On the Value of Repeated Measures of Intention, Vocabulary, and Grammar for Children With Autism

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Children’s development of communicative intention has been studied frequently by researchers who are interested in the language deficits of children with autism. In these studies, children’s development of intentionality is often analyzed along with their vocabulary and grammar to examine how these different skill areas are related. Findings from some studies suggest that deficits in communicative intent serve as obstacles to the acquisition of vocabulary and grammar (Rollins & Snow, 1998). Other studies suggest a relationship between intentionality, vocabulary, and grammar, but they also find other skills (e.g., verbal imitation, pretend play, and object play) to be important to these children’s language development (Smith, Mirenda, & Zaidman-Zait, 2007; Yoder, 2006). Still other studies have shown that some children with autism can produce words and grammar at levels that are superior to their skills in communicative intention (Wetherby, Prizant, & Hutchinson, 1998).

The purpose of the current study was to learn more about the development of intention, vocabulary, and grammar in children with autism by completing a longitudinal case study. In addition to learning about how skills in these three areas relate to each other in a single child, we hoped to use the data to show the efficacy of repeated measures of these three skill areas for helping a clinician and family determine a child’s current level of communication skills and predict future levels of language growth.

Although an evaluation of these three skill areas should be fairly standard within the assessment of young children, repeated testing of these skills during treatment is not. This is especially true now that numerous autism treatment options are offered to families by professionals within and outside of the field of communication disorders. Information from repeated testing of these three behavioral areas may provide interventionists with a more precise profile of the child’s communicative skills, allowing for a more
consistent manner of evaluating the child’s responses to various types of treatments.

One of the reasons why repeated testing of intentionality, vocabulary, and grammar may be particularly advantageous to children with autism relates to the variable rates at which these children develop language and respond to treatment, as well as the potential instability of an autism diagnosis in children who are under the age of 3 years. Indeed, results from four studies have shown that 11% to 31% of children who had been diagnosed with autism before the age of 3 years no longer met the criteria for this diagnosis when they were 4 years old and older (Charman et al., 2005; Chawarska, Klin, Paul, & Volkmar, 2007; Lord et al., 2006; Turner & Stone, 2007). Given this type of variable outcome, repeated testing of key behaviors across time, regardless of the type and intensity of treatment a child receives, may be the ideal mechanism for helping a family learn about their child’s developmental growth potential and long-term prognosis relative to other children with autism.

Studies of children with autism also appear timely given the results of a recent survey conducted by Schwartz and Drager (2008). They reported that 25% of speech-language pathologists (SLPs) in their study did not feel competent in their ability to determine goals for children with autism, 33% were uncomfortable counseling parents of children with autism, and 91% felt that they would benefit from additional training in the clinical management of children with autism. These results underscore the need for more research that relates to the clinical management of children with autism. As background for this project, we reviewed studies that examined children’s development of communicative intention, vocabulary, and grammar. These studies included both children who were developing language typically and children who had been diagnosed with autism.

**Children With Typical Development**

Research studies on children with typical development have shown that the ability to produce communicative intention is strongly related to the development of expressive language. Wetherby, Cain, Yonclas, and Walker (1988) studied 15 typically developing 1- to 2-year-olds longitudinally to evaluate their use of intentional communication at the prelinguistic, one-word, and multiword stages. Results showed that across time, the children’s use of intentional acts increased along with their development of vocabulary and grammar. Specifically, the children’s number of intentional communicative acts increased from 62.6 ($SD = 22.26$) at the one-word stage to 152.1 ($SD = 57.23$) at the multiword stage. The children’s mean number of word types increased from 3.33 ($SD = 4.27$) at the one-word stage to 67.47 ($SD = 32.70$) at the multiword stage. The children’s mean length of utterance (MLU) in morphemes also increased from .74 ($SD = .47$) at the one-word stage to 2.20 ($SD = .64$) at the multiword stage.

In another study, Crais, Douglas, and Campbell (2004) examined the emergence of two types of intentional acts (i.e., behavior regulation and joint attention) and children’s early word use. The participants were 12 typically developing infants who were studied from 6 to 24 months of age.

The results of this study showed that for the majority of the children, behavior regulation gestures emerged before joint attention gestures, yet their earliest word productions served to both regulate behaviors and engage others in social interaction. These findings demonstrate the link between children’s intentional behaviors and their development of spoken language and show that very early in development, typically developing children begin producing different types of communicative intents through nonverbal and verbal means.

**Children With Autism**

For children with autism, deficits in joint attention and social interaction are often viewed as barriers to the development of their language systems (Baron-Cohen, Baldwin, & Crowson, 1997; Mundy, Sigman, & Kasari, 1990; Prizant, Schuler, Wetherby, & Rydell, 1997). Research by Rollins and Snow (1998) supports this claim. They evaluated the language profiles of 6 children with autism and 30 children with typical language development with two goals in mind: (a) to study the relationship between children’s linguistic skills and their mother’s communication styles and (b) to study relationships between the children’s intentional behaviors and their expressive language skills. In addressing the first objective, the authors studied the children’s language skills as a function of their mothers’ child-centered versus child-directed interaction profiles. They measured the children’s language skills using the Index of Productive Syntax (IPSyn; Scarborough, 1990). Results showed that the language skills of the typically developing children were related to their mothers’ styles of interactions. Children whose mothers used a child-centered style had higher IPSyn scores 20 months later than did children whose mothers used a child-directed style. However, this was not the case for children with autism. The authors speculated that the joint attention deficits of the children with autism made it difficult for these children to benefit from a child-centered interactive style.

In addressing their second objective, Rollins and Snow (1998) examined relationships between the children’s intentional behaviors and their IPSyn scores. The results showed a positive correlation between the children’s IPSyn scores and their frequency of joint attention acts but not between their scores and their behavior regulatory acts. These findings indicate that the development of some types of intentional acts (i.e., joint attention) is more important than others for the development of spoken language.

In a later study of 5 children with autism, Rollins (1999) provided additional support for the link between acts of joint attention and the development of language. In this study, Rollins examined children’s language profiles from the prelinguistic to early one-word stage while they were engaged in a classroom-based treatment program. Of the 5 children, 3 showed an increase in vocabulary development across time, 1 showed a decrease, and 1 showed no statistically significant change. Of those who showed an increase, < 40% of their communicative acts involved behavior regulation and > 40% of their communicative acts involved joint attention.
Interestingly, though, children with autism have also been shown to produce words and grammar at levels that are higher than might be expected given their deficits in communicative intent. Wetherby et al. (1998) documented this finding in a study of 22 children with autism and 22 children with delayed language but without autism. The data were collected using the Communication and Symbolic Behavior Scales (CSBS; Wetherby & Prizant, 1993). Wetherby et al. found that the children with autism presented lower scores than the children without autism on subtests involving communicative functions and gestural communicative acts, but they displayed comparable scores on subtests involving vocal and verbal communicative acts.

Finally, research has shown that other skills in addition to the development of intentionality also contribute to the development of language in children with autism. For example, over a 2-year period, Smith et al. (2007) analyzed the vocabulary development of 35 children with autism using the MacArthur Communicative Development Inventory (MCDI; Fenson et al., 1993). The age of the children at the start of the study ranged from 20 to 71 months. The first step of the analysis was to classify the children into four clusters based on the growth of their vocabularies across time. The vocabulary development of children in Cluster 1 was characterized by flat growth with a slight incline; development in Cluster 2 was characterized by a slow incline with a noticeable change between 12 and 24 months; development in Cluster 3 was characterized by a high, steady increase; and development in Cluster 4 was characterized by a steep increase. These results were found in spite of the fact that all of the children were receiving a similar amount (15–20 hr per week) of community-based treatment for their communication disorders.

Smith et al. (2007) then used the data from the initial MCDIs to identify early predictors of these four clusters. Results showed that some, but not all, of the subtests on the MCDI predicted the children’s later development of vocabulary. The positive predictors included verbal imitation, using objects to pretend, and imitation of joint attention. Variables not found to predict the children’s growth in vocabulary included gestures for games/routines, actions with objects, and imitations of actions. In addition, neither the cognitive status of the children nor their autism severity at the onset of the study was predictive of their later vocabulary growth.

In a similar study, Yoder (2006) examined the vocabulary growth of 35 children with autism who ranged in age from 21 to 54 months. After controlling for expressive language impairment at the start of the study, Yoder found both the children’s use of intentional communication and their object play diversity to be positive predictors of their vocabulary growth 12 months later. Variables not found to predict the children’s vocabulary growth included their use of attention-following behaviors (i.e., responding when name is called, coupled with a short-arm point and gaze), motor imitation behaviors, and amount of therapy received (which varied across children from 11 to 145 hr per month). In both the Smith et al. (2007) and Yoder studies, joint attention was identified as an important predictor of children’s development of vocabulary along with other skill areas.

In light of this literature, we designed a case study to examine the communicative intention, vocabulary, and grammar skills of 1 child with autism during the course of his community-based treatment. Our primary objective was to determine how the child’s (a) communicative intentions, (b) production of words, and (c) production of grammar changed over the course of his treatment.

### METHOD

#### Participant

At the start of the study, the participant was age 2:9 (years:months). He was selected for the study based on his diagnosis of autism by a pediatric neurologist at the age of 2 years. He was given the alias Michael after obtaining parent consent and approval from a university institutional review board. At the time of the study, Michael was the youngest child of two, and he lived with his mother and father in a middle class home. The highest level of education completed by Michael’s mother and father was 16 years.

#### Description of Child’s Community-Based Treatment

During the project, Michael received 5–9 hr per week (with no more than 2 hr a day) of community-based treatment for his communication disorders. This amount of treatment is consistent with or less than the amount received by the children studied by Rollins (1999), Smith et al. (2007), and Yoder (2006). Michael’s treatment included applied verbal behavior therapy (a style of applied behavior analysis; ABA; Skinner, 1957) and traditional speech and language therapy (which included relationship development intervention; Gutstein & Sheely, 2002). Before the start of the study, Michael had been in the ABA program for 11 months and in traditional speech and language therapy for 16 months.

To further describe Michael’s language abilities, the first author administered Module 1 of the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 2002). The ADOS is a semistructured assessment of communication, social interaction, and play for individuals who are suspected of having autism or other pervasive developmental disorders. When administering the ADOS, the clinician presents a hierarchy of “social presses” during a set of semistructured activities (e.g., free-play, snack, bubble play, role-playing a birthday party) in an attempt to elicit various behaviors from the child. On completion of these presses and the semistructured activities, the clinician then rates the child’s behaviors on a 0–3 scale; high scores are consistent with a diagnosis of autism and low scores are not.

Table 1 lists Michael’s ADOS scores. As can be seen, Michael’s performance on the ADOS was consistent with his diagnosis of autism. His scores on this tool also show that at the start of the study, his strengths included pointing, spontaneous initiation of joint attention, response to joint attention, and functional play with objects, and his weaknesses included use of gestures, facial expressions directed toward others, showing objects to others, and
engaging in unusually repetitive interests or stereotyped behaviors.

**Materials and Procedures**

Data were collected every other month over the course of 14 months using two tools—a language sample and the words and sentence version of the MCDI. Both of these tools were administered in Michael’s home. The first author collected the language samples, and Michael’s mother completed the MCDIs.

The language samples lasted on average 14:10 min (range = 12:48 to 15:59), and the following toys were used as prompts: a garage/car wash scene, a picnic, a baby with related items, and books with flash cards. Only the first author and child participated in the language samples, and only one set of toys was in Michael’s view at a time (to decrease potential distractions). Each language sample session was audio- and video-recorded, and then the samples were transcribed by the first author using Systematic Analysis of Language Transcripts Version 8.0 software (SALT; Miller & Iglesias, 2004).

The words and sentence version of the MCDI is a parent-administered inventory that is designed for children who are 16 to 30 months of age (or who are functioning within the 16- to 30-month age range). The first part of the inventory involves a 680-word vocabulary production checklist that is divided into 22 semantic categories. Eleven categories relate to nouns (e.g., animals, vehicles, toys, food and drink, clothing, body parts, small household items, furniture and rooms, outside things, places to go, and people), and 11 categories relate to sound effects and animal sounds, games and routines, verbs, adjectives, words about time, pronouns, question words, prepositions and locations, quantifiers and articles, helping verbs, and connecting words. Following these items are five questions regarding the child’s use of decontextualized language, including reference to past, future, and absent objects and events.

The second part of the inventory assesses the child’s morphological and syntactic development using 125 items organized into five sections. Three of the sections assess the production of regular and irregular bound morphemes such as plural -s, possessive -s, progressive -ing, past -ed, irregular plural nouns, irregular past tense verbs, and over-regularized plural nouns and past tense verbs. Another section reflects a forced choice format that requires the parent to choose which member in each of 37 sentence pairs best characterizes the syntactic form that is produced most often by the child. The final section asks the parent to record three of the longest utterances that were recently spoken by the child.

**Measures of Communicative Intent, Vocabulary, and Grammar**

Measures of Michael’s communicative intentions were collected from the language samples, and measures of
his spoken vocabulary and grammar were collected from the language samples and the MCDIs. For communicative intent, the language samples were limited to Michael’s initiations while he played with the picnic toy set. A focus on Michael’s initiations rather than his responses followed the procedures of Rollins and Snow (1998). Coding of Michael’s intentional acts was further facilitated by seven behavioral codes consistent with Wetherby and Prizant (1989; see Table 2).

Once Michael’s intentional behaviors were identified, they were further classified as nonverbal or verbal. Nonverbal behaviors include gestures and vocalizations, with the latter consisting of transcribable vowels or vowel plus consonant-like sounds. Verbal behaviors include recognizable words that were produced in isolation or in combination with others. If a nonverbal behavior was produced either simultaneously or overlapping in time with a verbal behavior, the behaviors were coded separately.

Michael’s intentional behaviors were also classified as serving to either regulate the examiner’s behavior or engage the examiner in social interaction. Behavior regulation acts served to obtain or restrict a goal, such as requesting or protesting an object or action. Social engagement acts either directed the examiner’s attention for the purpose of sharing the focus of an entity or event or served to attract and maintain the examiner’s attention for affiliative purposes.

Initially, we planned to focus on acts of joint attention only, but early in our coding, we found it difficult to distinguish acts of joint attention from acts of social interaction. Following Wetherby and Prizant’s (1989) criteria, acts of joint attention include comments, requests for information, and clarification of previous utterances; acts of social interaction include showing off, requests for social routines, greetings, acknowledgement of a previous statement, requests for permission, and calling the attention of the listener. The following example from a play sample illustrates our coding difficulties. At the time, Michael was playing with the toy slide that went to the picnic set. After he pushed toy people down the slide, he picked up the fork, held it out to the examiner, and commented, “The fork has to slide.” The examiner asked, “Do forks slide?” to which Michael responded, “no” with a giggle. Then, Michael continued his giggling while he slid other objects down the slide that he viewed as funny (i.e., “The plate has to slide.”).

This showing off behavior occurred at the same time that commenting was taking place. According to Wetherby and Prizant’s (1989) codes, the commenting portion of the act reflected joint attention while the showing off behavior reflected an act of social interaction. We resolved these types of coding issues by combining acts of joint attention and social interaction and classifying all of these behaviors as social engagement.

For Michael’s vocabulary and grammar abilities, two measures were calculated from the language samples: Michael’s total number of different word types and his MLU in morphemes. Michael’s total number of word types was based on a random selection of 49–50 utterances from each sample, and his MLU was calculated using all of the complete and intelligible utterances within the sample. SALT software was used to generate both of these indices. Three measures of vocabulary and grammar were taken from the MCDI: Michael’s total number of different word types produced (from a closed set of 680 words), his sentence complexity score (from a closed set of 37 paired sentences), and his MLU (as calculated from his three longest utterances).

### Reliability

Reliability was examined in two ways. First, ten 1-min excerpts from the language samples were randomly selected and independently transcribed by the second author. When these excerpts were compared to the originals, 171 morphemes out of 229 (75%) were in agreement. Second, fourteen 1-min excerpts were randomly selected from the picnic scenes, and these were independently coded for communicative intent, mode, and function by the second author. During these 14 min, there were 90 behaviors exhibited by the child, and for each of these, three sets of codes were possible (intentional vs. nonintentional; verbal vs. nonverbal; social engagement vs. behavior regulation). This resulted in 270 opportunities for the coders to agree or disagree. Of these 270 opportunities, 192 codes (71%) were in agreement.

Although rates of agreement in the 70% to 80% range are lower than desired, they are not inconsistent with other studies that have examined the pragmatic language skills of children with autism (e.g., Stiegler, 2007; Thunberg, Ahlström, & Sandberg, 2007). Further analysis of the reliability data indicated that disagreements were related to the second author identifying less intelligible speech and fewer nonverbal intentional behaviors than the first author; however, when the MLU values of the first and second authors’ transcripts were calculated, they were identical (MLU = 3.02). Nevertheless, when transcription and coding differences were identified by the two examiners, they were resolved through consensus.

### Table 2. Intentionality criteria (consistent with Wetherby and Prizant, 1989).

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternating eye gaze between goal and listener</td>
<td></td>
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<tr>
<td>Persistent signaling until the goal is accomplished or failure is indicated</td>
<td></td>
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<tr>
<td>Changing the signal quality until the goal has been met</td>
<td></td>
</tr>
<tr>
<td>Ritualizing or conventionalizing the form of signal within specific communicative contexts</td>
<td></td>
</tr>
<tr>
<td>Awaiting a response from the listener</td>
<td></td>
</tr>
<tr>
<td>Terminating the signal when the goal is met</td>
<td></td>
</tr>
<tr>
<td>Displaying satisfaction when the goal is attained or dissatisfaction when it is not</td>
<td></td>
</tr>
</tbody>
</table>
RESULTS

Communicative Intentions

Table 3 shows data from the language sample excerpts that were used to measure Michael’s communicative intentions across the seven testing sessions. This table lists the total number of minutes and the total number and rate per minute of Michael’s intentional behaviors within each excerpt; this latter rate-based measure of intentional behavior controls for length differences across the sessions. Also listed for each excerpt are Michael’s proportion of nonverbal and verbal acts, proportion of behavior regulation and social engagement acts, and proportion of utterances without intent.

As can be seen, Michael produced some communicative acts with intention in every session, although his rates of communicative acts per minute were lower than what one might expect for his age based on Wetherby et al.’s (1998) data on typically developing children. Michael’s rates of intentional communicative acts per minute also varied across the seven sessions, but in general, they showed an overall pattern of increasing from an initial rate of .98 acts per minute to a final rate of 4.79 acts per minute.

The rates of Michael’s nonverbal versus verbal intentional acts also fluctuated across the sessions, but in general, his nonverbal behaviors decreased from an initial rate of 67% to a final rate of 0%, and his corresponding verbal behaviors increased from an initial rate of 33% to a final rate of 100%. Michael also displayed a relatively low rate (33%) of behavior regulation acts and a correspondingly high rate (67%) of social engagement acts at the start of the study, but his rate of the latter increased to 100% by the end of the study. As was found for the other measures of communicative intent, this general pattern of change was accompanied by fluctuating performance across the seven sessions.

The final analysis of these data focused on Michael’s proportion of utterances without intent. This was examined because children with autism have been shown to produce words and utterances without communicative intent. As shown in Table 3, Michael’s proportion of utterances without apparent communicative intent again fluctuated across the seven sessions, but there was also a general pattern of decreased use of these types of utterances from an initial rate of 94% to a final rate of 19%.

Vocabulary and Grammar

Table 4 presents information about Michael’s vocabulary and grammar development as measured from the language samples and the MCDIs. As was found for his communicative intentions, measures of Michael’s language skills fluctuated across the seven testing sessions, but across time, he showed consistent increases in his use of both vocabulary (as measured by either number of word types within the samples or different number of words produced from the MCDI) and grammar (as measured by his MLU from the samples or the sentence complexity score and his MLU from the MCDI). For both measures of MLU, these increases were evident in spite of the fact that the MLUs from the language samples were based on all of Michael’s utterances, whereas the MLUs from the MCDI were based on his longest three utterances recalled by his mother.

Relationships Among Measures Across Sessions

To examine relationships among Michael’s intentionality, vocabulary, and grammar abilities across the seven testing sessions, we transformed his scores in all three domains to z scores, thereby providing a simultaneous visual representation of changes across time using a standardized unit of measurement for each of these skill areas. Figure 1 shows Michael’s scores for his (a) rate of intentional communicative acts per minute, (b) number of word types from the language sample, (c) MLU from the language sample, (d) number of words produced from the MCDI, (e) sentence complexity score from the MCDI, and (f) MLU from the MCDI. As can be seen, Michael’s rates of intentional behaviors generally increased along with his vocabulary and grammar. Most of these relationships were not statistically significant at the .05 level, but they were moderate to high in magnitude when Spearman rank correlations were computed (i.e., \( \rho \) ranged from .67 to .71 for all measures). The only exception to this claim involved Michael’s rates

<table>
<thead>
<tr>
<th>Table 3. Measures of Michael’s intentional acts.</th>
</tr>
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<tbody>
<tr>
<td><strong>Minutes of analyzed excerpt</strong></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td><strong>Total number of intentional behaviors</strong></td>
</tr>
<tr>
<td><strong>Rate of intentional behaviors per minute</strong></td>
</tr>
<tr>
<td><strong>Intentional behaviors by mode</strong></td>
</tr>
<tr>
<td>% of nonverbal acts</td>
</tr>
<tr>
<td>% of verbal acts</td>
</tr>
<tr>
<td><strong>Intentional behaviors by function</strong></td>
</tr>
<tr>
<td>% of behavior regulation acts</td>
</tr>
<tr>
<td>% of social engagement acts</td>
</tr>
<tr>
<td><strong>Proportion of utterances without intent</strong></td>
</tr>
</tbody>
</table>

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Table 4. Measures of Michael’s vocabulary and grammar.

<table>
<thead>
<tr>
<th></th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
<th>Session 5</th>
<th>Session 6</th>
<th>Session 7</th>
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<tbody>
<tr>
<td>Language samples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of utterances</td>
<td>49</td>
<td>61</td>
<td>75</td>
<td>57</td>
<td>96</td>
<td>57</td>
<td>95</td>
</tr>
<tr>
<td>Utterance rate per minute</td>
<td>3.73</td>
<td>4.89</td>
<td>5.35</td>
<td>3.98</td>
<td>6.71</td>
<td>4.06</td>
<td>6.09</td>
</tr>
<tr>
<td>Number of different word types</td>
<td>45</td>
<td>60</td>
<td>59</td>
<td>53</td>
<td>86</td>
<td>81</td>
<td>99</td>
</tr>
<tr>
<td>MLU a</td>
<td>2.51</td>
<td>2.70</td>
<td>3.81</td>
<td>2.89</td>
<td>4.68</td>
<td>3.30</td>
<td>3.99</td>
</tr>
<tr>
<td>MCDI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of words produced</td>
<td>273</td>
<td>474</td>
<td>432</td>
<td>427</td>
<td>482</td>
<td>495</td>
<td>551</td>
</tr>
<tr>
<td>Sentence complexity score</td>
<td>5</td>
<td>26</td>
<td>28</td>
<td>26</td>
<td>31</td>
<td>31</td>
<td>37</td>
</tr>
<tr>
<td>MLU b</td>
<td>3.67</td>
<td>6.33</td>
<td>4.00</td>
<td>5.6</td>
<td>5.67</td>
<td>12.67</td>
<td>9.67</td>
</tr>
</tbody>
</table>

Note. MCDI = MacArthur Communicative Development Inventory (Fenson et al., 1993).

aCalculated from a random selection of 50 utterances to control for sample size differences between sessions, with calculations for Session 1 based on 49 utterances. bCalculated using all complete and intelligible utterances in the samples. cCalculated from the child’s three longest utterances recalled by his mother.

Figure 1. Relationships among Michael’s acts of communicative intention and language measures.
of intentional behaviors and his MLUs from the MCDI; the correlation between these two measures was low, $\rho = .43$, $p = .33$.

Figure 2 shows a reorganization of these same data. In this graph, Michael’s intentional abilities are divided into acts of behavioral regulation and acts of social engagement, and his language $z$ scores are averaged together to form a language composite score for each testing session. This language composite score included his word counts from both the language samples and MCDIs, his MLU values from the language samples, and his sentence complexity scores from the MCDIs. As can be seen, increases in Michael’s language skills were positively tied to his increased rates of social engagement acts, $\rho = .78$, $p = .04$, and negatively tied to his corresponding rates of behavioral regulation acts, $\rho = -.78$, $p = .04$.

**DISCUSSION**

One of the goals of the current study was to examine three areas of language development in a child who had been diagnosed with autism. These areas were intentionality, vocabulary, and grammar, and they were selected because literature on children with autism has indicated that these areas are important for characterizing the communicative profiles of children with autism. Results from each testing session indicated that Michael’s abilities in these three skill areas were significantly delayed for his age. Within every session, Michael also produced some utterances that were void of communicative intent. Both of these findings are consistent with Michael’s test results from the ADOS and with his initial diagnosis of autism.

Another goal of the study was to examine the ways in which Michael’s skills in communicative intention, vocabulary, and grammar changed over time. Recall that the literature review indicated that these three skill areas are related to each other in typically developing children. These three areas have also been shown to be related in children with autism, but the relationship is more variable. Regarding this goal, results showed that all of Michael’s abilities showed fluctuation across the seven testing sessions, but they also showed an overall pattern of improvement over the course of the study. In addition, Michael’s growth in communicative intention was positively related to his growth in spoken vocabulary and grammar. Finally, of his communicative intentions, it was Michael’s increased use of social engagement acts and not his acts of behavior regulation that was positively related to his increased use of expressive language.

![Figure 2. Relationships among Michael's acts of behavioral regulation, acts of social engagement, and language measures.](image-url)
Michael’s data support work by Rollins (1999), Smith et al. (2007), and Yoder (2006) because these studies showed the development of expressive language in children with autism to be positively linked to acts of joint attention and social interaction. Using data from these previous group-based studies, we also can conclude that Michael’s particular growth profile is consistent with that of other children with autism who show high and steady increases in expressive language. This is an important finding because not all children with autism who receive treatment present this developmental profile. Indeed, only 3 of the 5 children studied by Rollins and 7 of the 35 children studied by Smith et al. presented this type of growth profile. Interestingly, in Rollins’ study, the 3 children who showed steady advances in their language skills also showed high rates (> 40%) of social engagement acts throughout the study. At the start of this study, 67% of Michael’s communicative acts also served to engage others, even though at that time, 94% of his utterances were void of intention.

Clinical Implications

Measurement of all three skill areas (i.e., communicative intention, vocabulary, and grammar) was needed to document a communication profile that was consistent with a diagnosis of autism. Without this information, we would have been unable to examine Michael’s communicative profile relative to those of other children with language deficits who do not present with a clinical diagnosis of autism.

Our single case study also supports the use of language samples and the MCDI for documenting changes in these three skill areas in young children with autism. In Michael’s case, the use of these two tools allowed us to document not only his fluctuating performance across sessions, but also the positive changes he was making across the 14-month study period. This was important because measures of reliability from the language sample were lower than desired, and data from the MCDI were based on parent report. In a review of the data generated from the two tools, the calculation of MLU from the MCDI was the only measure that was not strongly related to the others. Recall that MLU values from this tool are based on a child’s three longest utterances as reported by a caregiver. Given this, the lack of a strong relationship between this measure and the others is not too surprising.

Nevertheless, the caregiver’s completion of this section on the MCDI provided her with a mechanism by which to tell the researcher about important events occurring in Michael’s life. For example, all of Michael’s scores were low during the sixth testing session. For this testing session, Michael’s caregiver noted that his three longest utterances were related to toilet training, which his caregiver also described as a highly traumatic experience for him. For clinical purposes, we interpret these findings as supporting the use of the MLU subtest on the MCDI for facilitating dialogue between caregivers and clinicians. For calculations of MLU, however, the use of a spontaneous language sample remains our preferred method because changes in this measure were related to changes in the other language measures we collected.

Lastly and perhaps most importantly, the findings support the use of repeated measures of these three skill areas during treatment for children with autism. Repeated measures testing allows a clinician to document positive changes over time even when a child’s performance fluctuates across sessions. Fluctuations occur for a variety of reasons in young children with autism. Some of these reasons include fatigue; mood; anxiety; wellness; environmental distractions; disruptions of familiar routines; and the training of new behaviors, as was the case with Michael’s toilet training.

Although data from every single testing session and administration of the ADOS showed Michael’s communicative profile to be consistent with a diagnosis of autism, it was his growth profiles in intentionality, vocabulary, and grammar that allowed us to compare his skills to those of other children with autism who have also received treatment. This was an important service to Michael’s family because it confirmed their perceptions of his progress. This progress played a role in their choice of a preschool placement for Michael after the study was completed. Their choice consisted of a regular education classroom with additional support for Michael from a classroom assistant. Previously, this particular preschool had been used for another child with a developmental profile that was similar to Michael’s.

Turner and Stone (2007) argued that repeated testing of behaviors that are central to the diagnosis of autism must be conducted to monitor the potential instability of a diagnosis of autism for children under the age of 3 years and to ensure that the educational programming of these children remains consistent with their evolving skill levels. We find Turner and Stone’s recommendations to employ repeated testing of core behaviors to be relevant to Michael and other children with autism because these recommendations have led us to use this procedure to monitor children’s abilities in intentionality, vocabulary, and grammar as part of our diagnostic sessions and as part of a wide range of autism treatments that are available to families in our area.

This change in our practice has also helped us talk to parents about the value of learning about a child’s developmental growth trajectories relative to those of other children with similar diagnoses. Interestingly, Luyster, Qiu, Lopez, and Lord (2007) recently showed that the MCDI, when given to children with autism at the age of 3, is also predictive of a number of skill areas at the age of 9. Some of these later skill areas include verbal and nonverbal IQ, language, and adaptive functioning. Findings from Luyster et al. are important to share with families of children with autism so that the families can think about and plan for their child’s future. Findings from Luyster et al. also remind us that discussions about a child’s growth and change will need to be ongoing and long term when the child’s developmental profile includes a diagnosis of autism or other pervasive communication disorders.

Additional studies are needed to further document the different patterns of growth and different responses to intervention that are exhibited by young children with autism. As shown by our case study, this type of work can be done with repeated measures of a child’s intentionality, vocabulary, and grammar. Through the use of language samples and tools like the MCDI, clinicians should be able
to do this type of work as part of the clinical services they provide to families, regardless of the type and intensity of treatment a child receives.

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REFERENCES


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