocity and it represents how often the child reciprocates socially directed behaviors. Repair Strategies is the third category of reciprocity. This category measures the child's persistence in attaining a desired object or action through his/her continued use and/or modification of communicative acts. In a repeated act, the child repeats exactly his or her previous act following the adult's violation or lack of acknowledgement of the child's intent. The repeated act reflects uniformity of behavior by lack of modification to the original message. In

a modified act, the child changes the message or he/she directs the act to another person. Examples are presented in Appendix C.

Social-affective signaling. The last child measure was social-affective signaling. Three measures were used in this category. Gaze Shifts are defined by alternating eye gaze between a person and an object and back. Shared Positive Affect is a measure of sociability or sharing of positive affective states through clear facial expression of pleasure or excitement sometimes accompanied by a vocalization (e.g., laughter, squeal). The last category is Negative Affect which is defined as a clear vocal expression of distress or frustration, the display must contain a vocalization and may include a change in facial expression, body posture, and gesture.

Scoring Procedures

To address the research questions posed for this study, several scoring procedures were utilized to study group differences in the areas of communicative function, communicative means, reciprocity and social-affective signaling. The scoring system used in the CSBS provides for the calculation and interpretation of cluster scores, scaled scores, percentiles and standard scores.

1) Raw scores: The total number of observations made for each of 18 categories (scales) of behaviors.

2) Scaled scores: Scaled scores were calculated by converting each of the raw scores for the 18 different categories (scales) into a 1-5 range.

3) Cluster scores: Cluster scores were calculated by summing 2-4 of the scaled

scores which make up any one of the five clusters. For example, the cluster, Reciprocity, would combine the following scales: 1) Respondent Acts, 2) Rate of Communicative Acts, and 3) Repair Strategies.

4) Percentile and Standard Scores: The cluster score was converted into a percentile and/or standard score by comparing it to the norms from the CSBS.

5) The Communication Composite/Total Score: The Communication Composite/Total score was calculated by summing the cluster scores. The Communication Composite/Total score was used to determine the child's overall standard score and percentile for his/her age.

Data Analysis

The variance of raw scores is significantly reduced once they are converted into scaled scores. In order to explore potential group differences which might not be detected using scaled scores, raw scores and raw score clusters were compared in addition to the usual scoring procedures outlined in the CSBS manual. Raw scores are not interpreted using the CSBS guidelines because raw scores cannot be combined across categories, like scaled scores, to form clusters. Therefore, *z*-scores were used to normalize the raw scores for calculation of cluster scores. The independent variable was birthweight and the dependent variable was CSBS scores. Fisher's Exact t test (Hays, 1994) was used to compare mean scores from the subjects in the groups with VLBW and NBW on the various measures of the CSBS.

Reliability

The coder was naive to the subjects' classification of VLBW or NBW to reduce the risk of bias in coding. Instruction for coding included verbal and written description of measures. Videotaped examples of behaviors was also used to train the coder to identify CSBS behaviors. In addition, the coder was provided with a training manual and training tape which specified the scoring process and definitions for each of the categories of behaviors.

Interrater reliability between the coder and experienced rater (the investigator) was determined by randomly selecting 25% of coding protocols for double coding. The experienced rater is the person most familiar with the CSBS administration, scoring, interpretation and theory. Percentages of agreement between the raters were calculated independently for the four child measures by dividing the number of items on which there was agreement by the total number of items coded (i.e., the number of agreements + disagreements) and multiplying by 100.

Percentages of agreement between the experienced and trained raters are presented in Appendix D. Of the 18 categories that were coded, the experienced and trained raters were $\geq$90% reliable for 9/18 categories; 80-89% reliable for 6/18 categories; 70-79% reliable for 1/18 categories; and $\leq$69% reliable for 2/18. The two categories with the lowest reliability were Shared Positive Affect and Respondent Acts. These same two categories were lowest in reliability when the same training process was utilized for the standardization sample, as described in the CSBS manual.

CHAPTER III

Results

Measures of potential confounding variables known to effect early development, such as socioeconomic (SES) level, parental marital status, and maternal education level (Bradley, et al., 1994) revealed no significant differences between the groups. The only demographic variable which significantly differed between the two groups was the chronological ages of the subjects, which was expected, because subjects from the group with VLBW were matched to subjects with NBW on the former's corrected age. Consequently, the results of this investigation, which were used to answer the five research questions, were attributed to the independent variable, birthweight.

Are there significant differences in the type and frequency of Communicative Functions exhibited by toddlers with VLBW compared to toddlers with NBW?

The cluster of Communicative Function includes Behavior Regulation, Joint Attention and Sociability of Communicative Functions. As seen in Table 3.1, the raw score data revealed a significant difference in Behavioral Regulation between the groups, [$t(37) = 2.27$, $p < .05$]. Subjects in the group with VLBW scored significantly lower for this scale than subjects in the group with NBW. Significant differences in the other scaled scores or cluster scores were not found. The answer to the first research question was that subjects with VLBW used most Communicative Functions at the same frequency as subjects with NBW. However, the subjects with VLBW demonstrated significantly fewer functions of the Behavioral Regulation type.

Table 3.1. Communicative Function Scores for Groups with NBW and VLBW.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Raw Scores					
Communicative Functions Cluster	.33	1.60	-.33	2.15	1.08
Behavioral Regulation	31.32	8.73	25.32	7.55	2.27*
Joint Attention	11.42	6.62	9.26	6.85	.99
Sociability of Communicative Functions	.36	.09	.43	.24	-1.10
Scaled Scores					
Communicative Functions Cluster	9.21	.98	8.74	1.73	1.04
Behavior Regulation	3.42	.77	3.00	.75	1.71
Joint Attention	3.10	.46	2.79	.63	1.77
Sociability of Communicative Functions	2.68	.67	2.95	1.13	-.87

*$p < .05$

Are there differences in the type and frequency of communicative means between toddlers with VLBW and NBW?

The CSBS consists of three types of Communicative Means (i.e., Gesture, Vocal, and Verbal). As seen in Table 3.2, significant differences were not obtained between the groups when raw or cluster scores were compared. However, significant differences were found when the scaled score data were analyzed. Subjects with VLBW scored significantly lower on Coordination of Gestures and Vocalizations [$t(37) = 2.37$, $p < .05$]

and Verbal). As seen in Table 3.2, significant differences were not obtained between the groups when raw or cluster scores were compared. However, significant differences were found when the scaled score data were analyzed. Subjects with VLBW scored significantly lower on Coordination of Gestures and Vocalizations [$t(37) = 2.37$, $p < .05$] (one of the three scales which make up the Communicative Means - Gestural cluster). Of the four scales which make up the cluster of Communicative Means - Vocal, the subjects with VLBW used Syllables with Consonants at a significantly lower frequency than the toddlers with NBW, [$t(37) = 2.28$, $p < .05$]. The answer to the second research question was, that toddlers with VLBW did not differ significantly in the frequency of most of the Communicative Means exhibited compared to NBW. However, subjects with VLBW used two of nine types of Communicative Means significantly less frequently than their peers with NBW.

Table 3.2. Communicative Means Scores for Groups with NBW and VLBW.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Raw Scores					
Gestural Cluster	.57	1.60	-.33	2.15	1.50
Conventional Gestures	8.11	2.13	7.32	1.87	1.05
Distal Gestures	7.42	5.97	5.89	4.52	.89
Coordination of Gestures and Vocalizations	16.11	11.05	10.63	9.51	1.64
Vocal Cluster	.40	3.75	-.40	3.40	.72
Vocal Acts without Gestures	4.84	4.51	5.84	4.79	-.66
Inventory of Different Consonants Used	3.84	2.32	3.05	2.25	1.06
Syllables with Consonants	10.47	11.37	6.37	7.44	1.32
Multisyllables	9.21	8.37	7.16	7.60	.79
Verbal Cluster	.01	1.63	-.01	1.73	.06
Inventory of Different Words Expressed	3.32	3.33	1.84	2.95	1.44
Inventory of Different Word Combinations	.05	.23	.42	1.17	-1.35

Table 3.2. Communicative Means Scores for Groups with NBW and VLBW.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Scaled Scores					
Gestural Cluster	9.26	.98	8.74	1.73	.23
Conventional Gestures	3.11	.88	2.89	.57	.88
Distal Gestures	3.21	.98	3.11	.88	.35
Coordination of Gestures and Vocalizations	2.95	.62	2.47	.61	2.37*
Vocal Cluster	11.32	2.06	10.79	1.84	.83
Vocal Acts without Gestures	2.84	.69	3.11	.57	-1.29
Inventory of Different Consonant Used	2.79	.54	2.58	.51	1.24
Syllables with Consonants	2.79	.63	2.37	.50	2.28*
Multisyllables	2.89	.57	2.74	.73	.74
Verbal Cluster	5.79	.54	5.58	.51	1.24
Inventory of Different Words Expressed	2.84	.50	2.53	.51	1.92
Inventory of Different Word Combinations	2.95	.23	3.05	.23	-1.41

*$p<.05$

Do toddlers with VLBW and NBW differ significantly in measures of reciprocity?

The measures of reciprocity which were analyzed to answer this question include: Respondent Acts, Rate of Communicative Acts, and Repair Strategies. As seen in Table 3.3, the raw score analysis revealed that the group with VLBW scored significantly lower only on Rate of Communicative Acts compared to the subjects with NBW, [$t(37) = 2.12$, $p < .05$]. Differences were not found in any of the other raw, scaled or cluster scores for Reciprocity. The answer to the third research question was, with the exception of Rate of Communicative Acts, toddlers with VLBW demonstrate a comparable frequency of behaviors to toddlers with NBW in reciprocal communication skills.

Do toddlers with VLBW and NBW differ significantly in Social-Affective Signaling?

The behaviors which comprise the cluster of Social-Affective Signaling include: Gaze Shifts, Shared Positive Affect, and Episodes of Negative Affect. A comparison of the subjects' with VLBW and NBW performance in these three areas was completed to answer this research question. The results are presented in Table 3.4.

The results of the raw, scaled, and cluster score analyses revealed that significant differences were not obtained in any of the measures of Social-Affective Signaling between the two groups. The answer to the fourth research question was, toddlers with VLBW and NBW do not differ on measures of Social-Affective Signaling.

Table 3.3. Reciprocity Scores for Groups with NBW and VLBW.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Raw Scores					
Reciprocity Cluster	.33	1.97	-.33	2.50	.90
Respondent Acts	7.74	5.61	8.63	10.04	-.34
Rate of Communicative Acts	3.00	.77	2.49	.71	2.12*
Repair Strategies	9.26	3.12	8.89	3.49	.34
Scaled Scores					
Reciprocity Cluster	10.32	1.11	9.68	1.83	1.23
Respondent Acts	2.74	.56	2.68	.89	.22
Rate of Communicative Acts	3.42	.61	3.11	.57	1.66
Repair Strategies	4.16	.69	3.89	.88	1.03

*$p<.05$

Table 3.4. Social-Affective Signaling Scores for NBW and VLBW Groups.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Raw Scores					
Social-Affective Signaling Cluster	-.42	1.45	.42	2.12	-1.28
Gaze Shifts	29.16	12.13	27.26	15.57	.42
Shared Positive Affect	3.21	2.30	7.42	9.08	-1.96
Episodes of Negative Affect	1.63	2.34	2.63	3.20	-1.10
Scaled Scores					
Social-Affective Signaling Cluster	8.21	1.23	8.26	1.79	-.11
Gaze Shifts	3.26	.87	3.16	1.12	.32
Shared Positive Affect	2.58	.61	2.89	.88	-1.29
Episodes of Negative Affect	2.37	.68	2.21	.79	.66

Is there a significant difference in social-communicative behaviors between subjects with VLBW and NBW on standardized scores developed with the CSBS norming sample?

The final research question was posed to compare the performance of the groups with NBW and VLBW using norms obtained from the larger standardization sample of 282 children. The purpose of this analyses was to determine the clinical status of study subjects using the norms provided by the CSBS and to compare subjects with VLBW to chronologically-aged matched peers, since the latter were not included in this study. Percentile ranks and standard scores were calculated from the scaled cluster scores.

Standard Scores and Percentiles using Corrected Ages. Group performance, using corrected ages for the subjects with VLBW, is presented in Table 3.5 and 3.6. Significant differences between the groups were not found on percentiles or standard scores. In addition, both groups scored within one standard deviation of the CSBS sample mean, on all of the communication clusters. The lowest scores obtained for both groups were on Communicative Means (Verbal) (M=29.11%; NBW and M=23.11%; VLBW).

Standard Scores and Percentiles using Chronological Ages. When chronological ages were used for the group with VLBW to calculate percentile ranks and standard scores, significant differences were obtained for the communication clusters. As presented in Tables 3.7 and 3.8, the group of subjects with VLBW performed significantly lower than the group with NBW in Communicative Function, [$t(37) = 2.12$, $p < .05$], Communicative Means (Vocal), [$t(37) = 2.33$, $p < .05$], and Communicative Means (Verbal), [$t(37) = 3.26$, $p < .05$]. The group with VLBW also had a significantly lower Total/Composite score than the group with NBW, [$t(37) = 2.70$, $p < .05$]. The lowest mean scores obtained for the six clusters were in Communicative Means (Vocal)

and Communicative Means (Verbal), 16.32% and 11.95%, respectively, which placed the group with VLBW greater than one standard deviation below the CSBS mean.

Table 3.5. CSBS Percentile Scores of Toddlers with Normal Birth Weight and Very Low Birth Weight using Corrected Ages.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Communicative Function	43.42	17.65	38.63	25.27	.68
Communicative Means-Gestural	46.95	25.58	47.16	27.49	.98
Communicative Means-Vocal	31.47	22.64	28.26	24.62	.42
Communicative Means-Verbal	29.11	21.17	23.11	18.10	.94
Reciprocity	56.53	18.19	51.58	29.98	.62
Social-Affective Signaling	57.84	20.67	58.58	23.73	-.10
Composite/Total	37.63	18.73	35.16	19.29	.40

Table 3.6. CSBS Standard Scores of Toddlers with Normal Birth Weight and Very Low Birth Weight using Corrected Ages.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Communicative Function	9.47	1.43	8.84	2.61	.93
Communicative Means-Gestural	9.68	2.36	9.68	3.07	0
Communicative Means-Vocal	8.11	2.42	7.79	2.53	.39
Communicative Means-Verbal	7.95	2.20	7.42	1.89	.79
Reciprocity	10.63	1.71	10.05	2.86	.76
Social-Affective Signaling	10.68	1.70	10.89	2.26	-.32
Composite/Total	91.11	13.33	92.58	10.67	-.38

Table 3.7. CSBS Percentile Scores of Toddlers with Normal Birth Weight and Very Low Birth Weight using Chronological Ages.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Communicative Function	43.42	17.65	29.05	23.68	2.12*
Communicative Means-Gestural	46.95	25.58	39.16	27.38	.91
Communicative Means-Vocal	31.47	22.64	16.32	17.03	2.33*
Communicative Means-Verbal	29.11	21.17	11.95	8.84	3.26*
Reciprocity	56.53	18.19	44.89	28.89	1.48
Social-Affective Signaling	57.84	20.67	58.58	23.73	-.10
Composite/Total	37.63	18.73	23.37	13.33	2.70*

*$p<.05$

Table 3.8. CSBS Standard Scores of Toddlers with Normal Birth Weight and Very Low Birth Weight using Chronological Ages.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Communicative Function	9.47	1.43	7.84	2.59	2.41*
Communicative Means-Gestural	9.68	2.36	8.79	3.17	.99
Communicative Means-Vocal	8.11	2.42	6.21	2.25	2.50*
Communicative Means-Verbal	7.95	2.20	6.21	1.47	2.86*
Reciprocity	10.63	1.71	9.21	3.03	1.78
Social-Affective Signaling	10.68	1.70	10.89	2.26	-.32
Composite/Total	91.11	13.33	87.11	9.45	1.07

*$p<.05$

In summary, the groups with VLBW and NBW did not significantly differ on the communication clusters represented by the first four research questions (i.e., Communicative Functions, Communicative Means, Reciprocity, and Social-Affective Signaling). Consequently, differences were not obtained on the Communication Composite/Total scores (see Table 3.9). In addition, few differences were found when both scaled and raw scores were analyzed for the 18 individual scales of the CSBS: 1) Subjects with VLBW scored significantly lower than subjects with NBW on two of the Communicative Means scaled scores; Coordination of Gestures and Vocalizations, [$t(37) = 2.37$, $p < .05$] and Syllables with Consonants, [$t(37) = 2.28$, $p < .05$], 2) Subjects with VLBW used significantly fewer Behavioral Regulation acts, [$t(37) = 2.27$, $p < .05$], and they had a significantly lower Rate of Communicative Acts, [$t(37) = 2.12$, $p < .05$].

The final analysis compared the groups with VLBW and NBW on percentile and standard scores which were obtained from the CSBS norming sample. Overall, significant differences were not found on any of the CSBS clusters or total scores when corrected age was used for the subjects with VLBW. The group with VLBW scored significantly lower than the subjects with NBW on half of the clusters (Communicative Functions and Communicative Means - Vocal and Verbal) and the Composite/Total when chronological age was used for the VLBW subjects.

Table 3.9. Communication Composite/Total Scores for Groups with NBW and VLBW.

	Normal Birth Weight		Very Low Birth Weight		
	Mean	SD	Mean	SD	t
Communication Composite					
Raw Score	1.24	10.08	-1.24	10.64	.79
Scaled Score	54.11	5.26	52.63	6.98	.74

CHAPTER IV

Discussion and Conclusions

This investigation was designed to study the early social and communicative behaviors of children born with Very Low Birth Weight (VLBW) compared to children with Normal Birth Weight (NBW). Specifically, this study sought to determine whether or not differences exist in the areas of Communicative Function, Communicative Means, Reciprocity and Social-Affective Signaling. The present study included only healthy subjects with VLBW (i.e., those without a documented history of neurological impairment and/or medical problems requiring hospitalization after NICU discharge) who were closely matched to controls with NBW on several demographic variables. The major findings of this research were: 1) toddlers with VLBW demonstrate comparable frequencies of behaviors to their peers with NBW in all social-communicative clusters of the CSBS, 2) toddlers with VLBW and NBW do not significantly differ on CSBS standardized scores when corrected ages are used for the subjects with VLBW, 3) toddlers with VLBW perform significantly lower than their peers with NBW on three of the communication clusters (Communicative Functions and the Vocal and Verbal clusters of Communicative Means) when chronological ages are used for the former to calculate standardized scores, 4) toddlers with VLBW demonstrate specific deficits in two of the individual behavioral categories which make up the clusters (Coordination of Gestures and Vocalizations and Syllables with Consonants) and, 5) the group with VLBW demonstrated significantly lower scores than the group with NBW in two additional areas (Rate of Communicative Acts and Behavioral Regulation) when raw scores were calculated.

The results of this study will first be discussed in terms of the major findings and how these compare to previous studies of low birth weight children. Next, a discussion of the results for the communication clusters and the individual scales and how these relate to early developmental and neurodevelopmental theories is presented. The final section of this chapter focusses on some methodological considerations in the study of children with VLBW for both clinical and research applications.

The Communication Skills of Toddlers with VLBW

Previous studies have shown that toddlers with VLBW perform at or near age-level on standardized assessment tools such as The Sequenced Inventory of Communicative Development (Hendrick, et al., 1975) (Eilers, Oller, Levine, Basinger, Lynch, & Urbano, 1993; Menyuk, et al., 1991; Stevenson, et al., 1988). However, the results of these studies were based on assessments which typically measure only one or two domains of communication (i.e., speech and language skills). The present study was conducted with the Communication and Symbolic Behavior Scales (CSBS), which differs from communication assessments used in previous studies since it is designed to sample a wide range of social-communicative behaviors in naturalistic contexts such as communicative temptation and social interaction (i.e., book reading). Due to the level of specificity required for coding the CSBS and the wide range of spontaneously sampled behaviors, it was predicted that potential, underlying deficits in social interaction and communication might be identified which have not previously been found in studies of low birthweight children. This prediction was not supported by the findings of this study. Very few, significant differences were found between the groups with VLBW and NBW across the 18 categories of social-communicative functioning.

Communicative functions. The first research question related to the frequency and types of communicative functions used by children with VLBW and NBW. Communicative functions represent the reasons for communicating (i.e., to request, protest, draw attention, and/or socially interact). The toddlers with VLBW in this study communicated functions of joint attention and social interaction during the temptations and book sharing contexts as frequently as the group with NBW. This is an important finding because previous studies of the social-interactive behaviors of children with VLBW in infancy have shown them to be less playful, attentive, and responsive to their adult partner (Cohen & Beckwith, 1979; Field, 1979; Field, 1980). The results of this study suggest that by toddlerhood, children with VLBW have developed joint attentional and socially-interactive behaviors like their peers with NBW.

The only significant difference between the groups was in the raw scores for the Behavioral Regulation category. Children with VLBW requested objects and actions and protested less frequently than the group with NBW. One explanation for this finding is that children with VLBW may be accustumed to caregivers who compensate for a perceived lack of ability on the part of the child (Stern & Hildebrandt, 1986). In the present study, the children with VLBW may have been less inclined to request assistance during the temptations because they expected the examiner to provide it, without the child signaling for assistance first.

Communicative means. The second research question focussed on the frequency and types of communicative signals (i.e., means) used by the toddlers with VLBW compared to the group with NBW. The group with VLBW used a variety of communicative means to express intentions (i.e., functions). The cluster scores for Communicative Means (Gestural, Vocal and Verbal) were not significantly different between the groups, sug-

gesting that the children with VLBW signaled communicative intentions just as frequently as the children with NBW. However, the scaled score analysis of the various types of gestures, vocalizations, and verbalizations used to signal intentions revealed some significant differences between the groups.

The children with VLBW used significantly fewer Coordinated Gestures and Vocalizations and Syllables with Consonants. One explanation for the significant differences in these two scales is that the children with VLBW may have had limited fine motor skills and coordination of the articulators. Herrgard, et al., (1993) found that preschoolers with VLBW exhibited minor impairment in fine motor skills and coordination. In addition, McAllister, et al. (1993b), found that preschoolers with VLBW exhibited minor deficits in articulation.

The poorer performance of the children with VLBW compared to their peers with NBW on the Coordination of Gestures and Vocalizations and Syllables with Consonants suggest that children with VLBW in the age-range of the current study (i.e., 15-20 months) may present with early indications of a later articulation deficit in the form of highly specific difficulty in the areas mentioned above (fine and articulatory motor skills). Although these limitations may not present clinically, as an articulation deficit early on, (due to the lack of spontaneous speech normally produced at 15-20 months), by preschool, the indications of impairment become more obvious. Previous studies have shown that deficits in underlying and/or highly specific areas of neurodevelopment may not be detected in infancy or toddlerhood since they appear to have no functional significance (Achenbach, et al., 1993; Jacobson & Jacobson, 1991). This study showed that the children with VLBW were functionally as capable of communicating their intentions as the NBW, evidenced by the lack of differences for all of the Commun-

icative Means clusters and the Communication Composite/Total score. The subjects with VLBW were able to compensate for possibly poorer articulatory-gestural coordination using several other types of signaling, such as distal and conventional gesturing and/or words.

Reciprocity. The third research question related to the reciprocal communication skills of the children with VLBW. The subjects with VLBW were as responsive as the subjects with NBW when the examiner initiated a communicative act toward the child; the former acknowledged communicative acts via gestural or verbal contingent behaviors. These findings are consistent with and support those presented earlier in this discussion regarding the social-interactive and joint attentional behaviors of the children with VLBW. While children with VLBW may be hyporesponsive to communicative input as infants (Field, 1979; Goldberg, et al., 1980) they become just as responsive as their peers with NBW by toddlerhood. In addition, the children with VLBW were just as successful at revising their communicative message after a failed attempt in order to obtain a communicative goal. This was evidenced by the lack of significant differences in Repair Strategies. Because the subjects with VLBW were competent in using a variety of communicative signals, as described above, they would be able to repair an unsuccessful message using an alternate communicative means.

The only scale included in Reciprocity which significantly differed between the groups when raw scores were analyzed was Rate of Communicative Acts. One explanation for this finding is that the significantly lower rate of Coordination of Gestures and Vocalizations and Syllables with Consonants used by the group with VLBW reduced the overall rate of communicative acts. Oller, et al. (1994) found a similar pattern in their study of infants' with LBW vocalizations. The infants with LBW were not delayed

in the acquisition of early vocalizations but the frequency of production of vocalizations was significantly less than that produced by controls with NBW.

Social-Affective Signaling. The final research question regarding the childrens' with VLBW ability to signal communication via gaze shifting, positive and negative affect revealed that significant differences were not obtained in any of the scales of this cluster. This finding shows the strengths of the children with VLBW to communicate nonverbally, with social-affective signalling, as frequently as their peers with NBW.

Comparison on CSBS standard scores. Significant differences were not found when the groups with VLBW and NBW were compared on percentile and standard scores using corrected-age for the subjects with VLBW. However, the standard scores obtained for both groups were lower than the CSBS means on most of the communication clusters (i.e., with exception of Social-Affective Signaling). One potential reason for the lower scores was cultural differences in social and communicative behaviors, associated with different child-rearing practices, parent interactions and family values between the standardization sample (predominately Caucasion) and the study groups (all African American) (Cazden, 1983; Heath, 1982).

The results of the standard score analysis, when chronological ages were used for the subjects with VLBW, were surprising. Significantly lower scores were expected on all of the clusters for the group with VLBW compared to the group with NBW since they were conceptually three months younger (developmentally). However, the children with VLBW performed comparably to peers with NBW on Communicative Means - Gesture, Reciprocity and Social-Affective Signaling. One explanation for the lack of differences in these three clusters is that they include relatively immature forms of communication compared to the other clusters, such as gaze shifting, smiling (positive affect) and

crying/whining (negative affect). These behaviors emerge in the first year of life, during the early stages of communication (Prizant & Wetherby, 1993). Because the children with VLBW would have had the most experience with these forms of communication, they appear to catch up to their chronologically age-matched peers in some areas of social-communicative functioning. However, because vocabulary and early syntactic development accelerate during the ages tested in this study (i.e., 15-20 months) (Tager-Flusberg, 1985), the group with VLBW may have been unable to keep up with chronologically age-matched peers in the rapidly growing areas of vocal and verbal development assessed by the CSBS; Communicative Means (Vocal and Verbal).

The results of the comparison between the groups using both corrected and chronological ages can be discussed in terms of the two major theories of early development. The ethological perspective proports that development is genetically programmed for behaviors to emerge at a specific time. The present results lend support to this theory because the group with VLBW did not significantly differ from their peers with NBW when corrected ages were used. This suggests that the social-communicative behaviors measured in this study were programmed to emerge at the same time in development for both groups.

The results using chronological ages lend some support to the opposing perspective. The constructivist perspective proports that the child determines the rate with which behaviors emerge through experience and actively shaping their development by mastering the environment. In the present study, the subjects with VLBW did not significantly differ from chronologically age-matched peers on three clusters of the CSBS (Communicative Means - Gesture, Reciprocity, and Social-Affective Signalling) although the former were developmentally younger than the latter. Because these clusters represent

the earliest forms of communication, the children with VLBW would have had more experience communicating with these behaviors than they would vocally or verbally. According to the constructivist perspective, the experience should have accelerated the rate with which the behaviors emerged. According to the ethological perspective, the behaviors should not have emerged until the children with VLBW matured another two-three months.

In summary, each perspective adequately explains some of the results of the comparison to the standardization sample. It appears that some social-communicative behaviors (i.e.,vocal and verbal behaviors) may be "hard wired" to emerge at a specific point in development. This is supported by the results showing that children with VLBW perform comparably to those with NBW on vocal and verbal clusters when corrected ages are used, but not when comparison is made with chronological ages. The social communicative behaviors which appear to be influenced by experience are those which are exhibited earliest in the communication of young children (e.g., gestures, smiling, crying). This is supported by the results showing that subjects with VLBW performed as well as chronologically-aged matched peers on the Communicative Means -Gesture, Social-Affective Signaling and Reciprocity clusters.

In summary, this study has shown that children with VLBW develop social and communicative behaviors in ways that are highly similar to children with NBW. The present findings suggest that children with VLBW, without significant medical or neurological impairment, appear not to be adversely affected in most areas of early communication by their early exposure to neonatal care and the associated consequences of being born early (e.g., atypical infant-caregiver interactions). These findings are contrary to what was pre-

dicted by the theory proposed by Als (1980). According to Als, the children with VLBW in this study should have obtained poorer scores on at least some of the social-communicative measures than the children with NBW due to differences in neonatal brain development, which affects processing of sensory information and communicative input.

Although differences in brain development between children with VLBW and NBW may exist, the effects may not be obvious until later ages. Duncan, Schneider, & Robertson (1996), who found significant differences between five to seven-year-old children with VLBW and NBW on measures of syntactic development, use Als' (1980) theory to suggest the following:

> Communication skills in the very preterm child may be affected as birth occurs at a time of rapid growth of the brain when much central nervous system maturation is occuring. If there is an interference with neuronal migration, for example, to the left hemisphere, the ensuing deficit, if any, may be in complex language functioning. Because communication skills depend upon the integration of motor, auditory, and cognitive systems and a facilitative social environment, they are at particular risk for impairment (p. 72).

Only the significantly lower scores on Coordination of Gestures and Vocalizations and Syllables with Consonants for the subjects with VLBW lend support to this theory. Perhaps the poorer performance obtained by the group with VLBW on these scales is the first indication of later impairment described above by Duncan, et al.(1996). Because of the relationship between early speech deficits and later language development (Rescorla & Berstein-Ratner, 1996), limitations in articulatory skills, discussed previously in this chapter, may predispose children with VLBW to later, higher-level

language deficits, such as those identified by Duncan, et. al. (1996). However, because so few significant differences were obtained across a wide range of behaviors and with several scoring procedures, the possibility that the differences were attributed to mere chance should not be ruled out.

Methodological Issues and Considerations of the CSBS

Assessment. The advantage of using a communication assessment such as the CSBS is that is allows for the evaluation of several areas of communication and social interaction skills. The majority of standardized assessments used to evaluate communication skills in young children do not include assessment of communicative functions, reciprocity, social-affective signalling and detailed vocal and verbal analyses. In addition, popular assessment tools do not evaluate the frequency a behavior is displayed. In other words, communication skills are typically scored for the presence or absence of a behavior (e.g., Preschool Language Scale (Zimmerman, et al., 1979) and the Sequenced Inventory of Communication Development (Hendrick, et al., 1975).
The results of this study show that measures of frequency using raw data may be more important in detecting group differences than items which simply identify if a particular skill or behavior has been mastered. Unfortunately, frequency measures are typically more time consuming because several behaviors must be observed over a specified period of time. Although, for research purposes, frequency measures may be appropriate when studying high-risk groups of children, this time consuming method of evaluation may not be clinically functional. In addition, raw scores are not clinically relevant because comparison across behaviors, subtests and/or different groups is not always possible. Norms for frequency measures of behaviors are needed which can be completed in a shorter observation period than what is recommended for the CSBS.

Because the developmental literature on children with VLBW postulates deficits in underlying areas of neurodevelopment, assessment tools which provide detailed analysis of behaviors are needed (Achenbach, et al., 1993; Stewart, et al., 1989). The results of the present study support this recommendation. Although the subjects with VLBW did not differ on more global scores (i.e., communication cluster scores, communication composite/total), some differences were found between the groups in the analyses of isolated behaviors. Thus, the CSBS seems to be an appropriate tool for the follow-up assessment of high-risk children.

One problem identified with the CSBS in this study was that the scoring procedures as outlined in the CSBS manual rely on scaled scores, which are calculated from raw scores, to compute a child's level of communicative functioning. The variability in subject performance was greatly reduced when the raw scores were transformed into scaled scores. For example, a child receiving a raw score of 31 on Behavioral Regulation would receive the same scaled score of 3 as a child who obtains a raw score of 19 because the scale ranges from 19-31. Because this method of scoring had the potential to mask smaller differences between the groups than could be detected with scaled scores, raw score comparisons were made across the 18 categories of behaviors.

Significant differences were detected in two of the individual categories when raw scores were compared between the groups. The subjects with VLBW scored significantly lower in the area of Behavior Regulation and Rate of Communicative Acts. These two measures of communication have not previously been used in studies of high-risk children. In addition, they are not typically included in standardized communication assessments of high-risk children. The analysis of raw scores proved a successful way to detect subtle, possibly, underlying differences in two areas of communication. Similarly,

Siegel, Cooper, Fitzhardinge, and Ash (1995) found that two-year old children with LBW with significant language delay scored in the normal range on the Mental Developmental Index of the BSID. However, the children with LBW with language delay were identified when a detailed analysis of the raw scores for language items on the Bayley was conducted. This example demonstrates another effective means for detecting speech and language delays in a high-risk group using a commonly administered, developmental assessment. Therefore, it is recommended that, in addition to the usual scoring procedures for the CSBS, researchers and clinicians consider analysis of raw scores and performance on particular subscales when evaluating high-risk children.

Intervention. The present study provided important information about the assessment of communication skills in a high-risk group of children. However, there are also some some important implications for early intervention with children with LBW. First, results of this study indicate that early intervention programs with a general focus on language stimulation to improve verbal skills may be inappropriate for children with LBW. The children in this study did not demonstrate significant deficits in linguistic areas (i.e., Words and Word Combinations). The areas identified as being significantly different between the groups were articulatory-fine motor, behavioral regulation and rate of communication. Consequently, caregivers of children with LBW would benefit more so from a program with concentrated efforts to improve communication skills in these areas.

Children with VLBW may require intervention programs which focus on motor speech and fine-motor coordination. In addition, treatment programs should focus on increasing the number of opportunities provided for communication in a daily activities (i.e.,modifying the environment to elicit more frequent requesting, protesting, etc.) since the present study showed that children with VLBW communicate at a lower rate than

those with NBW. Because of the many categories analyzed with the CSBS, it provides specific information about treatment goals to include in an intervention program. By targeting specific areas of communication, treatment programs would require less time, fewer professionals and financial resources to implement. Considering that the number of children born earlier and earlier will continue to grow with medical advances, treatment programs will need to become more efficient and easier to implement than what is currently available.

The limitations of this study include the following: 1) the number of subjects in each group (n=19) may have been inadequate to detect differences, 2) a parent perception questionaire was not utilized to determine whether or not the subjects' behavior at the time of testing was representative of his/her usual functioning, 3) the Peabody Picture Vocabulary Test-Revised (Dunn, 1965) was used to match subjects for parental verbal input to the child. This tool does not provide a comprehensive measure of the verbal input provided to the child by the caregiver.

Future studies of the communication skills of toddlers with VLBW should include some measure of child-caregiver interaction, such as the Nursing Child Assessment Teaching Scale (Sumner & Spietz, 1995) or the Ecological Communication Observation Scales (McDonald and Gillette, 1980), which would have been useful in studying the communication style of the parents of children with VLBW compared to the parents of children with NBW. The lack of significant differences between groups in this study may have been attributed to similar types of communicative input and interaction provided by the parents of the toddlers studied in this investigation. In addition, a larger sample size than what was used for the present study is recommended since significant differences in other areas of communication may be identified with more subjects.

Future studies should continue to investigate the individual and unique characteristics of high-risk children using proper control for confounding variables and comprehensive measures of communication which will provide important assessment and intervention information to reduce and possibly eliminate deficits which may otherwise be evident by school age.

Conclusions

The following conclusions are based on the results of this investigation:

1. The risk factor of very low birth weight does not appear to limit the basic communication skills of toddlers.
2. Toddlers with VLBW appear to have limited fine motor-articulatory coordination which may not have a functional consequence in toddlerhood.
3. Toddlers with VLBW appear to perform at their chronological age-level in nonverbal forms of communication.
4. Assessment tools which analyze a wide range of communicative behaviors and measure the frequency with which behaviors are displayed appear to hold promise in the detection of impairment and intervention with high-risk children.

Appendix A:

Socioeconomic Questionaire

I. IDENTIFYING INFORMATION

1. Subject Name:

_____

2. Mother's Name:

_____

Last First Middle

3. Father's Name:

_____

Last First Middle

4. Child's Address:

_____

Stree/Apt. # City State Zip Code

II. FAMILY SITUATION:

5. Does the child live with both parents? _____Yes _____No
(If no, who does the child live with? _____)

6. Are the child's parents married? _____Yes _____No

7. Number of Siblings (brothers and sisters): _____
What is the birth order of your child? _____First born
_____Middle Child
_____Last born

8. Total number of persons in the home: _____

9. How many rooms are in the child's home? _____

10. Who does the child spend the majority of time with during the day?

_____

11. How often do you read to your child? _____

IV. PARENTS AGE AND OCCUPATION:

12. Mother's Age: _____

13. Father's Age: _____

14. Mother's Highest Education Level:

_____Less than 7th grade
_____Junior high school (to 9th grade)
_____Partial high school (10th or 11th grade)
_____High school graduate
_____Partial College (at least 1 year)
_____College or University graduation
_____Graduate-Professional training (graduate degree)

15. Father's Highest Education Level:

_____Less than 7th grade
_____Junior high school (to 9th grade)
_____Partial high school (10th or 11th grade)
_____High school graduate
_____Partial College (at least 1 year)
_____College or University graduation
_____Graduate-Professional training (graduate degree)

16. Mother's Occupation: _____

17. Father's Occupation: _____

18. Approximate Yearly Household Salary: _____

V. INTERVENTION INFORMATION:

19. Does the child receive early intervention services (a teacher comes to the home or the child is taken to a center for therapy)?

_____Yes _____No

20. Does the child receive speech-language therapy?

_____Yes _____No

VI. BIRTH AND PREGNANCY INFORMATION:

21. Did you smoke during your pregnancy? _____Yes _____No
(If yes, how many packs per day? _____)

22. Did you drink alcohol during your pregnancy? _____Yes _____No
(If yes, how many drinks per day or week? _____)

23. Did you use any other illegal drugs during your pregnancy?

_____Yes _____No

(If yes, what drug?_____ How often used?_____)

Appendix B:

Informed consent for Subjects with Normal Birth Weight and Very Low Birth Weight

HENRY FORD HOSPITAL
INFORMED CONSENT FOR CONTROL SUBJECTS WITH NORMAL BIRTH WEIGHT

Title: Communicative Behaviors of Toddlers with Very Low Birth Weight in Social Contexts

1. Purpose of the Project

You are being asked to have your child participate in a research study because your child was a healthy, full-term infant at the time of birth and he/she has no serious medical conditions. The purpose of this research project is to study the early language skills of children who were born premature and who were very low birth weight and compare these skills to children who were born full-term.

There will be 37 other children in this research study at Henry Ford Hospital and Medical Centers. Nineteen children will have histories of prematurity and very low birth weight (VLBW) and nineteen children will have histories of being full-term with normal birth weight (NBW).

2. Procedures of the Project

Your child is being asked to participate for one, 2-hour appointment. In the first hour, your child will be given a test of thinking skills (The Bayley Scales of Infant Development). In the second hour, your child will be given a test of language skills (The Communication and Symbolic Behavioral Scales). Your child will be given a break in between the tests if needed. The tests will be given at the out-patient clinic of The Speech-Language Pathology department of Henry Ford Hospital. As part of this study, your child will be videotaped during the testing. You will also be asked to complete a questionaire and take a short (10-15 minutes) language test where you will name common pictures. You will be present with your child during all phases of the testing.

3. Risks/Discomforts of the Project

There are no risks expected in this project. Your child may be uncomfortable with the examiner at the beginning of the testing session. However, most children are interested and amused by the activities in the test which generally allows the child to feel comfortable with the examiner in a short period of time.

4. Benefits of the Project

The information which will be gathered from the two tests given to your child will be helpful in finding out if your child has any early problems in thinking skills and/or speech and language development which might not be identified without this testing. You would then be given the option to get treatment for your child through the school system. In addition, you will be given brochures with information about normal speech and language development to help you identify any problems in speech and language skills at later ages. Because you will be able to observe the testing with the Speech-Language Pathologist, you may also learn ways to help your child talk if he/she is not yet doing so.

5. Alternatives to Participation

There is no routine way to test speech and language skills for children who are healthy and have no serious medical problems. You may complete a short checklist for speech and language behaviors during your child's routine pediatric appointment. However, this process only screens for 1-2 behaviors. It is not an in-depth test of speech and language development.

6. Privacy

Research data that include your child's name or other identifying information will not be published or otherwise released unless you give permission in writing or unless there are legal requirements to disclose that information.

7. Injury due to Project

If your child has a medical emergency as a result of participating in this study while at Henry Ford Hospital and Medical Centers, emergency treatment will be given to your child. There is no federal, state, or other program that will compensate you or pay for your child's medical care if he/she is injured as a result of participating in this study. You and/or your medical insurance may have to pay for your child's medical care if he/she is injured as a result of participating in this study.

8. Information about the Project

Ms. Colleen Allen, M.S., CCC/SLP has explained this project and has offered to answer any questions. If you have additional questions about the research, you may contact Dr. S. Kumar at (313) 876-3146. If you have questions about your rights as a research subject you may contact Ms. Julie Washington in the Research Office at Henry Ford Hospital at (313) 876-2024.

9. Voluntary Participation

Your child's participation in this research study is voluntary. Your child does not have to take part in this study, and if you decide to have your child participate, he/she can stop at any time. If you decide to not have your child participate, or if your child enters the study but then you later decide to stop, your child will get the same medical care from Henry Ford Hospital and Medical Centers that he/she would have without your consenting to take part in the study. There will be no penalities or loss of benefits that would otherwise be entitled if you choose to not have your child participate or if you choose to stop your child's participation once he/she has started.

10. Stopping the Project

The project director or examiner can end your child's part in the research if he/she exhibits uncontrollable and/or destructive behavior at any point during the testing. In addition, your child's part may end if he/she exhibits significant inattention to test stimuli, hyperactivity or any other behaviors which result in difficulty completing the assessment. You may be asked to return for a second visit if it is anticipated that the child's behavior would improve at another time.

11. Cost to the Subject

You will not have any extra medical costs because your child is in the study.

12. Payment to the Subject

You will be reimbursed $50.00 for your child's participation. Your check be mailed to you approximately 4 weeks after all testing is completed.

13. Consent

This consent has been reviewed with you. You have read this consent form or it has been read to you. All of the procedures have been explained to you. You understand what your child is being asked to do. Your questions have been answered, and any technical terms you did not understand have been defined for you. You agree to have your child in this study. You will be given a copy of this consent form.

_____ _____

Signature of Subject's Parent(s) Date

_____

Print Name of Person(s) Signing and Relationship to Subject

_____

Print Name of Minor Subject

_____ _____

Witness' Signature Date

_____ _____

Investigator's Signature Date

HENRY FORD HOSPITAL
INFORMED CONSENT FOR SUBJECTS WITH
VERY LOW BIRTH WEIGHT

Title: Communicative Behaviors of Toddlers with Very Low Birth Weight in Social Contexts

1. Purpose of the Project

You are being asked to have your child participate in a research study because your child was premature when he/she was born. The purpose of this research project is to study the early language skills of children who were born premature and who were very low birth weight and compare these skills to children who were born full-term.

There will be 37 other children in this research study at Henry Ford Hospital and Medical Centers. Nineteen children will have histories of prematurity and very low birth weight (VLBW) and nineteen children will have histories of being full-term with normal birth weight (NBW).

2. Procedures of the Project

Your child is being asked to participate for one, 1-hour appointment. Your child will be given a test of language skills (The Communication and Symbolic Behavioral Scales). The test will be given at the out-patient clinic of The Speech-Language Pathology department of Henry Ford Hospital. As part of th is study, your child will be videotaped during the testing. You will also be asked to complete a questionaire and take a short (10-15 minutes) language test where you will name common pictures. You will be present with your child during all phases of the testing. The Bayley Scales of Infant Development is a developmental test routinely given to children born premature during visits to the Developmental Assessment Clinic (DAC) at Henry Ford Hospital. If your child has not been seen in the DAC or has not been given a Bayley test within 6 months of this study, you will be asked to bring your child for Bayley testing by a cert ified Occupational Therapist. This test is needed for your child to participate

in this study.

3. Risks/Discomforts of the Project

There are no risks expected in this project. Your child may beuncomfortable with the examiner at the beginning of the testing session. However, most children are interested and amused by the activities in the test which generally allows the child to feel comfortable with the examiner in a short period of time.

4. Benefits of the Project

The information which will be gathered from the test given to your child will be helpful in finding out if your child has any early problems in speech and language development which might not be identified without this testing.
You would then be given the option to get treatment for your child through the school system. In addition, you will be given brochures with information about normal speech and language development to help you identify any problems in speech and language skills at later ages. Because you will be able to observe the testing with the Speech-Language Pathologist you may also learn ways to help your child talk if he/she is not yet doing so.

5. Alternatives to Participation

Your child's speech and language development is usually checked during your Developmental Assessment Clinic (DAC) visits. The DAC visits are scheduled every 3-6 months until 3 years of age. The testing in DAC is a screening rather than an in-depth evaluation of speech and language skills.

6. Privacy

Research data that include your child's name or other identifying information will not be published or otherwise released unless you give permission in writing or unless there are legal requirements to disclose that information.

7. Injury due to Project

If your child has a medical emergency as a result of participating in this study while at Henry Ford Hospital and Medical Centers, emergency treatment will be given to your child. There is no federal, state, or other program that will compensate you or pay for your child's medical care if he/she is injured as a result of participating in this study. You and/or your medical insurance may have to pay for your child's medical care if he/she is injured as a result of participating in this study.

8. Information about the Project

Ms. Colleen Allen, M.S., CCC/SLP has explained this project and has offered to answer any questions. If you have additional questions about the research, you may contact Dr. S. Kumar at (313) 876-3146. If you have questions about your rights as a research subject you may contact Ms. Julie Washington in the Research Office at Henry Ford Hospital at (313) 876-2024.

9. Voluntary Participation

Your child's participation in this research study is voluntary. Your child does not have to take part in this study, and if you decide to have your child participate, he/she can stop at any time. If you decide to not have your child participate, or if your child enters the study but then you later decide to stop, your child will get the same medical care from Henry Ford Hospital and Medical Centers that he/she would have without your consenting to take part in the study. There will be no penalities or loss of benefits that would otherwise be entitled if you choose to not have your child participate or if you choose to stop your child's participation once he/she has started.

10. Stopping the Project

The project director or examiner can end your child's part in the research

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if he/she exhibits uncontrollable and/or destructive behavior at any point during the testing. In addition, your child's part may end if he/she exhibits significant inattention to test stimuli, hyperactivity or any other behaviors which result in difficulty completing the assessment. You may be asked to return for a second visit if it is anticipated that the child's behavior would improve at another time.

11. Cost to the Subject

You will not have any extra medical costs because your child is in the study.

12. Payment to the Subject

You will be reimbursed $25.00 for your child's participation. Your check be mailed to you approximately 4 weeks after all testing is completed.

13. Consent

This consent has been reviewed with you. You have read this consent form or it has been read to you. All of the procedures have been explained to you. You understand what your child is being asked to do. Your questions have been answered, and any technical terms you did not understand have been defined for you. You agree to have your child in this study. You will be given a copy of this consent form.

Signature of Subject's Parent(s)	Date
Print Name of Person(s) Signing and Relationship to Subject	
Print Name of Minor Subject	
Witness' Signature	Date
Investigator's Signature	Date

Appendix C:

Examples of Communication and Symbolic Behavior Scales (CSBS) Behaviors

Examples of Communicative Functions.

	Examples
Behavioral Regulation	Requesting Object/Action Acts
	Protesting Object/Action Acts
Social Interaction	Requesting Social Routine Acts
	Requesting Comfort Acts
	Calling Acts
	Greeting Acts
	Showing Off Acts
	Requesting Permission Acts
Joint Attention	Commenting on Object/Action Acts
	Requesting Information Acts

Examples of Communicative Acts.

	Examples
The act is a gesture, vocalization, or verbalization	giving object to adult touching adult's hand, arm, body, or face moving adult's hand or face pushing object toward or away from adult head shaking or nodding hitting, biting, or pinching self or adult throwing or dropping object showing off without object showing off with object near child's face making indicative gesture(e.g., pointing) making depictive gesture (e.g., pantomime-like action) waving clapping nontranscribable vocalization transcribable vocalization verbalization (single, multiword or signed)
The act was directed toward the adult	giving object to adult touching adult moving object toward or away from adult using any other gesture and looking at adult using any other gesture and vocalization or verbalization using a vocalization or verbalization and looking at adult

Examples of Communicative Acts.

	Examples
The act serves a communicative function	behavior regulation
	social interaction
	joint attention

Examples of Reciprocity.

	Examples
Respondent Act	1. Adult: You're playing with the doll. Child: (holds up doll to show adult) 2. Adult: Give me the ball. Child: My ball.
Repair Strategies	
Repeated Act	1. Adult: What do you want? Child: ba. Adult: A what? Child: ba.
Modified Act	2. Adult: What do you want? Child: ba. Adult: A what? Child: da ba. (that ball)
Rate of Communicative Acts	The number of communicative acts per minute

Appendix D:

Percentages of Agreement between Experienced and Trained Raters for Communication and Symbolic Behavior Scales (CSBS)

Percentages of Agreement between Experienced and Trained Raters for Communication and Symbolic Behavior Scales (CSBS).

Scale	% Agreement
Communicative Function	
Behavior Regulation	.91
Social Interaction	.80
Joint Attention	.85
Communicative Means - Gestural	
Conventional Gestures	.97
Distal Gestures	.90
Coordination of Gestures and Vocalizations	.80
Communicative Means - Vocal	
Vocal Acts without Gestures	.78
Inventory of Different Consonants Used	1.00
Syllables with Consonants	.87
Multisyllables	.85
Communicative Means - Verbal	
Inventory of Different Words Expressed	.95
Inventory of Different Word Combinations	1.00
Reciprocity	
Respondent Acts	.55
Rate of Communicative Acts	.97
Repair Strategies	.96
Social-Affective Signaling	
Gaze Shifts	.86
Shared Positive Affect	.50
Episodes of Negative Affect	1.00

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ABSTRACT

COMMUNICATIVE BEHAVIORS OF TODDLERS WITH VERY LOW BIRTH WEIGHT IN SOCIAL CONTEXTS

by

COLLEEN MARY ALLEN

May, 1998

Co-Advisors: Lynn S. Bliss, Ph.D.
Melissa Estrin-Kaplan, Ph.D.

Major: Audiology and Speech-Language Pathology

Degree: Doctor of Philosophy

The purpose of this investigation was to examine the social-communicative behaviors of toddlers born with Very Low Birth Weight (VLBW) in contexts of social interaction and communicative temptation. Nineteen toddlers with VLBW were compared to nineteen NBW toddlers on communicative means, communicative functions, reciprocity and social-affective signaling using the Communication and Symbolic Behavior Scales. The major findings of this research were: children with VLBW did not differ from NBW children in global measures of social and communicative functioning, children with VLBW were limited in highly specific areas of communication such as fine motor and articulatory coordination, children with VLBW did not differ from chronologically age-matched children in nonverbal social-communicative measures. The results are discussed in terms of early developmental and neurodevelopmental theories.

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