Comparison of Syntax Training for Students with Developmental Disabilities Utilizing Clinician-Directed Versus Self-Determined Session Paradigms

Jane O’Regan Kleinert, Lori Gonzalez and John W. Schuster
University of Kentucky
Ruth Huebner
Eastern Kentucky University

Abstract: The ability to make choices, plan, and self-evaluate are among the primary skills included in the development of self-determination. This study was designed to determine if a teaching paradigm, which incorporates key elements of self-determination, is as effective and more efficient in teaching syntax than a traditional, clinician-directed teaching paradigm for students with developmental disabilities. Two methods of syntax instruction were compared for four students with Down syndrome between the ages of 7 and 13 years using an Adapted Alternating Treatment (AAT) single subject design. Results of the study indicated that both the traditional clinician-directed approach (CD) and the self-determined approach (SD) were effective in teaching syntax targets, with all four students achieving criterion at an unexpectedly rapid rate and maintaining skills regardless of the teaching condition. The CD condition was slightly more efficient than the SD condition in achieving criterion for three of the four students in the study. Further investigation is needed, but a case might be made that including elements of self-determination in syntax training could justify the slight loss of efficiency, and does so without disrupting teaching effectiveness.

Self-determination has been described as “the ability to control the basic decisions and directions of one’s life,” or “a fundamental approach to one’s life” (Kleinert et al., 2001). Indeed, self-determination has been recognized as a critical life outcome, especially for individuals with developmental disabilities who are at risk for being denied such opportunities (Bambara & Koger, 1996; Brown, Gothelf, Guess, & Lehr; Brown, Gothelf, Guess, & Lehr, 1998; Field, Martin, Miller, Ward, & Wehmeyer, 1998; Holub, Lamb, & Bang, 1998; Martin & Marshall, 1995; Ryan & Deci, 2000; Wehmeyer & Schalock, 2001; Wehmeyer & Schwartz, 1998). The characteristic behaviors that reflect a degree of self-determination most often cited in the literature include: choice-making; making one’s needs known; self-initiated behaviors; self-prompting; involvement in assessment, planning, and goal selection; decision making skills; the ability to control one’s own behaviors; and self-management (Kleinert et al.; Palmer & Wehmeyer, 2003; Wehmeyer, Field, Doren, Jones, & Mason, 2004; Wehmeyer & Sands, 1998). Also considered part of self-determination are the ability to evaluate one’s performance and one’s work or activities; involvement in activities of daily living such as community access and in the planning of one’s life activities. Additionally, skills in self-advocacy and self-assertion are important for self-determination (Pennell, 2001; Turnbull & Turnbull, 2001). Often, however, persons with developmental disabilities are not taught or allowed to practice these life skills (Brown et al.; Falvey, 1995; Kleinert et al.).

This study is based on a dissertation completed by the first author as partial fulfillment of a Ph.D. in the Department of Rehabilitation Sciences at the University of Kentucky. Correspondence concerning this article should be addressed to Jane Kleinert, CTW Building, Rm. 124N, University of Kentucky, 900 S. Limestone St., Lexington, KY 40536-0200.
growing since the late 1990s and indicates that the various components of self-determination can be successfully taught to students and adults with developmental disabilities. A field test of *The Self-Determined Learning Model of Instruction* (Wehmeyer, Palmer, Agran, Mithaug, & Martin, 2000) conducted with 40 students with disabilities found that students instructed with this model achieved their educational goals and showed increased self-determination. Cooper and Browder (2001) designed and implemented a multicomponent training package for staff of a community based program for individuals with severe disabilities which focused on increasing the staff’s frequency of offering choices to clients and the number and quality of choices clients actually made. Prior to training, staff did not offer opportunities for client choice and were intrusive in their prompting with the clients. In the first probe after training, all 4 staff immediately increased choice opportunities and decreased intrusive behaviors. In addition, staff generalized these behaviors across clients and situations. Clients increased their frequency and level of choice-making skills as well.

Agran, Blanchard, Wehmeyer, and Hughes (2002) believe that problem solving promotes the development of self-determination in students with developmental disabilities. Their approach to facilitating self-determination utilized a self-determined learning model to develop a problem solving program for 4 students with mental retardation. These students were taught problem-solving skills to achieve their “self-set” educational goals. Within a multiple-baseline-across-participants design, students were taught skills for participation in general education classes. Students achieved and maintained at the 100% level for performance utilizing this model. A meta-analysis of studies on outcomes of self-determination programs was completed by Algozzine, Browder, Karvonen, Test, and Wood (2001). Most studies were found to focus on the self-determination elements of choice-making for individuals with moderate to severe mental retardation and self-advocacy skills for individuals with higher functioning levels. These authors reported that the median effect size for group studies was 1.38. Seven of the thirteen single-subject studies analyzed yielded a strong effect size with a percent of non-overlapping data (PND) of 100%. In a study by Palmer and Wehmeyer (2003), which looked at the application of the self-determined model of learning with much younger children, 14 teachers were trained in the Self-Determination Learning Model, originally used with middle and high school aged students, which requires the students to identify problems, possible solutions, barriers to solving the problem and consequences of each proposed solution. Students as young as five years of age were found, with teacher facilitation, to select a goal, and to identify and solve problems that might bar progress toward the goal.

The self-determination skills addressed in the research above include various components of self-determination with major emphasis on the abilities of choice-making; self-evaluation; autonomy; planning; goal setting; problem solving; self-assertion and an intrinsic motivation.

Expressing one’s choices, making decisions, asserting one’s self and evaluating one’s own behavior require a mechanism for communication that is easily accessible to the individual and understandable to others. In light of this connection between self-determination and communication, it might be assumed that speech-language pathologists or communication disorders specialists would be frequently involved in this research. It is surprising, however, that an extensive literature search of self-determination with students having disabilities revealed only one contribution by speech-language pathologists in this area of intervention (Light & Gulens, 2000). These authors have stressed the importance of using alternative and augmentative communication systems with individuals who can not express their choices and needs due to severe speech impairments. They state, “communicative competence and self-determination are separate constructs, but they are highly interdependent” (p. 138). However, these authors stress that “there is a critical lack of research to address issues of communicative competence and self-determination” (p. 138), as yet. Kleinert (2004), in a survey of public school based speech/language pathologists found that less than 50% of the respondents were familiar with the concept of self-determination for students with developmental disabilities and over half of these clinicians were never or seldom involved in self-determination program imple-
mentation. This is of particular interest in light of the fact that self-determination programming is being addressed with students in the school setting, and the school setting is the largest single employment setting for speech/language pathologists (SLP) in the U.S. (ASHA, 2000). Considering that the mean size of SLP caseloads in the U.S. is 50 students (Janota, 2004), it may be considered problematic by some to ask the school based SLP to take on even more responsibilities by adding involvement in self-determination programming. A study by Stowitschek, Laitinen, and Prather (1999), however, which investigated whether self-determination skills could be embedded into the educational curriculum without disrupting other programming, found that teachers could embed “planned incidents of instruction” in self-determination without “significantly disrupting core lessons” (p. 15). It would be of interest to determine if such positive results could be obtained if elements of self-determination were also incorporated into on-going speech/language therapy sessions conducted by an SLP. Such information might be helpful in facilitating the inclusion of communication specialists in self-determination programming for students with developmental disabilities.

The purpose of this investigation was to determine if infusion of elements of the valued outcome of self-determination by a speech/language pathologist into communication therapy sessions could be done without interfering with on-going speech/language programming. In addition, the study investigated whether such intervention would produce equivalent or more rapid achievement of therapy targets when compared to a more traditional clinician-directed treatment paradigm.

Method

Participants

Four students aged 7.6 to 13 years who have Down syndrome and an expressive syntax deficit, (below age-level expressive use of grammatical forms in conversation), participated in this study. Prior to intervention, all were assessed in the following areas: hearing, expressive and receptive language, concept development, comprehension and use of syntax and semantics, mean length of utterance (MLU), speech sound production and oral-motor skills in order to determine their current communication status and to select syntax targets for the instructional phase of the study. Students also had been previously assessed on a cognitive instrument, and these scores are reported, if the parent gave consent. Three parents did not agree with their children’s most recent assessments in the area of cognition, believing that they underestimated their child’s actual level of functioning. They did, however, report their child’s approximate results in IQ assessments.

Jan was a 13 year old female who attended 7th grade in a regular education classroom with special education support. She received speech and language services in the public school and on a private basis. Her IQ was reported to be “around 50,” receptive and expressive language levels ranged between 48 and 86 months per the Clinical Evaluation of Language Fundamentals-4 or the CELF-4 (Semel, Wiig, & Secord, 2003), with receptive functioning much higher than expressive output. Jan had a mean length of utterance (MLU) of 2.4 reflecting a severe syntax deficit. She had a severe articulation deficit and hearing within normal limits.

Lucy was a 10 year old female who attended the 3rd grade in a regular classroom setting with special education support. She received speech and language services in the public school. Receptive and expressive language levels, as assessed on the CELF-4 ranged between 42 and 81 months with receptive functioning higher than expressive output. Lucy had an MLU of 3.4 reflecting a moderate to severe syntax deficit. Lucy had a mild to moderate articulation deficit and hearing within normal limits.

Tom was a 12 year old male who attended 6th grade in a resource classroom in a public middle school. He received speech and language services in the public school. He reportedly had an IQ score of “around 50,” receptive and expressive language levels, as assessed by the CELF-4 ranging from 51 to 85 months, with receptive functioning higher than expressive output. MLU was 4.56 reflecting a moderate syntax deficit. He had a mild to
moderate articulation deficit and hearing within normal limits.

Joe was a 7 year old male who attended regular second grade in the public school setting with special education support. He received speech and language services in the public school. Assessment on the Stanford-Binet-4th Edition revealed a composite score of 51. Receptive and expressive language functioning levels as assessed by the CELF-4 ranged from 38 to 51 months with receptive functioning greater than expressive output. An MLU of 2.9 reflected a moderate to severe syntax deficit. Joe exhibited a mild to moderate articulation deficit and hearing within normal limits.

Setting

Students were seen in an individual, 1:1 setting by the researcher, who is a licensed speech-language pathologist (SLP) with 30 years of pediatric experience. For three of the students, sessions were conducted at a university communication disorders clinic. For one student, Tom, the sessions were conducted in his home because of concerns about his poor immune system. All sessions were video-taped.

Experimental Design

An Adapted Alternating Treatments Design (Sindelar, Rosenberg, & Wilson, 1985) was used to compare the effectiveness and efficiency of the two intervention procedures. “This design is used when comparing two or more independent variables...on two or more equivalent dependent variables...Experimental control is established when the dependent variable assigned to one intervention is acquired more rapidly than the dependent variable assigned to the other intervention regardless of the sequence of application,” (Johnson, Schuster, & Bell, 1996, p. 446).

Target Selection

Two syntax targets for each student were selected based on the assessment completed prior to the study. Since this study was an adapted alternating treatments design, it was necessary to select two goals for each student that were equivalent in difficulty, but independent or functionally unrelated. In order to determine if the two targets were equivalent, but independent, possible syntax targets found in the student’s assessment data were compared on the basis of the following aspects. First, the stage of developmental acquisition as judged by the student’s MLU and Brown’s (1973) Five Stages of Sentence Construction was compared. If the potential target syntactic forms emerged at an MLU level at or below that of the student, as judged by Brown’s stages, and the two targets emerged in the same stage or within one stage above or below each other, they were considered to be roughly equivalent. The other criteria considered in determining the equivalency and independence of the two targets included functional relationships between the two targets, the number of morphemes contained in the target forms, and the student’s receptive comprehension of the target item as judged by the standardized assessments completed at the beginning of the study and/or informal receptive assessment of the specific syntactic forms which were completed before baseline sessions began. Potential targets were analyzed and compared on a matrix developed from the above criteria.

Specific syntax targets selected for Jan were use of the subjective first person pronoun “I” with an uninflected verb and use of the possessive morpheme “s” with a noun. The targets selected for Lucy were use of the possessive morpheme “s” with a noun and use of the regular past tense morpheme “ed” with a verb. The targets selected for Tom were use of the possessive morpheme “s” with a noun and use of the regular past tense morpheme “ed” with a verb. The targets selected for Joe were use of the subjective first person pronoun “I” with an uninflected verb and use of the plural morpheme “s” with a noun. Thirty exemplars of
each target, which could be depicted in a picture or photograph, were then selected for use in the intervention conditions of the study.

**Procedure**

*General procedures.* Students were seen twice weekly with each session approximately 50 to 60 minutes in length. Each session was divided into two segments, one conducted in the Clinician-Directed (CD) treatment condition and the other segment in the Self-Determined (SD) treatment condition. In Segment One of each session, one syntax target was taught and in Segment Two of the session, the other syntax target was taught. Each session included: an overview of the scheduled activities for the segment and explanation of the treatment condition, a presentation of 10 models by the clinician of the syntax target; an instructional phase and probe phase for the first segment, followed by an 8 to 10 minute break. The second segment repeated the order of the first with the only change being the instructional condition. The order of the conditions was determined by a counterbalancing schedule with interventions and targets counterbalanced across the sessions and across students.

The specific instructional program used to teach the syntax targets under both conditions was based on the mand-model approach (Alpert & Kaiser, 1992; Fey, 1986; Rogers-Warren & Warren, 1980; Warren, McQuarter, & Rogers-Warren, 1984). For this study, a stimulus picture that depicted the syntax target to be taught was presented along with a “mand” such as “Tell me about the picture.” After the mand was given, if the student did not make a response containing the syntax target within 5 seconds, the clinician modeled a correct response and asked the student to imitate. If the student correctly imitated the model, the clinician said, “Good job.” If the student did not correctly imitate the model, the clinician simply said, “OK.” This completed one instructional trial.

The study employed a “drill-play” (Paul, 2001) organization for delivery of the instructional phase. In this mode of delivery, the child is allowed to engage briefly in a reinforcing activity after a set number of instructional trials. For this study, the student was allowed to engage in a reinforcing activity after every five instructional trials. The reinforcing activity was changed after a total of 15 instructional trials had been completed. Each treatment condition segment included a total of 30 instructional trials for the target syntax utterance and incorporated two short reinforcing activities.

In summary, each instructional segment included 10 initial models of the syntactic form by the clinician at the beginning of the segment; an instructional phase and probe phase for the first segment, followed by an 8 to 10 minute break. The second segment repeated the order of the first with the only change being the instructional condition. The order of the conditions was determined by a counterbalancing schedule with interventions and targets counterbalanced across the sessions and across students.

The specific instructional program used to teach the syntax targets under both conditions was based on the mand-model approach (Alpert & Kaiser, 1992; Fey, 1986; Rogers-Warren & Warren, 1980; Warren, McQuarter, & Rogers-Warren, 1984). For this study, a stimulus picture that depicted the syntax target to be taught was presented along with a “mand” such as “Tell me about the picture.” After the mand was given, if the student did not make a response containing the syntax target within 5 seconds, the clinician modeled a correct response and asked the student to imitate. If the student correctly imitated the model, the clinician said, “Good job.” If the student did not correctly imitate the model, the clinician simply said, “OK.” This completed one instructional trial.

The study employed a “drill-play” (Paul, 2001) organization for delivery of the instructional phase. In this mode of delivery, the child is allowed to engage briefly in a reinforcing activity after a set number of instructional trials. For this study, the student was allowed to engage in a reinforcing activity after every five instructional trials. The reinforcing activity was changed after a total of 15 instructional trials had been completed. Each treatment condition segment included a total of 30 instructional trials for the target syntax utterance and incorporated two short reinforcing activities.

In summary, each instructional segment included 10 initial models of the syntactic form by the clinician at the beginning of the segment; two short reinforcing activities, each repeated three times throughout the 30 instructional trials; and the 10 trial probe on the syntactic target at the end of the segment. After a student had achieved criterion on one target, only the remaining target was addressed in the following sessions along with a maintenance or generalization probe for the first target. This reduced the length of these sessions to about 30 minutes each. Table 2 displays the sequence of each full session.

**Treatment Conditions**

**Clinician-directed instructional condition (CD).** Since this condition was clinician-directed, the clinician selected the targets, materials, activ-

### Table 1: Targets for Each Student

<table>
<thead>
<tr>
<th>Targets</th>
<th>Jan</th>
<th>Lucy</th>
<th>Tom</th>
<th>Joe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target 1 Possessive noun forms using the “’s”</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular past tense verbs with “ed”</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posessive noun forms using the “’s”</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First person singular “I” used with a verb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular past tense verbs with “ed”</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plural morpheme “’s” with a noun</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ities, and sequence of activities used in the segment. At the beginning of the segment, the clinician showed the student the two reinforcing activities, which were selected from a list of the student’s favorite activities developed from parent and student questionnaires. Pictures that depicted the sequence of the session’s 2 reinforcing activities were placed on a schedule board in the order in which they would occur within the segment. In addition, the clinician judged the accuracy of the student’s response and informed the student. This response procedure was as follows. If the student correctly used the syntax target following a mand such as, “Tell me about the picture,” the clinician said “Good job, you said ________,” and repeated the student’s response. If the student produced an incorrect response, the clinician repeated the utterance using a questioning inflection (“Me walk?”) and then said “No, tell me ‘I walk,’” thus modeling the correct response.

Choice-making. The clinician showed the student a menu of four possible activities, which were selected from a list of the student’s favorite activities developed from parent and student questionnaires. Potential activities for the SD condition were presented to the student and he/she selected two of the activities for use in that segment.

Planning. The student then planned the order in which the activities would be completed by placing them on a schedule board, with the first activity on top and the second activity to be completed under the first.

Self-evaluation. For each instructional trial, the clinician waited up to five seconds for the student to initiate his/her response using the syntax target.

If the student produced a correct response, the clinician repeated the student’s response and then asked “Is that right?” The student then judged his response as correct or incorrect. If the student had correctly produced the syntactic target and correctly judged his/her response, the clinician said “Yes, you said correct response.” If the student correctly produced the syntax target, but misjudged his/her correct answer, did not reply or said “I don’t know,” the clinician said, “Oh, you did say it right. You said __________. Good job.” If the student did not produce the correct syntactic target, the clinician repeated the student’s response and asked, “Was that right?” If the student correctly judged his response to be incorrect, the clinician said, “It was not right, was it. Tell me correct response.” If the student judged his/her incorrect response to have been correct, did not respond or said “I don’t know,” the clinician said, “Oops, no. Tell me, correct response.”

Materials and Equipment

Two sets of materials were necessary for this study. One set was the 30 stimulus cards and data sheets for use in the instructional program for each target. The second set of materials included those used in the reinforcing activities completed after each set of five instructional trials.

### TABLE 2

<table>
<thead>
<tr>
<th>Sequence of Full Session for Each Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening of Session</td>
</tr>
<tr>
<td>Clinician greets student and gives overview of the session and explains the 2 conditions</td>
</tr>
<tr>
<td>Instructional Phase for Segment I</td>
</tr>
<tr>
<td>A. Introduction of the condition</td>
</tr>
<tr>
<td>B. Selection of reinforcing activities</td>
</tr>
<tr>
<td>C. Clinician modeling of 10 exemplars</td>
</tr>
<tr>
<td>D. Training for Segment I</td>
</tr>
<tr>
<td>5 trials and 1st Reinforcing activity</td>
</tr>
<tr>
<td>5 trials and 1st Reinforcing activity</td>
</tr>
<tr>
<td>5 trials and 2nd Reinforcing activity</td>
</tr>
<tr>
<td>5 trials and 2nd Reinforcing activity</td>
</tr>
<tr>
<td>Probe Phase for Segment I: 10 probe trials</td>
</tr>
<tr>
<td>Break: 8-10 minutes</td>
</tr>
<tr>
<td>Instructional Phase for Segment II: Repeat of Segment I Instructional Phase using opposite condition</td>
</tr>
<tr>
<td>Probe Phase for Segment II: 10 probe trials</td>
</tr>
<tr>
<td>End of Session</td>
</tr>
</tbody>
</table>
Stimulus materials for the instructional program were composed of 30 pictures, which depicted each of the syntactic structure targets for each student. There were a total of 30 picture representations for each of the two syntax targets. Ten of the 30 cards were chosen at random from a container and used as baseline stimuli and for probes after the instructional phase of the segment. The full set of 30 stimuli picture cards was used in the instructional phase for each target. Finally, 10 new exemplars and picture depictions for each syntax target were developed for use in the structured generalization probes conducted after the student reached criterion for each of his/her targets.

The second set of materials included all those materials necessary for completion of the six potential reinforcing activities per session. Each session had two treatment conditions, involving two different reinforcing activities for each condition. In addition, the student had a choice of four reinforcing activity options to choose from in the SD condition, thus requiring two additional sets of materials for a total of six sets of materials that were available for each session. The actual materials used in the reinforcing activities depended upon the interests of the student as noted in a parent and student survey completed prior to the study. Examples might include materials for playing a card game, reading a book about a favorite character, painting a picture, etc. Activities and materials chosen for use in the study were those that could be completed during the instructional phase and which could easily be completed within the confines of the therapy room or home setting. The same menu of materials and activities was used under both conditions, but in the SD condition the student chose two out of four possible activities and materials to be used that day. Ten different options were included for each student. The clinician began selecting options for activities starting from the top of the list and continuing down until the list was completed and then began the cycle again. This allowed for a large variety of materials and activities to be used in an effort to avoid boredom on the part of the student.

Data Collection and Scoring

Data were collected on baseline trials and daily probes of the two syntax targets. Data were also collected on the student self-evaluation responses in the SD condition for later analysis. Criterion for achievement of the syntax targets was set at a 90% success rate repeated three successive probe sessions.

Baseline data collection and scoring. A minimum of three days of baseline data on each student were collected for each syntax target. Baseline data were taken for three days, or until the baseline data were stable or in a contra-therapeutic direction. Percentage of correct responses was computed and entered on the data sheet and on the student’s graph for that target.

Probe data collection and scoring. At the end of each instructional segment, 10 probe trials were completed for each syntax target using the same 10 stimulus cards that were used in the baseline condition. These data were used for criterion purposes.

Reliability

Reliability data was collected for independent and dependent variables by a trained observer for at least 20% of the total number of baseline and instructional sessions. The trained observer was a licensed speech/language pathologist and professor in communication disorders.

Independent variables. Procedural reliability data were calculated by dividing the number of observed clinician behaviors by the number of planned clinician behaviors for each step of the instructional program and multiplying by 100. Average procedural reliability across all students was 96.5% with a range of 94% to 98.7%.

Dependent variables. A “point by point” procedure was used to calculate dependent variable reliability for baseline and probe data; the number of trials on which the raters agreed divided by the total number of trials times 100. Reliability for baseline sessions was 100% across the four students with data taken on 25-33% of the total number of baseline sessions. Reliability data for instructional probe sessions were taken on 20-25% of the total number of sessions. Average reliability across students for instructional probe sessions was 96.8% agreement with a range of 88.8% to 100%.
### Results

#### Accuracy and Efficiency

Both the CD and SD condition were effective for teaching the target syntactic structures across all students. The CD condition was slightly more efficient in reaching criterion, requiring 17 sessions to criterion versus 20 sessions for the SD condition across all students. The SD condition was more efficient than the CD for one of the students and required only one more session than the CD condition for two of the remaining students. Students achieved targets with unexpected accuracy under both conditions. Table 3 provides a summary of the overall effectiveness and efficiency for two treatment conditions.

#### Results for Jan

Jan’s baseline data for both targets were at 0% accuracy. Both the CD and SD conditions resulted in unexpectedly rapid acquisition of the syntactic targets with the CD target, use of the possessive morpheme “s” plus a noun, reaching criterion in three instructional sessions and the SD target, use of “I + verb” reaching criterion in 4 instructional sessions. Jan had only two errors to criterion for the SD target and two errors to criterion for the CD target. Results are displayed in Figure 1.

#### Results for Lucy

Lucy’s baseline data for both targets were at 0% accuracy. Both intervention strategies were successful in teaching her targets, but
her CD target, use of the possessive morpheme “s” plus a noun, was achieved more quickly than the SD target, use of regular past tense morpheme “ed” plus a verb. Results are displayed in Figure 2. The CD target reached criterion in four instructional sessions and the SD target in nine instructional sessions. In the SD condition a slight procedural alteration was made in the use of the elicitation prompt. Rather than only using the target verb plus the “ed” morpheme for some exemplars, Lucy would use a short phrase and then become confused as to which word in the phrase was the verb. For example, for the exemplar “opened” which was depicted as a girl who had opened an umbrella, Lucy would say “open the umbrellaed,” placing the “ed” morpheme on the word “umbrella.” This occurred on up to four exemplars. In order to avoid this, the prompt for these exemplars included the direction, “Just use the _____ (verb) word.” This strategy corrected the problem, but her confusion on the target word resulted in the longer acquisition time for this target.

Figure 1. Jan’s baseline and probe data. CD data are in upper panel and SD data are in lower panel.
Results for Tom

Tom’s baseline data for the CD target of use of the possessive morpheme “s” plus a noun were at 0% accuracy. On the SD target, use of the past tense morpheme “ed” plus a verb, one baseline/probe word (kicked) had to be removed after the third day of baseline, since it was too difficult to determine if Tom was adding the “ed” or not due to articulation difficulties. When this word was replaced, three more days of baseline were taken with an average of 10% accuracy for three days. To assure that the other target had not improved, one more day of baseline was taken for the CD target, which remained at 0% accuracy. Both conditions resulted in unexpectedly rapid acquisition of the syntactic targets with the CD target, use of possessives, achieved in three instructional sessions and the SD target, use of regular past tense morpheme “ed” plus a verb achieved in four instructional sessions. Results are displayed in Figure 3. Tom had 0 errors to criterion for the CD target and three errors to criterion for the SD target.

Figure 2. Lucy's baseline and probe data. CD data are in upper panel and SD data are in lower panel.
Results for Joe

Joe’s baseline data for the CD target, use of the first person personal pronoun “I” plus a verb resulted in an average of 3.3% and a range of 0% to 10%. The 10% accuracy occurred on the second day of baseline, but fell back to 0% on the third day of baseline. Baseline for the SD target, use of the plural morpheme “s” plus a noun, was at 0% accuracy for all three days. Both procedures resulted in acquisition of the syntactic targets with the SD target achieved in three instructional sessions and the CD target achieved in seven instructional sessions. The SD target was achieved more quickly than the CD target. Results are displayed in Figure 4. Joe had eight errors to criterion for the CD target and 0 errors to criterion for the SD target.

Maintenance

Maintenance data were collected during next session(s) after criterion was met. Since sessions were conducted twice a week, the first day of maintenance data was collected be-
tween two and four days after criterion was met. If criterion had been met on one of the student’s targets before the other, maintenance data were collected on that target at least weekly until the other target was achieved.

Results of maintenance probes indicated that both the SD and CD conditions were equally effective in maintaining the new targets for three of the students, Jan, Tom and Joe, and the CD condition was only slightly more effective for maintenance for one student, Lucy (85% for CD vs. 80% for SD).

Maintenance data were again collected on both targets seven weeks after the study was completed. These additional maintenance probes indicated that the average level of maintenance across all students for the two conditions was equal at 92.5% each. On the structured generalization probes, the average level across the four students was higher for the SD condition than for the CD condition (95% vs. 87.5%). On the naturalistic generalization probes, the average level across the four students was higher for the CD than the
SD condition (92.2% vs. 79.4%). It should be noted that there were gains for all targets for all students on the naturalistic generalization probes over the scores on that task which had been obtained at the end of the study.

**Generalization**

Generalization data were collected on all targets immediately after criterion was reached. Data were collected on generalization in both structured and unstructured activities. For the structured tasks, 10 untaught exemplars were presented, using the exact same elicitation procedures that were used in the instructional probes. For the more natural generalization task, the syntax targets were elicited during less structured activities, such as play, reading books, or looking in family picture albums. On structured generalization accuracy, the conditions were equally effective for Lucy. The SD condition was slightly more effective in this area for Tom (90% vs. 85%) and the CD condition slightly more effective for Jan (50% vs. 45%) and Joe (100% vs. 90.8%). The CD condition was slightly more effective in naturalistic generalization for Jan (74.6% vs. 63.6%), Lucy (77.6% vs. 65.7%), and Joe (94% vs. 90.8%) and the SD condition slightly more effective for Tom (76.1% vs. 59.3%). Results of both forms of generalization probes for all students appear in Tables 4 and 5.

**Discussion**

**Efficiency and Effectiveness of the Interventions**

Results of the study indicate that both the traditional clinician-directed approach (CD) and the intervention which included a self-determination package (SD) can be used effectively to teach syntax targets to students who have Down syndrome. All students in this study attained criterion, and maintained and generalized their new skills regardless of the teaching condition.

In regard to the relative efficiency of each condition, results of this study indicated that

<table>
<thead>
<tr>
<th>Student</th>
<th>Mean for Structured Generalization for CD</th>
<th>Range</th>
<th>Mean for Structured Generalization for SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>50%</td>
<td>0%–100%</td>
<td>45%</td>
<td>10%–80%</td>
</tr>
<tr>
<td>Lucy</td>
<td>90%</td>
<td>90%–90%</td>
<td>90%</td>
<td>80%–100%</td>
</tr>
<tr>
<td>Tom</td>
<td>85%</td>
<td>80%–90%</td>
<td>90%</td>
<td>a</td>
</tr>
<tr>
<td>Joe</td>
<td>100%</td>
<td>100%–100%</td>
<td>90%</td>
<td>a</td>
</tr>
</tbody>
</table>

* Range not given because only one probe could be conducted on this target due to time constraints

<table>
<thead>
<tr>
<th>Student</th>
<th>Mean for Naturalistic Generalization for CD</th>
<th>Range</th>
<th>Mean for Naturalistic Generalization for SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>74.6%</td>
<td>a</td>
<td>63.6%</td>
<td>a</td>
</tr>
<tr>
<td>Lucy</td>
<td>77.6%</td>
<td>62.5%–92.8%</td>
<td>65.7%</td>
<td>a</td>
</tr>
<tr>
<td>Tom</td>
<td>59.3%</td>
<td>a</td>
<td>76.1%</td>
<td>a</td>
</tr>
<tr>
<td>Joe</td>
<td>94%</td>
<td>a</td>
<td>90.8%</td>
<td>90–91.6%</td>
</tr>
</tbody>
</table>

* Range not given because only one probe could be conducted on this target due to time constraints
the CD condition was slightly more efficient than the SD condition in achieving criterion for three of the students. It is of note, however, that for two of these three students, there was a difference of only one session between the two conditions. In addition, the SD condition incorporated an additional response step not included in the CD condition. Under the SD condition, the students were asked to indicate the accuracy of their productions, (i.e., to self-evaluate their responses). This additional skill was included in the SD package, since it is considered as primary in the achievement of self-determination (Agran et al., 2005; Agran, King-Sears, Wehmeyer, & Copeland, 2003; Grossi & Heward, 1998). The case could be made that the addition of this vital element in the development of self-determination to the SD condition would justify the slight loss of efficiency. This is especially true since the rate of target acquisition for all students (2.5 to 5 weeks of intervention) was unexpectedly rapid.

The CD condition resulted in fewer errors to criterion for three of the students in the study and overall there were fewer total errors to criterion for the CD than for the SD condition. It was interesting to note, however, that 34 of the total 38 errors that occurred in the SD condition were produced by Lucy on her SD target, the use of the past tense morpheme, “ed” plus a verb. Lucy had concomitant motor and cognitive difficulties that impeded her learning this target. In studying Lucy’s patterns of responses, three noteworthy patterns emerge. First, she had particular difficulty with the articulatory complexity of certain of her 30 exemplars and 10 probe words. If the verb to which the “ed” morpheme was to be added ended in a /k/ phoneme, such as “look,” “cook,” “work,” or “bark,” Lucy had difficulty motorically in producing the resulting consonant cluster of /kt/. Her 10 probe words included two such words and so possibly set her up for 20% incorrect productions due to a motoric problem, rather than a language-based problem. Second, she had a tendency to produce a phrase when making her responses to the prompts for past tense rather than just the targeted word. Three of these verb forms were included in her 10 probe words. These two difficulties set Lucy up to make up to five errors on her probe words which were not directly related to the syntactic form or the SD condition, but rather cognitive or motor difficulties. In light of this, it may well have been that she would have had as much difficulty learning the target under either condition and thus the comparison of efficiency, by errors to criterion, may be somewhat skewed. In actuality, if the past tense morpheme had been randomly assigned to the CD rather than the SD condition, the results of this study may have been interpreted quite differently with a much more favorable outcome for the SD condition.

Implications of Results for SLP

The positive results of this study are of particular importance since they offer speech-language pathologists (SLPs) more options when designing therapy programs for students with developmental disabilities. Such students comprise a significant portion of the caseloads for SLPs employed in the public schools (Janota, 2004; Kleinert, 2004). Federal legislation which determines the role of SLPs as related service providers in the school setting mandates that related services be directly linked to the student’s educational program. Many students in special education settings in the public school are now being provided training in self-determination within the school setting. It is important that the SLP, as a related service provider, design instructional interventions that align with each student’s Individualized Educational Program. Incorporating self-determination into SLP sessions is one way this can be accomplished. The data from this study indicate that the SLP can indeed reinforce elements of self-determination in ongoing therapeutic programs without jeopardizing the effectiveness of those programs. In addition, the concept of evidence-based practice, which is becoming a guiding force in both education and rehabilitation, directs that intervention programs must be based upon principles or paradigms that have been shown to be effective. This study contributes to that data base and offers support for the effectiveness of a syntax intervention that also reinforces the educational goal of the development of self-determination with students having developmental disabilities.
Other Important Issues Noted During the Study

Massed practice and target acquisition. Unexpectedly rapid acquisition of the syntax targets was observed for all students in this study. The fewest number of sessions to criterion was three for the CD target for Jan and Tom and for the SD target for Joe. Only four sessions were required for Jan and Tom to acquire their SD targets and for Lucy to acquire her CD target. The remaining two targets, the CD target for Joe, and the SD target for Lucy, required seven and nine sessions, respectively. These data indicated that even the longest period of intervention to criterion was less than five weeks at two sessions per week. Both the SD and CD conditions involved the production of a total of 40 exemplars (30 during the instructional phase and 10 during the probe phase) for each segment. The average length of all segments was approximately 20 min 25 s per session for the CD condition and 24 minutes for the SD condition. This indicates a very high rate of practice during each session for both conditions. Such a method of instruction can be referred to as “massed practice” in which a new skill is introduced and practiced in a structured setting and with a high rate of intensity. This approach has been used with persons having developmental disabilities for many years (Hart & Risley, 1980; Kleinert & Kearns, 2004; Miranda-Linne & Melin, 1992). While this approach has been successful in teaching skill acquisition, generalization skills have been shown to occur more often when distributive trials are given within more natural settings (Hart & Risley, 1975, 1980; Miranda-Linne & Melin; Oswald & Lignugaris, 1990). Incidental teaching practices have been utilized in early childhood programs for both skill acquisition and generalization for some time. All the students in this study had participated in early intervention programs from a young age and also had both preschool and school based language therapy programs. In light of this fact, it is highly likely that they had participated in incidental teaching programs. In addition, these students have been exposed to the targets which were taught in the study thousands of times over their life-time in natural conversation. However, despite their many naturalistic and incidental opportunities to learn their target syntactic structures, they had not acquired them in their expressive language. It is of interest that they were able to acquire, maintain, and begin to generalize these syntax targets when instruction was offered in a structured setting with multiple opportunities for practice. Further investigation of such instructional procedures for older students with developmental disabilities is indicated by these findings.

Single subject design. Many of the studies reported in the literature involving single subject alternating treatment or adapted alternating treatment designs have involved the training of highly discrete skills such as learning specific vocabulary words or learning to read word lists (Johnson et al., 1996; Kleinert, 1987; Singleton, Schuster, Morse, & Collins, 1999). This study utilized the adapted alternating treatment design to teach two equivalent, but generative syntax skills. The use of a specific syntactic marker, such as the plural morpheme “s,” the regular past tense morpheme “ed,” the possessive morpheme “’s,” or the first person pronoun “I” all require another word to accompany their use in order to be of communicative or pragmatic value. The additional word, though, must be a specific form (in these cases a noun or a verb), which could be one of perhaps a hundred or a thousand possible options. The pronoun “I” could be coupled with any number of possible verbs, so that even though a specific exemplar might have been selected to train the use of “I,” a student could easily have chosen another verb to use for his/her response during a trial and still be pragmatically and syntactically correct. So if the exemplar photo depicted the student smiling while sitting on a chair, in order to elicit the phrase, “I smile,” the student could have, and did say, “I sit” and still produce a correct response. This is unlike more discrete targets in which a student must read a specific word “chair,” for which there is no correct alternative. In addition, when learning generative language targets, a student is required to use more than just the one target word in his/her response. He is required to correctly couple the target syntactic form with another correct word form (noun or verb, perhaps) and so the task involves a greater “cognitive load” than other more discrete tasks. By demonstrating that the adapted alternating treatment design can be successfully used with gen-
erative language targets, this study adds to the literature in single subject research design.

Another unique aspect involved in utilizing the adapted alternating treatment design with language targets involves the difficulty in selecting targets which are both functionally independent but equivalent. When selecting equivalent lists of vocabulary or reading words, the researcher can obtain readily available list of equivalent words for targets from such sources as the Dolch Word lists (Lee, 2001). Selecting equivalent but independent syntactic forms requires weighing such factors as developmental level, number of morphemes involved when that syntactic form is actually used to communicate in a pragmatically correct form, and receptive comprehension of the many exemplars which could be used to represent the syntactic forms. For this study, a matrix was developed to help weigh each of these factors when selecting the syntactic targets to be used in the study. This level of specificity and detail also contributes to the literature of single subject research.

Syntax acquisition and students with Down syndrome. Syntax deficits are a major language deficit which persists in the expressive language of individuals with Down syndrome as they age (Chapman, 1997; Chapman, Hesketh, & Kistler, 2002; Kumin, Councill, & Goodman, 1998; Thordardottir, Chapman, & Wagner, 2002). Until recent years, it was believed that students with Down syndrome could not continue to learn syntactic forms after they entered adolescence. This has since been disproven by researchers (e.g., Chapman). This study contributes to the literature regarding the acquisition of syntax by older students with Down syndrome by indicating that not only can these students continue to acquire syntax into adolescence, but they can do so at a surprisingly rapid rate when given structured, intense training.

Self-Evaluation of Student Responses

The abilities to self-monitor and self-evaluate one’s behavior have received extensive notice in programs to promote self-determination with students having developmental disabilities (Agran et al., 2002, 2003, 2005; Grossi & Heward, 1998). For this reason, a self-evaluation of productions during the instructional phase was included in SD condition in this study. Initially, two subjects, Jan and Lucy, seemed intimidated by this task and were hesitant to respond when asked if their productions were correct. All four subjects, however, showed success at this task as the study progressed. Three of the subjects, Jan, Tom and Joe, reached criterion so quickly on their SD targets (within 3-4 sessions) that it was difficult to make statements about their performance on the self-evaluation task, since they had such a high rate of correct responses. This limited the number of opportunities to differentiate between correct and incorrect responses. However, Tom exhibited self-correction behaviors on his SD targets during the probe phase on the third instructional day and during the generalization probe for the CD target on the fifth day of his participation in the study. Jan and Joe also evidenced self-correction during generalization probes and Joe self-corrected during a probe session for his SD target. Joe self-corrected on his CD target once in spontaneous speech, but Jan did not. It would be of interest to know if the emphasis on self-evaluation contributed to each of subjects’ spontaneous evidence of self-correction during the study. Lucy was the most accurate of any of the subjects on differentiating correct from incorrect productions; she also was the student who spent the longest time in the SD condition. For example, over four sessions, Tom had no instances in which he correctly judged an incorrect target production. Lucy began to exhibit several instances of self-correction on probes in sessions 9 and 10 on her SD target, perhaps reflecting her greater exposure to the self-evaluation task. In light of these observations, it would be of interest to investigate if there is a relationship between the use of the self-determination skill of self-evaluation and the emergence of self-correction abilities.

Limitations of the Study

Difficulty in the selection of equivalent targets. Three of the four students obtained their targets within a similar number of sessions. Jan and Tom both required three CD sessions and four SD sessions to reach criterion. Joe required four SD sessions and seven CD sessions to meet criterion. Lucy, however, had a
greater discrepancy in target acquisition. She achieved criterion for her CD target of use of the possessive “’s” morpheme with a noun in four sessions, but required nine sessions to acquire use of the regular past tense “ed” morpheme plus a verb. Several factors indicate the possibility that the difference in her sessions to criterion may not have been based so much on the condition in which the targets were taught, as on the relative difficulty of the two targets specifically for Lucy. If the conditions for this student had been reversed when randomly assigned, the SD condition would have significantly improved in its efficiency.

Cognitive requirements of the self-evaluation task in the SD condition. Self-evaluation is one of the primary behaviors stressed in programs for the development of self-determination (Palmer & Wehmeyer, 2003) and so was included in the SD condition for this study. The self-evaluation task required the students to make judgments regarding the accuracy of their production attempts. Unfortunately, it is possible that the inclusion of this important element of self-determination in the SD condition may have slowed the students’ progress on the target taught under that condition. The added cognitive load of self-evaluation may have shifted some of the student’s focus away from the target production, since the self-evaluation task required a more complex response than the simple production of a target and imitation of a correct model (if the student’s production was incorrect) as required in the CD condition. Initially, the self-evaluation seemed to intimidate Lucy and Jan somewhat. However, as stated earlier, the students did begin to show a small trend toward self-correction on their SD condition targets slightly earlier and more frequently than they did on their CD condition targets. The rapid rate of acquisition by three of the students on their SD condition targets severely limited the data on their accuracy for the self-evaluation task and so it is impossible to say if they were able to learn this ability incidentally during this study.

The Speech-Language Pathologist’s Role in Self-Determination Programming

Speech-language pathologists have a long history of providing services to persons with disabilities across the life span and in the use of interdisciplinary or team service provision in order to meet the total needs of students and their families. It is easy to see, then, how participation in self-determination programming would be a natural “fit” for the profession of speech-language pathology. The exact role of the SLPs participation in such programs has yet to be defined, however. Only very limited contributions to the literature in this area by SLPs has been made and only limited familiarity with self-determination programming is reported by SLPs (Kleinert, 2004). The case can be made though, that SLPs may be especially well suited in fostering of self-determined behaviors in students with developmental disabilities. Much of the observable behavior related to self-determination such as, choice and decision making, self-assertion, self-evaluation, and planning requires a clear means of communication. While colleagues in special education and vocational rehabilitation may initiate the actual programmatic aspects of self-determination in their daily programs, the SLP, as well as other related service providers such as occupational and physical therapists, are needed to support and reinforce the skills necessary to evidence self-determination behaviors. In addition, we know that true interdisciplinary teams plan, support, and reinforce a core set of goals for a given student rather than focus on a single, narrow segment of behaviors. This study indicates that SLPs can support the practice of key self-determined behaviors without interfering with specific speech-language programming.

Future Research

This study was designed to determine if certain self-determination behaviors could be included and reinforced within speech-language intervention sessions without disrupting on-going instruction in language development. Results indicate that this can be done. Data from this particular study, however, were not collected regarding the possible acquisition of the self-determined behaviors that were reinforced within the SD condition. Future research should be conducted to determine if such skills can actually be taught or at least increased within speech-language intervention sessions, and to determine the most
efficient manner in which to include self-determination skills within an SLP program so that school-based SLPs are provided a model of effective intervention in this area.

In light of the possible trend for students to begin to self-correct earlier and more often in the SD condition, further research is clearly indicated in order to determine if there is a relationship between self-evaluation and self-correction of intervention targets; if self-evaluation can be taught incidentally during speech-language sessions; and if the inclusion of self-evaluation in a typical speech-language session does actually slow acquisition of the intervention target or if, as in Lucy’s case, the loss of efficiency under the SD condition as compared to the CD condition, is due to non-equivalent targets rather than a true difference between the two conditions.

It would be useful to replicate this study with students having other types of developmental disabilities and students of varying ages and completing the studies in their school setting, rather than in a clinic setting. This would offer greater opportunities especially for generalization probes across environments and individuals, as well as working with students in their more natural, daily environments. In light of the already overwhelming demands on public school SLPs, it will be important to have evidence of the effectiveness of incorporating elements of self-determination into existing language programs, and evidence which indicates that such programming additions do not impede the progress of students.

Indeed the areas of communication and self-determination offer a broad expanse of possibilities for future research in order to enhance the quality of life for persons with developmental disabilities. It is hoped that future research will focus on the blend of these two important elements in order to enhance the independence of persons with disabilities.

References


evaluation to improve the work productivity of trainees in a community-based restaurant training program. Education and Training in Mental Retardation and Developmental Disabilities, 33, 248–263.


Received: 6 December 2005
Initial Acceptance: 1 February 2006
Final Acceptance: 1 May 2006