

## Clinical Forum

# What Are Executive Functions and Self-Regulation and What Do They Have to Do With Language-Learning Disorders?

**Bonnie D. Singer**

Educational Enhancement Center, Newton, MA

**Anthony S. Bashir**

Emerson College, Boston, MA

W

ith writing and talking, too much information floods my mind at once. I don't know how to present it in a clear way. I especially have a hard time when I lose focus of what I want to say or when I lose my organization.... I often only "half bake" an argument. (George, age 16)

Like many students with developmental language disorders, George experiences problems with effective communication and performance in the classroom. George is frustrated by his difficulty communicating and is increasingly anxious about talking in class and dealing with new writing assignments. His teachers wonder whether he has mastered classroom content due to his difficulty

**ABSTRACT:** *In this article, executive functions and self-regulation are defined and the reciprocal influence of these factors on the performance of students with language-learning disorders (LLD) is explored. A case study demonstrates the integration of executive functions, self-regulation, and language processes within speech and language assessment and intervention. Clinicians are urged to consider the interactive effects of executive function, self-regulatory, and language processes when addressing the needs of students with LLD.*

**KEY WORDS:** *executive functions, self-regulation, language*

expressing what he knows and what he thinks. His classmates become impatient with him when he cannot express his ideas clearly. Although he maintains good friendships, he notes, "my friends just know that's how I am; they tolerate me." No single factor explains George's difficulty with communication and academic participation; a number of factors interact and constrain his performance. In addition to language production processes, these factors include executive function and self-regulatory processes.

The purpose of this article is to define our understanding of executive functions and self-regulation and their influence on the performance of students with language-learning disorders (LLD). We summarize an intervention approach based on our work with George, a high school student. In doing so, principles that integrate executive functions, self-regulation, and language into effective intervention are addressed.

## WHAT ARE EXECUTIVE FUNCTIONS AND SELF-REGULATION?

Although there are differences in the ways that the terms executive function and self-regulation are used, both are considered "meta" constructs. Aspects of executive functions and self-regulation overlap, yet these terms also refer to independent constructs (Borkowski & Burke, 1996).

For the purposes of this article, we make a distinction between these two terms, although we also recognize their interdependence.

## Executive Functions

Although executive functions are defined differently across disciplines, there are generally agreed on components. These include inhibiting actions, restraining and delaying responses, attending selectively, setting goals, planning, and organizing, as well as maintaining and shifting set. Most acknowledge the relationship between executive functions, attention, and working memory (e.g., Barkley, 1996, 1997; Esslinger, 1996; Pennington, Bennetto, McAleer, & Roberts, 1996).

Denckla argued that executive functions are control processes that overarch “all contexts and content domains” (Denckla & Reader, 1993, p. 433). Executive functions are reflected in such processes as developing plans for future actions, holding those plans and action sequences in working memory until they are executed, and inhibiting irrelevant actions (Pennington & Ozonoff, 1996). As such, executive functions are fundamental to setting and attaining future goals (e.g., performing complex motor acts, producing oral and written explanations, regulating affect, and controlling behavior). These are problem-solving processes that are invoked when tasks are nonautomatic and novel (Hayes, Gifford, & Ruckstuhl, 1996) and in the context of other prepotent, competitive responses (Pennington & Ozonoff). As used in this article, then, executive functions are the decision-making and planning processes that are invoked at the outset of a task and in the face of a novel challenge. At their fundamental level, they are directly involved with inhibition and working memory (Denckla, 1998). They are involved in defining the problem at hand, which requires that one stop to plan and analyze rather than act (Borkowski & Burke, 1996; Scholnick & Friedman, 1993). As such, executive functions are enlisted when setting goals that are consistent with one’s desires and with determining what is necessary for their attainment.

Different kinds of tasks place different demands on students for inhibition, reflection, planning, and organizing. Consider, for example, the following writing assignments: a diary or journal entry, a response to “what I did on my summer vacation,” an essay comparing and contrasting the early Jamestown settlements, and an analysis of F. Scott Fitzgerald and his era as reflected in *The Great Gatsby*. The student, whether communicating orally or in writing, needs to know how, when, where, and why to apply various amounts and kinds of control processes across these assignments. Moreover, the student also needs to realize when tasks do not require the application of conscious executive controls (Graham & Harris, 1997).

## Self-Regulation

Self-regulation is a term that is sometimes distinguished from and sometimes subsumed under the rubric of executive functions (Denckla, 1998; Denckla & Reader, 1993;

Hayes et al., 1996). The lines drawn between these two terms are often not clear. As used here, self-regulation refers to a set of behaviors that are used flexibly to guide, monitor, and direct the success of one’s performance. They are also used to manage and direct interactions within the learning environment in order to ensure success.

Self-regulation is co-constructed within social interactions and influenced in various settings by others’ attitudes and behaviors (Paris & Byrnes, 1989). Self-regulatory behaviors, then, are applied within specific settings when a student is engaged in task performance. Therefore, self-regulation is the result of the reciprocal influences of personal processes (e.g., perceptions of ability, self-motivation), the environment (e.g., task demands, encouragement from teachers), and one’s own behavior (e.g., performance outcomes) (Pintrich & DeGroot, 1990; Zimmerman, 1989). “Students can be described as self-regulated to the degree that they are metacognitively, motivationally, and behaviorally active participants in their own learning process” (Zimmerman, p. 329).

In response to personal goals, such as writing a term paper, arguing an opinion, or completing an assignment, individuals invoke specific self-regulatory processes and strategies to ensure their success (Zimmerman, 1989). Self-regulation includes three reciprocal subprocesses: self-observation (or self-monitoring), self-judgement (or self-evaluation), and self-reaction (or behavioral adjustment) (Bandura, 1986; Zimmerman). Each of these subprocesses is engaged in the act of self-reflection during task performance. “Reflection makes it possible for learners to utilize their metacognitive knowledge about task, self, and strategies during each stage of the regulatory (carryover) process: planning, monitoring, and evaluating” (Ertmer & Newby, 1996, p. 14).

Students are called on to self-regulate their behavior and learning throughout the school day. Self-regulation is seen in how students get ready for learning, stay engaged with tasks, and alter their approaches to problem-solving. Consequently, for the student, self-regulatory processes occur when strategies are used to guide and monitor one’s performance of a task (Zimmerman, 1986).

In summary, both executive functions and self-regulation are essential features of metacognition (Barkley, 1997). These processes emerge and are shaped across development (Denckla, 1998). Together, executive functions and self-regulatory processes are central to cognitive, linguistic, behavioral, and affective control—all of which are fundamental to learning and success in school.

---

## THE RELATIONSHIP BETWEEN EXECUTIVE FUNCTIONS, SELF-REGULATION, AND LANGUAGE

The importance of metacognition for academic success is well-established for typically achieving students as well as those with learning disabilities (Meltzer, 1993; Pressley & Woloshyn, 1995; Zimmerman, 1994). Yet, the important role that language plays in both executive function and

self-regulatory processes is not yet well-acknowledged or understood. Hayes et al. (1996) noted that executive functions are “all about the connection between human verbal abilities and actual behavioral regulation” (p. 300). Denckla (1996, 1998) also argued that language is enmeshed with executive control.

Metacognitive strategies, by and large, consist of routines that are mediated with language. In order to use metacognitive strategies effectively, students must learn to talk to themselves about what they are doing and how they are doing it. This special way of using talk to help one’s self is acquired through participation in a learning community in which instruction is scaffolded explicitly (Graham, 1998).

Vygotsky (1962) argued that speech plays a central role in the development of self-control, self-direction, problem-solving, and task performance. For Vygotsky, speech is learned in the course of social interaction, and becomes the medium for learning and knowing how to regulate one’s behavior. More recently, Wertsch (1998) argued that children appropriate language as a cultural tool that serves to mediate action. Once they have appropriated language, they use specialized verbal scripts to regulate their own thinking and guide their participation in the various learning and communication demands of school. In partnership with teachers and other students, children develop their ability to respond to different discourse styles and instructional demands (Bashir, Conte & Heerde, 1998). Thus, new ways of behaving and speaking are developed during the school years and provide the foundation for student participation in social and instructional discourse (Cazden, 1988; Tattershall & Creaghead, 1985).

The appropriation of language for controlling and guiding academic performance occurs through participation in context-specific scripts and conscious metacognitive routines. These scripts and routines develop over time and are shaped across different contexts and academic content experiences. Children learn to talk with each other, their teachers, and themselves. They make plans, discuss, evaluate ideas, participate in groups, reflect on their work, change their minds, and rewrite their papers. They remind themselves to finish their work on time, ask for help when they need it, wait to speak until they are called on, and go back to the library for more information. The successful completion of all of these actions is based on the development and use of language. In school, language becomes both the object of knowledge and the means through which knowledge is acquired (Cazden, 1973). Thus, within the early school years, and beyond the fourth grade in particular, the role of language becomes almost inextricably intertwined with executive function and self-regulatory processes.

---

## WHAT DO EXECUTIVE FUNCTIONS AND SELF-REGULATION HAVE TO DO WITH LANGUAGE LEARNING DISORDERS? A CASE STUDY

Clinicians and teachers need to realize that language deficits alone do not account for the range of difficulties

that students with a primary diagnosis of LLD encounter with language-based academic tasks. Language deficits are necessary but insufficient for explaining the academic success or failure of students with LLD. Students do not naturally bring to the learning process a sense of self-awareness, reflection, and task analysis that fosters an appreciation of what is needed to be successful within different academic contexts (Wong, 1994; Wong, Wong, & Blenkinsop, 1989). Consequently, the design of intervention requires the integration of both metacognitive and linguistic strategies. This integration is essential if the outcomes of therapy are to enhance students’ effectiveness with language and learning across a variety of academic settings.

We present here the case of George, a 16-year-old junior in high school. This case is used to demonstrate how executive functions, self-regulation, and language production are interrelated. We discuss the components of George’s intervention not as a recipe for language intervention, but as an argument for the need to address executive functions and self-regulation within a language intervention program. Additionally, we offer evidence that intervention focused at the metacognitive level can have a substantial influence on numerous levels of the productive language system.

### Assessment

Prior to our first meeting with George, he had been seen for speech-language evaluations at ages 5, 7, and 11 years. All of these assessments documented speech production that was characterized by sound sequencing difficulties, omission of sounds and syllables within words, and altered prosody. Test results also revealed word retrieval difficulties and problems related to producing complex syntactic structures. Despite these findings, no speech or language therapy was recommended.

George was referred to us at age 16 for treatment of his oral and written language problems subsequent to a psychoeducational evaluation. Results of that testing revealed a significant (52 point) discrepancy between verbal and nonverbal cognitive measures, as measured by the Wechsler Intelligence Scale for Children–III (WISC–III, Wechsler, 1991). Verbal skills were in the superior range (verbal IQ = 134, 99th percentile), and nonverbal skills were below normal limits (performance IQ = 82, 12th percentile). Academic abilities in all areas were above average, with the exception of written expression. George’s high verbal and low performance profile on the WISC–III was atypical of many students with language disorders. However, his high verbal score on the WISC–III did not preclude difficulties with language and communication, especially as they related to school performance and social interaction. Furthermore, the high score on the WISC–III verbal scale did not reflect George’s specific deficits in speech and language.

George presented to us with the same communicative profile as documented in three prior speech-language assessments (ages 5, 7, and 11). He had difficulty with speech production, word retrieval, and language formulation. Using an authentic assessment framework (Palincsar,

Brown, & Campione, 1994), we conducted in-depth interviews and analyzed language samples to determine the features of his problems with oral and written expression. Through extended conversation with George, we identified the settings (i.e., environment), context (i.e., discourse genre), and content (i.e., topic) variables that influenced his difficulty with verbal expression. Along with the findings of the psychoeducational assessment, our data analysis confirmed that George's communication and academic difficulties resulted from the interacting effects of linguistic, executive function, and self-regulatory processes. These findings are summarized briefly below.

**Speech and language.** George's communication was characterized by the presence of articulatory and prosodic disturbances and co-occurring language retrieval and formulation difficulties. His presenting communicative profile was similar to that associated with cluttering (Daly, 1993; St. Louis & Rustin, 1992). Planning disturbances were evident within multiple levels of George's speech and language production systems, including message generation as well as grammatical and phonological encoding (Levitt, 1989). George spoke in short bursts of very rapid speech, deleted syllables, and rarely finished a sentence before either rephrasing or abandoning it. His oral expression was difficult to follow not only because of reduced speech fluency (due to altered timing and reduced articulatory precision), but also because it was poorly structured from a discourse point of view.

George noted that he consistently had difficulty expressing himself orally, especially within his history class, wherein class discussion and debate predominated. He noted, "I have difficulty holding my own in an argument." This was true in spite of his extensive topical knowledge. He indicated that his classmates were often not able to understand points that he made, and that they frequently tried to speak for him or restate his remarks for the group. At times, their interpretations of what he had said did not match what he intended. Problems with conveying meaning and intention were evident with both oral and written language. George also had difficulty with planning, organization, thematic development, sentence structure, cohesion, and coherence in writing.

In sum, George experienced the greatest difficulty with oral and written tasks that placed demands on higher level formulation abilities, especially in such communication activities as open-ended discussion, argument, debate, and expository writing.

**Executive functions.** Results of psychoeducational testing revealed that George had exceptional reasoning abilities in both verbal and nonverbal realms, as evidenced by his performance on cognitive measures. Test results also revealed that George had marked difficulty with perceiving part-whole relationships. Tasks sensitive to executive dysfunction included the following: WISC-III (Wechsler, 1991), Rey Osterreith Complex Figure Drawing (Osterreith, 1944), Connors Continuous Performance Test (Connors, 1985), and Trailmaking A & B (Reitan & Wolfson, 1985). Unfortunately, test scores for each of these tasks were neither provided in the psychoeducational evaluation report nor available to us. However, the examiner noted in her

interpretation of these data that George's performance revealed a range of executive function deficits involving inhibition of response, control of impulsivity, maintenance of attentional set, generation of effective strategies, and adaptation of strategies in the face of failure.

In our interviews, George indicated, "I have trouble pretty consistently when I have to analyze or argue a position...It's hard starting." George also noted, "With writing and talking, too much information floods my mind at once. I don't know how to present it in a clear way...I often half bake an argument. My teachers tell me that I make leaps without providing enough details." Reflecting with George on his own insights, we determined together the functional implications of his difficulty planning, organizing, initiating, and sustaining a focus while he spoke and while he wrote. We pursued each of these and determined their components. For example, George's problems with initiation were related to a number of different factors, including problems with setting goals, knowing how and where to start, managing task-induced anxiety, and responding to an open-ended assignment or question.

**Self-regulation.** George reported specific difficulty developing arguments and holding his ground when arguing a point of view. This was especially problematic in history and English literature classes. George stated, "I have trouble expressing the answer...I have trouble expressing the idea...I feel a block somewhere." He added, "I try to do outlines sometimes. It doesn't work...Talking doesn't help because people don't help me focus." George clearly conveyed an awareness of his problem and attempted to use strategies to address his difficulty, but could not develop effective regulatory approaches for language production.

George's past experiences with meeting the verbal demands of his history and English classes caused him to doubt his ability to express himself clearly and effectively. Although he continued to speak up in these classes (he was passionate about the academic content), each experience of failure reinforced a sense of self-doubt and lowered his self-efficacy. He noted, "Other people usually articulate my point better than I do." In pursuing comments such as these, we recognized the interdependence of self-regulatory and language production processes and their cumulative effects on self-perception.

Table 1 presents a transcript of George's oral language at the outset of therapy, where he is explaining to us the comments he typically gets from his teachers about his writing. Although articulatory and prosodic features are not represented, the transcript portrays the difficulty George experienced with expression. This difficulty stemmed from a reduced ability to plan and organize his thoughts, formulate language, and regulate his communication effectively.

---

## INTERVENTION

The general approach to our intervention combined metacognitive and speech-language instructional strategies that have been empirically validated within authentic learning contexts (Graham, 1998; Harris & Graham, 1996;

**Table 1. Transcript of George's baseline oral language sample. His response is to the question, "What kind of feedback do your teachers tend to give you about your writing?"**

---

*George:* See, that's the thing is – I don't know my English teacher – I do really well most of the time. I mean there are times where I didn't do well and definitely situations in my history, but in my history I usually do really well on my papers. And then she'd have couple comments, but this wouldn't really cause a problem. And in English there's sometimes, say that. Like my English teacher will sometimes, like. I got a paper back and it was a good grade for, I mean this year, it was like "good job". And then there would be comments. It seems like a lot of her comments, not on all of my papers, but on comments that she thought – on papers that she thought were OK – papers she thought were bad then these would come up. Papers she thought were OK, most of the comments are within the margins and not really sss – do you know what I'm saying?

*Clinician:* They're not about a specific thing in the writing?

*George:* They're more about specifics than about. They are about specifics.

*Clinician:* They're about specific things in the text?

*George:* In the writing, yeah.

*Clinician:* In the words — in the grammar, not about what you said?

*George:* Yeah. It seems like. Not just that, but it's not like, even at the end she doesn't say, "Your organization needs." I don't know.

---

Meltzer et al., 1996; Paris & Byrnes, 1989; Pressley & Woloshyn, 1995). Dialogue and discussion were both the object and the medium of our intervention. We posed questions to foster self-reflection and the use of executive and regulatory behaviors (e.g., What is the nature of the problem you are having right now? Where are you going with this argument? What are your options? How did you feel you did with that explanation?).

In addition, we taught George to use self-talk as a way to analyze, plan, organize, and regulate his communication (e.g., What do I want to say? How should I organize it? I'm going too fast; slow down. I'm getting lost; what am I trying to say?). We also taught George specific strategies for controlling his speech and language production. For example, we introduced speaking rate control strategies (Daly, 1993), reflective pausing (German, 1993), and graphic organizers (Hyerle, 1996; Merrit, Culatta, & Trostle, 1998). We provided an explanation of what each strategy was (what it was designed to do), how it could be used (its purpose), and when and where it would be most beneficial (settings, contexts, and content). Our intervention goals were for George to understand the multiple, interacting factors that caused him difficulty, to develop a reflective stance about his communication, to understand how to plan and organize his discourse efficiently, and to regulate his oral and written language production effectively.

Some of the strategies that we introduced to George were domain specific (e.g., specific to speech production only), and some of them were intended to effect change across executive function, self-regulation, speech, and language domains. Because of the reciprocal relationship

between executive, self-regulatory, and linguistic processes, it is difficult to neatly define the aspects of our intervention that were specific to each of these areas. We attempt to delineate these parameters of our intervention here, but caution the reader to recognize that these parameters are highly interrelated.

## Executive Functions

George often began to speak without first identifying what he wanted to say, and began to write without first identifying the focus and structure of his paper. Barkley (1996) noted that delaying a response to an event or message allows one to engage executive processes, thereby evaluating one's behavior and substituting a more adaptive response. We taught George to inhibit his immediate response, thereby allowing him to take time to analyze and set goals, as well as to plan and develop an organized approach for his communication.

We introduced George to Hyerle's (1996) thinking maps, which are visual graphics that depict the structure of a variety of different discourse genres. These graphics constituted a visual strategy for planning and organizing discourse, and illuminating part-whole relationships, such as the relationship of details to the main ideas. Using these maps, we helped George to recognize the organizing principles underlying a variety of discourse schemas and written genres (e.g., cause/effect, description, classification, sequence). George used pause time before he began to speak to reflect on his communication goals and to select an appropriate schema for his expression. We suggested that he visualize the discourse map during pause times and refer to that image as a guide for planning, organizing, and monitoring his discourse.

School writing assignments were also used as the context for teaching George to apply executive controls by inhibiting his response to the writing assignment, analyzing what was being asked of him, and planning his approach. George actively identified key words in the assignment that signaled the genre and nature of his task. He then selected appropriate graphics to assist with planning and organizing a draft of the paper.

## Self-Regulation

Our intervention was designed to foster a more self-regulated approach to oral and written communication. Strategies for speaking and writing were highly coordinated, and promoted the reciprocal interaction of three self-regulation subprocesses: self-observation, self-judgement, and self-reaction (Zimmerman, 1989). By learning to recognize the feelings that he experienced in the face of ineffective verbal expression (e.g., anxiety, increased speaking pitch, louder volume, scattered thinking, groping for ideas), George began to recognize when he needed to employ specific strategies. For example, strategies included parse ideas, pause for self-reflection, self-evaluation and planning, use complete sentences, or select an appropriate organizational strategy for the discourse.

Awareness permitted George to self-apply strategies that would allow him to move into a problem-solving stance and select (consciously) behaviors that would resolve the immediate problem effectively. For example, by using the strategies of slowing down and pausing, George created time for reflection. Pausing for reflection afforded him time to access a discourse schema, monitor the content of what he had said so far, take note of his listener, plan what to say next, and formulate the next utterance. Also, pause time allowed him to judge whether he was off course and decide how he might craft his expression more precisely. We encouraged George to be flexible in applying strategies. Flexibility meant that George should base his selection of appropriate strategies on situational demands and his experience as a speaker at any given time.

## Speech and Language

George presented with speech production problems due to articulatory imprecision, rapid speaking rate, and altered prosody. Therapeutic techniques were used to improve the rate, timing, articulatory precision, prosodic features, and intelligibility of George's speech production (Daly, 1993). These techniques were integrated with approaches to enhance self-regulation and reflection.

George's verbal expression was notable for a high proportion of mazes, which are false starts, repetitions, and reformations that occur when the oncoming spoken idea is undeveloped, uncertain, or complicated, or the speaker is having difficulty retrieving a word (Leadholm & Miller, 1992). George experienced difficulty with word retrieval as well as with planning and organizing what to say. Both of these factors interfered with the speed and economy of his verbal expression. By learning to parse his communication into phrase and sentence size "chunks," George was able to regulate the grammatical structure of what he was saying and afford himself more time to retrieve relevant vocabulary, using active word retrieval cues as necessary (e.g., see German, 1993). Concurrently, he was encouraged to use mental representations of the thinking maps (Hyerle, 1996) to assist with planning each utterance with an appreciation of the overall goal and structure of his discourse. George was also taught to use self-questioning strategies as a means for focusing what he wanted to say, evaluating how well he had said it, and making necessary adjustments. If he was aware that what he said was not what he meant or that the organization of his discourse was unclear, he was instructed to provide overt revisions that allowed the listener to follow his train of thought (e.g., "That's not what I mean. What I really mean is..."). In sum, our aim was to provide George with a set of strategies and therapeutic techniques for facilitating speech production that were designed to affect executive functions, self-regulation, and language reciprocally.

## Outcomes

George was quite capable of learning to be more reflective; thus, his ability to be more self-regulated

progressed rapidly. He readily applied speaking strategies within higher level discourse contexts. By the end of the school year, he was regularly experiencing success with oral and written expression in both history and English, contexts that had been most difficult for him initially. His use of targeted speaking strategies had also generalized across all speaking contexts. Distant relatives (who had not known he was receiving intervention) commented on his improved ability to converse on the telephone. Family members and friends also noticed changes in his speech. George's expression was relaxed, fluent, organized, coherent, and intelligible. Near the end of the school year, George took the advanced placement achievement test in history, wherein he had to write three essays in 60 minutes. He achieved the highest score possible on his essays. Having met his therapy goals, George was discharged from intervention.

We heard from George again 3 months later because he was anxious about upcoming college interviews and wanted a refresher. George had maintained his earlier progress through the summer months. Table 2 includes a transcript of his response within a mock college interview; he is responding to the question, "Why do you want to come to X College?" George's speaking pace was slow, clear, and well-paced. His vocal volume and pitch were well-modulated. Moreover, his verbal organization and formulation were much more fluent and coherent than they had been when he started treatment.

Our role as clinicians was to reframe George's understanding of his problem by helping him to understand it as

**Table 2. Transcript of George's oral expression, posttreatment. His response is to the question, "What is it that attracted you to X college?"**

---

Well there's the honor code, but there are also other parts of X that I like. I like the idea that it's near a city. (It's right outside Philadelphia.) And I think that's important because I like what the city has to offer – the cultural aspects of the city. If I do want to get involved in something political, I have the city venue to use – maybe go in there once a month to work.

I also think that there's interesting museums and interesting sights of Philadelphia that I've never seen. And another part is I want to, it's nice to be in another part of the country. I've lived in San Francisco and I've lived outside Boston, but I've never really lived in the mid-Atlantic region or near Philadelphia.

Also what I like about X is the size. I feel that I want to know my classmates well and, with it only being 1200 people, I feel that I'll be able to make long-lasting friendships and that I'll be part of a community. It's kind of what I was talking about with the honor code – that there's really a strong sense of community, which I think is important because I don't want to be lost at a university.

Also I think size is important because I want to have a close relationship with my professors and really understand what they're trying to teach me and make sure I understand – make sure that they understand what I want to learn. And that we have a give and take environment where they help me learn and I am able to get that from them. And that they are open to hearing what I have to say.

---

the cumulative effect of a number of factors. Our intervention did not address the use of cohesive ties or grammatical structure directly. Yet, by strengthening executive functions and George's ability to self-regulate, these aspects of his oral language improved considerably. Gradually, we moved him from reflecting on himself and his problem to reflecting on what strategies were called for in any given situation and whether and how they helped him. In addition, we enabled this shift by providing specific feedback about his behavior, supporting him to gradually use learned strategies in safe settings, and addressing his feelings about himself and his effectiveness as a communicator. We concur with Ertmer and Ertmer (1998), who stated, "Without reflection, learners may fail to transfer metacognitive knowledge and strategies for improvement to new situations and tasks" (p. 74). By learning to recognize *when* he was in trouble, and also understand *why* and what he might *do* about it, we fostered the use of more effective executive routines, provided George with a more self-regulated approach to communication, and facilitated a shift in his self-efficacy. As he experienced our belief that he could be a successful communicator and began to encounter success, he began to change his mind about himself. George shifted from believing that he was unable to speak or write coherently to viewing himself as a speaker who could "think on his feet" in class and as a writer who was able to develop an organized and supported argument.

In our final session with George, he reported that he no longer had to consciously apply the speaking strategies that we taught him; they were now automatically invoked whenever he spoke. George noted,

The truth is that it's mainly become subconscious. And I don't really think about what I'm doing and how I'm doing it. But I realize that I am able to get my point across easier and able to process the information that I want to give out easier and that I'm more coherent. Really I don't think about how I'm doing what I'm doing. I know I used to be more conscious of it. But now when I raise my hand in history class [what we did last year] doesn't go through my mind at all. But at the same time I know that there has been a difference and I'm able to say what I want to say effectively.

## SOME PRINCIPLES OF INTERVENTION

The intervention approach presented here was highly effective with this high school student who had superior cognitive abilities within the verbal domain. George's unusually high cognitive abilities may have facilitated the rate of response to intervention. However, for these methods to be effective, high cognitive abilities are not essential. We have also had success using these approaches with elementary- to high school-age students with low average to average cognitive abilities and a variety of language and learning disorders. Additionally, similar approaches have been effective for addressing the oral and written language needs of students in third grade and above.

What have we learned from working with George and other students like him? The following principles capture our experience and reflect best practices in the literature, much of which has been cited.

## Getting Started

- Understand a student's abilities and needs using the results of standardized tests; a picture of strengths and needs is fundamental to designing sound language intervention programs.
- Conduct a careful student interview to reveal the specific problems the student encounters with communication and academic performance. Formulate, confirm, and refine hypotheses about the presenting problems with the student.
- Use information obtained from formal and informal assessments to help the student acknowledge the influence of different settings, contexts, and content demands on performance.
- Clarify for the student the insights derived from integrating interview and assessment data. Discuss strengths and needs in different domains (e.g., communication, language, executive functions, self-regulation, and cognitive), and set relevant intervention goals.
- Assist the student with recognizing how intervention processes will enhance his or her day-to-day performance. Have the student commit to achieving intervention goals.

## Establishing an Intervention Framework

- Promote an understanding of the processes involved in oral and written language, guide the flexible use of strategies to facilitate academic and communicative performance, and create new habits of communication, thinking, and problem-solving that promote independence.
- Base intervention on dialogic and interactive teaching approaches that serve to help students understand and develop active problem-solving through self-reflection (self-monitoring, self-evaluation, and behavioral adjustment).
- Address the language underpinnings of metacognitive functioning and support the development and appropriation of language for verbal mediation and regulation of behavior.
- Address issues of self-efficacy and motivation directly by helping students to understand their current problems with learning, know what they can do to alleviate their problems, and realize their developing capacity to control their performance and their learning environments.

## Components of Intervention

- Design intervention goals that address the linguistic, executive, self-regulatory, and strategic learning needs of students explicitly and systematically.
- Avoid decontextualized interventions. Goals of intervention are not isolated from the day-to-day

demands for communication and learning that students encounter.

- Assist students with understanding where, when, why, and how to use context-specific strategies that can be applied across social and curriculum content areas as well as spoken and written language systems. Teach students to recognize when tasks require mindful use of executive functions and self-regulating behaviors.
- Support students to take risks in order to become effective communicators and learners, and help them adapt strategies to fit their own styles and needs.
- Provide frequent and systematic conferencing with students in order to help them realistically appraise their academic and personal growth, and set goals accordingly.

## SUMMARY

Language disorders alone are insufficient for explaining the oral and written language performance problems of students with LLD. The influence of executive functions and self-regulatory processes on language production are multiple and must be accounted for in speech-language assessments and interventions. Interventions that address the reciprocal influences of executive function, self-regulatory, and language processes are essential if students with LLD are to realize success and independent functioning within academic and social settings.

## ACKNOWLEDGMENTS

We are grateful to Penny Prather for her helpful suggestions. We also express our appreciation to our reviewers, whose insights guided the final preparation of this manuscript.

## REFERENCES

- Bandura, A.** (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Barkley, R. A.** (1996). Linkages between attention and executive functions. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 307–325). Baltimore, MD: Paul Brookes.
- Barkley, R. A.** (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin*, *121*, 65–94.
- Bashir, A. S., Conte, B. M., & Heerde, S. M.** (1998). Language and school success: Collaborative challenges and choices. In D. D. Merritt & B. Culatta (Eds.), *Language intervention in the classroom* (pp. 1–36). San Diego, CA: Singular Publishing Group.
- Borkowski, J. G., & Burke, J. E.** (1996). Theories, models, and measurements of executive functioning: An information processing perspective. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 235–261). Baltimore, MD: Paul Brookes.
- Cazden, C. B.** (1973). Problems for education: Language as curriculum and learning environment. *Daedalus*, *102*, 135–148.
- Cazden, C. B.** (1988). *Classroom discourse: The language of teaching and learning*. Portsmouth, NH: Heinemann.
- Connors, C. K.** (1985). The computerized continuous performance test. *Psychopharmacology Bulletin*, *21*, 891–892.
- Daly, D. A.** (1993). Cluttering: Another fluency syndrome. In R. Curlee (Ed.), *Stuttering and related disorders of fluency* (pp. 179–204). New York: Thieme Medical Publishers.
- Denckla, M. B.** (1996). A theory and model of executive function: A neuropsychological perspective. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 263–278). Baltimore, MD: Paul Brookes.
- Denckla, M. B.** (1998, November). Understanding the role of executive function in language, academics, and daily life. Paper presented at American International College, Springfield, MA.
- Denckla, M. B., & Reader, M. J.** (1993). Education and psychosocial interventions: Executive dysfunction and its consequences. In R. Kurlan (Ed.), *Handbook of Tourette's Syndrome and related tic and behavioral disorders* (pp. 431–451). New York: Marcel Dekker.
- Ertmer, D. J., & Ertmer, P. A.** (1998). Constructivist strategies in phonological intervention: Facilitating self-regulation for carryover. *Language, Speech, and Hearing Services in Schools*, *29*, 67–75.
- Ertmer, D. J., & Newby, T. J.** (1996). The expert learner: Strategic, self-regulated, and reflective. *Instructional Science*, *24*, 1–24.
- Esslinger, P. J.** (1996). Conceptualizing, describing, and measuring components of executive function: A summary. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 367–395). Baltimore, MD: Paul Brookes.
- German, D.** (1993). *Word Finding Intervention Program*. Austin, TX: Pro-Ed.
- Graham, S.** (1998, November). *The ABCs of writing: Making the writing process work*. Paper presented at the Annual Meeting of the American Speech-Language-Hearing Association, San Antonio, TX.
- Graham, S., & Harris, K. R.** (1989). Components analysis of cognitive strategy instruction: Effects on learning disabled students' compositions and self-efficacy. *Journal of Educational Psychology*, *81*, 353–361.
- Graham, S., & Harris, K. R.** (1997). Self-regulation and writing: Where do we go from here? *Contemporary Educational Psychology*, *22*, 102–114.
- Harris, K. R., & Graham, S.** (1996). *Making the writing process work: Strategies for composition and self-regulation*. Cambridge, MA: Brookline Books.
- Hayes, S. C., Gifford, E. V., & Ruckstuhl, L. E.** (1996). Relational frame theory and executive function. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 279–305). Baltimore, MD: Paul H. Brookes.
- Hyerle, D.** (1996). *Visual tools for constructing knowledge*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Leadholm, B. J., & Miller, J. F.** (1992). *Language sample analysis: The Wisconsin guide*. Milwaukee, WI: Wisconsin Department of Public Instruction.
- Levelt, W. J. M.** (1989). *Speaking: From intention to articulation*. Cambridge, MA: MIT Press.



- Meltzer, L. J.** (1993). Strategy use in students with learning disabilities: The challenge of assessment. In L. J. Meltzer (Ed.), *Strategy assessment and instruction for students with learning disabilities: From theory to practice* (pp. 93–136). Austin, TX: Pro-Ed.
- Meltzer, L. J., Roditi, B., Haynes, D., Biddle, K., Paster, M., & Taybor, S.** (1996). *Strategies for success: Classroom teaching techniques for students with learning problems*. Austin, TX: Pro-Ed.
- Merritt, D. D., Culatta, B., & Trostle, S.** (1998). Narratives: Implementing a discourse framework. In D. Merritt & B. Culatta (Eds.), *Language intervention in the classroom* (pp. 277–330). San Diego, CA: Singular Publishing Group.
- Osterrieth, P. A.** (1944). Le test de copie d'une figure complexe; contribution à l'étude de la perception et de la mémoire [A test of copying a complex figure: Contributions to the study of perception and memory]. *Archives de Psychologie [Archives of Psychology]*, *30*, 286–356.
- Palincsar, A. S., Brown, A. L., & Campione, J. C.** (1994). Models and practices of dynamic assessment. In G. P. Wallach & K. G. Butler (Eds.), *Language learning disabilities in school-age children and adolescents: Some principles and applications* (pp. 132–144). New York: Macmillan.
- Paris, S. G., & Byrnes, J. P.** (1989). The constructivist approach to self-regulation and learning in the classroom. In B. J. Zimmerman & D. H. Schunck (Eds.), *Self-regulated learning and academic achievement: Theory, research, and practice* (pp. 169–200). New York: Springer-Verlag.
- Pennington, B. F., Bennetto, L., McAleer, O., & Roberts, R. J.** (1996). Executive functions and working memory: Theoretical and measurement issues. In G. R. Lyon & N. A. Krasnegor (Eds.), *Attention, memory, and executive function* (pp. 327–348). Baltimore, MD: Paul Brookes.
- Pennington, B. F., & Ozonoff, S.** (1996). Executive functions and developmental psychopathology. *Journal of Child Psychology and Psychiatry*, *37*, 51–87.
- Pintrich, P. R., & DeGroot, E. V.** (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, *82*, 33–40.
- Pressley, M., & Woloshyn, V.** (1995). *Cognitive strategy instruction that really improves children's academic performance*. Cambridge, MA: Brookline Books.
- Reitan, R. M., & Wolfson, D.** (1985). *The Halstead-Reitan Neuropsychological Test Battery*. Tucson, AZ: Neuropsychology Press.
- Scholnick, E. K., & Friedman, S. L.** (1993). Planning in context: Developmental and situational characteristics. *International Journal of Behavioral Development*, *16*, 145–167.
- St. Louis, K. O., & Rustin, L.** (1992). Professional awareness of cluttering. In F. L. Myers & K. O. St. Louis (Eds.), *Cluttering: Clinical perspective* (pp. 23–35). Kibworth, England: Far Communications, Ltd.
- Tattershall, S., & Creaghead, N.** (1985). A comparison of communication at home and school. In D. W. Ripich & F. M. Spinelli (Eds.), *School discourse problems* (pp. 53–76). San Diego, CA: College-Hill Press.
- Vygotsky, L.** (1962). *Thought and language*. Cambridge, MA: MIT Press.
- Wechsler, D.** (1991). *Wechsler Intelligence Scale for Children—III*. San Antonio, TX: Psychological Corp.
- Wertsch, J. V.** (1998). *Mind as action*. New York: Oxford University Press.
- Wong, B. L.** (1994). Instructional parameters promoting transfer of learned strategies in students with learning disabilities. *Learning Disability Quarterly*, *17*, 110–120.
- Wong, B. L., Wong, R., & Blenkinsop, J.** (1989). Cognitive and metacognitive aspects of learning disabled adolescents' composing problems. *Learning Disability Quarterly*, *12*, 300–322.
- Zimmerman, B. J.** (1986). Development of self-regulated learning: What are the key subprocesses? *Contemporary Educational Psychology*, *16*, 307–313.
- Zimmerman, B. J.** (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, *81*, 329–339.
- Zimmerman, B. J.** (1994). Dimensions of academic self-regulation: A conceptual framework for education. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance* (pp. 3–21). Hillsdale, NJ: Lawrence Erlbaum.

Received September 21, 1998

Accepted April 5, 1999

Contact author: Bonnie D. Singer, PhD, Educational Enhancement Center, 23 Pleasant Street, Newton Center, MA 02459. Email: bsinger@ziplink.net