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PREVERBAL LANGUAGE ABILITIES IN MONOZYGOTIC AND DIZYGOTIC TWINS

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Abstract

This study examined prelinguistic language development of twins by delineating: differences from developmental expectations; twin-twin communication and twin-mother communication differences; and monozygotic-dizygotic differences. Nine families with twins between seven and 16 months of age participated in the study. Five families had dizygotic twins, three of which were male/female pairs, and four families had monozygotic twins, only one of which was female. The primary caregiver completed a developmental history. Data consisted of Dore's Primitive Speech Acts (PSA) coding during in-home video-taping (30 minute sessions) with a second coding from the video material, and maternal reporting of vocabulary and communication using the MacArthur-Bates Communicative Development Inventory (CDI) for each twin. Variations were found between twin-twin and twin-mother use of PSA with all twins using more PSA with mothers. Dizygotic twins used more PSA overall and had better communication scores on the CDI than did monozygotic twins. Overall, results suggest that twins may be at a greater risk for language delay than singletons and monozygotic twins even more so.

The study of twins has contributed to the understanding of development in several ways. Identical twins (I), or monozygotic twins, are defined as twins that originate from one egg. Fraternal twins (F), or dizygotic twins, are defined as twins that originate from two separate eggs but share the same uterus. From a research perspective, twins provide a unique window to development because they share the same environment but can vary genetically (I/F) and/or by gender.

Sometimes twins are used as constants and variables in scientific studies. In such studies, one twin is given a certain stimulus while the other is left as the constant to see how the stimulus will impact such developmental issues as language. Twin studies have also been used as a comparison and/or contrast of development in twins versus singletons. Such was the case with a study by Day (1932) as well as one by Rutter, Thorpe, Greenwood, Northstone and Golding (2003). Each of these studies investigated the language development and delay of children by comparing the performance of singletons to twins. There have also been cases where researchers have compared development between fraternal and identical twins. For example, Fischer (1973) as well as Munsinger and Douglass (1976) looked at the similarities and differences in the ways identical and fraternal twin pairs developed. Both of these studies looked at language development in terms of the specific aspects of language; Fischer (1973) compared all aspects, and Munsinger and Douglass (1976) looked specifically at syntactic abilities. Twins are particularly interesting when studying child language acquisition since research indicates environment influences language development (Fischer, 1973) and that twins frequently evolve a shared language code of their own (Malmstrom & Silva, 1986).

In research on the development of children in general (i.e., single children and not necessarily twins), there has been considerable investigation of development in the preverbal stage of infancy. This stage is usually six to 12 months of age and is characterized by vocalizations, such as babbling, and nonverbal communication, such as eye contact and meaningful gestures. One significant area of research involves primitive speech acts, which preverbally focus on the emerging use of sounds, voice and gesture for communication and then become verbal pragmatics. Primitive speech acts were adapted from the work of Austin (1962) and Searle (1969) by Dore in 1975 in order to analyze the communicative functions of infants at the preverbal and emerging language stages. "A primitive speech act might be a word, a change in prosodic pattern, or a gesture" (Hulit & Howard, 2002, p. 133). Dore found that young children used these speech acts to identify objects, reject objects, or to gain the attention of a specific person. The acts themselves, especially if they are gestures, have little semantic or syntactic relevance, and mainly serve a pragmatic purpose.

While differences in the development of the verbal aspects of language have been studied in twins, these early communicative acts characterized by Dore's work have not been the focus of past studies. It would seem reasonable that even these early aspects of communication development might differ from documented normal developmental patterns since: 1) twins reared together are constant communication dyads from birth; and 2) parents must divide their attention between the demands of two children as they move simultaneously through development. The goal of this study is to gain

information about the early speech acts of twins in the prelinguistic and emerging language stages of development in order to determine if differences may indeed be present even at this early age.

Review of the Literature

A literature review surveying twin language development was completed and is reported here. Both developmental studies and investigations of language differences are included. Because social communication shifts from being adult driven to child initiated somewhere around eight months of age (Owens, 2001), effort was made to include emerging language studies. However, this has apparently not been a focus of twin language research and there is little literature to review.

Munsinger and Douglass (1976) compared not only identical and fraternal twin pairs, but also the language development of their siblings, specifically looking at language skills due to genetics and environmental factors. Munsinger and Douglass studied 37 identical twin pairs and 11 of their siblings, and 37 same-sex fraternal twin pairs and 18 of their siblings. All participants were between the ages of 3 and 17 years and were found through Mothers of Twins Clubs in San Diego County. They used two different measures to test language and an intelligence test. Munsinger and Douglass concluded that identical twins had more similar language skills than fraternal twins. In addition, they found that fraternal twins and singletons develop language similarly.

In a study like this earlier work but with a language disorder base, Viding, Spinath, Price, Bishop, Dale, and Plomin (2004) looked at the genetic versus environmental causes for language disorders in twins. Participants were taken from an earlier study called Twins Early Development Study (TEDS). Participants included identical twin pairs, same-sex fraternal twin pairs, and opposite-sex fraternal twin pairs, all 4 years old with low vocabulary and grammar scores. The language test battery included nine different tests administered to each twin by a different tester to avoid biases. Viding et. al found that severe language impairment as opposed to more mild language impairment was usually influenced by genetics. It was also noted that more boys are impaired than girls. Again, environmental factors and genetics were studied to find the influence on twin language development in a study done by Kovas, Hayiou-Thomas, Dale, Bishop, Plomin, and Oliver (2005). This study also used participants from TEDS. In this case they were, on average, 4.5 years of age – some were within normal developmental ranges for control, and some had a measurable impairment. Each child was given a battery of verbal and nonverbal tests by a different tester to avoid biases. Kovas et. al tested the following aspects of language: expressive semantics, expressive syntax, receptive syntax, verbal memory, receptive phonology, and expressive phonology. They found that most aspects of language showed moderate heritability and moderate influence of nonshared environment. The study also noted that they did not find significant differences between the development of boys and girls.

As referenced earlier, Rutter, Thorpe, Greenwood, Northstone and Golding (2003) compared the development of twins and singletons, hypothesizing that perinatal features may be the cause for language delay among twins relative to the development of singletons. The study had a participant sample numbering more than 80 twin pairs and about 80 singletons. The assessments were obtained in the homes and completed at 20 months and 36 months for all participants. The primary caregiver was asked to fill out a language assessment and a verbal functioning assessment. Also, each child was assessed in the areas of language, cognitive abilities, and short-term memory. The researchers looked at medical and birth history information as well as family background. While they found that twins' language was significantly behind that of singletons through the first three years, the cause of the delays was not associated with perinatal features. It is interesting to note that these findings of twin delay still applied after full adjustment for the tendency among twins to be born prematurely.

In research by Thorpe, Rutter and Greenwood (2003), twins were assessed in naturalistic environments to study causes of language delay. The study included 96 twin pairs born after at least 33 weeks of gestation and 98 pairs of singletons who were close in age. Each child was assessed in the areas of language and cognitive abilities, and their primary caregivers were given an assessment of maternal depression and verbal functioning. Home visits were conducted at 20 months and 36 months of the children's age, in which parent interviews were done as well as observations of parent-child interaction. Their findings showed that one possible reason for language delay in twins, as compared to singletons, may be the fact that parent-child interaction is markedly different in these situations. It is easy to see, for example, that parents of twins will be less likely to focus ample amounts of attention on both twins than they would when dealing with a single child. This is clearly one of the environmental factors that would affect language development and delay. Maternal depression proved irrelevant in causing language delay in either twins or singletons.

Malmstrom and Silva (1986) found evidence of a "twin language" in their study of one pair of identical twin girls. The data consisted of 31 hours of tape recorded conversation between the girls from the time they were two years old through 3 years, 9 months old. This specific study showed that the girls developed a special joint name for themselves, as well as the use of "me" and singular verbs when referring to themselves as a unit. Malmstrom and Silva concluded that the girls did not have an immature development of syntax, but used appropriate forms indicative of their twin status. Research on twin languages has shown that when this develops, normal language development is delayed. Twin

languages are more commonly found in identical twins, rather than fraternal twins, but even then it is very rare, or very rarely reported.

As can be seen from this literature review, language development in twins has been studied in a number of ways resulting in a variety of findings. There is an overall consensus that twins do often use a shared language that may or may not impact the developmental trajectory expected for normal acquisition. Noting that most of these studies focus on the magic years of language development (i.e., 24 to 48 months) it is not surprising that morpho-syntax and semantic variations are most frequently cited in the literature. It is less clear if twins exhibit differences in the six to 12 month age range when language is just emerging. It would seem reasonable that twinness might influence the pragmatic skills that infants use to bootstrap the development of language form and content since they might attend more to each other during joint attention tasks, and that the attention of parents may be more splintered due to the simple imperative to manage life as the babies become more mobile.

A credible way to study language ability in prelinguistic children is to look at their early understanding of language and socialized gesture as reported by parents and additionally as observed within familiar everyday activities. Calculating the number of words understood is a semantic measure, while looking at vocalizations and nonverbal communication is a measure of pragmatic development. Due to the lack of research in the literature on twins in the prelinguistic stage, it seems appropriate that a study should be done to investigate the speech acts of identical and fraternal twins. This leads to the specific questions of this study.

1. Do the prelinguistic skills of twins differ from developmental expectations during the second six months of life?
2. Do the speech acts of twins differ between use with each other and use with adults during the second six months of life?
3. Do prelinguistic skills differ between identical and fraternal twins during the second six months of life?

Methodology

Participants

Nine families with monozygotic or dizygotic twins between seven and 16 months of age participated in the study. No controls were used for social and economic background, race, birth order, or health problems. The families were given codes from 1 through 9 in order of the twins' age at the time of the study; all twin sets used in the study fell between the ages of the twins in Family 1 (7 months 21 days old) and Family 9 (15 months 24 days old). Of the families that participated, there were five families with dizygotic twins, three of which were male/female pairs, and four families with monozygotic twins, only one of which were females. Three sets of twins from the whole group were second in their family's birth order; all other sets were the family's first children, as seen in Table 1.

Table 1
Age, Sex, Zygocity, and Birth Order of Twin Participants

Dizygotic Twins				
	Age (month and days)	Sex	Zygocity	Birth Order
Family 1 - Twin A	7m 21d	Male	Fraternal	First
Family 1 - Twin B	7m 21d	Male	Fraternal	First
Family 3 - Twin A	8m 7d	Female	Fraternal	First
Family 3 - Twin B	8m 7d	Male	Fraternal	First
Family 4 - Twin A	8m 28d	Male	Fraternal	Second
Family 4 - Twin B	8m 28d	Male	Fraternal	Second
Family 5 - Twin A	9m 15d	Male	Fraternal	Second
Family 5 - Twin B	9m 15d	Female	Fraternal	Second
Family 7 - Twin A	13m 1d	Female	Fraternal	First
Family 7 - Twin B	13m 1d	Male	Fraternal	First
Monozygotic Twins				
Family 2 - Twin A	7m 25d	Male	Identical	First
Family 2 - Twin B	7m 25d	Male	Identical	First
Family 6 - Twin A	9m 23d	Male	Identical	First
Family 6 - Twin B	9m 23d	Male	Identical	First
Family 8 - Twin A	13m 7d	Male	Identical	Second
Family 8 - Twin B	13m 7d	Male	Identical	Second
Family 9 - Twin A	15m 24d	Female	Identical	First
Family 9 - Twin B	15m 24d	Female	Identical	First

As reported by the mothers on a developmental history form, six of the nine sets of twins were born prematurely (i.e. before 37 weeks gestational age). As seen in Table 2, many of the participants remained in the neonatal intensive care unit (NICU) for some length of time, though health problems were minimal among the participants.

Table 2
Health Status of Twin Participants

Dizygotic Twins			
	Gestational Age	NICU	Health Issues
Family 1 - Twin A	34 weeks	10 days	Acid reflux
Family 1 - Twin B	34 weeks	10 days	Acid reflux
Family 3 - Twin A	34 weeks	14 days	Reflux
Family 3 - Twin B	34 weeks	14 days	Reflux
Family 4 - Twin A	35 weeks	14 days	Immature lungs
Family 4 - Twin B	35 weeks	14 days	None
Family 5 - Twin A	40 weeks	0 days	None
Family 5 - Twin B	40 weeks	0 days	None
Family 7 - Twin A	37 weeks	0 days	None
Family 7 - Twin B	37 weeks	0 days	None
Monozygotic Twins			
Family 2 - Twin A	35 weeks	12 days	None
Family 2 - Twin B	35 weeks	12 days	None
Family 6 - Twin A	33 weeks	35 days	None
Family 6 - Twin B	33 weeks	35 days	None
Family 8 - Twin A	34 weeks	28 days	None
Family 8 - Twin B	34 weeks	28 days	None
Family 9 - Twin A	40 weeks	0 days	None
Family 9 - Twin B	40 weeks	0 days	None

Procedures

Information about the study and a request for volunteers was distributed through doctors' offices and parenting networks (e.g. Mothers of Multiples Groups) in northwest Arkansas and Sugar Land, Texas. Interested families contacted the researcher by e-mail and the study was explained using an IRB approved script.

The study was conducted in the homes of each participating family. Parents were asked to fill out a brief developmental history for each child prior to meeting with the researcher. This served to document each twin's developmental status at the time of the data collection. Each family in the study was video taped participating in familiar play activities. The researcher adapted the video taping sessions in a variety of ways to fit each family's preferences and comfort levels as was appropriate. With some families, there were three distinct parts to the video taping: the twin set interacting together in their playroom for approximately 10 minutes; the mother and Twin A interacting in the playroom while Twin B was entertained by a third party in a separate room for 10 minutes; and then the mother and Twin B interacting in the playroom for 10 minutes while Twin A was entertained by a third party in a separate room. With other families, the separate sessions were not so deliberate or divided. The video data collected with these participants was 30 minutes of twin-twin interaction, twin A-mom interaction, and twin B-mom interaction randomly dispersed throughout the session. Finally, in a third scenario, the mother was constantly present with the twins and she was observed predominantly interacting with Twin A, interspersed among the twin-twin interaction. In these situations, a third party would remove Twin A from the playroom after 20 minutes to allow for distraction-free Twin B-mom interaction. In all cases, a minimum of 30 minutes of video recordings were obtained.

Following the video recording/observations, the parents were asked to fill out the MacArthur-Bates Communicative Development Inventory (CDI) for each child in order to document their language development status. All participants returned the completed forms to the primary researcher by mail within one to two weeks of the recording session except for Family 9. These twins were recorded at 15 months and 24 days of age, but the primary caregiver did not return the CDI form until the children were almost 18 months old.

The play activities for all participants utilized toys that the children were already familiar with in order to provide more natural opportunities for primitive speech acts (i.e., requesting, labeling, protesting). A coding sheet using Dore's Primitive Speech Acts (PSA) categories was designed by the researcher so nonverbal, vocal and/or verbal engagement with these speech acts by each of the participants could be documented. The use of speech acts was coded during the actual data-gathering session and then checked by viewing the recordings. A second coder reviewed and independently coded 25% of the video material using a description sheet that described each of the speech act categories. There was 90% agreement between the primary researcher and second coder.

Analysis

Information gathered from each family's history form was collapsed into a table that summarized health and developmental status. The presence or absence of each speech act category and the mode of communication (nonverbal, vocal, verbal) for each twin as well as the primary caregiver were summarized for each family. In addition, the CDI was scored and interpreted into percentages or percentiles according to the test manual. This information was then collapsed into tables that allowed each question of the study to be addressed.

Results

In order to look at the results of the study more easily, the 9 participating families will be divided into 3 groups according to the age of the children. The first group, Group A, will be made up of Family 1, 2, and 3 – all of which are about 8 months old. The second group, Group B, will be made up of Family 4, 5, and 6 – all of which are about 9 to 10 months old. Group C will be made up of Family 7, 8, and 9, the oldest group, who were between 13 and 16 months of age. These three groups will be used to help answer questions one and two. The natural division among the families, those who have monozygotic twins and those who have dizygotic twins, for each data set was used to answer question three.

Question #1

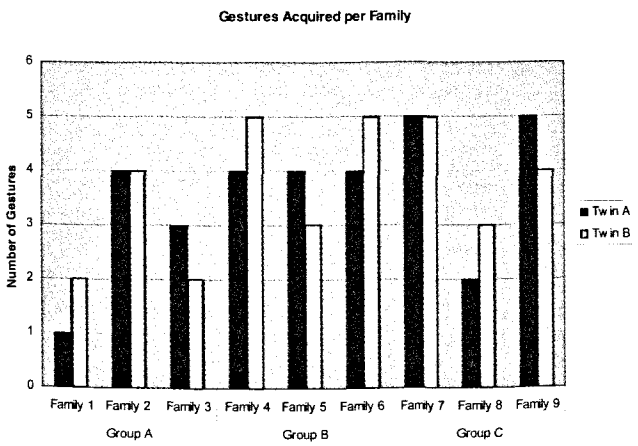
The first question of the study asked if the prelinguistic skills of twins differ from developmental expectations during the second six months of life. This question was answered by looking at each child's results from the CDI and the PSA coding. Vocabulary comprehension and production scores and early gestures scores on the CDI are recorded in percentiles that correspond to the age and sex of the child and how many words the mother reported that each child understood and produced or how many gestures the child had at the time of the study. In Table 3, these percentile scores have been converted into a developmental status of either "within normal limits" (WL) or "at risk" (AR) using the normal distribution curves and research information in the test manual. According to the manual, vocabulary production scores are not the best predictor of later language delay. in fact there is evidence to show that a child with delays in comprehension, production, and gestures will be "at greater risk for persistent language delay than a child with an expressive language delay alone" (Fenson, Marchman, Thal, Dale, Reznick, & Bates 2007). With this information, the researcher decided to give an "at risk" rating if the child's scores were in the 15th percentile or below in two or more areas. Below, Table 3 shows that three of the nine families were identified as at risk by these guidelines and the other six families were all within limits for their age.

Each primitive speech act was coded from the PSA form as either being present or absent as observed by the researcher in the time spent with each family. The speech acts coded were greeting, calling, labeling, answering, requesting an object, requesting an action, protesting, and imitating. Each act was coded as being nonverbal, vocal, or verbal. Many of

Table 3
Early language development in percentiles as reported on MacArthur-Bates Communicative Development Inventories

Dizygotic Twins				
	Vocab Comprehension	Vocab Production	Early Gestures	Dev Status
Family 1 - Twin A	25	85	45	WL
Family 1 - Twin B	25	85	45	WL
Family 3 - Twin A	85	40	45	WL
Family 3 - Twin B	90	55	60	WL
Family 4 - Twin A	40	55	25	WL
Family 4 - Twin B	40	55	25	WL
Family 5 - Twin A	65	75	50	WL
Family 5 - Twin B	60	65	60	WL
Family 7 - Twin A	35	65	25	WL
Family 7 - Twin B	40	45	35	WL
Monozygotic Twins				
Family 2 - Twin A	70	55	5	AR
Family 2 - Twin B	70	55	5	AR
Family 6 - Twin A	15	55	5	AR
Family 6 - Twin B	15	55	5	AR
Family 8 - Twin A	25	55	45	WL
Family 8 - Twin B	35	55	60	WL
Family 9 - Twin A	20	<1	<1	AR
Family 9 - Twin B	20	<1	<1	AR

Figure 1



these speech acts correlated with some of the early gestures reported on the MacArthur forms. In this way, it was possible to compare parent-reported gestures and researcher-observed gestures. According to normative information about child language development (Paul, 2001), children between the ages of 8 and 12 months should be using the following five gestures as pragmatic acts: requesting objects and actions, protesting, imitating, and labeling. Paul also reports that children between 12 and 18 months of age should develop verbalizations to accompany and/or replace these gestures. In Figure 1, the five gestures were considered developed if the child had produced each gesture nonverbally (i.e. a true gesture without a supporting sound). The majority of twins in each family were using at least three of these five gestures.

In Figure 2, the number of verbals acquired for each twin in Group C (out of the five reported by Paul) were compared to the number of nonverbals acquired. This figure only examines the results from Group C because this is the only group with children above 12 months of age. Because so few verbals had been acquired in this group, the number of vocals was added to the figure so it could be seen that, although the children were not using verbalizations for primitive speech acts, they had progressed to using meaningful vocalizations to accompany their gestures.

Question #2

The second question of the study asked if the speech acts of twins differ between use with each other and use with adults during the second six months of life. With one exception, twins consistently used more speech acts with their moms than with their sibling.

In Group A, each twin used more speech acts with their mother than with their sibling. In Group B, two of the families had similar numbers of acts with their siblings as with their mothers and in the third family, Family 6, each twin had at

Figure 2

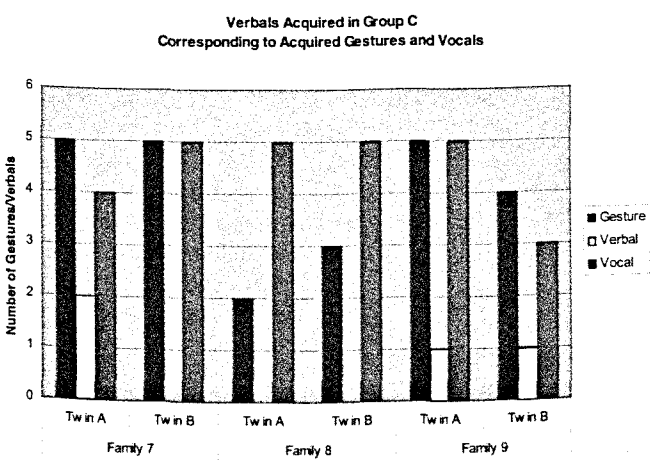
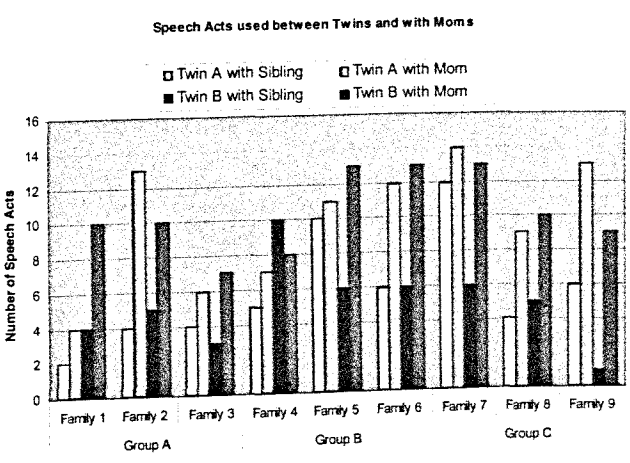


Figure 3

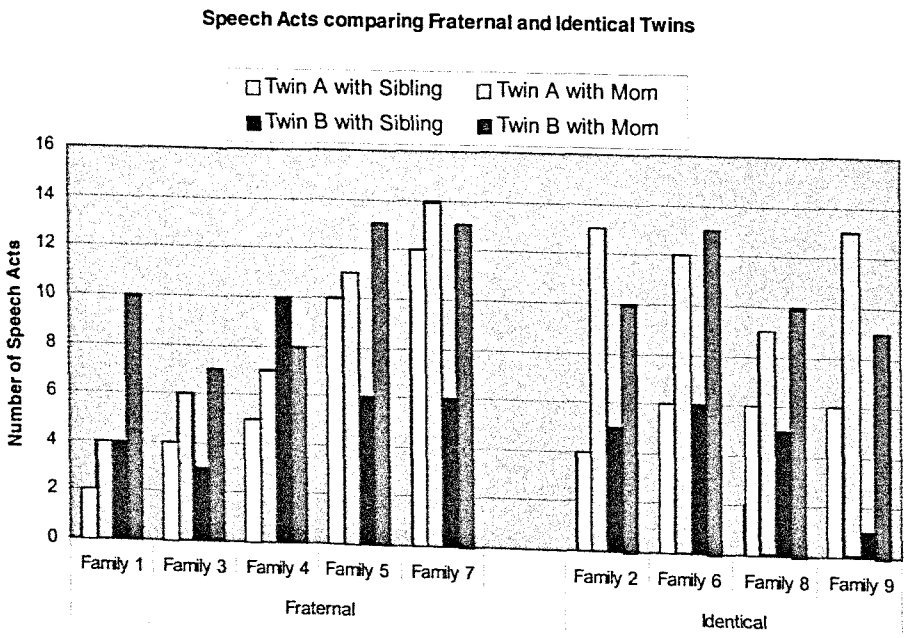


least twice as many speech acts produced with mother as with sibling. In Group C, only one twin in one family had similar use with mother as with sibling. The twins in Family 8 and 9 used many more speech acts with their mother than they did with their sibling. In each of the three groups, the twins seemed to use different speech acts with their mother than they used with their sibling, but some families showed that the twins used a considerably fewer number of speech acts during twin-twin interaction as compared to twin-mom interaction.

Question #3

The third question of the study asked if prelinguistic skills differ between identical and fraternal twins during the second six months of life. To best answer this question, all data in the tables was arranged into two groups: dizygotic twins and monozygotic twins. In Table 2 it can be seen that, on average, the identical twins had fewer health problems but longer hospital stays, as compared with the fraternal twins. Table 3 shows that all six twins with an at risk developmental status are identical, as compared with all fraternal twins being within normal limits. Only one set of identical twins was within limits. In Figure 4, there is a considerable difference in how many speech acts identical twins use with each other and how many they use with their mothers. Though all twin sets used more speech acts with their mothers than with their siblings, identical twins showed this pattern consistently and to a greater degree. Fraternal twins displayed less of a difference in the number of speech acts they used in each situation.

Figure 4



Discussion

Monozygotic twins, as compared to dizygotic twins, seem to have greater developmental communication differences. Data from the CDI show this most clearly; three of the nine families had twins with a developmental status of at risk, and all three of these families had identical twins. Only one set of identical twins, Family 8, was within limits. This twin set had one obvious difference that set it apart from the other identical twins in the study; they were second in the birth order of their family. This may have given these children an advantage, as their parents would have more infant communication experience and an older peer was present for child talk modeling.

For the majority of the participants, the number of gestures observed fell below the developmental expectations as reported by Paul (2001). Paul's normative information indicates that children in this age group should have developed five specific gestures, but only five children in this study had these developed as observed by the researcher. The majority of the participants had at least three of these gestures at the time of the study. Paul also indicates that children in a 12-18 month age group should have developed verbalizations to replace these gestures. Of the six children of this study that fell within this age group (i.e., 13 to 15 months of age), three had only one verbalization developed and the other three children had no verbalizations to go with their gestures. All of these children had developed vocalizations to accompany these gestures. Since these children are all over thirteen months of age and first words usually emerge between 10 and 14 months, the language development of the twins in this study parallels studies that suggest that twins have a different rate of early language growth (Day, 1932; Munsinger & Douglass, 1976; Rutter et al., 2003).

A very interesting pattern emerged when the use of speech acts between monozygotic twin pairs and those of monozygotic twins with their mothers were compared with their dizygotic twin counterparts. A close look at Figure 4 shows that monozygotic twins use considerably fewer speech acts when interacting with their twin than when interacting with their mother. A possible explanation for this is that identical twins are more likely to develop a shared language (Malmstrom & Silva, 1986). This language may allow identical twins to communicate with each other independent of the primitive

speech acts coded by the researcher. This explanation is even more likely based on the observation that the identical twins in this study had many vocalizations that were not interpretable. These vocalizations could be precursors of what will become a shared verbal language. One mother of identical twin girls spoke candidly on this very idea after being observed: "Sometimes I will wake up in the morning and listen to the girls on my baby monitor. They will babble back and forth for several minutes and then burst into laughter, and I have no idea what was so funny." This is the same mother that reported the following answer to the question 'how do you know if your child wants something' on the developmental history form: "points, signs, or grunts and I just know." This is perhaps the key to the development and maintenance of a twin language. These girls have obviously found a way to communicate with each other without using speech, and they have trained their mother to adapt to their communicative code instead of being forced to adapt to hers. As reported by their mother, the girls did not have any verbal production, though the researcher observed each girl to have one indefinite article: this and that, produced more like 'di' and 'da', respectively.

In comparison, dizygotic twins seem more likely to fall within normal developmental expectations. On the CDI, all dizygotic twin pairs had scores within normal limits for their age. Fraternal twins also seemed to produce more speech acts with their sibling than identical twins. With respect to the acquired gestures and verbalizations expected by this age, fraternal twins had development patterns similar to their identical counterparts.

Limitations of the Study

There are several limitations that impact the results and generalization of these findings. First, the choice was made to collect naturalistic data. As a result, video taping activities and sequences between mother and twins were adapted to families rather than being strictly controlled. Another limitation was the short amount of time the researcher was able to observe each family. A thirty minute observation time on a single day provides insight of a limited nature. For example, in one set of twins a child was miserable because of teething and in another, a child had a cold. These very real aspects of baby-life could have impacted the kinds of speech acts used between twins as well as with the mothers. And finally, a major limitation of this study is the participants. Nine families is a small number from which to obtain conclusive results. Additionally, the families were self-selected in that they volunteered for the study. As a result, there was no identifiable diversity with regard to social economic status, race or ethnicity.

References

Austin, J. (1962). *How to do things with words*. London: Oxford University Press.

Day, E. (1932). The development of language in twins: I. A comparison of twins and single children. *Child Development, 3*, 179-199.

Dore, J. (1975). Holophrases, speech acts and language universals. *Journal of Child Language, 2*, 21-40.

Fenson, L., Marchman, V.A., Thal, D.J., Dale, P.S., Reznick, J.S., & Bates, E. (2007). *MacArthur-Bates communicative development inventories: User's guide and technical manual* (2nd ed.). Baltimore, MD: Paul H. Brookes Publishing.

Fischer, K. (1973). A comparison of the similarity in language skills of identical and fraternal twin pairs. *Dissertation Abstracts International, 34*(8-A), 4864-4865.

Hulit, L. M. & Howard, M. R. (2002). *Born to talk: An introduction to speech and language development* (3rd ed.). Boston, MA: Allyn & Bacon.

Kovas, Y., Hayiou-Thomas, M., Dale, P., Bishop, D.V.M., Plomin, R., & Oliver, B. (2005). Genetic influences in different aspects of language development: The etiology of language skills in 4.5-year-old twins. *Child Development, 76*(3), 632-652.

Malmstrom, P., & Silva, M. (1986). Twin talk: Manifestations of twin status in the speech of toddlers. *Journal of Child Language, 13*(2), 293-304.

Munsinger, H., & Douglass, A., II. (1976). The syntactic abilities of identical twins, fraternal twins, and their siblings. *Child Development, 47*(1), 40-50.

Owens, R.E. (2001). *Language development: An introduction* (5th ed.). Needham Heights, MA: Allyn & Bacon.

Paul, R. (2001). *Language disorders from infancy through adolescence: Assessment and interventions* (2nd ed.). St. Louis, MO: Mosby, Inc.

Rutter, M., Thorpe, K., Greenwood, R., Northstone, K., & Golding, J. (2003). Twins as a natural experiment to study the causes of mild language delay: I: Design; twin-singleton differences in language, and obstetric risks. *Journal of Child Psychology and Psychiatry, 44*(3), 326-341.

Searle, J. (1969). *Speech acts.* Cambridge: Cambridge University Press.

Thorpe, K., Rutter, M., & Greenwood, R. (2003). Twins as a natural experiment to study the causes of mild language delay: II: Family interaction risk factors. *Journal of Psychology and Psychiatry, 44*(3), 342-355.

Viding, E., Spinath, F.M., Price, T.S., Bishop, D.V.M., Dale, P.S., & Plomin, R. (2004). Genetic and environmental influence on language impairment in 4-year-old same-sex and opposite-sex twins. *Journal of Child Psychology and Psychiatry, 45*(2), 315-325.

Mentor Comments

Dr. Fran Hagstrom, Ms. Albrecht's research mentor, made the following remarks:

> *It has been a joy to work with Sara and see her develop as a scholar over the last two years. Her Honor's thesis, Preverbal Pragmatic Abilities in Monozygotic and Dizygotic Twins, that appears in this journal is a well conceptualized first piece of research that has grown*

out of her interest in the research basis for clinical action in speech-language pathology.

Sara combined her educational background in child development and language acquisition with the life experience of being a twin to organize her research program. This included an extensive review of the child language literature where developmental language differences in twins are widely reported. Working from this, she designed a study to determine if twins display unique communicative features prior to the emergence of spoken language. Her idea to investigate the prelinguistic foundation of language by looking at dyadic interaction between twins and between individual twins and their primary caregiver was particularly innovative.

Innovation is often a metaphor for difficult and complex, which was the lived experience in this case. Small numbers of children are used in studies of early language because the data is often difficult to obtain, and the analyses are time consuming because they are complex. Nine families allowed Sara to come into their homes and study their children, all of whom were eight to 18 months of age. Thirty minutes of video recording was collected in each home, and mothers completed a brief developmental questionnaire and a vocabulary inventory for each twin. This is a remarkable data set with numbers of participants that meet or exceed many published studies of young twins. The analysis of non-verbal video data is an arduous process that requires multiple cross checks. The process consumed nights and weekends for weeks on end. Yet Sara's motivation and desire to work with this project continued to be energized as she analyzed these data for developmental patterns. In the end, as readers can see from the article, differences were found in the prelinguistic communication of twins. This is a significant developmental finding that will contribute to scientific knowledge about language development in twins. Thus, Sara's data collection and analysis stand out as remarkably thorough, grounded and equal to other studies published in child language journals.

It should be noted that this is original research rather than an extension of a faculty project; that Sara completed each step of the process needing only guidance and mentoring support; and that the caliber of this research is at a graduate rather than an undergraduate level. This last comment was made to Sara by several scholars after her peer reviewed presentation at the national convention of the American Speech-Language-Hearing Association. It also speaks to the merit of her research, which was supported by both Honor's College and SURF funding. Her final honor is seeing her first research effort in print and in Inquiry.