The Relationship Between Temperament and Language Use
in Middle Childhood and Adolescence

by
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Temperament and language

Abstract

The relationship between temperament, specifically sociability, and how children use language to communicate during middle childhood and adolescence was examined among 66 pairs of siblings, including monozygotic twins, dizygotic twins, and full siblings. Siblings were 8 to 14 years old and were observed in a laboratory setting. Language use was assessed by measuring latency, word use, pronoun usage, and nonverbal communication behavior in unstructured and structured contexts. It was hypothesized that participants rated as high in sociability would demonstrate a shorter latency to speak, speak more, and use language to focus attention on themselves more so than participants rated as less sociable. A twin/sibling design was used to test the hypothesis that identical twins use language more similarly than do full siblings. It was also hypothesized that older siblings, independent of their absolute ages, would demonstrate a shorter latency to speak and would speak more than younger siblings, and that older children would exhibit a shorter latency to speak and would speak more than younger children. Results indicate that age, birth order, and sociability are associated with language use; however no evidence was found to support a relationship between language use and genetic relatedness. Implications for future research are made, which include examining additional temperament dimensions, and assessing verbal and nonverbal communication on multiple levels.
Temperament and language

The Relationship Between Temperament and Language Use in Middle Childhood and Adolescence

Individuals use language in different ways. In everyday situations, people may make inferences about one another on the basis of how they speak to each other, and how they use language to communicate in a variety of social contexts. For example, talkative people may be perceived as being more sociable than less talkative people. Those who often speak about themselves may be categorized as egocentric. Language is a vehicle by which relationships with others are initiated, maintained, and terminated, and the inability to use language appropriately can negatively affect an individual's social interactions with others (Prutting, 1982). How one converses influences how one is regarded in day-to-day interactions (Evans, 1993).

Researchers use verbal expression to measure both personality and temperament (e.g. Kagan, 1994; Emde et al., 1992). Temperament, defined by Bates (1989) as biologically rooted individual differences in behavior tendencies, can be thought of as the precursor to personality (Rothbart & Ahadi, 1994). Temperament researchers have used language as a measure of sociability and inhibition in children (Garcia-Coll, Kagan, & Reznick, 1984; Kagan, 1994), and Kagan (1994) measured the amount of language spoken as an index of inhibition in adolescents. Clinical psychologists examine verbal expression as a way to assess personality, for example, through the use of projective picture tests such as the Rorschach Inkblot Test (Rorschach, 1942) and the Thematic Apperception Test (Morgan & Murray, 1935), both of which are designed to
elicit verbal responses from individuals. As with most projective tests, personality traits are then inferred from verbal responses (Frank, 1939).

Verbal expression has been operationalized in different ways. Studies by both Kagan (1994) and Garcia-Coll, Kagan, and Reznick (1984) measured verbal expression to gain information on temperament and personality. Kagan (1994) found an association between inhibition in preschoolers and the amount of speech produced, as measured by the number of spontaneous comments spoken during the course of the interview. The children who were categorized as inhibited were found to make fewer comments than their less inhibited counterparts (Kagan, 1994). Garcia-Coll et al. (1984) examined differences between behaviorally inhibited and uninhibited toddlers, and measured the latency to first speech and the total number of utterances spoken during 30 minutes of free play. Slomkowski, Nelson, Dunn, & Plomin (1992) searched for associations between several temperament dimensions and language. They measured receptive language (the ability to comprehend spoken speech) and expressive language (the ability to produce language) in preschoolers and middle childhood, and found a relationship between these measures and temperament. Specifically, affect-extroversion at age two predicted language ability at age seven. Given this association between temperament and receptive and expressive language, a related area that may warrant investigation is the possible relationship between temperament and how people use language. How people use language in social situations, which is referred to as the pragmatics of language use, may be related to temperament. The possibility that
Temperament and language use may be partly affected by an individual's temperament, has not been directly examined.

Developmental researchers have found evidence to support the idea that children play an active role in the process of learning language (Bates, Bretherton, & Snyder, 1988), and this active role may also influence how they construct their environments. For example, it has been suggested that extroverted children may engage people more often in interactions than would introverts, leading to increased experience with language, which may then account for advanced language development in the extroverted children (Slomkowski et al., 1992; Wells, 1986). However, few studies have focused on how temperament may be associated with the pragmatics of language use.

Temperament

Often the terms temperament and personality are used interchangeably, although they are distinct concepts. Temperament is defined by Bates (1989) as biologically based characteristics of individuals, which organize their interactions with the environment. As such, temperament may be inferred by measuring consistencies in behavior across situations (Bates, 1989). A number of dimensions of temperament are proposed, including emotionality, activity, and sociability (Buss and Plomin, 1984). Temperament dimensions exist in all individuals, but differ in the extent to which they are observable in behavior. For example, an infant that cries often may rate a higher score on the dimension of negative emotionality than would an infant who infrequently
Temperament and language

cries. In theory, temperament leads to a pattern of observable behavior that is different for each individual.

Bates (1989) argues that temperament can be exhibited on three levels: (a) behavioral, (b) neurological, and (c) constitutional. Temperament also is thought of as differences in anatomical and functional patterns of the central nervous system (Bates, 1989). Bates (1989) asserts, for example, that negative emotionality results from tendencies toward sympathetic nervous system dominance. Constitutional factors refer to the individual’s genetic make up, as well as prenatal experiences (Bates, 1989). On each of these levels, temperament is theorized as interacting with, not independently of, the environment (Bates, 1989).

The discussion of how temperament and personality overlap and interact is complex, but Rothbart and Ahadi (1994) generally refer to temperament as the substrate from which personality develops. Temperament researchers attempt to identify the psychological and biological processes by which individual differences arise (Ahadi & Rothbart, 1994). They also track the developmental course of these processes, and how they interact with the environment (Ahadi & Rothbart, 1994). Thus, temperament in childhood can be informative about personality in adulthood, although Rothbart and Ahadi (1994) describe personality as containing characteristics not necessarily found within the dimensions of temperament, including, for example, patterns of habitual behavior, skills, values, needs, goals, and the perception of self and others. These content-related variables, as they are called by Rothbart and Ahadi (1994), develop from the interaction of temperament and experience.
The Pragmatics of Language

To be able to use language appropriately in social situations requires a certain amount of experience. Many conversational skills begin to appear during early childhood but are not firmly in place until middle childhood. Shading, for example, is the ability to gradually initiate a change in topic, and first appears between the ages of 5 and 9 (Wanska & Bedrosian, 1985). Illocutionary intent is defined as knowing what a speaker means to say regardless of the form the utterance takes. For example, knowing that “Can you close the door?” is a request for action, not for information requires knowledge of illocutionary intent. An understanding of illocutionary intent usually develops during middle childhood. This illocutionary knowledge requires skills beyond a preschooler’s cognitive capabilities (Ackerman, 1978). In addition to cognitive abilities, using language appropriately in social situations requires that children be able to recognize social and informational demands in a given situation, to express a thought through several channels simultaneously (for example, with vocabulary, pronunciation, gestures), and to be able to synchronize these various abilities into the rapid conversational flow in which most adult communication takes place (Lapadat, 1991).

For these reasons, middle childhood and adolescence may be a particularly interesting time in which to examine the developing links between temperament and language use. Children in this age range would have the necessary social skills and cognitive capabilities to understand how to use language appropriately in context, yet may be less influenced than adults by the content-related variables, such as values, needs, and goals, described by Rothbart and Ahadi (1994).
As stated earlier, the examination of how people use language in social contexts is known as the study of pragmatics (Lapadat, 1991). The term pragmatics has been used to refer to both (a) context-dependent aspects of the structure of language, and (b) the rules of language use that are more or less independent of specific circumstances (Levison, 1983). For example, in a collective monologue, two or more children are together, but one speaks a soliloquy to which the others do not seem to listen. This provides an example of using language rules correctly, but independently of the social context. In this case, the child is following the correct rules for using language in that each sentence follows logically from the previous one, but the context is ignored.

Though pragmatics can simply refer to the rules for using language, most contemporary definitions include a discussion of either context (e.g. Prutting, 1982), or appropriateness (e.g. Lapadat, 1991).

Carroll (1986) defines pragmatics as the knowledge of the social rules underlying language. Part of that knowledge includes an understanding that speech should vary according to the situation and the listener's language ability (Carroll, 1986). What any utterance communicates depends not only on its linguistic structure, but also on the context in which it is presented and the assumptions made by the speaker and the hearer (Carroll, 1986). For example, the statement "I liked the actress' performance" may be interpreted very differently depending on the context and the assumptions made. It may simply be a statement of approval, or it may be interpreted to mean the speaker did not enjoy the movie in which the actress was appearing, or did not enjoy the actress' performance in another film. The hearer distinguishes between these
various interpretations by examining the context in which it is made, and by making assumptions. For example, if when asked "Did you like the film?" the speaker responds "I liked the actress' performance," the hearer may assume the speaker did not enjoy the film. Similarly, the hearer may make this assumption if the speaker frowns or grimaces when responding to the question. Therefore, context is comprised of both previous discourse and nonverbal behavior (Carroll, 1986).

Nonverbal behavior, when examined as contextual factors within the study of pragmatics, often refers to facial expressions or body stance (Carroll, 1986). For example, slouching down and frowning may indicate that a statement is conveying disappointment or sadness. All forms of nonverbal communication (e.g. shrugging or gesturing) may also be important contributors to a conversation.

Links Between Temperament and Language

Much of the research examining any type of language ability in children has focused on preschoolers (e.g. Klecan-Aker & Lopez, 1984; Barrenechea & Schmitt, 1989; Slomkowski et al., 1992). Barrenechea and Schmitt (1989) studied the pragmatics of language in Spanish-speaking preschoolers, and described the development of specific language functions. Klecan-Aker and Lopez (1984) also assessed pragmatic language abilities in preschoolers to investigate the effectiveness of a new method of categorizing pragmatic abilities. Only a few studies, however, have overtly looked for links between temperament and language ability (e.g. Slomkowski et al., 1992; Emde et al., 1992). For example, Slomkowski et al. (1992) found that temperament dimensions measured in early childhood were associated with receptive and expressive abilities in early
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childhood and with receptive language in middle childhood. Task-orientation, a scale comprised of concentration, attention span, and frustration, was associated with receptive language but not expressive language. Affect-extroversion also was associated with receptive language abilities both in early and middle childhood, indicating that extroverted toddlers are not simply using more expressive language, but that they are also exhibiting stronger abilities in receptive language (Slomkowski et al., 1992).

In an examination of individual differences in behavioral development in infants, Emde et al. (1992) found moderate genetic influences for expressive language abilities with significant shared environmental influences. On the other hand, they also found no evidence of genetic influence for receptive language, but very strong environmental influences. In both the studies by Slomkowski et al. (1992) and Emde et al. (1992), one aspect of the development of language was examined in preschoolers. These studies examined possible links between expressive/receptive language and temperament.

In two other studies examining the links between shyness and language use, Asendorpf (1992) found that latency to the first spontaneous speech and the length of pauses when conversing with an unfamiliar adult partner were highly positively correlated with ratings of shyness, and Zimbardo and Radl (1981) showed that children define shyness in terms of amount of talk. Overall, research has not been conducted on the possibility of a relationship between temperament and language in older children, or on temperament and the pragmatics of language use.
Temperament and language

This study is designed to be one step in the search for a relationship between temperament and language use. Past studies assessing language use often ask the child to speak one-on-one to the experimenter in a structured experimental setting (e.g. Klecan-Aker & Lopez, 1984; Barrenechea & Schmitt, 1989). Research has shown that fewer questions from adults result in longer speaking turns and more spontaneous speech from some children (Evans, 1993). However, in assessing language use in an older population, it may also prove informative to measure spontaneous language in unstructured settings (Barrenechea & Schmitt, 1989). The study described here relies on both unstructured and structured settings to measure language use.

Temperament is assessed using parent-report measures, which provide information on temperament at a behavioral level. Specifically, one dimension of temperament -- sociability -- is reported. Language use is measured in three ways: (a) latency to speak, (b) number and type of personal pronouns spoken, and (c) the number of words spoken. These language measures resemble those used by Kagan (1994) and are designed to quantify the amount and type of language used. Nonverbal communication behavior is measured by observing facial expression and body stance.

The purpose of the present study is to explore the possibility of a relationship between temperament and language use in middle childhood and adolescence. It is expected that (a) participants rated as high in sociability will demonstrate a shorter latency to speak, and will speak more (i.e., a greater number of words) than participants rated as less sociable; and (b) those scoring high in sociability will use language to focus attention on themselves (i.e., by using a greater number of first person pronouns than
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second or third person pronouns). Because temperament is theorized to be biologically, and thus in part, genetically based, if there is a relationship between temperament and language use, one might expect to find a similar relationship between language use and the degree of genetic relatedness. Therefore, a twin/sibling design will be used to test the hypothesis that (c) identical twins use language more similarly than do fraternal twins and full siblings. The effect of birth order and age on language use will also be examined, and it is expected that (d) older siblings, independent of their absolute age, will demonstrate a shorter latency to speak and will speak more, than younger siblings. It is also expected that (e) older children will exhibit a shorter latency to speak and will speak more, than younger children.

If a relationship between language use and temperament is discovered, it may add to existing research on the link between temperament and cognitive development (e.g. Matheny, 1989). A relationship between language use and temperament may also add to existing research on the child’s active role in language learning (Slomkowski et al., 1992). Reticent children who remain quiet in school have been shown to obtain lower scores on language and communication tasks, and less talkative children may be viewed as less approachable, less socially competent, and less desirable as social partners (Evans, 1993). Moreover, teachers may regard them as less successful and competent in school (McCroskey & Daly, 1976). If specific temperament types were found to be associated with a tendency to use language in a particular way, both clinicians confronting language disorders and educators may be assisted with their respective roles.
Participants

Participants were 63 same-gender sibling pairs (28 male pairs, 35 female pairs) and their parents, taking part in the San Diego Sibling Study (SANDSS), which is exploring links between temperament and social development in twins and full siblings. The families were primarily middle class and Caucasian (83%).

To control for the possibility that dependency exists in the data because participants are siblings, one sibling from each pair was randomly assigned to either Group 1 or Group 2, and their sibling was then assigned to the other group (see Appendix A for a complete description of randomization procedures). All analyses were conducted separately for these groups, with the expectation that Group 2 would replicate the results of Group 1. The participants were between the ages of eight and 14, and the siblings were not more than four years apart in age. The mean age of Group 1 was 10.21 (SD = 1.73). The mean age of Group 2 was 10.39 (SD = 1.81).

Thirty-eight pairs were non-twin full siblings, 9 pairs were monozygotic twins, 11 pairs were dizygotic twins, and one pair was genetically unrelated (i.e., one sibling was adopted). For the twin pairs, zygosity was determined using Nichols' and Bilbro's (1966) zygosity questionnaire, which relies on parent, tester, and self report, and has been shown to be 90% accurate when compared to blood tests. For four twin pairs, zygosity could not be determined using this method, and their data was excluded from analyses involving zygosity.
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Child participants were compensated with a SANDSS T-shirt. Some of the child participants who completed testing were recruited, at a later date, to serve as confederates, for which they were paid $5 per visit.

Materials

Temperament was assessed using the sociability scale of the shortened version of the parent-report Colorado Childhood Temperament Inventory (CCTI; Plomin, DeFries, & Fulker, 1988), which has been shown to be psychometrically sound. The items comprising the sociability scale are marked with an asterisk (*) (see Appendix B). Because these items do not directly ask about the child’s language behavior, it was hoped that any potential confounds between temperament and language measures were minimized. The shortened version of the CCTI is based on Buss and Plomin’s (1975) Emotionality, Activity, and Sociability (EAS) theory of temperament, and the New York Longitudinal Study (NYLS; Thomas, Chess, & Birch, 1970). This version yields four factors: sociability, emotionality, activity, persistence. Cronbach’s alpha for the parent-report version of the sociability scale was .77. Self- and sibling-report measures were not used because of low internal consistencies.

Child participants were video taped without their knowledge from behind a one-way mirror (parental consent was obtained), and language use was observed and coded for several variables, described below.

Coding of Video Tapes for Language Use

Participants’ language use was video taped both in an unstructured and structured setting. In the unstructured setting, participants were alone with an
unfamiliar adult who did not initiate conversation with the participant or attempt to elicit speech in any way. In the structured setting, a different unfamiliar adult attempted to engage the participants in conversation by asking them questions. Of the 63 pairs, all underwent the unstructured setting, and approximately half (30.5 pairs) also underwent the structured language elicitation setting.

Language use was measured by (a) the latency to talk, (b) the number of words spoken in each setting, and (c) the number of first-, second-, and third-person pronouns used. Latency to talk was defined as the number of seconds following the prompt until the participant speaks to anyone for any reason. In the unstructured setting, the closing of the laboratory door served as the prompt, and in the structured setting, the prompt occurred immediately after the experimenter asked a question. To examine contextual and nonverbal behavior variables, coders were also asked to rate (a) the clarity of the participants’ speech, (b) the degree to which their speech was self-directed, and (c) the degree to which participants used inward or outward gestures (i.e., hand movements that pointed toward themselves or away from themselves, respectively). Though the intention was to also code for facial expression, this proved to be extremely difficult. Because the video tapes were designed to record several variables at once, both for this study and the greater SANDSS study, the child participants were often too far from the camera, or were moving about the room too often, to allow for clear facial pictures. Also, the interrater reliabilities on the clarity of speech, self-direction of speech, and gestures variables were low (between .25 and .40), and these measures were excluded.
from all analyses. The coding scheme and the coding sheets are provided in Appendices C and D, respectively.

Approximately 20 percent of the video tapes were coded for reliability by a team of five undergraduate research assistants, and checks were conducted on a continuous basis. Rater agreement was estimated using Cohen's kappa, which indicated high reliability on all measures except the ratings of clarity of speech, self-directed speech, and the use of gestures. Interrater reliabilities for latency measures, word count, and pronoun usage ranged between .79 and 1.00.

**Design and Procedure**

Parent and child participants were asked to fill out several questionnaires, and child participants were unknowingly video taped in each of four sessions, as part of the larger SANDSS study. The first three sessions were designed to assess participants' reactions to the unfamiliar. During the first session, participants' behavior, including language use, was examined during a four-minute session with an unfamiliar adult confederate. The confederate was instructed not to initiate conversation or play with the participant, but to act normally if the participant initiated any contact. During the second session, the participant was video taped while alone in the same room for two minutes, and during the third session the participant was with a child confederate for four minutes. The fourth session, which was the structured setting, consisted of a language elicitation measure, added specifically for this study (see Appendix E). For the purposes of this study, only the first two minutes of the adult confederate session and the language elicitation session were examined.
Interviewing and video taping took place at the laboratory. Parents were told by telephone prior to arriving at the laboratory that testing would involve video taping, and were asked not to inform their children. Before the video taped conditions began, parents were shown around the laboratory and consent was obtained (see Appendix F for consent forms). Parents then completed their questionnaires in a room separate from their children.

Consent was obtained from both siblings before they participated in any aspect of the study. One sibling, randomly chosen, was escorted to the room with the video camera, where the adult confederate was waiting, while the other sibling began to complete the questionnaires. The first sibling participant spent four minutes with the adult confederate, after which the confederate left the room and the participant remained alone for two minutes. Then the participant spent four minutes in the room with a child confederate, after which the child confederate left. The experimenter then entered the room to ask the participants two questions in an attempt to elicit a response. The questions were designed to appear casual and conversational, as if the experimenter were simply chatting during a few free minutes (see Appendix E). Once the first sibling underwent all the sessions, the other sibling was then video taped following the same procedure, while the first sibling completed questionnaires.

Following all video taped components, participants were given time to complete the questionnaires if necessary. The child participants were told they had been video taped, and their consent to use the video tapes was obtained. Participants were asked their impressions of the study and debriefed.
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Results

Descriptive statistics are presented to show the percentage of participants who spoke and the characteristics of that speech. Descriptive statistics also provide an estimation of how well the groups were randomized. The number of participants who spoke in both the unstructured and structured settings for each group are presented in Table 1. Of the 63 participants in Group 1, 23 spoke (37%) in the unstructured session. Thirty-one participants in Group 1 underwent the structured session, and all 31 spoke. Of the 63 participants in Group 2, 29 spoke (46%) in the unstructured session. Thirty participants in Group 2 experienced the structured setting, and all 30 spoke.

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<th>Group 2</th>
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</thead>
<tbody>
<tr>
<td>Unstructured setting</td>
<td>23 of 63 (37%)</td>
<td>29 of 63 (46%)</td>
</tr>
<tr>
<td>Structured setting</td>
<td>31 of 31 (100%)</td>
<td>30 of 30 (100%)</td>
</tr>
</tbody>
</table>

The measures of central tendency for latency to speak, number of words spoken, and pronouns used for those who spoke are presented in Table 2, and show that the structured setting, in which language elicitation was attempted, succeeded in eliciting speech. The structured setting was characterized by shorter latencies and a greater number of words spoken. For example, in Group 1 the mean latency to speak in the unstructured setting was 18.48 seconds; in the structured setting it was 1.68 seconds.
Similarly in Group 2, the mean latency in the unstructured setting was 16.24 seconds compared to 1.57 seconds in the structured setting. Also, the mean number of words for Group 1 increased from 24.09 in the unstructured setting to 34.74 in the structured setting. For Group 2, however, the mean number of words did not show a large change from 41.38 in the unstructured setting to 41.13 in the structured setting. However, the median and mode for the number of words spoken in Group 2 indicate large increases in the number of words spoken: from a median of 17.00 in the unstructured setting to 32.50 in the structured setting, and a mode of 1.00 to a mode of 25.00. This difference among central tendency measures is a result of differences in variability of the distributions. The distribution of number of words spoken in the unstructured setting is slightly positively skewed and ranges in value from 1 to 175 words. In the structured setting the distribution is platykurtic and ranges from 9 to 126 words. In most cases the distributions are platykurtic with wide ranges (See Appendix G for Figures 1 - 20). For this reason, the mode and median values may be better indicators of central tendency in some cases.

The statistics presented in Tables 1 and 2 also serve as an indication of how successfully the groups were randomized. Though the groups are very similar in terms of the mean age of the participants ($M = 10.21$ for Group 1, $M = 10.39$ for Group 2), and show similar latencies to speak, the groups differ in the amount of speech produced. In Group 2, six more children chose to speak in the unstructured setting compared to Group 1, which led to larger numbers of words spoken and pronouns used for Group 2 overall (see Table 2).
Table 2

Characteristics of Speech: Central Tendencies for Latency to Speak, Number of Words Spoken, and Number and Type of Pronouns Used in Unstructured and Structured Settings Among Those Who Spoke.

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>median</td>
<td>mode</td>
</tr>
<tr>
<td><strong>Unstructured setting</strong></td>
<td>(n = 23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>18.48</td>
<td>10.00</td>
<td>multiple</td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>24.09</td>
<td>10.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Number of pronouns used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-person</td>
<td>.96</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Second-person</td>
<td>1.04</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Third-person</td>
<td>.22</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td><strong>Structured setting</strong></td>
<td>(n = 31)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>1.68</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>34.74</td>
<td>32.00</td>
<td>multiple</td>
</tr>
<tr>
<td>Number of pronouns used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-person</td>
<td>3.58</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Second-person</td>
<td>.29</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Third-person</td>
<td>.32</td>
<td>.00</td>
<td>.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Group 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>median</td>
<td>mode</td>
</tr>
<tr>
<td><strong>Unstructured setting</strong></td>
<td>(n = 29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>16.24</td>
<td>8.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>41.38</td>
<td>17.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Number of pronouns used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-person</td>
<td>2.34</td>
<td>1.00</td>
<td>.00</td>
</tr>
<tr>
<td>Second-person</td>
<td>1.86</td>
<td>1.00</td>
<td>.00</td>
</tr>
<tr>
<td>Third-person</td>
<td>.90</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td><strong>Structured setting</strong></td>
<td>(n = 30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>1.57</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>41.13</td>
<td>32.50</td>
<td>25.00</td>
</tr>
<tr>
<td>Number of pronouns used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-person</td>
<td>4.13</td>
<td>5.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Second-person</td>
<td>.43</td>
<td>.21</td>
<td>.00</td>
</tr>
<tr>
<td>Third-person</td>
<td>.53</td>
<td>.13</td>
<td>.00</td>
</tr>
</tbody>
</table>
Data Cleaning Issues

Because the distribution of the number of first-person pronouns used in the structured setting was severely positively skewed (See Appendix G for Figures 1 - 20), a logarithmic transformation was performed on this variable for both groups (See Figures 21 and 22 in Appendix G). The transformed data was used in all analyses. Logarithmic transformations can be especially useful for making positively skewed distributions more symmetrical (Howell, 1992).

Four siblings, three in Group 1 and one in Group 2, showed extreme values on either the latency to speak or number of words spoken variable. Given that such extreme outliers may distort results (Tabachnick & Fidell, 1996), analyses were conducted with these individuals and their co-sibling excluded. A comparison of the two sets of results -- with the outliers and without the outliers -- showed virtually no difference for the majority of analyses. Only two significant changes appeared: (a) the correlation between sociability and the number of words spoken in the unstructured setting increased from a nonsignificant .18 to still nonsignificant .53, and (b) the disappearance of a significant t-test, which found that the mean age of those in Group 2 who chose to speak in the unstructured setting was higher than those who did not choose to speak. Aside from this significant t-test that disappeared, the pattern of results with the outliers excluded was extremely similar to the pattern of results with the outliers included; significant results remained significant and nonsignificant results remained nonsignificant. In most cases, the values changed very slightly, for example
from a correlation of .23 to .26. It appears, then, that the data with the outliers excluded does not provide any additional meaningful information.

However, excluding the outlying data does cause several problems. First, the overall sample size is reduced from 63 to 59 participants in each group (1 and 2). Of the eight participants excluded, six chose to speak in the unstructured settings, causing a reduction of two participants in Group 1 (from 23 to 21) and four in Group 2 (from 29 to 25). Consequently, valuable language data is lost. Furthermore, of the four pairs of participants to be excluded, three are monozygotic twins. The number of monozygotic twin pairs who spoke is reduced from 2 pairs to 1 pair in the unstructured setting, and from 3 pairs to 2 pairs in the structured setting, prohibiting the calculation of a correlation coefficient. Also, this reduction in the number of twin pairs who speak prohibits the calculation of concordance values. Therefore, excluding the outlying data would prevent the analysis of the zygosity hypothesis.

For these reasons, including the outlying data seems to lead to more meaningful information, especially considering that the results did not change dramatically with the outliers excluded. A report of the changes with the outliers excluded can be found in Appendix H.

Sociability and Language Use

To test if those children who chose to speak in the unstructured setting were rated significantly higher in sociability than those who did not speak, an independent groups t test was used. The one-tailed t test compared the mean sociability score of those who chose to speak in the unstructured setting with those who did not. This was
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not found to be statistically significant for Group 1, \( t(61) = -1.05, p > .05 \), or Group 2, \( t(61) = -1.68, p > .05 \).

The hypothesis that those rated high in sociability will demonstrate a shorter latency to speak and will speak more (i.e., a greater number of words) than those rated as less sociable, was tested with a Pearson correlation. High sociability scores indicate greater sociability, and high latency scores indicate a longer latency to speak. One significant correlation was found for Group 2 in the structured setting between sociability score and latency to speak, \( r(30) = .31, p < .05 \), such that the higher the sociability score, the longer the latency to speak. This indicates that those rated as high in sociability took more time to initiate a response to the experimenters' questions, which is contrary to the hypothesis.

The hypothesis that those rated high in sociability will use language to focus attention on themselves (i.e., by using a greater number of first person pronouns than second or third person pronouns) was also tested with a Pearson correlation. To offer support for this hypothesis, the strongest correlations would be expected between sociability score and the number of first person pronouns spoken. However, the only significant correlation was found for Group 1 in the unstructured setting between sociability score and the number of third person pronouns used among those who spoke, \( r(23) = .42, p < .05 \). This indicates that the higher the ratings on sociability, the greater number of third person pronouns spoken by Group 1 participants when left alone with an unfamiliar adult. All correlations are presented in Table 3.
Table 3
Pearson Correlations Between Parent-Report of Sociability and Language Use for Groups 1 and 2 in Unstructured and Structured Settings Among Those Who Spoke

<table>
<thead>
<tr>
<th>Sociability</th>
<th>Group 1 (n = 23)</th>
<th>Group 2 (n = 29)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstructured setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>.01</td>
<td>.23</td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>.18</td>
<td>-.21</td>
</tr>
<tr>
<td>Number of pronouns used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-person</td>
<td>-.11</td>
<td>-.19</td>
</tr>
<tr>
<td>Second-person</td>
<td>.03</td>
<td>-.26</td>
</tr>
<tr>
<td>Third-person</td>
<td>.42*</td>
<td>-.04</td>
</tr>
<tr>
<td><strong>Structured setting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>.14</td>
<td>.31*</td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>-.09</td>
<td>-.17</td>
</tr>
<tr>
<td>Number of pronouns used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-person</td>
<td>.07</td>
<td>-.07</td>
</tr>
<tr>
<td>Second-person</td>
<td>.08</td>
<td>-.22</td>
</tr>
<tr>
<td>Third-person</td>
<td>-.07</td>
<td>.02</td>
</tr>
</tbody>
</table>

*p < .05

Age and Language Use

A one-tailed independent groups t test was used to test if those children who chose to speak in the unstructured setting were significantly older than those who did not speak. For Group 2, the mean age of those who spoke (M = 10.93) was found to be significantly higher than those who did not (M = 9.94), t(60) = 2.20, p < .05. However, the age difference was not significant in Group 1, t(60) = .21, p > .05, (M =10.27, 10.18).

For those children who spoke, a Pearson correlation was used to test the hypothesis that age is associated with language use such that older children exhibit a shorter latency to speak and speak more than younger children. In Group 2, age was
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significantly positively correlated with the number of words spoken in the structured setting, \( r (30) = .39, p < .05 \), indicating that older children speak more than younger children when questioned by an unfamiliar adult. No significant relationship was found between age and latency to speak. The correlations are reported in Table 4.

Table 4

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group 1 ((n = 23))</td>
<td>Group 2 ((n = 29))</td>
<td></td>
</tr>
<tr>
<td><strong>Unstructured setting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>-.26</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>.16</td>
<td>.22</td>
<td></td>
</tr>
<tr>
<td><strong>Structured setting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>-.22</td>
<td>-.12</td>
<td></td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>.22</td>
<td>.39*</td>
<td></td>
</tr>
</tbody>
</table>

* \( p < .05 \)

Birth Order and Language Use

To test if older siblings, independent of their absolute age, demonstrate a shorter latency to speak and speak more than younger siblings, a one-tailed independent groups \( t \) test was used. Only in the structured setting for Group 2 was this hypothesis supported. Older siblings were found to speak a significantly greater number of words \((M =63)\) than younger siblings \((M =21.70)\), \( t (10.2) = 2.97, p = .01 \) when questioned by an unfamiliar adult.
Genetic Relatedness and Language Use

To test the hypothesis that identical twins use language more similarly than do fraternal twins and full siblings, Pearson correlations were calculated in both settings on those who spoke, combining groups 1 and 2. Although the intraclass correlation is the common statistic to use to examine the relationship between siblings in a family, when siblings are randomly assigned to two arbitrary groups the interclass correlation is much the same as the intraclass (Plomin, DeFries, & McClearn, 1990). Intraclass correlations are used when correlating scores from pairs of subjects, in order to alleviate the difficulty associated with a Pearson's correlation of determining which sibling's score is "first" (i.e. the x variable) or "second" (i.e. the y variable) (Appelbaum & McCall, 1983).

In both settings, the pattern of results is contrary to what was predicted. It was expected that the MZ correlations would be stronger than the DZ or FS correlations, and that all correlations would be positive. The monozygotic twins do show the largest correlations in both settings compared to the dizygotic twins and full siblings, however in the unstructured setting the strong MZ correlations are negative. As Table 5 shows (the number of twin pairs is given in parentheses), most of the correlations are negative, indicating that siblings are not using language similarly. For example, a negative correlation shows that as one child speaks a large number of words, their sibling speaks few. In the structured setting the monozygotic twins show the strongest correlations for both latency and number of words spoken, however the corresponding dizygotic
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and full sibling correlations in that setting are negative. Additionally, the MZ correlation is computed only on three twin pairs.

Table 5
Pearson Correlations Comparing Language Use Between Twins and Full Siblings

<table>
<thead>
<tr>
<th></th>
<th>Unstructured</th>
<th></th>
<th>Structured</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MZ (2)</td>
<td>DZ (5)</td>
<td>FS (15)</td>
<td>MZ (3)</td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>-.99**</td>
<td>-.28</td>
<td>.78**</td>
<td>.40</td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>-.55</td>
<td>-.21</td>
<td>-.02</td>
<td>.51</td>
</tr>
</tbody>
</table>

The number of pairs is given in parentheses.

** p < .01

Because of the difficulties in drawing conclusions based on the correlational indices reported above due to conflicting results and small sample sizes, concordance values were also computed to examine similar language use between siblings.

Concordance values are used in twin studies to represent the proportion of co-twins who exhibit the same characteristic or behavior (Gottesman & Shields, 1982). For example, they are often used in psychopathology to indicate the percentage of twins...
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who have the diagnosis of schizophrenia. Here they are used to indicate the extent to which genetic differences influence language use.

The most common two methods used to indicate concordance are called pairwise concordance and probandwise concordance (Gottesman & Shields, 1982). Pairwise concordance represents the proportion of pairs in which each twin is affected, and is calculated by dividing the number of concordant pairs by the total number of pairs (Plomin, DeFries, & McClearn, 1990). In the pairwise method, each pair is counted only once (Gottesman & Shields, 1982). Probandwise concordance also represents the proportion of affected twins, but some pairs are counted twice if they are (a) concordant and (b) each member was identified independently (Gottesman & Shields, 1982).

Probandwise concordance is calculated by dividing the total number of affected individuals in concordant pairs by the sum of the total number of pairs plus the total number of concordant pairs. For example, if 10 monozygotic twins have schizophrenia, and 3 of their co-twins also are affected, the probandwise concordance rate would be calculated by dividing 6 by 13, which equals .46. A sample of only concordant pairs would yield a concordance rate of 1.00. The proband method is more appropriate if each affected member of the twin pairs was identified independently (Plomin, DeFries, & McClearn, 1990), and Gottesman and Shields (1982) have found that only probandwise concordance rates can be compared directly with general population rates. Because twins in this study were assigned to separate groups and treated as individuals, the probandwise concordance method was used.
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Because concordance rates require qualitative variables, choosing to speak in the unstructured setting was the variable examined. If one member of a twin pair spoke in the unstructured setting (defined as using one or more words), and their co-twin also spoke, then that pair was considered concordant. Of the 9 pairs of monozygotic twins, both twins spoke in 1 pair, yielding a probandwise concordance rate of .20. Among the 11 pairs of dizygotic twins, 3 pairs were concordant, giving a probandwise concordance of .43. If genes are important in determining if one would speak in an unstructured setting, then the MZ concordance rates would be significantly higher than the DZ concordance rates. If genetic differences were definitely not important, then MZ and DZ concordance rates would be expected to be about the same (Gottesman & Shields, 1982). Because the MZ concordance rate is not significantly higher than the DZ rate (.20 compared to .43), a case cannot be made for a genetic influence on initiating speech with an unfamiliar adult.

Gender and Language Use

A two-tailed t test for independent groups was used to compare language use between males and females. The only significant difference was found for first-person pronoun usage. Among those who spoke in the unstructured setting in Group 1 (see Table 1), boys used a significantly greater number of first-person pronouns ($M = 1.5$) than did girls ($M = .11$), $t(14.12) = 2.56, p < .05$. 
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Discussion

It appears that sociability is associated with how children and adolescents use language; however, the nature of the relationship seems to be different for the unstructured and structured settings, and for Group 1 and Group 2. Though the observed associations between sociability and language are contrary to the specific hypotheses tested, they do offer some evidence for the more general hypothesis that temperament is associated with language use. There is also some evidence to support the hypotheses that age and birth order are associated with language use. Gender was also found to be related to language use, specifically to pronoun usage. No evidence was found to support the hypothesis that language use is influenced by genetic factors, but suggestions for future research on this topic are given.

Overall, firm conclusions are difficult to draw, for several reasons. Though the participants were randomly assigned to groups, six more children in the unstructured setting spoke in Group 2 than spoke in Group 1 -- a 25% increase in the number of participants who chose to speak to an unfamiliar adult. Because most analyses were conducted only on those participants who spoke, this directly affected the sample size used in analyses. Also, as Table 2 shows, in the unstructured setting Group 2 participants used almost twice as many words and pronouns as did Group 1 participants. These may be the reasons Group 2 failed to serve as a replication of Group 1. It is also possible that the findings discussed in this section resulted from chance given that despite the pseudo-randomization, Group 2 contained six more children who spoke than did Group 1.
Groups 1 and 2 are much more similar in the structured setting in terms of sample size and number of words spoken. Because all participants responded when questioned by the experimenter, the sample size simply represents the number of participants who underwent the structured setting. However, Group 2 still used slightly more words and pronouns than did Group 1 (see Table 2). It is possible that the children in Group 2 were simply more talkative regardless of the setting. Yet it may also be the case that after having spoken to an unfamiliar adult in the unstructured setting, the children felt more comfortable in their surroundings, and thus were more inclined to speak when questioned by the experimenter. Because the structured setting always followed the unstructured setting, this question cannot be addressed without future studies in which the sessions are counterbalanced.

**Sociability and Language Use**

Sociability was found to be related to two measures of language use: latency to speak, and third-person pronoun usage. When responding to questions asked by an experimenter (structured setting), those children in Group 2 who were rated high in sociability demonstrated a longer latency to respond. It was expected that sociable children would be quick to speak in any setting, but this finding indicates just the opposite. It may be possible that these sociable children also score high on another trait, which is associated with a longer latency to respond. For example, perhaps they are more pensive and spend more time thinking about how to respond when questioned by an adult. The observed relationship between latency and sociability was not found among Group 1 participants.
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Sociability was also found to be related to third-person pronoun usage in Group 1, but not for Group 2. When left alone with an unfamiliar adult (the unstructured setting), the participants in Group 1 who were rated high in sociability also tended to use third-person pronouns. It was expected that sociable children would focus the conversation on themselves, and therefore would use more first-person pronouns than second- or third-person pronouns. However, this relationship indicates that sociable children seem to be focusing the conversation on others. It may be the case that sociable children have learned that talking about one's self may appear egocentric, whereas focusing the conversation on others may cause one to appear interested and inquisitive. Given that the adult confederate was instructed not to initiate nor encourage conversation, the participant may have found it difficult to focus the conversation on the confederate, and instead chose to speak about other people. Future studies could examine this possibility, and could look into a relationship between egocentrism and pronoun usage.

Age and Language Use

Age was found to be related to language use such that older children in Group 2 chose to speak when left alone with an unfamiliar adult, and used a greater number of words when questioned by the experimenter. When questioned (the structured setting), older children used a greater number of words than did younger children, which directly supports the hypothesis. Additional support for the hypothesis is provided by the finding that those in Group 2 who chose to speak were significantly older (almost 11 years old) than those who did not speak (almost 10 years old). It is possible that the
greater experience with language that older children have, which may include more advanced conversational skills, allows them to be more comfortable speaking with unfamiliar people. Age was not related to language use in any way for Group 1.

**Birth Order and Language Use**

Language use was also shown to be associated with birth order for Group 2 participants. When questioned by an unfamiliar adult, older siblings, independent of their absolute age, spoke more than younger siblings. It is possible that older siblings hold the role of communicating for themselves and their siblings, and therefore are more accustomed to speaking to adults when asked a question. They may also be spoken to more often by adults. This association between birth order and language is not found in the unstructured setting for Group 2, which may further indicate that the relationship results when older siblings are required or requested to communicate with unfamiliar people. This result is not found within Group 1 in either setting.

**Genetic Relatedness and Language Use**

Results do not support a relationship between genetic makeup and language use. Intraclass correlations yielded contradictory and contrary findings, and concordance rates offered no supporting evidence for any relationship between genetic relatedness and tendency to speak in the unstructured setting. However, this question may not have been adequately addressed by this study. Due to very small numbers of twins who spoke in each setting, the correlational indices proved to be not the best indicators of a relationship between zygosity and latency to speak and number of words spoken. Though concordance rates served as a viable method to assess a relationship, they could
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not be used with continuous variables, which excluded the main variables of interest -- latency and number of words spoken. Future studies should employ larger sample sizes of twins, and may benefit from including both quantitative and qualitative variables in order to maximize the analyses that can be applied.

Gender and Language Use

Among Group 1 participants in the unstructured setting, gender and first-person pronoun usage were found to be related such that boys used a significantly greater number of first-person pronouns than did girls. When left alone with an unfamiliar adult, the boys who spoke tended to speak about themselves. Possible reasons behind this finding could be examined by additional studies, which could explore if this relationship changes with age or across situations. Perhaps if the boys were divided into groups by age, this finding would appear with only younger or only older boys. It would also be interesting to discover if a similar relationship appears with girls at different ages, or if within different situations girls and boys learn distinctly different ways to interact with others.

Limitations

The primary research questions addressed in this study focus on how children use language, not if they use language, and consequently the sample sizes used in many of the analyses were dependent on how many children chose to speak in the unstructured setting. Previous research agrees that it is beneficial to include an unstructured setting, in which participants are not asked to speak, when studying language use (Barrenechea & Schmitt, 1989). However, in the unstructured setting in
this study, the child's tendency to speak may have been affected by the distant behavior of the confederate. Confederates were instructed (a) not to engage the participants in any way, and (b) not to initiate conversation. Therefore, confederates sat quietly and did not play with any toy or touch any object in the laboratory. Also, they spoke only when spoken to by the participant, and generally did not ask the participants any questions unless a topic of conversation was already established by the participant.

Consequently, though the majority of participants greeted the confederate upon entering the room, the confederate returned the greeting but said nothing more. More language data may have been collected in the unstructured setting if the confederate had been permitted (a) to play with a game in the room, in order to make it easier for the child to find something to say, and (b) to encourage (though not initiate) language, for example, by responding with a "How are you?" following their greeting.

Similarly, as has briefly been discussed above, sample size within the monozygotic and dizygotic twin groups was severely constrained by the number of twins who chose to speak. Though the number of pairs of twins employed in the study was expected to be adequate to run analyses -- nine MZ pairs and eleven DZ pairs -- these numbers dropped drastically when only those who spoke were included: in the unstructured setting, two MZ pairs and five DZ pairs; in the structured setting, three MZ pairs and six DZ pairs.

Another limitation of this study was that the language elicitation measure (the structured setting) was not entirely successful in eliciting language. The two questions asked by the experimenter were designed to appear casual and conversational, as if
they were not questions the child was required to answer. However, participants may nevertheless have felt compelled to respond, both because they were in a laboratory setting and because they may have viewed the experimenter as an authority figure.

Another related problem with the language elicitation measure was that though the questions were open-ended, the children often gave one-word answers. If the experimenter tried to probe the child to say more, the measure sounded less casual and conversational, and more like a required part of the study. A better way to gather conversational language data would have been to have the experimenter wear a hidden audio recording device, and talk with the participants throughout and in between all parts of the study. This would also have succeeded in providing data on how language differs in various settings.

Participants were video taped as part of the larger SANDSS study, which is concerned with if participants speak, not what they say. The video tapes showed if the participant spoke or not, but it was often very difficult to hear precisely what was said, especially if the child spoke softly. In some cases, transcription was impossible and data could not be used. In other cases, an accurate count of the number of words could be obtained, but the number and type of pronouns used was very difficult to ascertain. Future studies may benefit from using audio recordings, or video taping equipment designed to record language.

In addition to sometimes being unable to accurately count pronouns, the pronoun variable may not have been the best measure of language use in the structured setting. Because the questions in the language elicitation measure asked about the
participan ts' activities and likes and dislikes, the questions may have encouraged
responses using first-person pronouns.

One additional limitation may have been the choice of temperament dimensions
included, as well as how temperament was assessed. Though sociability was theorized
to be associated with language use, additional dimensions may also show a
relationship. For example, perhaps egocentrism is related to first-person pronoun
usage. Also, parent-reports of temperament can provide valuable information on
temperament at a behavioral level. Though it is not possible to assess temperament at a
truly neurological level, assessing it on a physiological level (e.g. measuring heart rate)
may have served to provide additional information or to confirm or contradict the
results of the parent-report measures.

Future Directions

The primary goal of future studies intending to examine a relationship with
language use should be to gather more language data, including nonverbal
communication behavior. This could be accomplished by wearing hidden microphones
as discussed above, and by using equipment that is designed to measure both facial
expressions and body language simultaneously. Also, the structured setting may be
improved by increasing the number of questions asked of the participants. Though this
might increase the chances that participants feel it is a required part of the study, if the
questions remain conversational and pertain to the child's interests, and if the
experimenters appear interested in learning more about the participants' interests, the
result may be more language data. This approach combined with the hidden
microphone should result in sufficient language data in a variety of settings. In some cases the limited amount of language data obtained in this study hindered analyses. However, future researchers can also incorporate suggestions to make confederates more animated and to discreetly record speech in a variety of situations, both structured and unstructured.

Additional studies may also want to include several dimensions of temperament, as noted above, and may want to assess temperament on behavioral and constitutional levels whenever possible.

Additionally, as discussed above, future studies should counterbalance the type of setting (structured and unstructured) to rule out the possibility that participants speak more in one setting simply because they are becoming accustomed to the laboratory.

Though the limitations described above affect the conclusions that can be drawn, the results still add to the existing body of knowledge on language use. The observed relationships between language use and gender, age and birth order may assist researchers concerned with developmental, clinical, social, linguistic, or educational issues. The relationship between sociability and language may encourage future study by temperament researchers and psycholinguists.
References


Temperament and language


McCroskey, J. C. & Daly, J. A. (1976). Teachers’ expectations of the
communication of the apprehensive child in the elementary school. Human
Communication Research, 3, 67-72.


Sibling number 1 was the first sibling to be video taped; sibling number 2 was the second. (The order in which siblings were video taped was determined by a flip of a coin.) Pieces of paper with the family ID number and the sibling number for all of the siblings with the number 1 (e.g. 115-1, 159-1, 242-1, etc.) were gathered in a box. The slips of paper were then drawn from the box and assigned to group 1 or 2 by a flip of a coin. Once all of the siblings with sibling number 1 were assigned to a group, their sibling (with sibling number 2) was then automatically assigned to the other group. This pseudo-randomization allowed each pair of siblings to be split up into different groups.
Appendix A

Random Assignment to Groups

All child participants were assigned a family identification number (which was the same for each sibling in a family), and then were given either sibling number 1 or 2. Sibling number 1 was the first sibling to be video taped; sibling number 2 was the second. (The order in which siblings were video taped was determined by a flip of a coin.) Pieces of paper with the family ID number and the sibling number for all of the siblings with the number 1 (e.g. 115-1, 159-1, 242-1, etc.) were gathered in a box. The slips of paper were then drawn from the box and assigned to group 1 or 2 by a flip of a coin. Once all of the siblings with sibling number 1 were assigned to a group, their sibling (with sibling number 2) was then automatically assigned to the other group. This pseudo-randomization allowed each pair of siblings to be split up into different groups.
## Appendix B

**Colorado Childhood Temperament Inventory**

**Family No. ____ Older Sibling’s/Twin A’s Behavior**

Here are a list of phrases. Please rate each one concerning how well it describes _______ behavior in the last year. Please answer honestly -- there are no right or wrong answers.

<table>
<thead>
<tr>
<th>1=strongly disagree</th>
<th>2=disagree</th>
<th>3=sometimes</th>
<th>4=agree</th>
<th>5=strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Likes to be around people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>When upset, can be easily distracted.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Is busy all the time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Persists at tasks or games until successful.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>* Makes friends easily.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Is always bursting with energy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Often gets upset.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Goes from game to game quickly.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>It takes a lot to get him or her mad.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Has strong likes and dislikes.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Is always on the go.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Reacts intensely when upset.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>* Would rather work with others than alone.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Is off and running as soon as he/she wakes up in the morning.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Is easily frightened.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Looks frustrated when learning something new.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>When s/he is mad, you know it right away.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>*(R) Is something of a loner.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Is quick-tempered.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Likes to go to new places.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Has few fears.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Prefers quiet, inactive games to active ones.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>*(R) Takes a long time to warm up to strangers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Often acts insecure.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Makes faces at new foods during dinner.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

* Indicates questions comprising Sociability scale.
(R) Reverse-scored items
## Appendix B

### Colorado Childhood Temperament Inventory

**Family No. _____ Younger Sibling’s/Twin B’s Behavior**

Please rate these phrases again. This time rate them according to how well each one describes behavior in the last year. Please answer honestly -- there are no right or wrong answers.

<table>
<thead>
<tr>
<th>1=strongly disagree</th>
<th>2=disagree</th>
<th>3=sometimes</th>
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</thead>
</table>

* Indicates questions comprising Sociability scale.

(R) Reverse-scored items

---

<table>
<thead>
<tr>
<th>* Likes to be around people.</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>When upset, can be easily distracted.</td>
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<td>3</td>
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<td>5</td>
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<td>Is busy all the time.</td>
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</tr>
</tbody>
</table>

* Indicates questions comprising Sociability scale.

(R) Reverse-scored items
Appendix C

Video Tape Coding Scheme

General rules:

Do not code any session for more than two minutes.
Do not code any participant whom you interviewed. (However, you may code if you served as the confederate.)
Do not code more than one sibling in the same family.
Do not leave any spaces on the Data Summary sheets blank!

** Reset the counter on the VCR to zero at the beginning of each participant! **

Description of sessions:

Sessions 1-5 should last two minutes each -- do not code for longer than two minutes.

**Session 1:** Adult confederate with wheeled chair

**Session 2:** Adult confederate after wheeled chair is removed

**Session 3:** Alone session

**Session 4:** Child confederate

**Session 5:** Child confederate (continued)

**Session 6:** Language elicitation measure

Session 1 begins: when the hallway door is opened
ends: when the hallway door is opened again

Session 2 begins: when the hallway door is closed
ends: when the hallway door is opened again

Session 3 begins: when the hallway door is closed
ends: when the hallway door is opened again

Session 4 begins: when the door to the inner office is opened for the second time
ends: after two minutes

Session 5 begins: when Session 4 ends
ends: when the hallway door is opened

**But remember to code for only two minutes!**

Session 6 is coded for language use and communication, and begins when the experimenter begins speaking, and ends when the experimenter either escorts the participant from the room or turns off the video camera. Data from Session 6 is only included on Data Summary Page 2.
Temperament and language

Operational definitions:

Pertaining to Data Summary Page 1:

play: Includes time spent in setting up or putting away a game or toy, and also may include playing with a non-toy object (e.g. the chalkboard).

latency to together play: Indicate how many seconds after the session begins that the participant and confederate begin playing together.

latency to play alone with a toy from the shelf: Indicate how many seconds after the session begins that the participant plays with an object on the shelf.

latency to play alone with a toy from the table: Indicate how many seconds after the session begins that the participant plays with an object on the table.

latency to stand: Indicate how many seconds after the session begins that the participant stands up voluntarily.

time spent in together play: Using the Scratch Sheet, note the beginning and ending time of all occurrences of the participant and confederate playing together. Add the number of seconds spent playing together, and indicate total on Data Summary Page 1.

time spent in alone play with a toy from the shelf: Using the Scratch Sheet, note the beginning and ending time of all occurrences of the participant playing alone with an object or toy from the shelf. Add the number of seconds spent playing alone at the shelf, and indicate total on Data Summary Page 1.

time spent in alone play with a toy from the table: Using the Scratch Sheet, note the beginning and ending time of all occurrences of the participant playing alone with an object or toy from the table. Add the number of seconds spent playing alone at the table, and indicate total on Data Summary Page 1.

frequency of moves: Indicate the number of times the participant changes location during the session, e.g. walks across the room.

frequency of total toys: Indicate the total number of toys or objects the participants plays with during the session, regardless of the location of the toys and whether or not the participant is playing alone.

rating of proximity: Indicate the closest that the participant ever gets to the confederate during the course of a session, using the ratings described below.

1 Farthest distance from confederate, e.g. when participant sits in wheeled chair, or standing at an equally far distance.

2 Closer to the confederate, e.g. when the participant sits in the gray chair.

3 Closer still to the confederate, although with space remaining between them, e.g. when the participant is standing at or leaning over the table.

4 Closest distance to the confederate, e.g. when the confederate and participant are playing a game together or sitting by one another on the couch.
Pertaining to Data Summary Page 2:

**latency to talk:** For sessions 1 through 5, indicate how many seconds after the session begins that the participant speaks to anyone for any reason. For the language elicitation session, indicate how many seconds elapse after the experimenter has finished asking the first question until the participant speaks.

**Remember to convert the time you enter on the Summary Sheet to seconds. If the participant didn’t talk at all during a session, enter 9’s under latency.**

**frequency of 1st person pronouns:** Counting from the Transcription Sheet, indicate the number of 1st person pronouns used by the participant for each session.

Example: I, we, me, us

**frequency of 2nd person pronouns:** Counting from the Transcription Sheet, indicate the number of 2nd person pronouns used by the participant for each session.

Example: you, you all

**frequency of 3rd person pronouns:** Counting from the Transcription Sheet, indicate the number of 3rd person pronouns used by the participant for each session.

Example: he, she, they, them

**frequency of total words:** Using the Transcription Sheet, count the total number of words or utterances spoken by the participant, regardless of meaning of the word or utterance. Contractions (e.g., don’t, I’ll, wasn’t) should be counted as one word.

**frequency of filler words:** Count the total number of filler words used by the participant. Filler words include words such as “like” or “um.”

**frequency of communicative words:** Count the total number of communicative words used by the participant. Communicative words can be defined as non-filler words, i.e. words that have meaning and contribute to the participant’s communication.

**ratings of clarity of speech, content of speech, and gestures:** Refer to the Transcription Rating Sheet, answer the questions and transfer your answers to the Data Summary Page 2. If the participant didn’t speak at all, indicate 9 for the clarity of speech and the content of speech.
<table>
<thead>
<tr>
<th>Session</th>
<th>Latency to (in seconds):</th>
<th>Time spent in (in seconds):</th>
<th>Frequency of:</th>
<th>Ratings of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>together play - 3</td>
<td>together play - 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>play at shelf - 3</td>
<td>alone play shelf - 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>play at table - 3</td>
<td>alone play table - 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>stand - 3</td>
<td></td>
<td></td>
<td>prox - 1</td>
</tr>
</tbody>
</table>

1 - AC w/ chair
2 - AC w/o chair
3 - alone
4 - CC
5 - CC

**Use 9's for latency measures if the participant didn't engage in the behavior.**

Did confederate initiate any play behavior or any contact with the participant? yes no
If yes, indicate session number and explain here:

---

Revised 6/20/96

Use Scratch Sheet
<table>
<thead>
<tr>
<th>Session begins:</th>
<th>Play together</th>
<th>Play alone - shelf</th>
<th>Play alone - table</th>
<th>Extra</th>
<th>Stand</th>
<th>Moves</th>
<th>Toys</th>
<th>Rating of Prox</th>
</tr>
</thead>
<tbody>
<tr>
<td>begin</td>
<td>begin</td>
<td>begin</td>
<td>begin</td>
<td>begin</td>
<td>begin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>end</td>
<td>end</td>
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<td>end</td>
<td>end</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total time</td>
<td>total time</td>
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<td>total time</td>
<td>total time</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>converted</td>
<td>converted</td>
<td>converted</td>
<td>converted</td>
<td>converted</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Revised 3/28/96
<table>
<thead>
<tr>
<th>Session</th>
<th>Latency to: (In seconds)</th>
<th>Frequency of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st person pronouns - 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2nd person pronouns - 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3rd person pronouns - 2</td>
<td></td>
</tr>
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<td></td>
<td>total words - 3</td>
<td></td>
</tr>
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<td></td>
<td>filler words - 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>comm. words - 3</td>
<td></td>
</tr>
</tbody>
</table>

1 - AC w/ chair
2 - AC w/o chair
3 - alone
4 - CC
5 - CC

B.O.: [ ]
Zy: [ ]

Did you remember to convert minutes-seconds to seconds for the latency?

** Use 9's for latency measures if the participant didn't engage in the behavior. **

Did confederate initiate any conversation or any contact with the participant?  
Yes  No

If yes, indicate session number and explain here:

Revised 6/20/96
Use Transcription Sheet
Appendix D

**Transcription Rating Sheet**

<table>
<thead>
<tr>
<th>Family ID</th>
<th>Subject #</th>
<th>Coder ID</th>
</tr>
</thead>
</table>

For each session, please answer the following questions:

Would you characterize the general content of the participant’s speech as more self-directed (talking about self) or other-directed (not talking about self):

1. self-directed
2. neutral
3. other-directed
4. didn’t talk

How clear was the participant’s speech (in terms of pronunciation, enunciation, etc.)?

1. very clear
2. somewhat clear
3. neutral
4. somewhat unclear
5. not at all clear
6. didn’t talk

If the participant used gestures, were they directed inward toward themself or outward toward the confederate?

1. didn’t gesture
2. mostly inward
3. equally inward & outward
4. mostly outward
Thank you all for your willingness to add to SANDSS for the benefit of not only my thesis (a small point), but also to allow us to add to the literature on the relationship between temperament and language use.

If you have any questions about anything mentioned here, please ask one of the graduate students or Dr. McGuire.

**The Goal**
Our goal is to add a measure to the existing SANDSS procedure that will attempt to elicit language use by the participants. The study as it stands now is strong because it does just the opposite -- it puts the participants in an unfamiliar environment and allows us to watch and measure how they use language spontaneously. However, to be able to make meaningful inferences about language use and how it may relate to temperament, we must also assess the participant's use of language when a relatively unfamiliar person attempts to engage them in conversation.

**The Purpose of the Questions**
The two questions below are designed to elicit a variety of responses -- this is why they ask about seemingly unrelated topics. If we obtain high variability in responses, we also will most likely see a greater variety in language use, and our subsequent results will be more meaningful.

However, with this said, we all still recognize the importance of standardizing our procedures. The questions below should be asked exactly as they appear. Please do not ad lib additional questions. If these two questions do not get them talking, that too is important. For those that do speak up, let them say as much or as little as they feel like saying. Encourage them to continue talking by using head nods, smiles, an "Oh, really?" (or similar comment), or a pause, if any of these seem appropriate.

**Your Role**
Your demeanor is critical. This segment needs to appear very casual and conversational. The participants should not feel as if you are asking these questions as part of the study. They should not feel as if there is a right or wrong answer. You should be friendly and open -- remember, we want them to talk -- but casual, as if you are simply chatting with them during a few spare minutes.

**The Whens and Wheres**
This language elicitation attempt will be video taped for each sibling, immediately following the observational session with the child confederate in room 4338. At the end of this session, please ask only the child confederate to leave the room; the participant stays, and the video camera and microphone stay on. You then enter the room, sit down and follow the script:
Temperament and language

The Script

1) Greet the participant.
   Use whatever words feel natural for you -- remember, this is supposed to look like a
casual chat.

2) Question One
   "We're almost done, I just have a few more things for you to do. So, what have you
   enjoyed most so far?"

   This is intentionally vague. If they interpret the question as what they enjoyed most so
   far in their life, in their summer vacation, in this century -- that's fine. Anything they say
   is fine.

   If they say, "About what?" or some such similar question, you may repeat the question
   and add "today" or "tonight" (whichever is appropriate), as in: "What have enjoyed most
   so far tonight?"

   Give them time to think. Pause. Don't let them off the hook too easily. A few moments
   of silence often can be effective in eliciting conversation. Use your best judgment as to
   how long you should wait before proceeding.

   Then, whether they have told you their life story or said absolutely nothing, still ask the
   second question:

3) Question Two
   "What do you like to do after school?"

   Again, give them time to think. Pause.

   When you feel it is appropriate, move on to complete the rest of the study as normal
   procedure dictates. Escort the participant from the room. The video camera may now be
   turned off; the video taped portion is completed for this participant.

Keep in Mind!

As you can see, it is important that the experimenters refrain from chatting with the participants
during free moments, for example, when escorting them to and from the various offices during
the interview, until this language elicitation component has been administered. If the
experimenter does initiate or encourage chatting during these times, then the experimenter will
become more and more familiar to the participant, which will add a confound to the elicitation
task. Additionally, we run the risk of having already chatted about the topics that we plan to
bring up later in the elicitation task.
Appendix F  
Temperament and language

UNIVERSITY OF CALIFORNIA, SAN DIEGO  
SAN DIEGO SIBLING STUDY (SANDSS)  
CONSENT TO ACT AS A RESEARCH PARTICIPANT  
Parent’s Consent

Shirley McGuire is conducting a study on sibling’s relationships. Dr. McGuire would like to include me and my children in the study because our family has two children in middle childhood or adolescence.

My participation will involve an interview lasting about fifteen minutes. I may refuse to take part or withdraw any time without penalty.

If I allow my children to take part, they will be videotaped interacting with an unfamiliar peer and adult by Dr. McGuire and her staff. The videotapes will only be viewed by the investigator and other professional researchers at UCSD. In addition, my children will be interviewed for approximately thirty minutes. If one of my children shows a reluctance to participate, his or her interview or videotaped play session will be stopped.

We will probably not receive any direct benefits from participating in this research, but the knowledge gained by the investigators will help others in the future.

Our family will receive a gift for taking part in this research. We will receive this gift even if a member of our family withdraws or refuses to participate. Our names (and any other identifying information) will be withheld from all published reports of this work.

The interviewer has explained this study to me and answered my questions. If I have other questions later, I can call Shirley McGuire at (619) 534-4634 or (619) 534-9752.

I have received a copy of this consent document to keep.

Based on the foregoing, I agree to participate. I also give permission for my child to take part in this study.

We will probably not receive any direct benefits from participating in this research, but the knowledge gained by the investigators will help others in the future.

Parent’s Signature  
Date

Family ID number

I give permission for excerpts of the videotapes to be shown at professional meetings.

I give permission for excerpts of the videotapes to be shown at UCSD classes.

We will probably not receive any direct benefits from participating in this research, but the knowledge gained by the investigators will help others in the future.
Appendix F  Temperament and language

UNIVERSITY OF CALIFORNIA, SAN DIEGO
SAN DIEGO SIBLING STUDY (SANDSS)
CONSENT TO ACT AS A RESEARCH PARTICIPANT
Child's Consent

Shirley McGuire is conducting a study to learn more about siblings' relationships. Dr. McGuire would like to include me in the study because my family has two children in middle childhood or adolescence.

My interview will last about thirty minutes. I understand that I may refuse to take part or withdraw any time without penalty. In addition, I am free to skip any questions I do not want to answer.

I will receive a gift for taking part in this research, even if I withdraw or refuse to participate.

My name be withheld from all papers and presentations of her work.

The interviewer has explained this study to me and answered my questions. If I have other questions later, I can call Shirley McGuire at (619) 534-4634 or (619) 534-9752.

Based on the statements above, I agree to take part in the study.

I will receive a gift for taking part in this research, even if I withdraw or refuse to participate.

My name be withheld from all papers and presentations of her work.

Family ID number: __________

Date of Birth __________________________

Date __________________________

Child's Signature __________________________

Date __________________________

Child's Signature __________________________

Date __________________________

Date of Birth __________________________

Date __________________________

Child's Signature __________________________

Date __________________________

Date of Birth __________________________

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Child's Signature __________________________

Date __________________________

Date of Birth __________________________

Date __________________________

Child's Signature __________________________

Date __________________________
Appendix G

Figure 1. Latency to speak in the unstructured setting by group 1 participants.

Figure 2. Latency to speak in the unstructured setting by group 2 participants.

Figure 3. Latency to speak in the structured setting by group 1 participants.

Figure 4. Latency to speak in the structured setting by group 2 participants.
Figure 5. Number of words spoken in the unstructured setting by group 1 participants.

Figure 6. Number of words spoken in the unstructured setting by group 2 participants.

Figure 7. Number of words spoken in the structured setting by group 1 participants.

Figure 8. Number of words spoken in the structured setting by group 2 participants.
Figure 9. Number of first person pronouns used in the unstructured setting by group 1 participants.

Figure 10. Number of first-person pronouns used in the unstructured setting by group 2 participants.

Figure 11. Number of first-person pronouns used in the structured setting by group 1 participants.

Figure 12. Number of first-person pronouns used in the structured setting by group 2 participants.
Figure 13. Number of second-person pronouns used in the unstructured setting by group 1 participants.

Figure 14. Number of second-person pronouns used in the unstructured setting by group 2 participants.

Figure 15. Number of second-person pronouns used in the structured setting by group 1 participants.

Figure 16. Number of second-person pronouns used in the structured setting by group 2 participants.
Figure 17. Number of third-person pronouns used in the unstructured setting by group 1 participants.

Figure 18. Number of third-person pronouns used in the unstructured setting by group 2 participants.

Figure 19. Number of third-person pronouns used in the structured setting by group 1 participants.

Figure 20. Number of third person pronouns used in the structured setting by group 2 participants.
Figure 21. Logarithmic transformation of first-person pronouns in the structured setting by group 1 participants.

Figure 21. Logarithmic transformation of first-person pronouns in the structured setting by group 2 participants.
Appendix H

Changes in Results Section with Outliers Excluded

The following serves as a report of how the results discussed in the paper changed when outlying values were excluded from the analyses. Four siblings, three in Group 1 and one in Group 2, showed extreme outlying values on either the latency to speak or number of words spoken variables. Analyses were conducted with these individuals and their co-sibling excluded. A comparison of the two sets of results -- with the outliers and without the outliers -- showed virtually no difference for the majority of analyses. The changes that did result are reported below.

Two significant changes appeared when the outliers were excluded: (a) the correlation between sociability and the number of words spoken in the unstructured setting increased from a nonsignificant .18 to still nonsignificant .53 (see Table H3), and (b) the disappearance of a significant t-test, which found that the mean age of those in Group 2 who chose to speak in the unstructured setting was higher than those who did not choose to speak. Otherwise, the pattern of results with the outliers excluded was extremely similar to the pattern of results with the outliers included; significant results remained significant and nonsignificant results remained nonsignificant. In most cases, the values changed very slightly.

Tables H1 and H2 (cf. Table 1 and Table 2, respectively) show the change in the descriptive statistics, such as the percentage of participants who spoke and the characteristics of that speech. The number of participants in Group 1 decreased from 63 to 59, 21 of whom (36%) spoke in the unstructured session. Twenty-nine participants in
Temperament and language

Group 1 underwent the structured session, and all 29 spoke. The number of
participants in Group 2 also decreased from 63 to 59, 25 of whom (42%) spoke in the
unstructured session. Twenty-eight participants in Group 2 experienced the structured
setting, and all 28 spoke (see Table H1).

Table H1
Number of Participants Who Spoke in the Structured and Unstructured Settings,
When Outliers Are Excluded.

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstructured setting</td>
<td>21 of 59 (36%)</td>
<td>25 of 59 (42%)</td>
</tr>
<tr>
<td>Structured setting</td>
<td>29 of 29 (100%)</td>
<td>28 of 28 (100%)</td>
</tr>
</tbody>
</table>

The measures of central tendency for latency to speak, number of words spoken,
and pronouns used for those who spoke are presented in Table H2, and show a similar
pattern of results as was discussed for Table 2 in the Results section. The structured
setting was characterized by shorter latencies and a greater number of words spoken.
Values that are different from those presented in Table 2 are in bold type.
Table H2
Characteristics of Speech:
Central Tendencies for Latency to Speak, Number of Words Spoken, and Number and Type of Pronouns Used in Unstructured and Structured Settings Among Those Who Spoke, When Outliers Are Excluded.

|                      | Group 1          |                     |                     
|----------------------|------------------|---------------------|---------------------
|                      | mean  | median | mode   |                     
| Unstructured setting (n = 23) |       |         |        |                     
| Latency to speak (seconds) | 14.71 | 10.00   | multiple |                     
| Number of words spoken | 19.14 | 10.00   | 1.00    |                     
| Number of pronouns used |       |         |        |                     
| First-person          | .96   | .00     | .00     |                     
| Second-person         | 1.04  | .00     | .00     |                     
| Third-person          | .22   | .00     | .00     |                     
| Structured setting (n = 31) |       |         |        |                     
| Latency to speak (seconds) | 1.52  | 1.00    | 1.00    |                     
| Number of words spoken | 30.34 | 28.00   | multiple |                     
| Number of pronouns used |       |         |        |                     
| First-person          | 3.58  | 3.00    | 3.00    |                     
| Second-person         | .29   | .00     | .00     |                     
| Third-person          | .32   | .00     | .00     |                     

|                      | Group 2          |                     |                     
|                      | mean  | median | mode   |                     
| Unstructured setting (n = 29) |       |         |        |                     
| Latency to speak (seconds) | 13.68* | 8.00   | 5.00    |                     
| Number of words spoken | 34.76 | 13.00   | 1.00    |                     
| Number of pronouns used |       |         |        |                     
| First-person          | 2.34  | 1.00    | .00     |                     
| Second-person         | 1.86  | 1.00    | .00     |                     
| Third-person          | .90   | .00     | .00     |                     
| Structured setting (n = 30) |       |         |        |                     
| Latency to speak (seconds) | 1.57  | 1.00    | 1.00    |                     
| Number of words spoken | 38.86 | 31.00   | 25.00   |                     
| Number of pronouns used |       |         |        |                     
| First-person          | 4.13  | 5.00    | 1.00    |                     
| Second-person         | .43   | .21     | .00     |                     
| Third-person          | .53   | .13     | .00     |                     

*Values that changed appear in bold type.
Sociability and Language Use

When testing the hypothesis that those rated high in sociability will demonstrate a shorter latency to speak and will speak more (i.e., a greater number of words) than those rated as less sociable, some changes in the Pearson correlations were found, though these changes did not alter the conclusions drawn. These changes are presented in Table H3.

Table H3

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unstructured setting</strong></td>
<td><strong>(n = 21)</strong></td>
<td><strong>(n = 25)</strong></td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>.07</td>
<td>.26</td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>.53</td>
<td>-.17</td>
</tr>
<tr>
<td><strong>Structured setting</strong></td>
<td><strong>(n = 29)</strong></td>
<td><strong>(n = 28)</strong></td>
</tr>
<tr>
<td>Latency to speak (seconds)</td>
<td>.22</td>
<td>.33*</td>
</tr>
<tr>
<td>Number of words spoken</td>
<td>-.00</td>
<td>-.12</td>
</tr>
</tbody>
</table>

* p < .05

Age and Language Use

As reported above, the significant one-tailed independent groups t test in Group 2, examining if those children who chose to speak in the unstructured setting were significantly older than those who did not speak, became insignificant when results were re-calculated with outliers excluded. The mean age of those who spoke (M =
Temperament and language

10.67) was not found to be significantly different from those who did not speak ($M = 9.94$), $t(56) = -1.55, p = ns$. This can be compared to the results reported in the Results section, which found for Group 2, the mean age of those who spoke ($M = 10.93$) was significantly higher than those who did not speak ($M = 9.94$), $t(60) = 2.20, p < .05$. No changes were found among Group 1 participants.

Small changes were also found among the Pearson correlations used to test the hypothesis that age is associated with language use such that older children exhibit a shorter latency to speak and speak more than younger children, although the pattern of results remained the same. The correlations are reported in Table H4.

Table H4

*Pearson Correlations Between Age and Language Use for Groups 1 and 2 in Unstructured and Structured Settings Among Those Who Spoke, When Outliers Are Excluded.*

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Group 1 ($n = 20$)</th>
<th>Group 2 ($n = 24$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unstructured setting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Latency to speak (seconds)</td>
<td>-.18</td>
<td>.00</td>
</tr>
<tr>
<td></td>
<td>Number of words spoken</td>
<td>-.27</td>
<td>.04</td>
</tr>
<tr>
<td><strong>Structured setting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Latency to speak (seconds)</td>
<td>-.18</td>
<td>-.12</td>
</tr>
<tr>
<td></td>
<td>Number of words spoken</td>
<td>.17</td>
<td>.37*</td>
</tr>
</tbody>
</table>

* $p < .05$
Genetic Relatedness and Language Use

As mentioned in the Results section, excluding outliers prevented testing of the hypothesis that identical twins use language more similarly than do fraternal twins and full siblings, because the sample sizes of monozygotic twins who spoke were reduced. Also, concordance values could not be computed for monozygotic twins. Of the 6 pairs of monozygotic twins, in no pairs did both twins speak, essentially yielding a probandwise concordance rate of .00. Though concordance values for dizygotic twins and full siblings remained unchanged, the reduction in the number of pairs of monozygotic twins makes comparison between sibling groups impossible.